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Takeover Trading Strategies

Is Risk Arbitrage and Reverse Risk Arbitrage Profitable in Europe?

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Abstract: This thesis examines the profitability of passive Risk Arbitrage and semi-active Reverse Risk Arbitrage strategies on a sample of 212 cash takeovers in the European market from June 1997 to December 2005. Benchmarking the risk arbitrage portfolios against the CAPM, we find that risk arbitrage generates significant monthly abnormal returns ranging from 2.27% to 3.24%. Moreover, we find that risk arbitrage portfolios in Europe constructed based on an expected return model developed by Wang, J. (2009), improves the performance of the strategy. Contrary to our expectations, our results show that reverse risk arbitrage strategies based on 1) an adjusted expected return model and 2) target resistance as predictor for takeover failure, are not profitable in Europe.

Keywords: risk arbitrage, merger arbitrage, reverse risk arbitrage, chinesing, takeover, takeover prediction

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1. Introduction

1.1. Background and Purpose

There are several ways for companies to expand their business. One way is through mergers and acquisitions. Typically, this process is initiated when a prospective buyer, the acquirer company, places a bid on a possible seller, the target company. In order to persuade managers and owners of the target to approve the acquisition, the price offered by the acquirer for the target is usually higher than the market price of the target. Usually this pricing difference persists and the shares of the target trade at a discount relative to the offer price. This creates an opportunity for investors to speculate on the outcome of the deal.

There are mainly two methods of payment in mergers and acquisitions: stock or cash. To exploit this pricing anomaly in a cash deal, the investor goes long the target, whilst in a stock deal the investor will simultaneously acquire long and short positions in the shares of both companies involved in the takeover. This strategy is called risk arbitrage.

Far from all merger and acquisition attempts are, however, successful. Common reasons for deal failures are the target company's board of directors rejecting the offer or regulators disapproving the takeover due to antitrust issues. If it is probable that the takeover will fail, an investor can instead take the opposite position of risk arbitrage, speculating that the takeover attempt will fail. This strategy is called reverse risk arbitrage and can be useful in economic downturns or when an increasing amount of capital is put into risk arbitrage. (Ineichen, 2002), (Branch & Yang, 2003). We use *takeover trading strategies* as a collective term for risk arbitrage and reverse risk arbitrage. For investors using these strategies, we will use the term *takeover traders*.

Previously conducted studies show that risk arbitrage generates significant monthly abnormal returns. Evidently, risk arbitrage is very profitable and it is today one of the core strategies used by hedge funds and proprietary trading desks within investment banks. (Cornelli & Li, 2002)

Despite the increased popularity of risk arbitrage among investors, much remains unknown about the process and returns of reverse risk arbitrage. To date, there has not been any extensive study examining reverse risk arbitrage and comparing it with risk arbitrage. This is very puzzling as a survey of risk arbitrage practitioners shows that 95.24 percent also use a reverse risk arbitrage strategy. (Moore, Lai, & Oppenheimer, 2006)

The purpose of this thesis is to examine and compare the returns of risk arbitrage and reverse risk arbitrage in Europe. Previous studies conducted in Australia, China, Emerging Markets, Sweden, the United Kingdom and the United States have shown that risk arbitrage is a very profitable strategy. But as of yet, to our knowledge, there has not been any study of the profitability of risk arbitrage in Europe as a whole. This is of utmost interest since Europe has its own unique history, culture and institutional context. Furthermore, this is the first extensive study comparing the returns of risk arbitrage and reverse risk arbitrage.

We will outline the conditions to maximize the returns from takeover trading strategies. Our thesis will also examine the role of how a takeover trading deal prediction model can enhance the returns of takeover trading strategies. A model predicting the outcome of a takeover attempt can be used to build takeover trading strategy platforms.

With the first thesis in this subject matter, we hope to raise the interest of takeover trading strategies among students in business and economics and provide them with a clearer picture of what risk arbitrage and reverse risk arbitrage are. We believe that this is of great interest as many of these students will continue their professional careers within finance.

We hope to contribute to previous research in the field of risk arbitrage and shed light on important questions for hedge funds and other investors that use these strategies. We believe that investment bankers, especially within mergers and acquisitions, may find this study useful as we will examine why a takeover attempt may be unsuccessful.

2. Theoretical Framework

2.1. Mergers and Acquisitions

Mergers and acquisitions are part of the market for corporate control. (Berk & DeMarzo, 2008) The difference between a merger and an acquisition is that a merger refers to the combining of two companies of relatively equal size while an acquisition refers to when a larger company acquires a smaller company. Takeover is sometimes used as a collective term for both mergers and acquisitions.

Mergers and acquisitions occur in waves and peak in times of economic expansion and correlates with bull markets. (Berk & DeMarzo, 2008) (Sudarsanam, 2003) The reason why companies participate in mergers and acquisitions in the first place is to take advantage of synergies. Synergies usually fall into two categories: cost reduction and revenue enhancements. Examples of such synergies are economies of scale, economies of scope, vertical integration, monopoly gains, efficiency gains and diversification. (Berk & DeMarzo, 2008) (Naheta, 2004) When two companies in the same industry merge, revenues usually decline as the two businesses overlap. However, both companies still consummate the merger in hope of that cost savings is able to compensate for the decline in revenue. (Wang J. J., 2005).

2.2. Short Selling in a Takeover Trading Strategy Context

Acquiring a long position or going long in a security implies that the holder of the security owns it and will profit it its price increases. In contrast, short selling, also known as shorting or going short, is when an investor sells a borrowed security with the intention of buying back an identical security later and returning it to the lender. The investor does this in the belief that the price of the security will fall between the sale and the repurchase. If it does, the investor will pocket the difference as a profit. Absent earning interest rate on short sale proceeds, the short position is exactly the reverse of the cash flows received if entering a long position. (Berk & DeMarzo, 2008) If a risk arbitrageur believes that a bid will be withdrawn or that the offer price will be revised downwards, short selling creates an opportunity to profit from the overpricing of the target company. By acquiring a short position, it is possible to exploit the arbitrage opportunity that an overpriced security gives.

Short selling is a controversial issue and is banned in many countries by regulators. (Bris, Goetzmann, & Zhu, 2003; Charoenrook & Daouk, 2005) Critics argue that it causes high volatility, panic selling and market crashes. Others argue that short selling enhances information flow, improves risk sharing and increases liquidity. (Charoenrook & Daouk, 2005) Nevertheless, the general academic standpoint is that short selling enhances market efficiency by correcting deviations in prices from fundamental values. (Diether, Lee, & Werner, 2007) Dechow et. al. (2000) found that short sellers are successfully able to identify overpriced securities and hence earning abnormal returns.

A full overview of short selling legality and feasibility in our sample countries is displayed in Appendix 1.

2.3. Risk Arbitrage

Risk arbitrage, also known as merger arbitrage, is an event driven investment strategy that seeks to exploit inefficiencies in the pricing of the target company's shares. As mentioned above, when an acquirer places a bid on a target the bid is usually higher than the market capitalization of the target. The percentage difference between the offer price and the target stocks market price is called the bid premium. On average, the bid premium is 38 percent above the pre-announcement market price of the target. (Berk & DeMarzo, 2008)

Once the acquirer company announces its bid on the target company, the target's share price rises by 16 percent on average. (Berk & DeMarzo, 2008) However, uncertainty about whether the takeover will succeed prevents the market price from converging to the offer price. The percentage difference between the offer price and the post-announcement market price is called the arbitrage spread. Investors known as risk arbitrageurs believe that they can predict the outcome of a deal and will try to capture the spread between the current market price and the price to which it will appreciate if the takeover is successful. (Berk & DeMarzo, 2008)

In order to realize the arbitrage spread, the risk arbitrageur will buy the target's stock in a takeover where the payment method is cash. In a deal where the payment method is in stocks, a stock swap, the risk arbitrageur will acquire a long position in the target and a short position in the acquirer. The short position in the acquirer is a hedge and makes it possible for the risk arbitrageur to only speculate on the outcome of the deal. If the takeover is successful, the risk

arbitrageur will capture the arbitrage spread between the offer price and the post-announcement market price of the target company.

The practicalities of risk arbitrage differ depending on the acquirer company's choice of payment for the target. As mentioned in the introduction there are mainly two methods of payment: stock or cash. In a stock swap deal, the acquirer offers to swap stock in the target company for stock in the acquirer company. In this case, the risk arbitrageur will long the stock of the target and short the stock of the acquirer. In a cash deal, the risk arbitrageur will capture the arbitrage spread simply by longing the stock in the target. This can easiest be illustrated with an example from our data sample:

On November 26th 2002, the Italian Oil and Gas company, ENI (Ente Nazionale Idrocarburi) placed a bid on rival Italgas. The bid was a cash offer for 56 percent of the shares; prior to the bid ENI owned 44 percent of Italgas. The offer price was €13 per share, representing a bid premium of approximately 15 percent. On January 28th 2003, ENI announced that it had increased its total stake in Italgas to 98.3 percent. On March 25th, ENI announced it had acquired the remaining shares in Italgas following the completion of the mandatory squeeze out bid and Italgas was delisted.

In this scenario, the risk arbitrageur would acquire a long position in the target company to be able to profit from an eventual spread between the offer price and the target's share price. Thus, he or she makes the assessment that the takeover will succeed and the target's share price will converge to the offer price. Suppose the risk arbitrageur would have purchased the target shares which were trading at €12.82 per share on November 28th, two days after the announcement, and held them until the completion date. The risk arbitrageur would capture an arbitrage spread of (13 / 12.82) - 1= 1.4 percent. By holding the shares until completion, January 27th, the risk arbitrageur would realize an annualized return of 12.7 percent.

Previous Research Summary: Risk Arbitrage Abnormal Returns

Table 1.

Studies	Market	Sample Payment Method	Monthly Abnormal Return(α)
Mitchell and Pulvino (2001)	U.S	cash and stock	**0,29%**
Baker and Savasoglu (2002)	U.S	cash and stock	**0,84%**
Maheswaran and Yeoh (2005)	Australia	cash	**1,14%**
Branch and Yang (2006)	U.S	cash	**1,50%**
Ercan and Bharucha (2007)	Sweden	cash	**0,21%**
Sudarsaman and Nguyen (2008)	U.K	cash and stock	**0,64%**

In these portfolios risk arbitrage positions have been set up for ***all*** takeover attempts, without making a difference between deals that are probable to succeed or fail. For this kind of portfolios we use the term *passive strategy*.

Although the table displays the abnormal returns of this strategy, risk arbitrage is not arbitrage in the true sense of the word. As a matter of fact, the strategy is very risky. The risk in risk arbitrage is that the deal fails or is revised downwards. The principal risk is thus deal risk and deal risk is nonsystematic risk. The positions of risk arbitrage are considered to be uncorrelated to the overall market direction. However, Mitchell and Pulvino (2001) found that takeovers are more probable to fail in the event of an economic downturn.

Risk arbitrageurs differ according to the degree to which they are willing to take on a deal risk. Where antitrust issues are involved, this risk is often related to regulatory decisions. In other cases, as was predominant in the late 1980s, financing risk was the major concern to arbitrageurs. Most managers invest only in announced transactions, whereas a few are likely to enter positions with higher deal risk and wider spreads based on rumors or speculation. (Ineichen, 2002)

2.4. Reverse Risk Arbitrage

The increased popularity of risk arbitrage is not necessarily positive from the perspective of an investor. The standard theory in finance is that inefficiencies disappear if more capital is chasing the same inefficiency. (Bodie et al. 2008) As more capital is put into risk arbitrage hedge funds, the stock prices of the target companies will increase and as a result the spreads that can be captured by risk arbitrageurs will narrow. Thus, the increasing popularity of risk arbitrage will lead to lower abnormal returns. In accordance with this, Cornelli and Li (2002) have found that arbitrage spreads have narrowed over time as an increased number of investors have become aware of the profitability of risk arbitrage.

It is often overlooked that an increasing amount of capital chasing inefficiency can create inefficiencies in itself. We want to investigate if this is the case with risk arbitrage. Ineichen (2002) argues that the overflow of new capital coming from less experienced risk arbitrageurs creates opportunities for experienced risk arbitrageurs to use a reverse risk arbitrage strategy instead.

Reverse risk arbitrage, also known as "Chinesing" a deal (Ineichen, 2002), is a strategy that takes the opposite position of risk arbitrage. Consequently, a reverse risk arbitrageur short sells the target stock if he or she believes that the deal will fail and expects the target's share price to fall to pre-announcement levels. This strategy can be exploited when the takeover trader believes it is probable that the takeover will fail or that the offer price will be reversed downwards. This can easiest be illustrated with an example:

On August 14th 2001, the French construction company Vinci SA announced that it had acquired a 14.90 percent stake in the British airport operator TBI PLC for £0.90 per share. Vinci's intention was to make an offer to purchase the remaining shares at the same price. The following day, Vinci announced a cash offer of £0.90 per share with a bid premium of 50.6 percent on the closing price of £0.5975 on August 13th. The value of Vinci's offer was £500 million.

TBI:s board of directors opposed the takeover and described it as "opportunistic." Rumors began circulating about competing bids from Spanish construction company Grupo Ferrovial and Australian investment bank Macquarie. Supposedly private equity firm 3i was also showing interest in TBI.

Keith Brooks, CEO of TBI, announced that the board of directors and other investors, whom held a 19 percent stake in TBI, rejected Vinci's bid. On September 11th, however, the acquisition gained regulatory approval. Later on the very same day, the now infamous terrorist attacks on the United States occurred and had a major impact on companies active in the air travel industry. On September 18th, rumors circulated that Vinci may withdraw its bid. On September 21st, TBI:s board of directors changed their minds about Vinci's bid describing the offer as fair and reasonable given the uncertain future of the industry. On September 25th, Vinci announced that 71.46 percent of the outstanding shares had been tendered and as this was below the minimum acceptance level of 90 percent, Vinci withdrew its bid.

Suppose that an investor made the assessment that this takeover would fail and decided to use a reverse risk arbitrage strategy. Next, suppose that the investor at the price of £0.955 per share acquired a short position in TBI two days after the announcement, on August 17th, and held the position until September 25th, when the bid was withdrawn. On September 25th, when the bid was withdrawn the share price fell to £0.45. The investor would have made a profit of £0.955 - £0.450 = £0.505 per share.

As the example above shows, a takeover trader needs to continuously make new assessments as new information arrives and events occur. This can sometimes lead to changes in positions. The example also shows the risk inherent in risk arbitrage. If the investor used a risk arbitrage strategy and acquired a long position in the target company at the announcement of the bid, he or she would face severe losses since the share price fell when the bid was withdrawn.

Ineichen (2002) argues that reverse risk arbitrage can be used by risk arbitrageurs since it requires the same assessment of each deal, mainly the probability of success and failure. In risk arbitrage, the focus is on the probability of takeover success. In reverse risk arbitrage, the focus is on the probability of takeover failure. In both cases, it is important to estimate the consequences if the takeover fails or succeeds in order to predict the size of potential losses.

Hedge funds usually combine risk arbitrage with distressed investing, also an event driven investment strategy, where the hedge fund invest in distressed securities of companies or government entities that are in default, under bankruptcy protection or in distress. Risk arbitrage and distressed investing are contra-cyclical. By using both risk arbitrage and distressed investing, hedge funds can provide positive returns regardless of the market conditions. (Dinkelspiel, 2010). In periods when mergers and acquisitions activity have been low, previous studies have found signs of risk arbitrageurs, in lack of other investment opportunities, have entered unannounced deals based strictly on rumors. (Moore, Lai, & Oppenheimer, 2006)

Since the probability of failure increases during market downturns (Mitchell & Pulvino 2001) reverse risk arbitrage makes it possible for hedge funds and other investors focusing on risk arbitrage to strictly give attention to mergers and acquisitions only. In bull markets, when there are a lot of mergers and acquisitions, risk arbitrage generates a high return. On the other hand in

bear markets, when there are less mergers and acquisitions and the probability for deal failure is higher, reverse risk arbitrage would generate a high return.

We have found one thesis examining the characteristics of reverse risk arbitrage Branch and Yang (2003), however they only included stock deals in their portfolios. Furthermore they use the event-time approach to calculate the returns which is not representative of the returns realizable for takeover traders. (Sudarsaman and Nguyen 2008)

2.5. Previous Research and Literature – Predictor Variables

In order to determine which strategy – risk arbitrage or reverse risk arbitrage – to use, the takeover trader must know which variables that are indicators of the outcome of a deal. Previous studies have found several predictor variables influencing the outcome of a deal. Predictor variables can be used for two purposes: (1) as a checklist and as guidance for takeover traders to assess the prospects of every takeover and (2) as an aid in developing a prediction model that assist in assessing the attractiveness of each deal. For portfolios based on predictor variables we use the term *semi-active portfolio*, consequently, for portfolios constructed by real life takeover traders, we use the term *active-portfolio*.

To a large extent we follow Wang and Branch (2009) when summarizing the predictor variables.

2.5.1. Attitude

A takeover is usually initiated with private negotiations between the acquirer company and the target company. In order for a takeover to succeed, the board of directors of the target must first accept the bid and second let the shareholders vote on the issue. The attitude of the acquirer is essential for determining the preceding course of the takeover. In a friendly takeover, the target board of directors supports the acquisition. In a hostile takeover on the other hand, the target board of directors opposes the acquisition. A hostile bid often follows a breakdown in negotiations between the acquirer and the target. (Berk & DeMarzo, 2008).

Previous research has found that a friendly takeover attempt is more likely to succeed than a hostile takeover attempt. Hoffmeister and Dyl (1981) found that hostile bids decrease the probability of deal success. Schwert (2000) found that hostile bids have the lowest probability of success. (Baker & Savasoglu, 2001) Walkling (1985), Mikkelson and Partch (1989), Cotter and Zenner (1994) and Branch and Yang (2006) found that the acquirer attitude is the best single

indicator of the probability of takeover success. (Wang & Branch, 2009). These results were also validated by Flanagan, D'Mello and O'Shaughnessy (1998), Forsberg and Nilsson (2000), and Koch and Sjöström (2003).

Baker & Savasoglu (2001) found that hostile takeovers have a success ratio of 38 percent. Hsieh (2001) found that the attitude of the target's management is correlated with probability of takeover success. Branch and Yang (2003) found that alongside the target's relative size, attitude is the most important indicator of takeover success. Narayanan (2004) found that hostile bids have a 14.2% higher probability of failure than friendly bids. However, Hsieh and Walkling (2004) found that risk arbitrageurs' decision to enter the market is not affected by management hostility. However in a qualitative study, Beunza and Stark (2007) found that one of the most central variables that real life risk arbitrageurs base their decisions on is attitude.

2.5.2. Bid Premium

The bid premium, sometimes referred to as the acquisition premium, is the percentage difference between the offer price and the pre-announcement market price of the target company. If a takeover fails, the target share price often falls back to pre-announcement level and the bid premium is lost. Thus, the bid premium reflects the potential loss for the risk arbitrageur. (Branch & Wang, 2008).

Walkling (1985) found that the size of the bid premium is positively correlated with takeover success. This was supported by Jennings and Mazeo (1993). However, Pellegrino (1972), Hoffmeister and Dyl (1981), Baker and Savasoglu (2002) and Mitchell and Pulvino (2001) could not find any significant relationship between the bid premium and the probability of takeover success. (Wang & Branch, 2009).

Branch and Wang (2008) argue that the greater the bid premium is the greater is the arbitrage spread. In contrast, the greater the premium is the more attractive is the offer and an attractive offer increases the probability of takeover success, which in turn reduces the arbitrage spread. Branch and Wang (2008) argue further that the two forces are in conflict; which force is the strongest is an empirical issue.

2.5.3. Arbitrage Spread

The arbitrage spread is defined as the percentage difference between the offer price and the post-announcement market price of the target company. The arbitrage spread mirrors the market's certainty that a merger or an acquisition will occur. If a takeover is successful, the acquirer and the target will become a single company and therefore the difference between their prices will disappear. If a takeover is unsuccessful, however, the merger of the two companies will be called off and the arbitrage spread will increase. A wider arbitrage spread indicates a lower probability of takeover success. A narrower arbitrage spread indicates a higher probability of takeover success. (Beunza & Stark, 2007)

The greater the uncertainty about whether a takeover will succeed, the wider will the arbitrage spread be. Hence, the arbitrage spread is negatively correlated with the probability of takeover success. (Wang & Branch, 2009) Previous studies by Brown and Raymond (1986) and Samuelsson and Rosenthal (1986) have found that the arbitrage spread is an indicator for the probability that a takeover will succeed. Mitchell and Pulvino (2001) and Branch and Wang (2008) have found that the arbitrage spread is wider for unsuccessful takeovers, which implies that the probability of failure is integrated in the share price.

2.5.4. Relative Size

The size of the target company relative to the acquirer company is according to previous studies an indicator of the outcome of a bid. Branch & Yang (2003) found that alongside attitude, the target's relative size is the most important indicator of takeover success. Branch and Yang (2006) found that the relative size of the target has a negative influence on the probability of takeover success. Daul (2008) found that the target's relative size together with attitude and competing bids are important indicators. The reason is the risk for potential integration problems when acquiring large targets.

2.5.5. Competing Bids

Betton and Eckbo (2000) argue that the target company's stock price increase with the probability of competing bids. Walkling (1985) argues that competing bids reduce the probability that any bid will succeed. (Wang & Branch, 2009) However, Hsieh and Walkling (2004) found that risk arbitrageurs' decision to enter the market is not affected by competing bids. Bradley, Desai and Kim (1988) and Betton and Eckbo (2000) found that the existence of

competing bids increase the target's share price. (Branch & Wang, 2006) Bradley, Desai and Kim (1983) and Davidson, Dutia and Cheng (1989) argue that if no subsequent offers follow the termination announcement, the bid premium will disappear as the target company's stock price will fall to pre-announcement levels. (Branch & Wang, 2006)

2.5.6. Toeholds

The acquirer company often acquires a considerable amount of the target company's shares prior to placing its bid on the target. This holding is called a toehold as it usually increases the acquirer's influence over the target. (Berk & DeMarzo, 2008) Walkling (1985) and Singh (1998) argue that a toehold will increase the acquirer's bargaining power and as a consequence the probability of takeover success. (Wang & Branch, 2009) This was validated by Betton and Eckbo (2000) who also found that larger toeholds increase the probability of takeover success.

2.5.7. Target's Stock Price Run Up

The target company's stock price run up refers to the cumulative abnormal return in the target's stock price prior to the offer announcement. (Wang & Branch, 2009) This was also validated by Banerjee and Echard (2001) and Narayanan, Frye and Sabherwal (2001). Jindra and Walkling (2004) argues that the target's stock price run up is a sign of ownership distribution shifts (acquirer building a toehold), increased speculative activity and the accumulation of shares in more neutral hands. (Wang & Branch, 2009)

2.5.8. Poison Pills

A poison pill is a defense strategy against hostile takeovers, a rights offering or a security that a company issues to its shareholders, which gives them benefits in the event of a takeover. There are different types of poison pills, but all of them involve a transfer from the acquirer company to those shareholders of the target company that does not tender their shares. Thus, a poison pill increases the cost of a hostile takeover. (Hillier, Grinblatt, & Titman, 2008)

Poison pills are very common in the United States. In Europe, however, they are less common and some countries even have legislation forbidding poison pills.[1] Hence, hostile takeovers are

[1]This was confirmed in a test on our initial data sample, where less than 1% of the target companies had poison pills. In the interest of brevity, we omit these results.

more common in Europe than in the United States. In 2007, more than 70 percent of all hostile bids occurred in Europe. (Politi, 2007)

2.5.9. Additional Variables

Market Level

Mitchell and Pulvino (2001) found that the probability of failure increases during severe market downturns. This is supported by Narayanan (2004), and Sudarsaman and Nguyen (2008) who argue that this is due to banks withdrawing their financing and that the acquirer feels that it is overpaying for the target.

Advisor Parameter

Bodnaruk, Massa and Simovon (2008) found that the probability of takeover success is higher for deals in which the adviser to the acquirer takes a position in the target firm.

Regulatory Approval

Beunza and Stark (2007) found regulatory approval to be an essential variable used by risk arbitrageurs for estimating probability of takeover success. Karolyi and Shannon (1998) found that takeovers in closely-regulated industries such as communications and media, financial services and paper and forest products take longer to complete.

Transaction Size

Transaction size is defined as the percentage of shares sought by the acquirer company. Branch and Yang (2003) found that the percentage of shares sought by the acquirer is negatively correlated with takeover success.

Termination Fees

A termination fee is a fee that is imposed if the acquirer or the target company fails to consummate a merger or acquisition. A termination fee makes withdrawal costly. Officer (2002) found that the existence of termination fees increases the probability of takeover success.

3. Hypothesis Development and Formulation

3.1. Risk Arbitrage Hypothesis

Research conducted in other markets than Europe has shown that passive risk arbitrage has been a highly profitable strategy and we believe that this will also be true for Europe. As a result our first hypothesis is:

Hypothesis 1: *A passive risk arbitrage strategy in Europe is profitable and generates significant positive risk-adjusted returns.*

Active investors such as hedge funds and proprietary trading desks within investment banks can at times enter risk arbitrage positions before the announcement of a deal. This can be due to rumors and speculation or because they are better informed due to superior analytical tools such as examining target price run up's. Risk arbitrageurs have to make assessments of whether to enter in a deal or not, whereby the spreads decreases when they have more time at hand. As a result we believe that risk arbitrage returns decreases with the number of days it takes to set up the positions.

Hypothesis 2:*Risk arbitrage returns decreases with the number of days it takes to set up the position.*

3.2. Prediction Model Hypothesis

We believe that a semi-active strategy using a prediction model that incorporates predictor variables in order to invest in deals with positive expected returns should result in highly profitable returns. Furthermore, by avoiding deals with negative expected returns, the returns should be higher than a passive risk arbitrage strategy. As a result our third hypothesis is:

Hypothesis 3: a) *Using a prediction model, risk arbitrage in Europe is very profitable and generates significant positive risk-adjusted returns.* ***b)*** *Moreover, the returns are higher than passive risk arbitrage.*

The return of a passive reverse risk arbitrage portfolio consisting of all takeover attempts is not of interest as a reverse risk arbitrage strategy should only be used if it is probable that a takeover attempt will fail. With the help from a prediction model, a takeover trader is able to identify

deals where a reverse risk arbitrage strategy has a positive expected return. Therefore our fourth hypothesis is:

Hypothesis 4: *Using a prediction model, semi-active reverse risk arbitrage in Europe is profitable and generates positive risk-adjusted returns.*

For each deal, a takeover trader has to make an assessment about whether to use a risk arbitrage or a reverse risk arbitrage strategy. We want to examine if the return of a mixed portfolio, developed with a prediction model and consisting of risk arbitrage and reverse risk arbitrage positions, is profitable and generates positive risk-adjusted returns. This is the portfolio an takeover trader could construct if he or she is able to utilize both investment strategies.

Hypothesis 5: *Using a prediction model, a semi-active takeover trading strategy in Europe is profitable and generates positive risk-adjusted returns.*

3.3. Variable Hypothesis

The most significant parameter identified as an indicator of the outcome of a takeover is attitude. Thus, friendly bids are more probable to succeed and hostile bids are more probable to fail. We believe that a portfolio consisting of risk arbitrage positions in friendly deals will be profitable. We also believe that a portfolio consisting of reverse risk arbitrage positions in hostile deals will be profitable. Moreover, we want to examine the return of a takeover trading strategy portfolio in Europe using attitude as the variable deciding which strategy to use. Since all attitude portfolios only utilize one predictor variable and do not take the expected return into account, we believe that the returns are lower than of those portfolios constructed with a prediction model. Summing up the above aspect we form hypothesis 6, 7 and 8:

Hypothesis 6: a) *A semi-active risk arbitrage portfolio consisting solely of friendly bids generates positive risk-adjusted returns.* ***b)*** *However, the returns are lower than those of the risk arbitrage portfolio constructed using the prediction model.*

Hypothesis 7: a) *A reverse risk arbitrage portfolio consisting solely of hostile bids in Europe generates positive risk-adjusted returns.* ***b)*** *However, the returns are lower than those of a reverse risk arbitrage portfolio constructed using a prediction model.*

Hypothesis 8: a) *A takeover trading strategy portfolio based on attitude generates positive risk-adjusted returns.* ***b)*** *However, the returns are lower than the returns of a takeover trading strategy portfolio utilizing a prediction model.*

4. Methodology

4.1. Choice of Prediction Model

In order to determine if and how to enter a deal, we need a statistical prediction model for takeover success. Such a model gives the predicated probability of success for any given deal based on a number of variables. In general, a prediction model is developed through running stepwise logistic regression on predictor variables on a large sample of takeovers. The second step is to eliminate those variables that are statistically insignificant. It can be used as a risk management tool where the human factor, i.e. behavioral biases, can be circumvented since the model gives an answer on what to do. (Ineichen, 2002) It can also be helpful when building trading platforms focusing on takeover trading strategies.

We have four requirements for the model. First, it should be easy to implement; the variables necessary should be easy to obtain and there should be no need for extensive estimation of the variables. Second, it is important that the variables are identifiable at the announcement date or in the following few days. Third, the model should take into account not only the probability of takeover success, but also the expected return. All of these requirements are important because if our results are encouraging, we want the implications of our thesis to be easy to implement for practitioners.

Fourth, the model should be developed for the time period we intend to examine. The reason for this is that mergers and acquisitions occur in waves and there is a different climate in different time periods. (Ineichen, 2002) To be able to use the model on recent date and assess the attractiveness of takeover trading strategies, we need a model developed for and estimated on data for the period between 1990 and 2010.

Our choice of model lands upon Wang and Branch's logistic regression model. (Wang & Branch, 2009) The model was developed on a sample of 1,313 U.S mergers and acquisitions between 1995-2005. Furthermore, the model only utilizes information that is easily obtained after the announcement and it takes into account relevant research on risk arbitrage indicators. The model has also been developed to reduce the bias caused by non-random sampling, which gives it enhanced prediction ability. This circumvents the risk apparent in other models that can mislead takeover traders to make suboptimal investment decisions. In contrast to other models, Wang and

Branch have developed a model that does not only predict whether a takeover will succeed, but also the expected return. Thus, we are able to discriminate between which deals are suited to risk arbitrage by checking if the expected return is positive. This model can furthermore, with some adjustments of our own, be used in reverse to estimate the expected return of reverse risk arbitrage.

Wang and Branch found that target attitude, arbitrage spread, target's stock price run up and competing bids are the most significant variables predicting the outcome of a takeover.

5. Data and Sample Description

5.1. Data

We have collected data from three different sources. Brief summaries of each merger and acquisition were collected from Thomson Financial SDC Platinum Database. The collected data was cross-checked with the Bureau van Dijk Zephyr Database. Financial market data such as security prices were collected from Thomson Financial Datastream. The prediction model was, as mentioned, developed on a data from 1995 to 2005. As a result, we have restricted our data collection to this time period; the deal must be announced and completed during this period.

5.2. Data Adjustments

Data on mergers and acquisitions was collected from Thomson Financial SDC Platinum Database. For each deal, data was collected about announcement date, effective date, effective/unconditional date, withdrawal date, percentage held by acquirer at announcement, percentage sought by acquirer, short business description and industry for both acquirer and target, attitude, competing bids and initial offer price per share.

If any variable was missing, we performed a cross-check with Bureau van Dijk Zephyr. If it was missing there too, we decided to exclude the deal. In order to be included in our sample, a deal had to meet the following selection criteria:

- Both acquirer and target must be located in a country included in the MSCI Europe Index
- Both acquirer and target must be public
- The payment method must be cash only
- The acquirer and the target must have Thomson Financial Datastream codes

Geographically, we have limited our study to the European countries in the MSCI (Morgan Stanley Capital International) Europe Index. The MSCI Europe Index consists of 16 European Developed countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Takeovers in emerging markets have different characteristics and the liquidity is relatively low due to their smaller market capitalization. Previous studies have found that this may prevent investors from unwinding unprofitable positions quickly to minimize losses. (Goh, 2008) In our

study, we have excluded cross-continent mergers and acquisitions. Thus, both the acquirer and the target must be a country in the MSCI Europe Index.

We have excluded stock swap offers and mixed cash and stock offers. We have also excluded more complicated deal structures involving collars, containing options, convertible preferred stock and warrants because the takeover trading strategies in these deal payment methods is not straightforward.

Furthermore, we have restricted our sample to mergers and acquisitions where the acquirer company is seeking to purchase more than 50 percent of the target. Likewise, we have excluded deals where the acquirer owns more than 75 percent of the target. We have excluded mergers of equals since we cannot identify which company is the acquirer and which is the target. Due to practical implications in using a takeover trading strategy, we excluded deals where the announcement date and effective date were the same.

From Thomson Financial Datastream, we collected data on the target company's share price, market capitalization and dividends. Share prices were used to calculate pre-bid run ups and initial spreads. Share prices and dividends were used to calculate takeover trading strategy returns. For the acquirer company, we collected data on market capitalization. Data about market capitalization was used to calculate relative size. Furthermore, we retrieved data on MSCI Europe Index and risk-free rates, which were necessary to measure the risk-adjusted returns.

Certain deals were excluded due to lack of reliable share price data or when share prices were only available for a short period of time. Moore, Lai and Oppenheimer (2006) found that risk arbitrageurs invest mainly in transactions with a minimum size of $100 million and therefore we excluded deals where the target had a market value of less than $100 million. Furthermore, these deals are excluded because of liquidity considerations and short selling considerations, since larger companies are generally more liquid and there exists short selling possibilities. (D'Avolio, 2002)

When we cross-checked data with Bureau van Dijk Zephyr, we excluded deals where the announcement date differs from the announcement date recorded in Thomson Financial SDC Platinum Database. We have also excluded deals where the effective or withdrawal date differs between the two databases. In one case, Thomson Financial SDC Platinum Database recorded a

deal as a cash deal when it in fact was a mixed deal; this deal was excluded. Totally, eleven deals were excluded after cross-checking.

5.3. Final Data Sample

Since none of the deals before 1997 met our criteria the final sample consist of 212 European cash offers between June 1997 to December 2005.

Table 2. Overview of Final Data Sample

Year	Total Deals	Successful Deals (%)	Failed Deals (%)	Friendly Deals (%)	Hostile Deals (%)	Failed Hostile Deals
1997	15	13 (86.67%)	2 (13.33%)	13 (86.67%)	2 (13.33%)	1
1998	20	18 (90.00%)	2 (10.00%)	15 (75.00%)	5 (25.00%)	2
1999	42	32 (76.19%)	10 (23.81%)	32 (76.19%)	10 (23.81%)	7
2000	46	41 (89.13%)	5 (10.87%)	40 (86.96%)	6 (13.04%)	4
2001	19	16 (84.21%)	3 (15.79%)	18 (94.74%)	1 (5.26%)	1
2002	16	14 (87.50%)	2 (12.50%)	13 (81.25%)	3 (18.75%)	0
2003	11	11 (100.00%)	0 (0.00%)	10 (90.91%)	1 (9.09%)	0
2004	16	15 (93.75%)	1 (6.25%)	11 (68.75%)	5 (31.25%)	0
2005	27	25 (92.59%)	2 (7.41%)	19 (70.37%)	8 (29.63%)	0
Total	**212**	**185 (87.26%)**	**27 (12.74%)**	**171 (80.66%)**	**41 (19.34%)**	**15**

The total sample is shown in Appendix 2.

5.4. Risk-Free Rate

In order to risk-adjust the returns, we need a proxy for the risk-free rate. In finance, risk is the variance in actual returns around the expected return. Thus, for an investment to be risk free the actual return should be equal to the expected return. An alternative view is that a risk-free investment should have returns uncorrelated with risky investments. Thus, there are two conditions that must hold: there can be no (1) default risk or (2) reinvestment risk. These conditions make government securities the only risk-free securities since the government controls the printing of the currency. (Damodaran, 2008)

In our case, this causes inconvenience since none of the governments in our study, whom have the Euro as currency, technically control the money supply. Hence, there is default risk in all of them. In the Eurozone, a takeover trader should use lowest of the three-month government bonds as a proxy for the risk-free rate. (Damodaran, 2008)

Since we are calculating the historical returns of a portfolio with assets spread over many countries, the task of choosing a risk-free rate has been cumbersome. We have performed initial tests of which risk-free rate available in the time period of our study have been lowest. Sometimes it has been the British three-month Treasury bill rates and sometimes the German counterpart. An alternative is to use the average of the risk-free rates of the countries in the MSCI Europe Index. This would account for the different currencies (inflation), but would not be theoretically correct since the risk-free rate should be the lowest of the government bonds.

However, Thomson Datastream recommends and offers a proxy for the risk-free rate for the countries in the Eurozone, the three-month EURIBOR (Euro Interbank Offered Rate). To be consistent, we have day counted the rates and used this as a proxy for the risk-free rate. For deals before December 31st 1998, we have used the Synthetic Datastream three-month EURIBOR rate as a proxy for the risk-free rate.

6. Implementation of Hypothesis

6.1. Portfolio Construction

In order to answer our hypotheses, we have constructed 14 different portfolios from which we will obtain raw returns and which subsequently will be risk-adjusted.

6.2. Risk Arbitrage Portfolios

We have constructed eight risk arbitrage portfolios. The focus of the analysis will be on risk arbitrage portfolio t+2 (portfolio number 1).

6.2.1. Risk Arbitrage Portfolio, Two days after Announcement, t+2. (Portfolio 1)

In accordance with existing literature, this portfolio is constructed by entering the risk arbitrage positions two days after the announcement. Where t=0 is the day of the announcement. It is also consistent with Wang and Branch's prediction model where they calculated the return two days after announcement. This will make it possible to compare the portfolio with those obtained through the prediction model. Furthermore, we are examining returns achievable for passive investors who can be assumed to set up their positions two days after, compared to returns possible to achieve by informed investors who enter their positions earlier.

6.2.2. Risk Arbitrage Comparison Portfolios

2. Risk Arbitrage Portfolio, One Day *before* Announcement, t-1. **(Portfolio 2)**

This portfolio will show us risk arbitrage returns realizable for informed investors. It will be compared to portfolio 1, whereby we expect that the returns for informed investors will be higher than for passive investors. Since this portfolio is constructed on the assumption of superior information we will not use the results of it as a proxy for a passive risk arbitrage strategy.

3. Risk Arbitrage *Same Day* as Announcement, t=0. **(Portfolio 3)**

This is the only portfolio for which we have not found any study to compare our results with. However, by including it we will be able to assess how the returns of risk arbitrage are affected by how fast the risk arbitrageur acts.

4. Risk Arbitrage One Day *after* Announcement, t+2. **(Portfolio 4)**

This portfolio can be compared with Mitchell and Pulvino (2001), who constructed their passive risk arbitrage portfolio by entering positions one day after the announcement.

Hypothesis 2 will be answered by comparing the returns of the different portfolios, whereby we expect that the returns for portfolios decreases with the number of days it takes to set up the positions.

6.2.3. Risk Arbitrage First Offer Portfolios. (Portfolios 5-8)

For every risk arbitrage portfolio above, we have also constructed portfolios solely consisting of first offers. In these we have excluded offers from other bidders. The reason for this is that a follow-up bid has a different risk profile for the risk arbitrageur. The downside risk is limited because if one deal fails, the other can still succeed. Moreover, a portfolio consisting of only first offers ensures that the risk arbitrage portfolio contains only one position in a single target company, opposed to a portfolio including all deals where the probability exists that the portfolio contains more than one position in a single target company. (Baker & Savasoglu, 2001) The portfolios will be used to further validate or refute hypothesis 1.

6.3. Prediction Model Portfolios (t+2)

9. Risk Arbitrage Prediction Model Portfolio. **(Portfolio 9)**

This portfolio will help us answer hypothesis 3. It is constructed by entering the risk arbitrage position two days after the announcement. First, it will give us the magnitude of returns available for risk arbitrageurs using a prediction model. Second, it will be compared to portfolio 1 in order to investigate whether the returns are higher than for a passive portfolio including all deals without discrimination. This is consistent with how Wang and Branch (2009) constructed the prediction model starting two days after the announcement and holding the position until the resolution date. The resolution date is the date where the takeover is either completed or withdrawn. All semi-active, prediction and variable, portfolios are constructed starting two days after announcement.

10. Reverse Risk Arbitrage Prediction Model Portfolio. **(Portfolio 10)**

This portfolio will validate or refute hypothesis 4. It is constructed by entering the reverse risk arbitrage position two days after the announcement. The portfolio will give us the returns available for semi-active investors entering reverse risk arbitrage positions in Europe.

11. Takeover Trading Strategy Prediction Model Portfolio. **(Portfolio 11)**

This portfolio will help us answer hypothesis 5. It is constructed using the prediction model for determining which strategy use for each deal.

As opposed to the risk arbitrage portfolios, we will not construct portfolios consisting solely of first offers since competing bids is one of the predictor variables used in the prediction model. As such it will be incorrect to construct portfolios excluding these types of deals.

6.4. Attitude Portfolios (t+2)

12. Friendly Risk Arbitrage Portfolio. **(Portfolio 12)**

This portfolio is constructed for the purposes of giving us an answer on hypothesis 6. We want to examine if it is possible to realize abnormal returns using a risk arbitrage strategy solely on friendly deals. It will also be compared to the prediction model in order to examine if the use of a prediction model is better than using only one predictor variable.

13. Hostile Reverse Risk Arbitrage Portfolio. **(Portfolio 13)**

This portfolio will help us answer hypothesis 7. We want to examine if it is possible to earn abnormal returns by shorting target stocks in hostile deals in Europe. The portfolio will be compared to the reverse prediction model portfolio, which we expect will have higher returns.

14. Attitude Takeover Trading Strategy Portfolio. **(Portfolio 14)**

This portfolio will help us answer hypothesis 8. First, we will be able to determine the results of a takeover trading strategy portfolio where the attitude determines how to set up the position for each deal. Second, we will be able to compare it to portfolio 11. We expect the latter to have higher returns.

7. Return Measurement

In order to calculate the return of our portfolios, we will use the calendar-time approach in accordance with recent research in the field. (Sudarsaman & Nguyen, 2008) The return measurement calculations of *risk arbitrage portfolios* follow those of Maheswaran and Yeoh (2005). Due to the practical implication of transaction-adjusting the returns of our sample portfolios consisting of 16 different countries the portfolio returns that are calculated are raw returns.

7.1. Risk Arbitrage Portfolios

A deal is included in our portfolio at the date the risk arbitrageur purchases the target and is removed when the deal is completed or withdrawn. We will construct different portfolios where the risk arbitrageur sets up his position on different days around the announcement of a takeover. When a target is included in the risk arbitrage portfolio, the target is deemed to be active. This is when the risk arbitrageur buys the target's stock. To compute the return of a risk arbitrage portfolio, we start by computing the simple daily return for each active deal in the risk arbitrage portfolio:

$$R_{it} = \frac{P_{it}^{T} + D_{it}^{T} - P_{i,t-1}^{T}}{P_{i,t-1}^{T}} \qquad \text{(Equation 1)}$$

where the variables are defined as:

$$R_{it} = \text{Daily return of target } i \text{ at day } t.$$

$$P_{it}^{T} = \text{Price of target } i \text{ at the close of the market at day } t$$

$$D_{it}^{T} = \text{Dividend paid by target } i \text{ at day } t$$

$$P_{i,t-1}^{T} = \text{Closing price of target } i \text{ on day } t - 1^{2}$$

The subscript *i* refers to the particular deal number and *t* refers to the transaction time in days.

[2] An assumption for deals that are ultimately completed is that the spread between the offer price and the target stock price converges at the date of completion, this is an appropriate assumption since target shareholders receive the offer price by the acquirer in successful deals. However, similar to Maheswaran and Yeoh (2005), for some of the deals the last recorded price obtained from Thomson Financial Datastream does not coincide with the offer price. This non-convergence is suggested to be due to a lack of trading in the target stock as shareholders perceive the bid's success as increasingly likely.

These calculations were done for all the risk arbitrage portfolios: With the difference being on which date target was deemed to be active.

The same method was used when calculating the returns of portfolio 9 and 12. In both of these, the target was deemed to be active two days after the announcement. The next step was to use the daily returns for each active deal to construct risk arbitrage portfolio daily return series. This was done for all of the eight risk arbitrage portfolios.

The daily return risk arbitrage portfolio:

$$R_{RAP_t} = \sum_{i=1}^{N_t} w_{it} R_{it} \qquad \text{(Equation 2)}$$

where the variables are defined as:

$$R_{RAP_t} = \text{Return of risk arbitrage portfolio at day } t^3$$

$$N_t = \text{Total number of active deals in the risk arbitrage portfolio at day } t$$

$$w_{it} = \frac{1}{N_t} = \text{ Weight at any point in time of each active deal in the risk arbitrage portfolio}^4$$

Finally, like most research in the field, we compound the daily returns of the risk arbitrage portfolio to monthly return series. (Sudarsaman & Nguyen, 2008)

The monthly return for a particular risk arbitrage portfolio:

$$R_{RAP_j} = \prod_{t=m}^{M} \left(1 + R_{RAP_t}\right) - 1 \qquad \text{(Equation 3)}$$

where the variables are defined as:

$$R_{RAP_j} = \text{Monthly return on the risk arbtirage portfolio in month } j^5$$

$$R_{RAP_t} = \text{Return of risk arbitrage portfolio at day } t$$

[3] In the event that there is no active deal in the portfolio, we have assumed that the whole portfolio remains in cash earning no interest. This is done for all of the portfolios constructed in the study.
[4] All of the portfolios are equally weighted.
[5] Complication arises for the first deal which was announced on June 13 1997, since it is deemed to be active in the middle of the month we have to compound the returns on that deal to monthly frequency.

where *j* indexes months between June 1997 and December 2005 and *t* indexes trading days in a transaction month with the total number of trading days equal to *m*.

7.2. Reverse Risk Arbitrage Portfolios

Since no study has calculated the returns realizable using a reverse risk arbitrage strategy on cash takeovers using the calendar time approach, we have developed our own process. The procedure is similar to the return measurement of the risk arbitrage portfolios, however there is a difference in calculating the returns since the reverse portfolios are short the target.

In practice, the investor short selling target stock has to put the short proceeds as cash collateral to the broker who executes the short sale. Furthermore, the margin has to be posted to the broker. We have assumed that the margin is 100 percent and that there is no interest on cash collateral or margin. This is an appropriate short selling assumption for passive investors. (Bodie et al. 2008)

A deal is included in our portfolio at the date the investor short sells the target and is removed when the deal is completed or withdrawn. Both the reverse risk arbitrage portfolios start two days after the announcement date. Thus, a deal is included in a portfolio two days after the announcement. When a target is included in the reverse risk arbitrage portfolio, the target is deemed to be active. To compute the return of a reverse risk arbitrage portfolio, we start by compounding the simple daily return for each active deal in the reverse risk arbitrage portfolio:

$$R_{it} = \frac{P^{T}_{i,t-1} - P^{T}_{it} - D^{T}_{it}}{P^{T}_{i,t-1}} \qquad \text{(Equation 4)}$$

where the variables are defined as:

R_{it} = Daily return for a short position in target *i* at day *t*.

P^{T}_{it} = Price of target *i* at the close of the market at day *t*

D^{T}_{it} = Dividend paid by target *i* at day *t*

$P^{T}_{i,t-1}$ = Closing price of target *i* on day $t-1$

The subscript *i* refers to the particular deal number and *t* refers to the transaction time in days.

The next step is to use the daily return for each active deal to construct reverse risk arbitrage daily return series. This was done for portfolios 10 and 13. The return of a reverse risk arbitrage portfolio on day *t* is:

$$R_{RRAP_t} = \sum_{i=1}^{N_t} w_{it} R_{it} \qquad \text{(Equation 5)}$$

where the variables are defined as:

$$R_{RRAP_t} = \text{Return of reverse risk arbitrage portfolio at day } t$$

$$N_t = \text{Total number of active deals in the reverse risk arbitrage portfolio at day } t$$

$$w_{it} = \frac{1}{N_t} = \text{ Weight at any point in time of each active deal in the reverse risk arbitrage portfolio}$$

Finally, we compound the daily returns of the reverse risk arbitrage portfolios to monthly returns series. The monthly return for a reverse risk arbitrage portfolio is:

$$R_{RRAP_j} = \prod_{t=m}^{M} \left(1 + R_{RRAP_t}\right) - 1 \qquad \text{(Equation 6)}$$

where the variables are defined as:

$$R_{RRAP_j} = \text{Monthly return on the reverse risk arbitrage portfolio in month } j$$

$$R_{RRAP_t} = \text{Return of reverse risk arbitrage portfolio at day } t$$

where *j* indexes months between June 1997 and December 2005 and *t* indexes trading days in a transaction month with the total number of trading days equal to *m*.

7.3. Takeover Trading Strategy Portfolios

The returns are obtained using the returns calculated on the risk arbitrage and reverse risk arbitrage portfolios. The takeover trading strategy prediction model portfolio is constructed by equally weighting the daily returns of portfolio 9 and portfolio 10. The attitude takeover trading strategy portfolio is constructed by equally weighting the daily returns of portfolios 12 and 13. The returns are then compounded to monthly frequency. Thus, we use the daily return of risk arbitrage prediction model portfolio and friendly risk arbitrage portfolio calculated with equation

2. We also use the daily returns from the reverse risk arbitrage prediction model portfolio and hostile reverse risk arbitrage deal portfolio with equation 5. Then we equally weight the portfolio returns to obtain the daily return for the takeover trading strategy portfolios. The daily return of a takeover trading strategy portfolio is:

$$R_{TTSP} = \frac{R_{RAP_t} + R_{RRAP_t}}{2} \qquad \text{(Equation 7)}$$

The monthly return for a takeover trading strategy portfolio is:

$$R_{TTSP_j} = \prod_{t=m}^{M} \left(1 + R_{TTSP_t}\right) - 1 \qquad \text{(Equation 8)}$$

8. Predictor Variable Portfolios

This section helps us determine whether a deal should be treated as a risk arbitrage or a reverse risk arbitrage deal in our calculations. This is done for the prediction model and attitude portfolios. We have used the prices and probabilities to obtain the expected return of each deal.

8.1. Prediction Model

In order to identify which strategy to use for each deal, we have estimated the probability of success and failure for every deal in our sample using Wang and Branch's (2009) final logistic regression model:

$$\text{Prob(failure)} = \pi_f = \frac{1}{1 + \exp(-(\beta_0 + \beta_1 \text{tr} + \beta_2 \text{rs} + \beta_3 \text{sr} + \beta_4 \text{ias} + \beta_5 \text{tcar}))} \qquad \text{(Equation 9)}$$

where the probability of success is defined as:

$$\text{Prob(success)} = \pi_s = 1 - \text{Prob(failure)} = 1 - \pi_f$$

where the variables are defined as:

$$\pi_f = \text{Probability that a bid } i \text{ is withdrawn}$$

$$\pi_s = \text{Probability that a bid } i \text{ is completed}$$

Table 3. Parameter Estimates

	Intercept	Cb	Tr	rs	Ias	tcar
Parameter Estimates	β_0 = -6.04	β_1 = 2.69	β_2 = -3.03	β_3 = 7.41	β_4 = 0.98	β_5 = -0.86

Both cb and tr were obtained from SDC. All the other variables were calculated for each deal in our sample.

cb: If the bid is a competing offer for an existing bid then *cb* equals 1, otherwise *cb* equals zero.

tr: The target's resistance, attitude, equals 1 if the deal is friendly and zero otherwise.

rs: The target company's relative size and is calculated by taking the ratio of the logarithm of the target's market value divided by the logarithm of the acquirer's market value.

ias: The initial arbitrage spread equals the percentage difference between the offer price and the target's share price two days after the announcement.

tcar: The target's stock price run up, which is defined as the cumulative abnormal return for the target's share for days *t-15* to *t-1*.

Next, we have to estimate the abnormal returns for the target (tcar). In these calculations we follow those of Strong (1992). The market model is the statistical model most often used in event studies. Since it takes both market trends and firm-specific risk into account, we have chosen to use this model for calculating abnormal returns. To estimate the expected returns we have estimated beta, measuring systematic risk, and alpha, which is the average return of the firm compared to the market average, for each target in our sample. This was done by running OLS regressions for each target where the independent variable was the market return and where the dependent variable was the target stock return.

The expected return is given by:

$$E(R_{it}) = \alpha_i + \beta_M R_{mt} + \varepsilon_{it} \qquad \text{(Equation 10)}$$

$$E(\varepsilon_{it} = 0)\mathrm{Var}(\varepsilon_{it}) = \sigma^2_{\varepsilon_i} \qquad \text{(Equation 11)}$$

where the variables are defined as:

$$E(R_{it}) = \text{Return of target } i \text{ at day } t$$

$$R_{mt} = \text{Market return at day t} = \frac{\text{MSCI Europe Index}_t}{\text{MSCI Europe Index}_{t-1}} - 1$$

$$\alpha_i = \text{Intercept of the regression}$$

$$\beta_M = \text{Target Beta}$$

$$\varepsilon_{it} = \text{Error term}$$

The subscript *i* refers to the particular deal number and *t* refers to the transaction time in days.

The abnormal return for target *i* at date *t* is the difference between the actual return R_{it} and the expected return $E(R_{it})$. This has been calculated for each day,*t-15*to *t-1*. The daily abnormal return is:

$$AR_{it} = R_{it} - E(R_{it}) \qquad \text{(Equation 12)}$$

where the variables are defined as:

$$AR_{it} = \text{Abnormal return of security } i \text{ at day } t$$

$$R_{it} = \text{Actual return of security } i \text{ at day } t$$

$$E(R_{it}) = \text{Expected return of security } i \text{ at day } t$$

The cumulative abnormal return for the target *i*'s stock *t-15* to *t-1* is the sum of the daily abnormal returns:

$$CAR(t-15_i, t-1_i) = \sum_{t=t-15}^{t-1} AR_{it}$$

$$CAR(t-15_i, t-1_i) = \text{Cumulative abnormal return for target } i$$

8.1.1. Takeover Trading Strategy Expected Return

The decision rule is that we only form positions, whether it is risk arbitrage or reverse risk arbitrage positions, when the expected return is positive based on the estimated probabilities developed above.

8.1.1.1. Risk Arbitrage Decision Rule

Wang and Branch (2009) defines the expected return on a deal as:

$$\text{Expected Return} = \pi_f \times \text{Loss} + (1 - \pi_f) \times \text{Gain}$$

where π_f is the probability of failure and (1- π_f) is the probability of success.

Loss is the estimated potential loss for an investor if the deal is withdrawn. Since the actual price of the target on the resolution date is not known we assume that the target price will fall back to pre-bid levels, approximated by the target's share price two weeks prior to the bid. Gain is the estimated profit if the takeover is a success and is estimated by assuming that the target price converges to the offer price at completion date. Thus, the expected return is weighted by the probability of failure and the expected return in case of failure and the probability of success and the corresponding expected return. The equation for determining which deals to enter risk arbitrage positions in is:

$$\text{Expected Return} = \pi_f \times \frac{(T_{tw} - T_{t+2})}{T_{t+2}} + (1 - \pi_f) \times \frac{(\text{offer price} - T_{t+2})}{T_{t+2}} \qquad \text{(Equation 13)}$$

where $\frac{(T_{tw} - T_{t+2})}{t+2}$ is the estimated loss if the deal is withdrawn, $\frac{(\text{offer price} - T_{t+2})}{T_{t+2}}$ is the estimated gain if the deal is completed.

The variables are defined as:

$$T_{tw} = \text{Target's share price two weeks prior to the announcement}$$

$$T_{t+2} = \text{Target's share price two days after the announcement}$$

8.1.1.2. Reverse Risk Arbitrage Decision Rule

This decision rule was formed by adjusting Wang and Branch's risk arbitrage decision rule.

The expected return is:

$$E(R_i) = \pi_f \times \text{Gain} + (1 - \pi_f) \times \text{Loss}$$

Since the event is binary, either the deal is completed or withdrawn. Consequently, we have used the following equation as a decision rule for determining which deals to use a reverse risk arbitrage strategy for:

$$E(R) = \pi_f \times \frac{(T_{t+2} - T_{tw})}{T_{t+2}} + (1 - \pi_f) \times \frac{(T_{t+2} - \text{ offer price})}{T_{t+2}} \qquad \text{(Equation 14)}$$

The difference between this equation and the risk arbitrage equation is subtle, but still important. Here the gain comes from deals being withdrawn and the target's stock price falls to pre-announcement levels.

$\frac{(T_{t+2} - T_{tw})}{T_{t+2}}$ is the estimated gain if the deal is withdrawn and $\frac{(T_{t+2} - \text{offer price})}{T_{t+2}}$ is the estimated loss if the deal is completed. The variables are the same as before.

The number of deals for each strategy after implementing the decisions rules are displayed in table four.

Table 4.

Portfolio	Number of Deals
Risk Arbitrage Prediction Model Portfolio	109
Reverse Risk Arbitrage Portfolio	103
Takeover Trading Strategy Model Portfolio	212

8.2. Attitude Model

If the deal was recorded as friendly we undertook a risk arbitrage position and if the deal was not recorded as friendly we undertook a reverse risk arbitrage position. Table five displays number of deals for each strategy after implementing this decision rule.

Table 5.

Portfolio	Number of Deals
Friendly Risk Arbitrage Portfolio	171
Hostile Reverse Risk Arbitrage Portfolio	41
Takeover Trading Strategy Attitude Portfolio	212

9. Empirical Results

9.1. Descriptive Statistics: Portfolio Monthly Returns

The returns in this section are not risk-adjusted and most of the discussion and analysis will be based on the risk-adjusted returns in the next section. Nevertheless, as mentioned in the introduction, we expect that the portfolios should have less systematic risk than the market. The reason being that the principal risk in takeover trading strategies is deal risk, which is to a large extent idiosyncratic risk and thus diversifiable. The tables show the monthly mean (%) and median (%) return of the strategies. We have also, in line with other research in the field, calculated the Sharpe ratios for the portfolios. The Sharpe ratio measures reward-to-volatility and is a common statistic used to rank portfolios. It is defined as the ratio of the portfolio risk premium and the portfolio volatility measured as standard deviation. The portfolio risk premium is the return of the strategy less the risk-free rate in our case measured as the three-month Euribor. (Bodie et.al 2008)

$$\text{Sharpe Ratio} = \frac{\text{Rp} - \text{Rf}}{\text{Standard Deviation}}$$

9.1.1. Passive Portfolios

Table 6 displays the passive risk arbitrage portfolios:

Table 6.

Portfolio	Mean (%)	Median (%)	Standard Deviation (%)	Sharpe Ratio
Risk Arbitrage Portfolios				
All offers				
Two days after announcement (t+2)	**2.52%**	1.82%	4.73%	0.49
One day before announcement (t-1)	**6.76%**	4.16%	10.38%	0.63
The same day as announcement(t=0)	**3.45%**	2.13%	7.88%	0.41
One day after announcement (t+1)	**2.55%**	1.82%	4.76%	0.49
First offers				
Two days after announcement (t+2)	**2.51%**	1.69%	4.81%	0.48
One day before announcement (t-1)	**6.69%**	4.36%	10.57%	0.61
The same day as announcement(t=0)	**3.31%**	2.02%	7.82%	0.40
One day after announcement (t+1)	**2.48%**	1.70%	4.65%	0.49
Market Returns				
MSCI Europe Index	**0.51%**	1.58%	5.05%	0.06

The mean and median returns are in line with our first and second hypotheses. Moreover, all of the European passive risk arbitrage portfolios have higher Sharpe Ratios compared to passive risk arbitrage portfolios constructed by other researchers in Australia and the U.S.[6]

9.1.2. Semi-Active Portfolios:

Table seven displays the Prediction Model Portfolios:

Table 7.

Portfolio (t+2)	Mean (%)	Median (%)	Standard Deviation (%)	Sharpe Ratio
Prediction Model Portfolios				
Risk Arbitrage Prediction Model Portfolio	**2.94%**	1.87%	4.30%	0.64
Reverse Risk Arbitrage Prediction Model Portfolio	**-1.30%**	-0.84%	4.95%	-0.30
Takeover Trading Strategy Prediction Model Portfolio	**0.81%**	0.46%	4.71%	0.13

The risk arbitrage prediction model has a higher return and the highest Sharpe ratio of all the passive risk arbitrage strategies. This is in line with our third hypothesis.[7] However, contrary to our expectations the reverse risk arbitrage portfolio has a negative return. Which is not in line with our fourth hypothesis.

Table eight displays the Attitude Portfolios:

Table 8.

Portfolio (t+2)	Mean (%)	Median (%)	Standard Deviation (%)	Sharpe Ratio
Attitude Portfolios				
Friendly Risk Arbitrage Portfolio	**2.38%**	1.52%	4.26%	0.51
Hostile Reverse Risk Arbitrage Portfolio	**-0.59%**	0.00%	10.40%	-0.08
Attitude Takeover Trading Strategy Portfolio	**1.53%**	0.78%	6.32%	0.21

As expected the returns of friendly risk arbitrage is positive, it even has a slightly higher Sharpe ratio than the risk arbitrage portfolio t+2. However the hostile reverse risk arbitrage portfolio has a negative mean return which is not in line with our expectations. The median of 0.00% of the hostile portfolio is due to the small sample of hostile deals which lead to that the portfolio remained in cash for long periods of time.

Both the returns of the takeover trading strategy prediction model portfolio and the attitude takeover portfolio were burdened by the negative returns in their reverse risk arbitrage positions.

[6] For Australia see Yeoh and Maheswaran (2005) and for the U.S see Baker and Savasoglu (2001).
[7] As mentioned earlier, the risk arbitrage portfolio t-1 is not comparable to the other portfolios.

9.2. Risk-Adjusting Returns with the Capital Asset Pricing Model (CAPM)

A central part in evaluating the profitability of any investment strategy is to adjust for the risk. Although all the risk arbitrage strategies, passive and semi-active, have shown to generate high returns before risk-adjustment, the different takeover strategies would not be profitable if they are bearing too much risk.

We will use CAPM (Capital Asset Pricing Model) to benchmark the returns of the takeover trading strategies against its risk. Previous studies conducted in other geographical areas have shown that risk arbitrage portfolios generate significant positive risk-adjusted returns when adjusted with CAPM. This was shown in table 1 in the introduction. We have performed a regression analysis in order to test if the passive and semi-active takeover trading strategy portfolios generate abnormal returns. As seen in the previous section the returns of the reverse risk arbitrage portfolios are negative, but we will risk-adjust them as well to get a clearer picture of the underperformance.

Portfolio Risk Adjustment:

$$\left(R_j - R_{fj}\right) = \alpha_p + \beta\left(R_{Marketj} - R_{fj}\right) + \varepsilon_j$$

Where $R_j$is the monthly returns for the different portfolios, α_p(Alpha), is the intercept, β (Beta), is the systematic risk of the portfolio, R_{Market} is the monthly return of the market portfolio (MSCI Europe), R_f is the monthly risk-free rate (Euribor 3M) and ε_j is an error term assumed to be zero. Here, α_p (Alpha), measures the abnormal risk-adjusted returns on the different portfolios Jensen (1968). Assuming that the model is correct, then all of the hypotheses will be true if,α_p,is positive for all portfolios and significantly different from zero.

Although OLS regressions were run for all the risk arbitrage portfolios, as mentioned earlier, the focus will be on the all offer risk arbitrage t+2 portfolio.

9.2.1. Passive Risk Arbitrage Portfolios

Table 9.

			Intercept		$R_{Market} - R_f$	
Portfolio (Dependent Variable)	Sample Size (N)	R^2	Alpha (α)	p-value	Beta (β)	p-value
Risk Arbitrage Portfolios						
All offers						
Two days after announcement (t+2)	103	0.0043	2.31%	0.0000	0.0610	0.513
One day before announcement (t-1)	103	0.0013	6.54%	0.0000	0.0737	0.719
The same day as announcement(t=0)	103	0.0010	3.24%	0.0001	0.0481	0.757
One day after announcement(t+1)	103	0.0039	2.33%	0.0000	0.0588	0.530
First offers						
Two days after announcement (t+2)	103	0.0014	2.30%	0.0000	0.0354	0.709
One day before announcement (t-1)	103	0.0004	6.48%	0.0000	0.0410	0.844
The same day as announcement(t=0)	103	0.0003	3.10%	0.0001	0.0251	0.871
One day after announcement (t+1)	103	0.0014	2.27%	0.0000	0.0340	0.711

Sample size (N) is sample of monthly returns. Values indicate statistical significance at the 95% confidence level.

All of the Risk Arbitrage Portfolios, (all offers as well as first offers), generate positive significant monthly returns measured by the intercept, alpha (α_p), ranging from 2.27% first offer t+2 portfolio to 6.54% of the all offer portfolio t-1. If we only include passive risk arbitrage portfolio the range would be 2.27% to 3.24% of all offer t=0 portfolio. The intercepts are all statistically significant at the 5% level, with p-values of 0.000% for all intercepts (α_p). Clearly Risk Arbitrage in Europe is a profitable strategy and as a result we do not reject our first hypothesis:

Hypothesis 1: *A passive risk arbitrage strategy in Europe is profitable and generates significant positive risk-adjusted returns.*

As can be seen in table the risk arbitrage returns are higher for portfolios where the positions are set up earlier, and the returns decrease with the number of days it takes to set up the position. All the intercepts, alpha, are significant at the 5% level. As in the descriptive statistics portfolio returns, the returns of portfolio t+1, 2.33%, is only slightly higher than the returns of the t+2 portfolio, 2.31% As a result passive arbitrage portfolios that are set up closer to the announcement day generate higher returns and we do not reject our second hypothesis:

Hypothesis 2: *Risk arbitrage returns decreases with the number of days it takes to set up the position.*

9.2.2. Semi-Active Prediction Model Portfolios

Table 10.

			Intercept		$R_{Market} - R_f$	
Portfolio (Dependent Variable)	Sample Size (N)	R^2	Alpha (α)	p-value	Beta (β)	p-value
Prediction Model Portfolios (t+2)						
Risk Arbitrage Predictiom Model Portfolio	102	0.0026	2.76%	0.0000	-0.0434	0.608
Reverse Risk Arbitrage Prediction Model Portfolio	103	0.0445	-1.43%	0.0036	-0.2063	0.032
Takeover Trading Strategy Prediction Model Portfolio	103	0.0230	0.66%	0.1578	-0.1411	0.126

Sample size (N) is sample of monthly returns. Values indicate statistical significance at the 95% confidence level.

The risk arbitrage prediction model generates significant positive risk-adjusted returns of 2,76%. This is also much higher than the its counterpart passive Risk Arbitrage Portfolio t+2 which had a return of 2,31%. Both the intercepts are statistical significant at the 5% level. As a result we do not reject our third hypothesis.

Hypothesis 3: a) *Using a prediction model, risk arbitrage in Europe is very profitable and generates significant positive risk-adjusted returns.* ***b)*** *Moreover, the returns are higher than passive risk arbitrage.*

The reverse risk arbitrage prediction model has a significant negative monthly risk-adjusted return of 1.43%, as a result we reject our fourth hypothesis:

Hypothesis 4: *Using a prediction model, semi-active reverse risk arbitrage in Europe is profitable and generates positive risk-adjusted returns.*

As mentioned earlier, the takeover trading strategy portfolio returns is burdened by the reverse risk arbitrage positions. Nevertheless the takeover trading strategy prediction model portfolio generates significant abnormal returns of 0.66%, measured as the intercept (p-value is 0.1578). Thus we do not reject our fifth hypothesis:

Hypothesis 5: *Using a prediction model, a semi-active takeover trading strategy in Europe is profitable and generates positive risk-adjusted returns.*

9.2.3. Semi-Active Attitude Portfolios

Table 11.

			Intercept		$R_{Market} - R_f$	
Portfolio (Dependent Variable)	Sample Size (N)	R^2	Alpha (α)	p-value	Beta (β)	p-value
Attitude Portfolios (t+2)						
Friendly Risk Arbitrage Portfolio	103	0.0005	2.17%	0.0000	0.0193	0.818
Hostile Reverse Risk Arbitrage Portfolio	99	0.0288	-0.71%	0.4939	-0.3549	0.093
Attitude Takeover Trading Strategy Portfolio	103	0.0243	1.39%	0.0268	-0.1947	0.116

Sample size (N) is sample of monthly returns. Values indicate statistical significance at the 95% confidence level.

The friendly risk arbitrage portfolio generates significant abnormal returns of 2.17%, however the returns are lower than those of the risk arbitrage prediction model portfolio of 2.76%. As a result we do not reject our sixth hypothesis:

Hypothesis 6: a) *A semi-active risk arbitrage portfolio consisting solely of friendly bids generates positive risk-adjusted returns.* ***b)*** *However, the returns are lower than those of the risk arbitrage portfolio constructed using the prediction model*.

The Hostile Reverse Risk Arbitrage Portfolio has a negative monthly return of -0.71%, which leads us to reject hypothesis 7a), but the returns are less negative compared to the reverse risk arbitrage prediction model portfolio of -1.43%, this indicates that we should not reject hypothesis 7b):

Hypothesis 7: a) *A reverse risk arbitrage portfolio consisting solely of hostile bids in Europe generates positive risk-adjusted returns.* ***b)*** *However, the returns are lower than those of a reverse risk arbitrage portfolio constructed using a prediction model.*

The attitude takeover strategy portfolio has a significant positive monthly return of 1.39%,where this portfolio returns are burdened by the hostile reverse portfolio. Nevertheless the portfolio has significant abnormal returns and as a result we do not reject hypothesis 8a). However as mentioned in the descriptive statistics, the returns of hostile reverse risk arbitrage portfolio remains in cash for long periods of time, 35 of 103 sample months. Consequently the reverse positions in the attitude takeover trading portfolio does not burden the returns compared to how much the returns of the prediction model takeover strategy portfolio is burdened by the reverse positions. As a result the returns of the attitude takeover trading strategy portfolio is higher than

the takeover trading strategy prediction model portfolio of 0.66% indicating that we cannot reject hypothesis 8b):

Hypothesis 8: a) *A takeover trading strategy portfolio based on attitude generates positive risk-adjusted returns.* ***b)*** *However, the returns are lower than the returns of a takeover trading strategy portfolio utilizing a prediction model.*

9.2.4. Regression Caveats

The low R^2 for all regressions indicate that the Capital Asset Pricing Model is hardly explaining the variability in the return levels, this is in line with Ineichen (2002) who argue that hedge fund strategies have returns that are not normally distributed. Furthermore, as mentioned in the predictor variables, several researchers, among others Sudarsaman et. al. (2008) have found that risk arbitrage returns and market returns have a non-linear relationship. Finally, we want to point out that the returns are not net of transaction cost.

10. Conclusions

On a sample of 212 cash takeovers in Europe over the period of 1997-2005, this study is the first to provide empirical evidence about the profitability of takeover trading strategies in the European market. Consistent with the findings in other markets, passive European risk arbitrage portfolios generate significant positive abnormal returns before transaction costs ranging from 2.27% to 3.24% per month. We have also showed that risk arbitrageurs can easily enhance their returns by forming semi-active portfolios based on a takeover outcome prediction model, this we believe can be of great interest for the risk arbitrage community.

We have also examined the returns of semi-active reverse risk arbitrage portfolios which were constructed using 1) an adjusted expected return model and 2) the target resistance as indicators of takeover outcome, however the results were not encouraging, and we conclude that takeover traders should exercise caution when constructing semi-active reverse risk arbitrage portfolios in the European market.

10.1. Suggestions for Future Research

We believe that a thesis examining the returns of risk arbitrage in the European market based on other deal payment methods than cash would be of great contribution. Furthermore, since a study by Moore et al. (2006) has shown that a majority of active risk arbitrageurs use leverage when setting up their positions it would be of interest to examine the impact of this on the profitability of the strategy. Moreover, as has been done in the U.S by Mitchell and Pulvino (2001), we believe that a thesis using contingent claims analysis and a piecewise linear model to risk adjust the returns in addition to CAPM would have interesting results. Finally, we believe that a thesis that developed a prediction model based on a European merger and acquisition sample would provide interesting results.

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Electronic and Other Resources

Bureau van Dijk Zephyr

Thomson Financial Datastream

Securities Data Corporation (SDC) Thomson Financials' International Merger and Acquisitions Database.

Appendix 1

Short-Selling Legality and Feasibility

Country	When short selling was allowed	Whether short selling is practiced
Austria	before 1990	Yes
Belgium	before 1990	Yes
Denmark	before 1990	Yes
Finland*	allowed in 1998	No
France	before 1990	Yes
Germany	before 1990	Yes
Greece**	not allowed	No
Ireland	before 1990	Yes
Italy	before 1990	Yes
Netherlands	before 1990	Yes
Norway***	allowed in 1992	Yes
Portugal	before 1990	Yes
Spain****	allowed in 1992	No
Sweden	allowed in 1991	Yes
Switzerland	before 1990	Yes
United Kingdom	before 1990	Yes

The table is adapted from Charoenrook and Daouk (2005), besides selecting our sample countries no changes have been made.

*The transfer tax laws place a serious burden on the activity.
**Securities lending and borrowing have been legalized by the Greek parliament, but the operational framework has yet to be established.
***Securities lending is still in the early stages of development and tax implications are being discussed at the Ministry of Finance.
****Securities lending and short selling is available since 1992. Since 1994, SCLV has acted as a principal for the lending pool formed by the daily bids from the clearing members. The load must be reported to the SCLV within two working days of the sale date.

Appendix 2

Total sample of cash takeovers in Europe between June 1997 to December 2005

Date Announced	Target Name	Target Nation	Acquirer Name	Acquirer Nation	Attitude
1997-06-12	Hapag-Lloyd AG	Germany	Preussag AG	Germany	Friendly
1997-07-04	Midland Independent Newspapers	United Kingdom	Mirror Group PLC	United Kingdom	Friendly
1997-07-07	Bridon PLC	United Kingdom	FKI PLC	United Kingdom	Friendly
1997-09-16	Salomon SA	France	Adidas AG	Germany	Friendly
1997-10-13	AGF	France	Assicurazioni Generali SpA	Italy	Hostile
1997-10-13	Redland PLC	United Kingdom	Lafarge SA	France	Hostile
1997-11-06	Dassault Electronique	France	Thomson-CSF	France	Friendly
1997-11-11	Banque Bruxelles Lambert SA	Belgium	ING Groep NV	Netherlands	Friendly
1997-11-12	Etam PLC	United Kingdom	Etam Developpement SA	France	Friendly
1997-11-17	AGF	France	Allianz AG	Germany	Friendly
1997-11-28	Vendome Luxury Group PLC	United Kingdom	Compagnie Financiere Richemont	Switzerland	Friendly
1997-11-28	Sirti SpA	Italy	Pirelli & Co SpA	Italy	Friendly
1997-12-05	Rosenthal AG	Germany	Waterford Wedgwood PLC	Ireland-Rep	Friendly
1997-12-22	Aachener und Muenchener	Germany	Assicurazioni Generali SpA	Italy	Friendly

1997-12-23	HIT SA	France	Bodycote International PLC	United Kingdom	Friendly
1998-01-21	Allied Colloids Group PLC	United Kingdom	Ciba Specialty Chemicals	Switzerland	Friendly
1998-02-03	Argos PLC	United Kingdom	Great Universal Stores PLC	United Kingdom	Hostile
1998-02-09	Koninklijke Bijenkorf Beheer	Netherlands	Vendex International NV	Netherlands	Friendly
1998-04-17	Courtaulds PLC	United Kingdom	Akzo Nobel NV	Netherlands	Friendly
1998-05-19	American Port Services PLC	United Kingdom	Assoc British Ports Hldgs PLC	United Kingdom	Friendly
1998-08-05	Inspec Group PLC	United Kingdom	Laporte PLC	United Kingdom	Friendly
1998-08-10	Discoverer ASA	Norway	Prosafe ASA	Norway	Friendly
1998-09-09	Nackebro	Sweden	Drott AB	Sweden	Friendly
1998-09-11	Bilton PLC	United Kingdom	Slough Estates PLC	United Kingdom	Hostile
1998-09-30	But SA	France	Kingfisher PLC	United Kingdom	Friendly
1998-10-30	Fokus Bank A/S	Norway	Svenska Handelsbanken AB	Sweden	Unsolic.
1998-11-12	Fokus Bank A/S	Norway	Den Danske Bank AS	Denmark	Friendly
1998-11-13	Cie Royale Asturienne de Mines	Belgium	Nord-Est SA	France	Friendly
1998-11-26	Marston Thompson & Evershed	United Kingdom	Wolverhampton & Dudley	United Kingdom	Hostile
1998-11-26	Marley PLC	United Kingdom	John Mansfield Group PLC	United Kingdom	Hostile
1998-11-30	Ulstein Holding(Ulstein Grp)	Norway	Vickers PLC	United Kingdom	Friendly
1998-12-01	Verseidag AG	Germany	Gamma Holding NV	Netherlands	Friendly
1998-12-17	Kalmar Industries AB(NEW)	Sweden	Partek AB Oy	Finland	Friendly
1998-12-21	Ibstock PLC	United Kingdom	CRH PLC	Ireland-Rep	Friendly
1998-12-23	Evans Halshaw Holdings PLC	United Kingdom	Pendragon PLC	United Kingdom	Friendly
1999-01-06	Finansbanken ASA	Norway	Storebrand ASA	Norway	Friendly
1999-01-11	English China Clays PLC	United Kingdom	Imetal SA	France	Hostile
1999-01-22	Servisair PLC	United Kingdom	Amey PLC	United Kingdom	Hostile
1999-01-27	Xavier Computer Group PLC	United Kingdom	CCI Holdings PLC	United Kingdom	Friendly
1999-02-01	Guardian Royal Exchange PLC	United Kingdom	Sun Life and Provincial	United Kingdom	Friendly
1999-02-04	Delphi Group PLC	United Kingdom	Adecco SA	Switzerland	Friendly
1999-02-08	Lahmeyer AG	Germany	RWE AG	Germany	Friendly
1999-02-20	Telecom Italia SpA	Italy	Ing C Olivetti & Co SpA	Italy	Hostile
1999-02-23	Telecom Italia Mobile SpA	Italy	Telecom Italia SpA	Italy	Friendly
1999-03-08	Asticus AB	Sweden	IVG Holding AG	Germany	Friendly
1999-03-11	M&G Group PLC	United Kingdom	Prudential PLC	United Kingdom	Friendly
1999-03-19	Gucci Group NV	Netherlands	LVMH Moet-Hennessy Louis SA	France	Hostile
1999-03-23	PriFast AB	Sweden	Fastighets AB Balder	Sweden	Friendly
1999-03-24	Strafor-Facom SA	France	Fimalac SA	France	Hostile
1999-03-30	Tryg-Baltica Forsikring	Denmark	Codan Forsikring AS	Denmark	Friendly
1999-03-30	Capital Corp PLC	United Kingdom	Stanley Leisure PLC	United Kingdom	Friendly
1999-03-31	Comau SpA(Comau Finanziaria)	Italy	Fiat SpA	Italy	Friendly
1999-04-15	Polypipe PLC	United Kingdom	Imperial Metal Industries PLC	United Kingdom	Friendly
1999-05-03	Scancem AB	Sweden	Heidelberger Zement AG	Germany	Friendly
1999-05-04	Royal Packaging Inds Van Leer	Netherlands	Huhtamaki Oy	Finland	Friendly
1999-05-18	Portsmouth & Sunderland News	United Kingdom	Johnston Press PLC	United Kingdom	Friendly
1999-05-24	Hodder Headline PLC	United Kingdom	WH Smith Group PLC	United Kingdom	Friendly
1999-05-24	Chesterfield Properties PLC	United Kingdom	Quintain Estates & Dvlp PLC	United Kingdom	Friendly
1999-05-26	NKF Holding NV	Netherlands	Draka Holding NV	Netherlands	Friendly
1999-07-19	Banco Pinto & Sotto Mayor SA	Portugal	Banco Comercial Portugues SA	Portugal	Hostile
1999-07-19	Credito Predial Portugues SA	Portugal	Banco Comercial Portugues SA	Portugal	Unsolic.
1999-07-27	Scancem AB	Sweden	Heidelberger Zement AG	Germany	Friendly
1999-08-13	BHF Bank KGaA	Germany	ING Groep NV	Netherlands	Friendly
1999-08-16	AGA AB	Sweden	Linde AG	Germany	Friendly
1999-08-19	Finansieringsinstitutet for	Denmark	Kapital Holding A/S	Denmark	Hostile
1999-08-20	SITA(Suez Lyonnaise des	France	Suez Lyonnaise des Eaux	France	Friendly

	Eaux)		SA		
1999-08-31	Investec SGPS SA	Portugal	Lusomundo SGPS SA	Portugal	Neutral
1999-09-13	TAG Heuer International SA	Switzerland	LVMH Moet-Hennessy Louis SA	France	Friendly
1999-09-15	Milner Estates PLC	United Kingdom	Delancey Estates PLC	United Kingdom	Friendly
1999-09-20	Vickers PLC	United Kingdom	Rolls-Royce Plc	United Kingdom	Friendly
1999-10-05	Sotogrande SA	Spain	NH Hoteles SA	Spain	Friendly
1999-10-28	Intertechnique SA	France	Zodiac SA	France	Friendly
1999-11-05	Tarmac PLC	United Kingdom	Anglo American PLC	United Kingdom	Friendly
1999-11-08	Rugby Group PLC	United Kingdom	RMC Group PLC	United Kingdom	Friendly
1999-11-22	Swallow Group PLC	United Kingdom	Whitbread PLC	United Kingdom	Friendly
1999-11-24	Alpinvest Holding NV	Netherlands	GIMV	Belgium	Friendly
1999-12-06	Selmer ASA	Norway	NCC AB	Sweden	Hostile
2000-01-11	Banco Mello SA	Portugal	Banco Comercial Portugues SA	Portugal	Friendly
2000-01-13	Racal Electronics PLC	United Kingdom	Thomson-CSF	France	Friendly
2000-01-24	BTP PLC	United Kingdom	Clariant AG	Switzerland	Friendly
2000-01-25	MAPFRE(Corp MAPFRE SA)	Spain	Corp MAPFRE Cia Internacional	Spain	Friendly
2000-01-28	Real Time Control PLC	United Kingdom	NSB Retail Systems PLC	United Kingdom	Friendly
2000-02-01	Blue Circle Industries PLC	United Kingdom	Lafarge SA	France	Hostile
2000-02-08	Gildemeister Italiana SpA	Italy	GILDEMEISTER AG	Germany	Hostile
2000-02-09	Fastighets AB Balder	Sweden	Drott AB	Sweden	Hostile
2000-02-25	Hollandsche Beton Groep NV	Netherlands	Boskalis Westminster NV	Netherlands	Hostile
2000-03-03	Hoek's Machine NV(Linde AG)	Netherlands	Linde AG	Germany	Friendly
2000-03-14	Burmah Castrol PLC	United Kingdom	BP Amoco PLC	United Kingdom	Friendly
2000-03-22	St James' Place Capital PLC	United Kingdom	Halifax Group PLC	United Kingdom	Friendly
2000-03-22	Befesa Medio Ambiente SA	Spain	Abengoa SA	Spain	Friendly
2000-03-24	HIDROCANTABRICO	Spain	Union Electrica Fenosa SA	Spain	Friendly
2000-03-29	British Borneo Oil & Gas PLC	United Kingdom	ENI SpA	Italy	Friendly
2000-03-31	Dorling Kindersley Holdings	United Kingdom	Pearson PLC	United Kingdom	Friendly
2000-04-13	Border Television PLC	United Kingdom	Capital Radio PLC	United Kingdom	Friendly
2000-04-13	Selmer ASA	Norway	Skanska AB	Sweden	Friendly
2000-04-19	Banca Popolare di Crema	Italy	Banca Popolare di Lodi Scarl	Italy	Friendly
2000-04-25	Inmobilaria Zabalburu	Spain	Bami SA Inmobiliaria	Spain	Friendly
2000-05-02	Sun Life and Provincial	United Kingdom	AXA SA	France	Friendly
2000-05-02	Sylea SA(Labinal)	France	Valeo SA	France	Friendly
2000-05-05	BHV(Societe Anonyme des)	France	Galeries Lafayette SA	France	Friendly
2000-05-05	Magneti Marelli SpA(Fiat SpA)	Italy	Fiat SpA	Italy	Friendly
2000-05-16	NetCom ASA	Norway	TeleDanmark AS	Denmark	Hostile
2000-05-22	Arjo Wiggins Appleton PLC	United Kingdom	Worms & Cie	France	Friendly
2000-05-31	BAAN Co NV	Netherlands	Invensys PLC	United Kingdom	Friendly
2000-06-07	Banco di Napoli SpA	Italy	SanPaolo IMI SpA	Italy	Friendly
2000-06-13	COBEPA	Belgium	BNP Paribas SA	France	Friendly
2000-06-21	Svedala Industri AB	Sweden	Metso Oyj	Finland	Friendly
2000-06-23	NetCom ASA	Norway	Telia AB	Sweden	Friendly
2000-07-18	Prism Rail PLC	United Kingdom	National Express Group PLC	United Kingdom	Friendly
2000-07-30	Falck SpA	Italy	Cia di Partecipazioni Assicura	Italy	Friendly
2000-08-17	Bayerische Vita	Italy	Ergo Versicherungsgruppe AG	Germany	Friendly
2000-08-24	Morrison PLC	United Kingdom	Anglian Water PLC	United Kingdom	Friendly
2000-09-06	Allianz Subalpina SpA	Italy	RAS	Italy	Friendly
2000-09-07	Sylea SA(Labinal)	France	Valeo SA	France	Friendly
2000-09-21	British Polythene Inds PLC	United Kingdom	Macfarlane Group PLC	United Kingdom	Hostile
2000-10-12	Finoutremer	Belgium	Societe Generale de Belgique	Belgium	Friendly
2000-10-25	SAI Automotive AG	Germany	Faurecia SA	France	Friendly
2000-10-27	Southnews PLC	United Kingdom	Trinity Mirror PLC	United Kingdom	Friendly
2000-11-09	Beers NV	Netherlands	Scania AB	Sweden	Friendly
2000-11-10	Ellis & Everard PLC	United Kingdom	Koninklijke Vopak NV	Netherlands	Friendly

2000-11-10	Hazlewood Foods PLC	United Kingdom	Greencore Group PLC	Ireland-Rep	Friendly
2000-11-24	Wates City of London Props PLC	United Kingdom	Pillar Property PLC	United Kingdom	Friendly
2000-12-20	Banca di Legnano	Italy	Banca Popolare di Milano	Italy	Friendly
2001-01-08	Blue Circle Industries PLC	United Kingdom	Lafarge SA	France	Friendly
2001-01-12	Asturiana de Zinc SA	Spain	Xstrata AG	Switzerland	Friendly
2001-02-06	HIDROCANTABRICO	Spain	RWE AG	Germany	Friendly
2001-04-02	Saint Gobain Cristaleria SA	Spain	Cie de Saint-Gobain SA	France	Friendly
2001-04-06	Calve-Delft Bel Mij	Netherlands	Fortis(NL)NV	Netherlands	Friendly
2001-04-09	Entrelec Group	France	ABB Ltd	Switzerland	Friendly
2001-04-26	Community Hospitals Group PLC	United Kingdom	Capio AB	Sweden	Friendly
2001-06-21	Meconic PLC	United Kingdom	Johnson Matthey PLC	United Kingdom	Friendly
2001-06-22	Austria Tabakwerke AG	Austria	Gallaher Group PLC	United Kingdom	Friendly
2001-06-26	AGIV AG	Germany	HBAG Real Estate AG	Germany	Friendly
2001-06-27	Expand SA	France	StudioCanal	France	Friendly
2001-07-03	Goody's SA	Greece	Delta Holding SA	Greece	Friendly
2001-07-19	Tempus Group PLC	United Kingdom	Havas Advertising SA	France	Friendly
2001-08-14	Euro Sales Finance PLC	United Kingdom	Royal Bank of Scotland Group	United Kingdom	Friendly
2001-08-15	TBI PLC	United Kingdom	VINCI SA	France	Hostile
2001-08-20	Tempus Group PLC	United Kingdom	WPP Group PLC	United Kingdom	Friendly
2001-09-07	Bodegas y Bebidas	Spain	Allied Domecq PLC	United Kingdom	Friendly
2001-10-03	Koipe SA(Medeol SA)	Spain	SOS Cuetara SA	Spain	Friendly
2001-10-30	Moeara Enim Petroleum	Netherlands	Fortis(NL)NV	Netherlands	Friendly
2002-01-24	Lapeyre(Financiere Poliet)	France	Cie de Saint-Gobain SA	France	Neutral
2002-01-28	Europeenne de Casinos	France	Groupe Partouche SA	France	Neutral
2002-02-05	Hollandsche Beton Groep NV	Netherlands	Dragados y Construcciones SA	Spain	Friendly
2002-02-10	Modelo Continente SGPS SA	Portugal	Sonae SGPS SA	Portugal	Friendly
2002-03-15	Iberica de Autopistas SACE	Spain	Aurea	Spain	Friendly
2002-03-19	Iberica de Autopistas SACE	Spain	ACESA	Spain	Hostile
2002-03-22	Innogy Holdings PLC	United Kingdom	RWE AG	Germany	Friendly
2002-04-03	Coface	France	Natexis Banques Populaires	France	Friendly
2002-04-29	ConSors Discount Broker AG	Germany	BNP Paribas SA	France	Friendly
2002-05-08	Bouygues Offshore	France	Saipem SpA	Italy	Friendly
2002-05-17	Prowting PLC	United Kingdom	Westbury PLC	United Kingdom	Friendly
2002-05-28	Tecis Holding AG	Germany	AWD Holding AG	Germany	Friendly
2002-06-25	Gullane Entertainment PLC	United Kingdom	HIT Entertainment PLC	United Kingdom	Friendly
2002-09-09	Grantchester Holdings PLC	United Kingdom	Hammerson PLC	United Kingdom	Friendly
2002-11-26	ITALGAS	Italy	ENI SpA	Italy	Friendly
2002-12-09	Squaresum Plc	United Kingdom	CODASciSys PLC	United Kingdom	Friendly
2003-01-13	Vodafone Telecel-Comunicacoes	Portugal	Vodafone Group PLC	United Kingdom	Friendly
2003-02-26	Oxford GlycoSciences PLC	United Kingdom	Celltech Group PLC	United Kingdom	Hostile
2003-03-26	PRI Group PLC	United Kingdom	Brit Insurance Holdings PLC	United Kingdom	Friendly
2003-04-09	Air Dolomiti SpA	Italy	Deutsche Lufthansa AG	Germany	Friendly
2003-05-02	BBAG Oest Brau-Beteiligungs AG	Austria	Heineken NV	Netherlands	Friendly
2003-05-02	Brau Union AG	Austria	Heineken NV	Netherlands	Friendly
2003-05-28	Terra Networks SA	Spain	Telefonica SA	Spain	Friendly
2003-07-18	Entenial SA	France	Credit Foncier de France SA	France	Friendly
2003-08-04	Project Telecom PLC	United Kingdom	Vodafone Group PLC	United Kingdom	Friendly
2003-10-01	Polar Kiinteistot Oyj	Finland	IVG Immobilien AG	Germany	Friendly
2003-12-19	Banco Atlantico SA	Spain	Banco de Sabadell SA	Spain	Friendly
2004-02-06	Entenial SA	France	Credit Foncier de France SA	France	Friendly
2004-03-23	SAP Systems Integration AG	Germany	SAP AG	Germany	Friendly
2004-03-29	Phoenix AG	Germany	Continental AG	Germany	Friendly
2004-04-05	Aare-Tessin fuer Elektrizitaet	Switzerland	UBS AG	Switzerland	Friendly
2004-05-18	Celltech Group PLC	United Kingdom	UCB SA	Belgium	Friendly

2004-06-03	Alvis PLC	United Kingdom	BAE Systems PLC	United Kingdom	Friendly
2004-09-10	SNT Group NV	Netherlands	Koninklijke KPN NV	Netherlands	Neutral
2004-09-14	Song Networks Holding AB	Sweden	TDC A/S	Denmark	Neutral
2004-09-22	Song Networks Holding AB	Sweden	Tele2 AB	Sweden	Friendly
2004-11-01	PinkRoccade NV	Netherlands	Getronics NV	Netherlands	Neutral
2004-12-05	Maag Holding AG	Switzerland	Swiss Prime Site AG	Switzerland	Neutral
2004-12-07	Bail Investissement SA	France	Fonciere des Regions SA	France	Neutral
2004-12-16	ITNET PLC	United Kingdom	Serco Group PLC	United Kingdom	Friendly
2004-12-17	Ioltech SAS	France	Carl Zeiss Meditec AG	Germany	Friendly
2004-12-28	Investkredit Bank AG	Austria	Oesterreichische Volksbanken	Austria	Friendly
2004-12-29	Aluminium de Grece SA	Greece	Mytilineos Holdings SA	Greece	Friendly
2005-01-11	Elkem ASA	Norway	Orkla ASA	Norway	Neutral
2005-01-12	Aggregate Industries PLC	United Kingdom	Holcim Ltd	Switzerland	Unsolic.
2005-01-24	Equant NV	Netherlands	France Telecom SA	France	Friendly
2005-01-25	Altedia SA	France	Adecco SA	Switzerland	Friendly
2005-01-27	Aldeasa SA	Spain	Autogrill SpA	Italy	Neutral
2005-02-10	Sapa AB	Sweden	Orkla ASA	Norway	Friendly
2005-03-14	Ioltech SAS	France	Carl Zeiss Meditec AG	Germany	Friendly
2005-03-14	Gecina SA	France	Metrovacesa SA	Spain	Friendly
2005-05-02	Banca Antonveneta SpA	Italy	Banca Popolare di Lodi Scarl	Italy	Friendly
2005-05-11	Koninklijke P&O Nedlloyd	Netherlands	AP Moller Maersk AS	Denmark	Neutral
2005-05-23	Pillar Property PLC	United Kingdom	British Land Co PLC	United Kingdom	Neutral
2005-06-13	Leica Geosystems AG	Switzerland	Hexagon AB	Sweden	Hostile
2005-06-20	Unitor A/S	Norway	Wilh Wilhelmsen ASA	Norway	Neutral
2005-06-21	Scottish Radio Holdings PLC	United Kingdom	Emap PLC	United Kingdom	Friendly
2005-06-24	Meta SpA	Italy	Holding Energia & Risorse	Italy	Friendly
2005-06-28	James Beattie PLC	United Kingdom	House of Fraser PLC	United Kingdom	Friendly
2005-07-17	Versatel Telecom International	Netherlands	Tele2 AB	Sweden	Neutral
2005-08-15	Exploration Resources ASA	Norway	Fugro NV	Netherlands	Friendly
2005-08-21	CP Ships Ltd	United Kingdom	TUI AG	Germany	Friendly
2005-08-22	Belhaven Group PLC	United Kingdom	Greene King PLC	United Kingdom	Friendly
2005-08-29	Exploration Resources ASA	Norway	Cie Generale de Geophysique SA	France	Friendly
2005-09-09	Sarna Kunststoff Holding AG	Switzerland	Sika AG	Switzerland	Friendly
2005-09-11	RAS	Italy	Allianz AG	Germany	Friendly
2005-09-12	Pohjola-Yhtyma Oyj	Finland	OKO Bank	Finland	Friendly
2005-09-19	Exel PLC	United Kingdom	Deutsche Post AG	Germany	Friendly
2005-10-17	Guinor Gold Corp	United Kingdom	Crew Gold Corp	United Kingdom	Friendly
2005-10-28	Sygen International PLC	United Kingdom	Genus PLC	United Kingdom	Friendly