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Merger Arbitrage in Germany

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Abstract

This paper analyses the risk and return characteristics from a merger arbitrage trading strategy in Germany for the first time. The extant literature focuses mainly on data sets from Anglo-American based jurisdictions with mixed results. We argue that because in Germany i) acquisition laws bias consideration toward cash bids thereby decreasing the uncertainty of announced transactions (versus share offers) and ii) the Aufsichstrat (supervisory board with employee participation) has corporate governance oversight over any proposed merger such that only bids tacitly approved by it are likely to be announced in the first instance, a merger arbitrage trading strategy in a German setting will have different risk and return characteristics. To estimate the significance of merger arbitrage returns we construct a realistic measure of risk arbitrage which factors in transaction costs and other practical limitations encountered by arbitrageurs employing this strategy. We also construct two additional portfolios, an equally-weighted portfolio and a value weighted portfolio, for comparison purposes. The results show that the practical risk arbitrage manager portfolio fails to outperform on a risk-adjusted basis indicating that insofar as the German setting yields benefits in the form of lower risk, these are properly priced by the market.

JEL classification numbers: G11, G15, G34
Keywords: Merger arbitrage, Germany, abnormal returns, practical limitations

1 Introduction

Merger arbitrage involves the integrated purchase and sale of shares in companies

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engaged in acquisitions to capitalise on the spread between the consideration offered (cash and/or shares) for a target firm's shares and the market price of those shares [1]. Previous merger arbitrage trading strategy research has focused on the US, Canadian, and UK markets — all of which have similar legal and internal corporate governance systems — for different periods and the results have been inconclusive [2][3][4][5][6]. For the first time this paper investigates the profitability of the merger arbitrage strategy which involved firms listed on the German stock exchange, arguing that because Germany's corporate governance structures and acquisition laws are likely to combine to decrease merger risk relative to previously researched jurisdictions, an analysis of the risk-adjusted characteristics of the merger arbitrage strategy in a German setting is merited.

Germany operates a two tier corporate governance structure versus the one-tier board structure in the Anglo-American jurisdictions where previous merger arbitrage research was undertaken [7][8]. The Aufsichtsrat — a supervisory board which is comprised of an equal number of employee and shareholder representatives — is particularly relevant for this study because one of its main roles is to confirm all corporate actions, of which proposed mergers are an example. Indeed, Köke argues that the Aufsichtsrat is likely to have a profound effect on the probability of any announced acquisitions completing successfully [9]. Another factor likely to impact of the successful consummation of announced acquisitions is that German takeover law makes share offers more difficult and so biases consideration toward cash. These stipulations decrease the likelihood that announced mergers will fail, and so decrease the uncertainty of a merger arbitrage strategy involving German firms.

The objective of this paper is to examine the impact of setting in the merger arbitrage process. Cornelli and Li argue that arbitrageurs can impart demand side pressure via their holdings to influence outcomes of announced mergers [10]. This paper adopts a sell side approach to argue that the corporate governance and legal setting can also influence outcomes. To test this hypothesis we follow the prior literature by creating a simulated risk arbitrage portfolio using high frequency daily data in a manner ascribed to practitioners [11]. To construct the simulated portfolio a long position is taken in the target equity and a simultaneous short position is taken in the consideration, creating a merger arbitrage position that captures deal spreads. We then combine the merger arbitrage positions into three portfolios: an equally weighted portfolio; a value weighted portfolio; and a real world portfolio which controls for transaction costs and capital constraints. We use multi-factor asset class pricing models, which have been specified extensively in the hedge fund and mutual fund literature to assess risk and performance of investment funds, to examine the data generating process of the merger arbitrage strategy.

As such this paper represents a robust extension of the extant research in an

alternative setting (i.e. non Anglo-Saxon) where the governance and legal setting is expected to favourably impact the risk and potentially the risk-adjusted returns to a merger arbitrage strategy.

2 Literature Review

When a merger is announced a spread between the target's share price and the consideration (deal price) is established instantaneously. The size of the spread between the target price and the consideration depends on investors' expectations of whether or not the merger will be successfully consummated (ceteris paribus the spread will decrease as the consummation date approaches). Merger arbitrageurs attempt to profit from the narrowing spread by purchasing shares in the target firm and simply waiting (in all-cash transactions) or by simultaneously short-selling shares in the acquirer (in all-share transactions).

Drawn by the high reported returns by practitioners, academics have attempted to replicate the merger arbitrage strategy in various markets. Early evidence from the US markets, where the majority or merger activity takes place, was that the strategy was indeed profitable. Dukes et al. studied 761 tender offers involving US firms between 1971 and 1985 and found that 82% of the transactions to be profitable with average abnormal returns of 24.6% [2]. Similarly, Jindra and Walkling studied 362 cash tender offers between 1981 and 1995, reporting annual returns of 24.0% [3]. Branch and Yang concentrated their research on 244 stock swap offers with collars between 1994 and 2003 and estimated annualised excess returns of 9.2% [1]. Outside of the US Karolyi and Shannon examined the profit potential of a risk arbitrage trading strategy involving Canadian firms [4]. They studied 37 transactions valued over CAD$50million which took place in 1997, reporting an annualised excess return of 33.9%

A criticism of academic risk arbitrage research is that the studies often ignore practical factors. Indeed, Shleifer and Vishny argue that the textbook definition of arbitrage is unrealistic because the strategy can be hindered by real world factors which, if not accommodated in the analysis, can bias prior performance estimates upwards [12]. With this in mind, more recent research has attempted assess whether the reported excess returns are robust to the accommodation of such practical limiting factors. For instance, in their study of a diversified portfolio of 1,901 cash and stock mergers and acquisitions risk arbitrage positions from 1981–1996, Baker and Savasoglu constrained the risk bearing capacity of the arbitrageur to better reflect reality [13]. The authors observed returns ranging from 0.6–0.9% per month for the sample period (annual return 7.2–10.8%), with estimated positive excess returns of a more modest 3.6% per annum. Similarly, based on a comprehensive sample of 4,750 transactions spanning from 1963 to 1998, in the knowledge that in the real world transaction costs prevent rational

traders from fully eliminating inefficiencies, i.e. make arbitrage costly (Pontiff, 2006). Mitchell and Pulvino controlled for transaction costs and generated abnormal returns of just 4.0% per annum [11].

Extending the research outside of a North American setting Maheswaran and Chin Yeoh and Kearney et al. studied returns to merger arbitrage in Australian and UK settings, respectively [6][5]. Maheswaran and Chin Yeoh find that merger arbitrage generates statistically and economically significant excess risk-adjusted returns when the portfolios are benchmarked against the CAPM and Fama and French three-factor models [15], but only before transaction costs [6]. Kearney, Hutchinson and Cotter include transaction costs and limitations on investing capital to reflect real world constraints in their study [5]. The authors find evidence that excess returns are robust to the accommodation of these practical limiting factors in the UK generating 2.5% per annum. They also find that, contrary to prior evidence, the strategy produced consistently positive returns with a low variance, i.e. there is almost no significant relationship with equity market risk factors over the sample period.

What is evident from is the extant research is that all of the prior studies are located in jurisdictions with Anglo/American (outsider) governance characteristics (i.e. US, Canada, Australia and the UK). Shleifer and Vishny identified agency problems as one of the limiting practical factors that might hinder the success of a merger arbitrage strategy [12]. Although the agency problem to which they refer is that between the brains and the resources involved in implementing the strategy, the agency problems that exist within both companies involved in an announced merger are also likely to impact both on the consideration in that merger as well as the probability of that merger being successful, and so impact on the risk-adjusted returns from a merger arbitrage strategy based thereon.

2.1 The German Setting

There are differences in corporate governance and legal systems across countries which, for the purposes of this study, are likely to impact the outcome of those mergers. At one extreme of the corporate governance landscape is the Anglo-American system found in the US, Canada, Australia and the UK which, because ownership tends to be diffuse, has rules designed to promote shareholder value. At the other extreme is the Continental system found in Germany where management have responsibilities to multiple stakeholders, including employees, which limit management's ability to engage in activities which are in line with their own interests. Specifically, German corporation law (the Aktiengesetz), requires all public companies to have two boards: a management board called a Vorstand and a supervisory board called an Aufsichtsrat (half of which, in large firms, is comprised of employee representatives). Not only must the supervisory board approve all major business decisions (of which a merger is an example), but a supermajority is also required such that this study contends that the Aufsichstrat

will likely materially impact on the consideration offered, the probability of success, and hence on the risk-adjusted returns from a merger arbitrage strategy involving firms listed on the German stock exchange.

Germany's legal system pertaining to business combinations is also likely to influence merger arbitrage outcomes. Takeovers of public companies in Germany are regulated by the Securities Acquisition and Takeover Act (Wertpapiererwerbs-und Übernahmegesetz) which, due to stipulations contained therein, biases consideration toward cash bids. One such stipulation is that any shares offered as consideration for a German firm must be tradable on a regulated market within the European Economic Area (EEA) making share offers more complicated for non-EEA bidders. Another stipulation is that any proposed merger must be approved by a majority of 75% of the share capital of both entities (target and bidder) represented at each of the two shareholder meetings. In addition, dissenting target shareholders can challenge the majority agreed exchange ratio in the courts and, if successful, the bidder will have to pay to all target shareholders (and not only those dissenting) extra amounts in cash as determined by the court.

Given the inconclusive results from Anglo-American settings and the likely impact of German takeover law and governance structures on the risk of mergers, this research aims to examine if positive excess risk arbitrage returns are achievable from a merger arbitrage trading strategy in the German market.

3 Data and Methodology

The initial sample is all merger and acquisitions activity by publicly traded companies on the German market between the 1st January, 2003 and 1st June, 2007 for a total of 83 possible transactions. As a result of the relatively small number of all-share transactions on the German market during the sample period as well as the lack of available date on some mergers (i.e. where the information necessary for the study was not available from any source), the focus of this research is on a revised total final sample of 61 all-cash and cash-and-share transactions only for transactions (see Table 1).

Table 1: Mergers and Acquisitions Sample

Announcement Date	Conclusion Date	Acquirer	Target
2007			
12/12/2006	31/03/2007	Golman Sachs Group Inc (US)	Bayerische Hypo-und Vereins bank AG
30/11/2006	10/01/2007	PerkinElmer Inc (US)	Evotec Technologies Gmbh
23/11/2006	23/11/2006	Capital & Regional PLC (UK)	HAHN-Immobilien-Beteiligungs AG
04/12/2006	03/01/2007	BNP Paribus SA (FR)	Lafarge Roofing Gmbh
11/12/2006	18/01/2007	Fujitsu Ltd (JP)	TDS Informationstechnologie AG
30/01/2007	26/03/2007	Belden CDT Inc (US)	Hirschmann Automation & Control Gmbh
22/01/2007	24/05/2007	Areva SA (FR)	Repower Systems AG
26/03/2007	28/03/2007	Porsche AG (GM)	Volkswagen AG
2006			
06/12/2005	06/12/2005	Anglo Irish Bank Corp PLC (IR)	Der Praktiker Bau-und Heimwerkermarkt AG
12/12/2005	13/04/2006	Kemet Corp (US)	Epcos AG
14/12/2005	01/01/2006	Inter pipeline Fund (CA)	Tanklager-Gesellschaft Hoyer mbh
31/10/2005	31/12/2005	Hg Capital	Duerr AG
12/01/2006	01/03/2006	Pfizer Inc (US)	Sanofi-Aventis SA
22/02/2006	01/06/2006	Silgan Holdings Inc (US)	Amcor Ltd
16/02/2006	04/03/2006	Dr Reddy's Laboratories Ltd (IN)	Betapharm Arzneimittel Gmbh
27/03/2006	27/03/2006	Goldman Sach Group Inc (US)	KarstadtQuelle AG
23/03/2006	29/12/2006	Bayer AG (GM)	Schering AG
13/04/2006	13/06/2006	Pfizer Inc (US)	Schwarz Pharma AG
13/07/2006	13/07/2006	Record Realty (AU)	Deutsche Telekom AG
29/06/2006	31/07/2006	Archstone-Smith Trust (US)	Deutsche WohnAnlage Gmbh
20/06/2006	31/07/2006	Macquarie Bank Ltd (AU)	Petroplus International NV
05/07/2006	07/09/2006	SCOR (FR)	Revios Rueckversicherung
06/07/2006	06/07/2006	Delphis NV (BE)	Team Lines Gmbh & Co KG
17/09/2006	28/02/2007	Telecom Italia SpA (IT)	AOL Deutschland Gmbh
27/09/2006	27/09/2006	IVG Immobilien AG (GM)	CS Euroreal
25/09/2006	17/10/2006	OPG Groep NV (NT)	DIA Real Gmbh
05/10/2006	31/12/2006	Fonciere des Regions SA (FR)	Morgan Stanley Real Estate Fund LP
25/09/2006	28/12/2006	UCB SA (BL)	Schwarz Pharma AG
23/10/2006	23/10/2006	Morgan Stanley (US)	Commerz Grundbesitz Investment Gmbh
26/10/2006	22/01/2007	Global Equity Partners (AS)	Varta Microbattery Gmbh
2005			
23/11/2004	13/01/2005	Agfa-Gevaert NV (BE)	GWI
16/12/2004	07/04/2005	MobilCom Holding Gmbh (GM)	Strato AG
10/12/2004	19/04/2005	Heidelberg Cement AG	Teutonia Zementwerk AG
13/01/2005	31/03/2005	Metra Oy (FN)	Deutz Power Systems Gmbh
23/12/2004	15/04/2005	Deutsche Immobilien Chancen (GM)	Frankfurter Sparkasse Gmbh
28/01/2005	15/04/2005	BASF AG (GM)	Merck KGAA
01/03/2005	24/03/2005	Australian Infrastructure Fund (AU)	Hochtief Airport Gmbh
01/07/2005	01/09/2005	Danaher Corp (US)	Leica microsystems AG
05/08/2005	01/02/2006	Axel Springer Gmbh (GM)	ProSiebenSat.1 Media AG
13/10/2005	12/04/2006	Blackstone Group LP (US)	Cleanaway Deutschland Holding Gmbh
14/10/2005	28/02/2006	Fresenius AG (GM)	Helios Kliniken Gmbh
17/11/2005	31/03/2006	Commerzbank AG (GM)	Eurohypo AG

Table 1: Continued

Announcement Date	Conclusion Date	Acquirer	Target
2004			
23/12/2003	29/06/2004	Uniqa Versicherungen (AS)	Mannheimer AG Holding
13/01/2004	13/01/2004	Nufarm Ltd (AU)	BASF AG (GM)
12/02/2004	12/02/2004	Hg Capital (UK)	Hirschmann Electronics Gmbh & Co Kg
23/02/2004	31/03/2004	Hewlett-Packard Co (US)	Triaton Gmbh
15/03/2004	01/10/2004	United Technologies Corp (US)	Linde AG
23/04/2004	23/04/2004	Monster Worldwide Inc (US)	Jobpilot AG
22/06/2004	01/09/2004	Eaton Corp (US)	Walterscheid Rohrverbindungstechnik Gmbh
07/10/2004	03/12/2004	Praxair Inc (US)	Air Liquide SA
01/11/2004	10/02/2005	BorgWarner Inc (US)	BERU AG
2003			
12/12/2002	06/01/2003	Xstrata PLC (SZ)	Metaleurop SA
27/12/2002	13/06/2003	Gaz de France	Preussag Energie Gmbh
18/03/2003	05/01/2004	Assa Abloy AB (SW)	Black & Decker Corp
18/03/2003	02/09/2003	Procter & Gamble Co (US)	Wella Ag
15/04/2003	30/06/2003	Deceuninck NV (BE)	Thyssen Polymer Gmbh
14/05/2003	31/07/2003	Royal Bank of Scotland Group (UK)	Santander Direkt Bank AG
15/08/2003	09/10/2003	Getinge AB (SW)	Siemens Medical Solutions
12/09/2003	02/02/2004	Dow Chemical Co (US)	Celanese AG
13/10/2003	03/06/2004	Fairchild Corp (US)	Eurobike AG
14/11/2003	27/02/2004	Agilisys International (US)	Infor Business Solutions AG

This table presents the revised sample of 61 merger and acquisitions analysed in this study and presents the announcement dates, conclusion dates, name of the acquirer, name of target and type of consideration.

Detailed information about each of these 61 transactions was collected from "Acquisitions Monthly", a worldwide publication, which records merger and acquisition activity in the Eurozone. Bloomberg was used to supplement the data collection process. For each merger the target and acquirer, the value of the merger, the payment methods, the announcement date, revision date and conclusion date, as well as the details of failed transactions are collected. The announcement date of an offer is defined as the date at which the formal offer is made public. Although it is well documented in the research that pre-announcement rumours can cause considerable share price movements, for practical purposes this research uses the actual offer date to determine the starting point of the transaction. The determination of the conclusion date depends on whether the transaction was successful or unsuccessful. For successful bids the conclusion date is the date when successful bids are determined wholly unconditional; for unsuccessful bids the conclusion date is defined as the date when a public announcement is made concerning the failure of the transaction.

All returns are calculated for all transactions while active from the date that they were publicly announced until one-week after the conclusion of the merger to allow the market sufficient time to fully digest the impact of the transaction on the companies involved. Information about share prices, dividends, the risk free rate of return, the market rate of return, and the return inputs for the Fama and French three factor model used in this study are collected from DATASTREAM. The

risk free rate of return used is the 1-month German euro mark middle rate and the Morgan Stanley Capital International (MSCI) price index Germany is used to represent the market rate of return. The other two components of the Fama and French three-factor model are the HML (value stocks minus growth stocks) and the SMB (small cap. stock minus large cap. stocks). The HML factor was obtained by using the FTSE Germany value stocks index and the FTSE Germany growth stocks index. The SMB factor is, due to the lack of available small and large indices from the same vendor, obtained by using the FTSE International small cap index Germany and the FTSE Germany large cap index. Capital which is idle during the period of investment is assumed to earn the risk free rate of return.

3.1 Calculating Returns

There are two sources of return from merger arbitrage. The main source of return is the spread, i.e. the difference between the price at which the arbitrageur purchases the targets stock and the price offered by the acquiring company. The other source of returns comes in the form of any dividends received from the long position held in the target company's stock which can, in certain circumstances, have a significant impact on the overall calculation of returns. The formula used to compute the daily returns for individual deals is:

$$R_{it} = \frac{P_{it}^{T} + D_{it}^{T} - P_{it-1}^{T}}{P_{it-1}^{T}}$$

where R_{it} is the return for deal "i" on day "t", P^{T}_{it} is the closing price of the target company "i" on day "t", P^{T}_{it-1} is the closing price of the target company "i" on day "t-1" and D^{T}_{it} is the dividend receivable form the target company "i" on day "t".

The returns are calculated for the week prior to the announcement date and for each day thereafter that the deal is deemed active. The value of the long position is included in the portfolio at the close of trading on each day, however the returns are not realised until the deal is complete. If a transaction is unsuccessful, the arbitrageurs may have to sell the target company's stock at its market price to close out the position, a price which might be substantially lower than the original purchase price thereby yielding a negative return.

A transaction that consists of a combination of both cash and shares is treated as if it is a stock swap deal. The reasoning for this is that it is assumed that the market incorporates the cash element of the deal and thus is included in the share price of the target firm. To do this the arbitrageur simultaneously takes a long position in the shares of the target company and a short position in the shares of the acquirer. In order to maximize returns from this situation, shares in both companies must be held (long or short) by arbitrageurs in a ratio which reflects the proposed offer

price. The number of shares needed by the arbitrageur is calculated by the share exchange ratio agreed between the acquiring and target company.

There are three sources of profit, which may be obtained by an arbitrageur if this strategy is employed. The first is the difference between the price obtained from short selling the shares of the acquirer and the price at which the target stock is purchased. The second source of profit is realised from the dividend paid on the investment in the target company's stock. Unlike all-cash transactions the contribution of dividend yield to the return when shares are involved can be miniscule or non-existent (or even negative) because dividends payable on the short position offset any gains from the dividends receivable on the long position. The third source of return available to large institutions and hedge funds is the interest earned (typically at the risk free rate) from the proceeds from short selling the acquirer's shares. The formula for calculating the return on cash and share mergers is:

$$R_{it} = \frac{P_{it}^{T} + D_{it}^{T} - P_{it-1}^{T} - \Delta(P_{it}^{A} + D_{it}^{A} - P_{it-1}^{A} - r_f P_{i1}^{A})}{Position\ Value_{t-1}}$$

where, superscript *T* refers to the target, superscript *A* refers to the acquirer, Δ represents the hedge ratio i.e. the number of shares in the acquiring company to be exchanged for each target share, r_f is the risk free rate of return, P^{A}_{i1} represents the acquirers stock price at the close of market on the day following the merger announcement, and $Position\ Value_{t-1}$ is the value of the overall position on the previous day calculated as ($P^{T}_{it-1} + \Delta P^{A}_{it-1}$). All other variables are as previously defined.

Once the transaction is successfully completed, the arbitrage returns are realised from the spread observed on the announcement date. However, if the deal is unsuccessful then the arbitrageur is open to downside risk from unwinding both the long and short positions previously entered into.

Similar to Mitchell and Pulvino and Kearney et al. , this study establishes three separate merger arbitrage portfolios and charts their progress over the sample period [11][5]. The first two are the equally weighted (EWRA) and value weighted portfolios (VWRA), respectively, both of which ignore transaction costs and other practical limitations and are used for the purposes of comparison. The EWRA is calculated by simply averaging returns over 1,160 trading days where transactions were active (transactions which are absent are presumed to earn the risk free rate of return). The VWRA takes the relative size (or value) of each transaction each day into consideration and uses this relative daily weighting (where the sum of all weights each day equals 1) to scale each transaction's return. Similar to the equally weighted portfolio, it is assumed that the risk free rate of return can be achieved by transactions that are absent.

The third portfolio more realistically emulates the performance of a hypothetical risk arbitrage index manager (RAIM) in that it includes transaction costs. Because all of the share prices are taken from the Frankfurt stock exchange, the relevant transaction costs to be included in the risk arbitrage index manager portfolio are sourced from the Deutsche Boerse which provides prices for using the Frankfurt Stock Exchange trading system (see Table 2).

Table 2: Transaction Costs on the Frankfurt Stock Exchange

Fee Model	Floor per order (€)	Value based price		Cap per order (€)
High Volume	0.60	0.48	Basis points	18.00
Medium Volume	0.63	0.504	Basis points	18.90
Low Volume	0.69	0.552	Basis points	20.70

This table presents the transaction costs per order for the equity transactions in the portfolio.

In addition to the inclusion of transaction costs, a limit is placed on the amount of investment capital available because, in the real world, arbitrageurs do not have unlimited capital to invest [13]. Specifically, as mergers are announced the €1.0 million capital is invested. Each transaction is attributed an amount which is equally weighted throughout the sample period subject to the condition that no investment can correspond to more than 10% of the total portfolio value at any time. This additional condition is in place to protect arbitrageurs from downside risk caused by unsuccessful transactions. Returns calculated from active transactions are summed daily. This is an important process as it provides the position value inclusive of open positions over the 1,160 trading days.

3.2 Regression Equations

Much of the extant literature has attributed the returns achieved by the merger arbitrage trading strategy to compensation commensurate with bearing large amounts of unsystematic risk, i.e. the inherent risk that the proposed merger will not be a success and so expose any shareholders to a large downside. Any investors who own shares in a company subject to an acquisition bid and are unwilling to countenance the potential for such a large downside risk will liquidate their shareholding soon after the announcement of an offer. Although these investors typically earn a substantial return from an increase in the value of their shares almost immediately, this return is less than the total return that could have been earned if, assuming the acquisition is successful, they had held the shares to the conclusion of the transaction. Therefore, the probability that the proposed

merger will fail is the single most important factor in determining the size of the discount, or spread, these investors are willing to accept and which is the principal source of returns to arbitrageurs. As a result, arbitrage returns should contain very little systematic risk because, as explained, spread is a function of transaction specific risk only such that an analysis of the risk-adjusted returns from arbitrage is possible.

In order to perform this analysis this study uses two asset pricing models, the market model derived from the Capital Asset Pricing Model (CAPM) and a three factor model incorporating a market, size and value factors [15]. The market model is a single index model which assumes that all of a stock's systematic risk can be captured by one market factor:

$$y_t = \alpha + \beta R_{Mt} + \varepsilon_t \qquad R_{Mt},\ \varepsilon_t \sim \text{IID}$$

where y_t is the excess return on each of the three portfolios (EWRA, VWRA and RAIM) at time *t*, R_M is the excess return on the MSCI index at time *t*, and β measures the portfolio's volatility in relation to the market.

The three-factor model takes account of two additional risk factors to give a better estimate of the factors affecting the returns of the three risk arbitrage portfolios [15]. The additional factors which are said to explain over 90% of stock returns are *SMB*, which stands for small cap. index stocks minus large cap. index stocks, and *HML*, which stands for high book-to-market stocks minus low book-to-market stocks. The Fama and French three factor model is:

$$y_t = \alpha + \beta_1 R_{Mt} + \beta_2 SMB_t + \beta_3 HML_t + \varepsilon_t \qquad R_{Mt},\ SMB_t, HML_t,\ \varepsilon_t \sim \text{IID}$$

where all variables are as previously defined.

The important variable for this study is the intercept (Jensen's alpha) which measures the average return on a portfolio over and above that predicted by asset pricing models (given the portfolio's beta and the average market return) and other factors, or, in other words, the average abnormal returns generated by an arbitrageur. A significantly positive alpha is evidence that the portfolio generates positive risk adjusted abnormal returns.

4 Empirical Analysis

4.1 Descriptive statistics

Preliminary statistical analysis was carried out on the return series generated by the three risk arbitrage portfolios. Although the focus of this study is on the returns form the risk arbitrage index manager portfolio (RAIM), the returns from

the equal-weighted (EWRA), and the value-weighted (VWRA) included in Table 3, Panel A are useful benchmarks for comparison purposes.

Table 3: Descriptive Statistics

Panel A: Descriptive Statistics of Daily Portfolio Returns

Variable	Mean	Maximum	Minimum	Variance	Skewness	Kurtosis
EWRA-Rf	0.002	0.489	-0.136	0.07	6.508	107.4
VWRA-Rf	0.001	0.156	-0.101	0.03	1.221	17.72
RAIM-Rf	0.000	0.209	-0.091	0.01	7.029	165.5
Panel B: Descriptive Statistics of Explanatory Factors						
MSCI-Rf	0.001	0.072	-0.059	0.00	0.038	4.141
SMB	0.000	0.039	-0.050	0.00	-0.122	4.082
HML	0.000	0.026	-0.029	0.00	-0.188	3.743
Panel C: Cross Correlations Explanatory Factors						
		R_M	1.00			
		SMB	(0.65)	1.00		
		HML	0.29	(0.28)	1.00	

Panel A presents the descriptive statistics for the daily returns of the three return series. The statistics are analysing three different time series of returns, which span over a four-and-a-half-year period from 1/1/2003 to 12/6/2007. The first portfolio of returns (EWRA) is equally weighted, ignoring the practical limitations of risk arbitrage and is averaged across daily returns. The second portfolio of returns (VWRA) is similar to the equally weighted however returns are weighted according to the value of market capitalisation and averaged across daily returns. The third portfolio of returns (RAIM) simulates a risk arbitrage index manager and is comparative to an actively managed risk arbitrage portfolio. The excess return series generated by the market R_M (i.e. MSCI-Rf) for the sample period and the size (SMB) and book to market (HML) factors are also analysed in Panel B. Panel C presents the correlation coefficients between the 3 explanatory factors.

What is immediately evident is that, as predicted, the risk (as measured by variance) of the merger arbitrage strategy in Germany is significantly lower than that observed in other studies in alternative settings. That said, however, the returns are also significantly lower. The RAIM portfolio generates a positive daily excess return of 0.000% for the sample period. The VWRA portfolio performs better, earning an excess daily return of 0.001%. The EWRA portfolio performs best generating an excess return of just 0.002%, despite ignoring many of the practical limitations encountered by risk arbitrageurs. The positive skew observed for all return distributions combined with the large kurtosis figure indicate a portfolio exhibiting a number of extreme excess returns generally observed on profit making days. Overall the results indicate that ignoring transaction costs and other real world limiting factors play a major role in earning excess returns from employing a risk arbitrage trading strategy (i.e. help explain why the equal- and value-weighted portfolios outperform the risk arbitrage index manager portfolio) such that ignoring them is entirely unrealistic.

Descriptive statistics of the three risk factors are reported in Table 3, Panel B. The risk factors have mean returns which are zero over the sample period. It is also notable that the variance of the risk factors is considerably lower than the variance of the risk arbitrage portfolios. These factors also exhibit negative skewness and positive excess kurtosis. This study also employs a correlation analysis to detect any relationship that may exist between the individual return series and the Fama and French risk factors (see Table 3, Panel C). The correlation coefficients observed from this analysis are as expected. Of note is the high negative correlation between SMB and R_M which is due to the large cap stocks representing a large proportion of the market capitalisation of the MSCI index.

4.2 Regression Analysis

In order to account for the lower risk and return of the merger arbitrage strategy in the German setting, this section of the paper tests the risk-adjusted returns for each of the three return series over the test period January 2003 to June 2007. The regression results for both pricing models for each portfolio are included in Table 4.

Table 4: Time series Regression of Risk Arbitrage Returns

$$y_t = \alpha + \beta_1 R_M + \beta_2 SMB + \beta_3 HML + \varepsilon_t$$

y	α	R_M	SMB	HML	Adj R^2
EWRA – R_f	0.002	0.578			6.7%
	(0.03)	(0.00)			
EWRA – R_f	0.001	0.667	0.196	0.027	6.8%
	(0.05)	(0.00)	(0.09)	(0.87)	
VWRA – R_f	0.001	0.594			19.4%
	(0.21)	(0.00)			
VWRA – R_f	0.000	0.652	0.117	-0.025	19.5%
	(0.27)	(0.00)	(0.08)	(0.78)	
RAIM – R_f	0.000	0.120			1.9%
	(0.18)	(0.00)			
RAIM – R_f	0.000	0.142	0.046	-0.006	1.8%
	(0.21)	(0.00)	(0.33)	(0.93)	

This table presents the results from regressions run using a market model and a Fama and French (1993) three-factor model on each of the risk arbitrage return series on the market returns and two additional risk factors, SMB and HML. Where y_t is the excess return on the portfolio at time t, R_M is the excess return on the MSCI index at time t, SMB represents small cap stocks minus large cap stocks, HML represents value stocks minus growth stocks, and R_f represents the risk free rate of return. *p*-values from the test of $\alpha = 0$, and $\beta = 0$ (for R_M, SMB and HML) are in parentheses.

The results show that alpha is only significant for the equal-weighted regression.

Although positive, none of the alphas are statistically different from zero in both the value-weighted regression and the RAIM portfolio. Also of interest is that in all regression specifications of all three portfolios none of the additional factors used in this analysis are significant.

5 Conclusion

This paper researches the returns to a merger arbitrage setting in the German setting. The German market represents an interesting setting for this research because the extant literature to date has focused on data sets from Anglo-American based jurisdictions with mixed results. We argue that because in Germany i) acquisition laws bias consideration toward cash bids thereby decreasing the uncertainty (versus share offers) of announced transactions and ii) the Aufsichstrat (supervisory board with employee participation) has corporate governance oversight over any proposed merger such that only bids tacitly approved by it are likely to be announced in the first instance, a merger arbitrage trading strategy designed to profit from the successful completion of announced bids is likely to be less risky. As such, this study is the first to provide robust empirical evidence about the risk-return characteristics of the merger arbitrage strategy in a non-Anglo American context.

To perform the analysis in this study we construct three portfolios (an equally weighted, value weighted and a real world). What is immediately evident is the, as predicted, the risk of the merger arbitrage strategy in Germany is lower than those reported in Anglo/American settings [5]. In addition, all three portfolios outperform the market generating annualised returns of 57.9%, 26.7%, and 14.9%, respectively. The relative underperformance under real world conditions indicates that practical limiting factors play a major role in earning excess returns from employing a risk arbitrage trading strategy (i.e. help explain which the equal- and value-weighted portfolios outperform the risk arbitrage index manager portfolio) such that ignoring them is entirely unrealistic. By its very nature, merger arbitrage as a trading strategy has significant downside risk and this is reflected in the large skew and kurtosis figures observed for each of the risk arbitrage portfolios.

To analyse the risk-adjusted returns of the three portfolios we specify two asset pricing models, the market model and a Fama and French three factor model, incorporating size and value risk factors. The results show that only the equal-weighted portfolio generates significant abnormal returns indicating that (versus the value weighted index) larger deals may be more efficiently priced and that (versus the RAIM portfolio), once again, transactions costs and real world restrictions significantly limit the ability of risk arbitrageurs to generate abnormal returns. In other words, the market more favourable risk setting for merger

arbitrage in Germany is effectively priced by the market such that when real world conditions are also applied, arbitrageurs cannot generate abnormal risk-adjusted returns.

The evidence presented in this paper on merger arbitrage performance has important implications for researchers and practitioners. The inclusion of transaction costs as well as considering other practical limitations (capital) is fundamental to the risk arbitrage index manager portfolio in order for its results to be realistic. With the growth in online trading platforms, transaction costs and their impact have significantly reduced allowing greater possibility for merger arbitrage opportunities to be exploited. As a result, further research regarding this topic should factor in the impact of these trading platforms and the competition for business between them.

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