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Chair of Alternative Investments

**European Evidence on the Profitability and  
Characteristics of Merger Arbitrage**

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# Abstract

The objective of this thesis is to analyse the profitability of merger arbitrage strategies in Western Europe markets. The deals included in this study involve European publicly listed companies announced between 2002 and 2001. Deals were then divided into three portfolios according to the payment method offered by the acquiring company. The total sample counts 665 deals distributed as 586 cash deals, 39 stock deals, and 40 mixed deals. The procedure adopted to evaluate the performance of the portfolios sees two steps. First were calculated the returns generated by merger arbitrage trades on each deal in the sample. Then, returns were summed instead of being compounded under the assumption that merger arbitrageurs do not reinvest all the capital earned. The strategy analysis was conducted for the whole sample as well as for each of the three portfolios. Consistent with the findings of prior research, evidence from this study shows that merger arbitrage portfolios are profitable.

The final part of this study focuses on three case studies from real-life, one for each deal type. This addition's purpose is to analyse the behaviour of merger arbitrage returns more deeply. Limiting the analysis to only three deals allowed calculations to rely on more precise data and follow step by step the response of stock prices to news regarding the underlying deal. The transactions included in this section are 888 Holdings' attempt to acquire William Hill in 2016, the merger between Essilor and Luxottica in 2017-2018, and the current Twitter-Musk saga. Also the results from this analysis seem to confirm the theory and prior literature. The returns generated by investing in withdrawn deals were negative or close to zero, while the returns on successful deals were positive.

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# Introduction

The developments in technology of the last decade have made access to financial markets much easier and cheaper. This increased the participation of small retail investors who now can comfortably access capital markets through trading platforms from wherever they want. The spectrum of market participants ranges from small private investors to gigantic institutional investors like pension funds and asset managers that share a common purpose: generating returns on their investments. However, due to differences in risk profile and skills, each investor category looks for different investment opportunities. Typically, retail investors and pension funds expose themselves to small risks by entering long-only positions or passively replicating market indexes. On the other side, skilled investors like hedge funds take on more risks by adopting a highly active approach to their investments through long-short positions and using complex derivative products. The focus of this thesis will be on merger arbitrage, a strategy that hedge funds claim can consistently earn abnormal returns.

Merger arbitrage is an investment strategy that belongs to the macro category of event-driven investments. This category aims at exploiting stock price discrepancies in the firms involved in special corporate events. In the case of merger arbitrage strategies, arbitrageurs try to capture the merger arbitrage spread following the announcement of a takeover attempt. After the announcement, the share price of the target company tends to increase towards the offered price, but since risk is involved in deal completion there remains a small difference between the two prices, called arbitrage spread. For this reason, since merger arbitrage is not risk-free, the strategy is also referred to as risk arbitrage. The risk involved in merger arbitrage derives from the potential losses suffered in case the merger fails as the target and acquirer stock prices could move unfavourably. Additionally, according to theory, merger arbitrageurs suffer much higher losses on withdrawn deals than profits on successful deals.

Most prior academic studies like Mitchell and Pulvino (2001), Baker and Savasoglu (2002), and Maheswaran & Yeoh (2005) have found evidence of large excess returns related to this

strategy. If this is true, it raises questions as to why these opportunities exist and are not arbitrated away by investors who are always seeking less risky and more profitable investment opportunities. Academics provide different theories. Some suggest that excess returns associated with this strategy are compensation for obtaining costly private information (Larcker & Lys, 1987). Others advocate that risk arbitrageurs provide liquidity to markets during these events and therefore excess returns reflect a premium paid for their presence (Mitchell & Pulvino, 2001).

Mergers and acquisitions remain one of the most studied topics in financial literature. However, this subject is mostly faced from the point of view of the transaction itself and rarely from the perspective of merger arbitrageurs. Most existing studies were conducted over the US market as it is the most active in terms of M&A deals. However, some papers analysed the same phenomenon in different countries outside the US, e.g., the UK, China, Australia, and various emerging countries. Additionally, it is worth noting that most of the papers published in academic journals rely on a sample of mergers and acquisitions announced before the financial crisis of 2007-2008.

This work will focus on those deals in which the target company is headquartered in some Western European countries. This doesn't mean that acquiror companies can't be listed outside European markets. The sample data of this study consists of mergers and acquisitions announced between 2002 and 2021. Further, the sample is restricted to those deals involving only listed companies in which the payment method offered by the acquiror is either 100% cash, 100% stock, or 100% a mixture of cash and stock. Those deals including other forms of payment were excluded like in most prior studies as it would have required complicated valuation methods and additional assumptions. Mithcell and Pulvino (2001) argue that the large excess returns in previous papers could be attributed mostly to not accounting for transaction costs, contrarily to Baker and Savasoglu (2002) who advocate that the impact of transaction costs on merger arbitrage returns is quite small. Due to the complexity of estimating these values, transaction costs were not considered in this study. A more detailed description of selected data, assumptions made, and limitations of this paper will be discussed in later chapters.

The fact that this study is conducted over European countries between 2002 and 2021, i.e., data from a different continent and a different time series with respect to prior literature, can lead to unpredictable results. However, the final sample turns out to be made mostly of M&A deals targeting UK companies and therefore the results of this study could be compared to evidence in UK markets. Literature suggests that merger arbitrage spreads have declined significantly in the last decades, especially between 2002 and 2007 (Jetley & Ji, 2010). Furthermore, some argue that this decline is likely to persist. Consequently, it will be interesting for researchers to investigate if such a decline in spreads has affected the returns of merger arbitrageurs, and to do so they will have to rely on a sample encompassing such a time frame.

The empirical part of the research was conducted quantitatively using both mathematical and statistical methods to calculate returns and analyse trends. The total sample counts 665 announced between 2002 and 2021. Deals have then been divided into cash deals, stock deals, and mixed deals to understand the differences and commonalities characterising the three merger arbitrage strategies.

The main objective of this work is to state whether merger arbitrage trades could consistently generate large returns in Western European markets since 2002. To answer the main research question the following three sub-questions were formed:

*Question 1: Are there differences in the returns between all-cash, all-stock, and mixed deals?*

*Question 2: How do merger arbitrage strategy returns behave during financial crises?*

*Question 3: Are there any differences between domestic and cross-border deals?*

Returns were calculated with different formulas according to the method of payment and then have been summed to provide an indicative measure of how much merger arbitrage hedge funds would have earned by investing in the deals in the sample. It is important to mention that all data for this part are in USD as Refinitiv, the database used for this thesis, automatically converts currencies into US dollars through historical exchange rates.

This work consists of eight chapters. The first chapter is an introduction to the alternative investment industry and how it is developing. The second chapter explains merger arbitrage strategies and the rationale behind the trades entered for each deal type. The third chapter provides an overview of the most relevant literature on risk arbitrage and its limitations. The main research question and sub-questions are described in chapter four. The research data is presented and analysed in chapter five while returns and comparisons between deal types are discussed in chapter six. The seventh chapter departs from the first part of the study. This second analysis treats three case studies from real-life, one for each deal type. Relying on a much smaller sample allowed for more precise calculations and the possibility to give a closer look at how stock prices of the firms involved in a transaction react to news concerning the underlying deal. Finally, the conclusion and final remarks of the thesis are discussed in chapter eight.



# 1 Alternative Investments Industry

We currently live in a world characterised by extremely low interest rates, relatively low returns from traditional asset classes and at the same time high investment risks and less available diversification. In an interesting report by the Callan Institute, it is highlighted how institutional investors face one of the most difficult investment environments in decades. In 1991, for an investor, it was possible to achieve a nominal 7% expected annual return for about 3% annualised volatility by investing in cash and bonds. Fifteen years later, an investor would have needed almost 40% of the portfolio invested in public equities to achieve a 7% expected return at more than six times the volatility compared to 1991. Nowadays, it would take a globally well-diversified portfolio (different equity investment styles, bonds, real estate, private equity, fixed income, etc.) to produce such returns but for more than seventeen times the risk compared to 1991 (Callan Institute, 2021). Consequently, investors reacted by adding alternative investments to their traditional portfolios. This allowed portfolio managers to generate higher risk-adjusted returns by investing in an expanded efficient frontier. Investment managers generated alpha by accessing opportunities outside the traditional space and reduced risk by diversifying into alternatives with risk-return characteristics that have a low correlation with those of traditional investments.

To have a better understanding of the massive capital inflow into the alternative investments industry, the Boston Consulting Group publishes every year a global asset management report. From the BCG Global Asset Management 2022 Report, we see how the AUM in alternatives increased from \$4 trillion in 2005 to \$19 trillion in 2021, representing 11% and 17% of the global AUM, respectively. In terms of revenues, these amounts correspond to \$41 billion (30% of the total) in 2005 and \$165 billion (44% of the total) in 2021. Further, according to BCG (2022), alternatives AUM are expected to grow to \$28 trillion (19% of the total) by 2026, corresponding to \$242 billion (51% of the total) in revenues.

One of the reasons for the growth in the alternative investments industry is the evolution of the investment ecosystem. The number of companies listed on public markets has reduced in the last decade, mostly in the US and to a lesser extent in the UK and Europe. The growth and interest in private markets have increased constantly over the last ten years and have accelerated recently, driven by investors looking to further diversify their investment portfolios (The Investment Association (IA), 2021). According to Perqin (2021), the global AUM in private markets grew from \$2.7 trillion in 2010 to \$8 trillion in 2020.

Starting from 2020, capital markets have been subject to huge levels of volatility dictated by the uncertainty deriving from the Covid-19 pandemic, the reaction of central banks to historic high levels of inflation, and the geopolitical tensions between Russia and Ukraine. On December 31, 2021, the S&P 500 rallied more than 100% from its Covid trough of 2,237.40 on March 23, 2020. This has marked the fastest bull market doubling off a bottom since World War II (CNBC, 2021). The peak in the final quarter of 2021 marked the beginning of a drastic downfall in worldwide stock markets. The recovery from the pandemic was followed by a rapid increase in demand which led to bottlenecks in the supply chain, long delivery times, and upward pressure on prices. Inflation reached historic high levels both in the US and in Europe. This brought a lot of uncertainty about when and by how much central banks would have started tapering and successively hiking interest rates. Many analysts trusted central banks defining inflation as transitory, while others, who turned out to be right, predicted that inflation would have kept rising for a much longer period. Even though some analysts successfully forecasted the start of tapering and raises of interest rates by central banks, it was almost impossible to foresee that Russia would have invaded Ukraine and that the conflict would have lasted for so long. At the time of this work, the conflict is still on, and it is dragging with it serious consequences. Following the sanctions imposed by the European Union and the US on Russia and its allies, energy and commodity prices skyrocketed from the already high levels at the beginning of the year, with the price of oil surpassing \$120 per barrel, and the price of wheat doubling YOY.

In such an economic environment, with flat or declining markets, it is not enough for professional asset managers to justify their poor returns by merely stating that despite their poor performance they still beat or equaled comparative market matrices. It becomes

necessary for portfolio managers to identify market-neutral investment strategies that provide adequate returns regardless of the direction of the economy (Block, 2006). It is in such circumstances that the \$4.5 trillion hedge fund industry has evolved (Statista, 2022). The term hedge originally derives from the investment strategy of hedging against market movements. In fact, hedge funds' intent is to maximize returns and eliminate risks by taking long (buy) and/or short (sell) positions within the market to take advantage of market imperfections irrespective of any market movement (Perqin, 2022). Perqin (2019) has sorted hedge funds into different categories according to the strategy employed. This makes it possible to measure the performance of every type of hedge fund. The most common investment strategies used by hedge fund managers are generally classified as equity, relative value, event-driven, macro, credit, managed futures/CTA, multi-strategy, and alternative risk premia. In this thesis, only event-driven and its sub-strategies will be discussed more in depth.

## 1.1 Event-Driven Hedge Funds

Event-driven hedge funds are active in those circumstances in which significant corporate events are associated with substantial market price reactions in the securities of the firms involved. This category of hedge funds includes activist hedge funds, merger arbitrage funds, and distressed securities funds. It also extends to special situation funds and multistrategy funds that combine a variety of event-driven strategies (Chambers, et al., 2020). Event-driven hedge funds take advantage of mispriced securities during both the anticipation and the realization of events by entering positions in the securities of the companies affected by the transaction. Securities involved can range from most senior in the capital structure to most junior or subordinated, and frequently involve additional derivative products.

Those who invest in these strategies are exposed to a combination of sensitivities to equity markets, credit markets and idiosyncratic corporate-specific events (HFR, 2022). These investors rely on the assumption that prices may not fully and quickly adapt to information associated with such events and therefore try to capture the risk premium associated with the opportunity. The list of events includes mergers and acquisitions, spinoffs, tracking stocks, accounting write-offs, reorganizations, bankruptcies, share buybacks and secondary offerings, and special dividends (Chambers, et al., 2020).

These strategies incur a substantial level of event risk, i.e., the dispersion in economic outcomes due to the uncertainty of corporate events. In other words, event-driven funds profit when events develop as predicted and suffer losses when events unfold in the opposite direction. By no surprise, according to Perqin (2021), 95% of event-driven funds tend to be discretionary rather than systematic, and it is therefore essential for the success of these strategies that the managers have complete understanding and expertise in the transactions underlying their trades.

Hedge Fund Research (HFR) estimated that at the end of 2018, the event-driven industry managed \$820 billion of which \$120 billion in activist funds, \$24 billion in merger arbitrage funds, \$200 billion in distressed securities funds, and \$460 billion in multi-strategy and special situations funds.

## 2 Merger Arbitrage

This study will focus on merger arbitrage funds, the best-known event-driven strategy although it is not the largest by assets under management (Chambers, et al., 2020). The strategies used by these funds attempt to profit from merger activity with minimal risk by taking positions in the target company and occasionally in the acquiror company. There are three main types of merger arbitrage which depend on the method of payment. The acquiring firm in mergers and acquisitions may decide to finance the acquisition of the target company with cash, its stock, or a combination of cash, equity shares, and other securities (Block, 2006).

Merger arbitrage involves some risk and therefore it is not a pure arbitrage. In fact, this investment strategy is also commonly known as risk arbitrage because on the one hand it exploits pricing discrepancies in the market for corporate control but on the other hand, the sought return is not risk-free. If the bid is unsuccessful, the trade generally leads to severe losses. Therefore, at least in theory, after the announcement of a takeover attempt, the target will typically trade at a discount to the bid price, i.e., the amount that target shareholders are going to receive if the transaction completes. If it was possible to forecast with certainty whether the merger will realize, then this strategy would be defined as a pure arbitrage.

The size of the discount depends on how the market perceives the bid as likely to succeed. The strategy of arbitrageurs consists in entering trades that lock in the discount, also known as merger arbitrage spread. If a bid is successful, arbitrageurs will earn a return equal to the spread. If the bid is unsuccessful, the return on the positions taken will typically be negative (Maheswaran & Yeoh, 2005).

## 2.1 M&A Deal Types and relative Merger Arbitrage Strategy

The specific trading positions entered by merger arbitrageurs depend on the method of payment offered by the acquiror company to target shareholders. The two primary means of payment used in mergers are cash-for-stock and stock-or-stock (Sudarsanam & Nguyen, 2008).

Before entering the trade, arbitrageurs must try to estimate two fundamental variables. First, whether the merger will succeed or fail and then how long it will take for the transaction to be consummated. The former reveals if the strategy will generate a positive or negative return. The latter is important to compare the profitability of the strategy on different deals. The same return generated over different lengths of time will be higher when realized in a shorter period. Therefore, deal duration can affect the return to arbitrageurs as much as the percentage premium can. However, the latter is known on announcement day, while the former is unknown until termination (Block, 2006). It is important to clarify that expressing merger arbitrage returns in annualized terms is just for the scope of comparative analysis as it would be wrong to assume that the same opportunity will repeat continuously. M&A are stand-alone events.

In a pure cash deal, the bidder offers a fixed amount of cash in exchange for all or part of the target company stock. The price offered by the acquiror is almost always higher than the market stock price of the target. This premium is to convince the target board and the target shareholders to approve the deal (Buehlmaier & Zechner, 2013). Here, arbitrageurs usually focus solely on the shares of the target firm and the arbitrage spread, i.e., the relationship between the target share price and the bid price. The investment strategy is simple and typically consists in taking a long position in the target stock after the deal is announced and holding it until merger consummation. If the bid is successful, the arbitrageur sells the target's common stock to the bidder at the offer price (Sudarsanam & Nguyen, 2008). Therefore, arbitrageurs try to take advantage of the existing bid premium and bet on the successful outcome of the takeover deal. There are two sources of return from this

investment. The primary source of profit is the difference between the purchase price of the target's stock and the ultimate offer price. The secondary source is the dividend paid by the target company (Mitchell & Pulvino, 2001). As a simplified example of a cash buyout, let's assume that Company A makes a cash tender offer for Company B of \$30 per share. On the day before the announcement, the stock price of Company B closes at \$24 which implies that the premium offered is 25% ( $6/24$ ). After the deal is publicly announced, Company B's stock price rises to \$27, and the premium becomes equal to 11.11% ( $3/27$ ). So, the merger arbitrageur has the opportunity to buy the target stock at \$27 and eventually sell it to the bidder for a cash value of \$30, earning the \$3 difference (less transaction costs). Now, assume that the number of days between the rank date (the first public disclosure of the intent to merge or acquire) and the effective date (the date when the entire transaction is completed and effective) was 162. This loss of time would translate an 11.11% return in the Company A-Company B merger into an annualized return of 24.69% ( $11.11\% * 360/162$ ).

In a stock offer deal, the acquiror doesn't finance the acquisition with cash but rather offers to finance the whole takeover with its stock. With this method of payment, there are additional variables to be considered. At the time of the announcement, the offer comes with a premium in terms of acquiror firm shares value. Therefore, like for cash deals, the target company share price is expected to move towards the bid value. The trading strategy still consists in taking a long position in the target stock which is expected to further appreciate should the deal be successful. When deals turn out to be effective, merger arbitrageurs will receive a specific number of acquiror shares per share of target stock that they own. The number of bidder shares that will be swapped per target share is determined by the exchange ratio implied in the offer. At this point, to consolidate the profit arising from the premium offered, arbitrageurs must act and protect themselves from an eventual drop in the bidder's stock price. Arbitrageurs in stock-for-stock mergers typically take offsetting hedged positions in the shares of the two firms based on the exchange ratio (Chambers, et al., 2020). The easiest way to do so is shorting the acquiror's stock while simultaneously purchasing the target company stock (Block, 2006). This typical stock merger arbitrage strategy seeks to lock in the price spread between the ratio-adjusted current market prices of the merger partners upon the successful completion of the transaction. Event risk in this trade is even higher than in pure cash deals. In the time between the merger announcement and its

resolution, long positions in the equity of the target are generally subject to a modest price increase if the merger is completed and to a larger decrease if the merger fails. Therefore, arbitrageurs should expect to receive a higher premium as compensation for bearing this risk (Chambers, et al., 2020). In stock deals, there are three sources of profit for arbitrageurs. The primary source is the difference between the cash in from the short sale of the acquiror's stock and the price paid for the target stock. The second source is the dividend received from the investment in the target stock which however is fully or partially offset by the dividend that must be paid on the shorted acquiror stock. Finally, the third source of income in a stock deal comes from the interest paid by the broker on the proceeds earned by the arbitrageur from the short sale of the acquiror's stock (Mitchell & Pulvino, 2001). As an example, assume Company C offered to acquire Company D at 0.65 shares of Company C stock for each share of Company D. On announcement day, Company C was trading at \$92 per share, so 0.65 shares had a value of \$59.80. At that time, Company D stock traded at \$44. Therefore, the merger premium at the time of announcement was \$15.80 or 35.91%. Stock-for-stock deals are slightly more complicated for arbitrageurs. The price of Company D could move up or down, thus changing the value of the offer accordingly. This is exactly what happened in the merger between Bank of America and FleetBoston. For several reasons, such as the premerger premium deemed to be too high for a bank merger, institutional investors reacted negatively to the merger announcement and shortly after began selling the acquiror stock. The stock of Bank of America fell sharply, and merger arbitrageurs found themselves in the red while starting with an initial positive arbitrage spread (Block, 2006). Arbitrageurs should protect themselves from this kind of exposure and they usually do so by simultaneously shorting the acquiror company stock and buying the target company stock. In the example above, arbitrageurs should short 0.65 shares of Company C for each share of Company D bought after the announcement. At inception, the arbitrageur would receive \$59.80 ( $0.65 * \$92$ ) from the short sale and pay \$44 per target company share on announcement day. By doing so, the arbitrageur will have locked in a gain of \$15.80 regardless of any fluctuation in either of the share prices (Chambers, et al., 2020). In the example given above, the exchange ratio is fixed at 0.65. It is important to mention that there are also deals in which the exchange rate is variable. These are called collar transactions and are an extremely useful tool that allows deal participants to partially or fully overcome the threat to deal completion that could arise from a significant change in



the value of the acquiror's stock (Block, 2006). As an example, assume that Company C offers to acquire Company D for \$46 per share in the form of stock but the parties are afraid that the bidder's stock price is too volatile. Under these circumstances, it may be decided that the average price of the acquiror would be determined during the "pricing period" close to the end of the deal (Block, 2006). If the average price turns out to be \$85, then 0.5412 shares of Company C will be exchanged for each share of Company D. By doing so, the desired value of \$46 would be achieved ( $0.5412 * \$85$ ). Even though the use of collars and variable exchange rates may be beneficial to the parties involved in the transaction, this type of deals will be excluded from this study because makes it more difficult to determine how many shares of the acquiror to short in relation to the number of target shares purchased.

In addition to all-stock and all-cash deals, there are also merger transactions in which the method of payment involves a mixture of securities. It is common that deals are financed with a combination of cash, stock, and other securities. Within this category, this thesis will only include mixed deals in which the compensation offered is a hybrid between cash and stock. Like in most prior studies, those deals that involve more complex securities will be excluded because harder to analyse.

## 2.2 Risks in Merger Arbitrage

Almost all merger arbitrage hedge funds tend to be discretionary and focus on company idiosyncratic factors. Implementing this strategy requires that fund managers have solid expertise in corporate events and the necessary skills to conduct a fundamental in-depth approach (Perqin Pro, 2021). This is because this strategy tends to be exposed to several sources of event risk that will affect the likelihood of success of a deal (Chambers, et al., 2020).

Unlike the academic definition of arbitrage, merger arbitrage is not risk-free. The risk is that the takeover deal will fail causing merger arbitrageurs to bear losses. When a merger fails, the prices of both the target and the bidder may go back to their preannouncement levels or even further. There are different sources of risk. The most relevant are regulatory risks and financing risks. Risks also include defensive actions taken by the management of the target company, bidding wars, and simply that one of the two parties involved in the transaction will walk away from the deal. This is why merger arbitrageurs specialize in every aspect of M&A transactions from a legal, managerial, and financial perspective. It is essential to the nature of this strategy to properly assess all the risks and create a well-diversified portfolio.

An important aspect of merger arbitrage is that these strategies are extremely time sensitive. Merger arbitrageurs usually have only a few days to evaluate whether the deal will be successful before the arbitrage spread reduces. In such a short loss of time, they have to review current and prior financial statements, filings within the regulatory authority, management structures, strategic reasons for the merger, regulatory issues, proxy statements, cost savings, press releases, and the competitive positions of the merged company within the industry in which it competes (Chambers, et al., 2020). Evaluation of risks is a crucial step before entering the arbitrage trade. Arbitrageurs will take positions only after assessing that the rate of return they calculated is enough to compensate for the event risk associated with the deal.

In some cases, even if less frequently, investors may even speculate that the deal will fail by taking inverted positions with respect to traditional merger arbitrage. Further, it may happen that some hedge fund managers put on positions before the bidding offer is publicly announced, especially in target firms, based on rumours to capture a higher spread (Chambers, et al., 2020). However, this study will stick to the assumptions of previous literature by Och and Pulvino (2005) and Moore et al. (2006). The formers state that merger arbitrageurs never take investment decisions based on rumours and only invest when the merger is officially announced. The latters affirm that merger arbitrageurs do not speculate on whether the bid will occur or not, but that they bet on whether the bid will be consummated within a certain time frame.

Mergers and acquisitions continuously undergo scrutiny by regulatory agencies which may not allow a proposed merger to take place for multiple reasons. The primary reason which leads regulators to reject a merger proposal is the threat that the merger may lead to reduced competition in a given market. Examples of regulatory agencies are the European Commission in the EU and the SEC, the DOJ, and the FTC in the US.<sup>1</sup> There are three possible outcomes to an antitrust ruling: yes, no, and conditional. Conditional means that the merger proposal is approved as long as the firms involved in the transaction divest from some specific assets before the merger is completed to ensure that market share across firms is well balanced (Chambers, et al., 2020). Most of the time regulators rule in favour of the merger, especially in those circumstances in which the parties in the transaction operate in highly fragmented industries in which market share is so widely diluted that antitrust issues are not a concern (Chambers, et al., 2020). It is, therefore, a key skill of merger arbitrageurs to anticipate the decision of the regulator. This is because, in deals in which antitrust issues could be a concern, merger arbitrage spread may start out wide and then narrow substantially in case the deal is cleared by regulatory bodies. Indeed, the merger arbitrage spread is inversely correlated to the likelihood of deal success. Moving beyond the potential rejection by regulators makes the deal more likely to close and its timing more predictable (Chambers, et al., 2020).

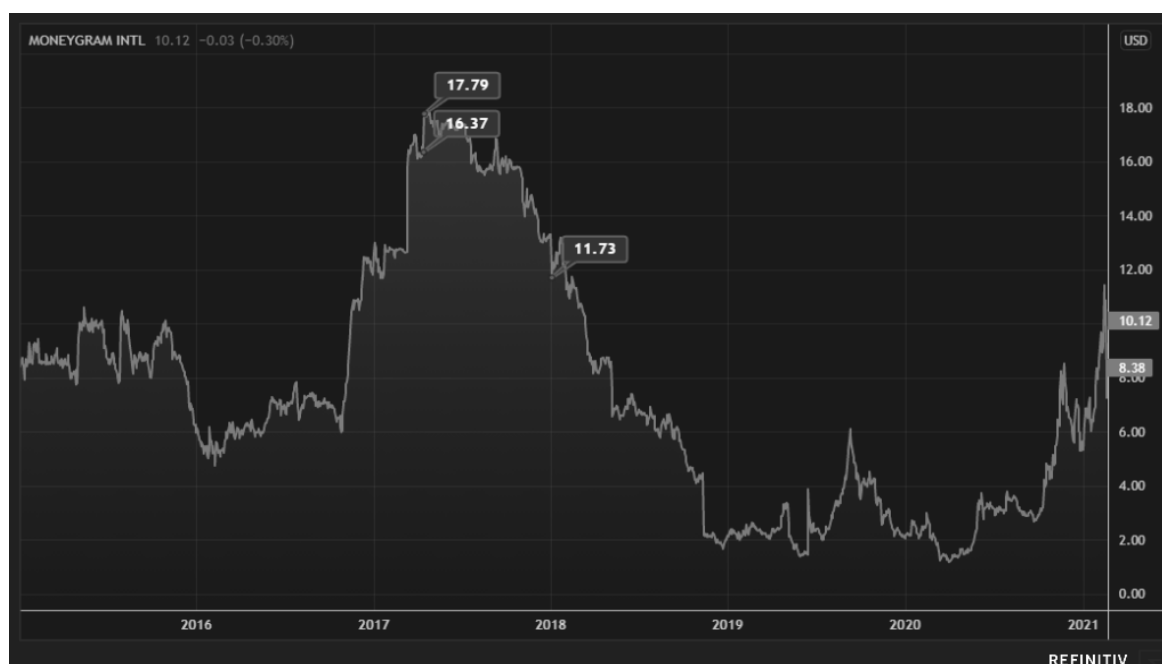
Antitrust regulation is not the only regulatory risk leading regulators to deny merger proposals. Deals could also be disallowed for nationalistic or tax-related reasons. Cross-border mergers are more exposed to these risks, especially when the merging parties belong to industries like national defence and commodity production which tend to be extremely politically sensitive (Chambers, et al., 2020). As an example, back in 2016, the \$160 billion deal between the US drugmaker Pfizer Inc and the Ireland-based Allergan Inc was abandoned by the parties because of the tax-related regulatory environment. Among other things, the merger represented an opportunity for Pfizer to relocate its headquarters overseas and benefit from the lower tax rates in Ireland. According to Reuters (2016), this operation would have allowed the New-York based Pfizer to cut its tax bill by an estimated \$1 billion per year. The failure of this deal constituted a major win for the presidency of Barack

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<sup>1</sup> The federal government regulates sales and transfers of securities through the Securities and Exchange Commission (SEC), and polices competition matters through the Antitrust Division of the Department of Justice (DOJ) and the Federal Trade Commission (FTC).

Obama. The former President of the United States was pushing to amend tax rules to fight corporate inversions, i.e., American companies trying to reduce their tax bills by moving profits abroad. With the new Treasury rules, the financial advantages that Pfizer hoped to get from buying Allergan were removed, causing the deal to be abandoned (TMF Group, 2021). Another example of a failed deal because of the regulatory framework, is Ant Financial's plan to acquire the US money transfer company MoneyGram International Inc in 2018. The \$1.2 billion deal failed after a US government panel rejected the proposal over national security concerns, being Ant Financial the financial arm of the Chinese e-commerce giant Alibaba Group. At that time, the US were under the presidency of Donald Trump who was trying to put pressure on China to help tackle North Korea's nuclear ambitions and to be more accommodative on trade and foreign exchange issues. Following this line, the US government was toughening its approach towards the sale of US companies to Chinese entities (Reuters, 2018). In Figure 1 it is possible to see how a few days before the announcement of the merger agreement on April 16, 2017, the stock price of MoneyGram started climbing towards the bid price of \$18.00 per share offered by Ant Financial. Afterwards, probably due to national security concerns, MoneyGram's stock price plunged, reaching approximately a price per share of \$11.70 on January 2, 2018. Therefore, assuming that merger arbitrageurs purchased MoneyGram stock at \$17.79 and then sold it at \$11.73, they would have lost 34.06% (less transaction costs) on their investment.

Figure 1: MoneyGram Intl stock price movement during Ant Financial takeover attempt (Refinitiv)



Financing risk is another source of uncertainty concerning deal completion. It could be defined as the economic dispersion which may arise in case of failure of an acquiring firm to raise the necessary funding to complete a deal. This kind of risk only applies to merger transactions which involve a cash component in the merger offer. For stock swap deals, investors only need to focus on the regulatory issues and the fit between the two firms (Chambers, et al., 2020). Financing is the ability of the acquiring firm to obtain the necessary funds to finance the purchase of the target firm. Therefore, financing risk should be seen as minimal when a large firm with a strong balance sheet acquires a smaller company. The most common way for the bidder to raise cash is through bank loans, bond issues, or asset sales. Once the financing for the transaction is arranged, the merger arbitrage spread is likely to reduce (Chambers, et al., 2020).

Several sources also include third-party bidders and bidding wars among the risks linked to merger arbitrage strategies. Bidding contests, or bidding wars, describe those situations in which two or more companies compete with each other on the takeover of the same target firm. In general, bidding wars are beneficial to merger arbitrageurs. During negotiations,

bidders will offer higher premiums to beat the competition and this, in turn, will drive up the stock price of the target and bring down the price of the original bidder. Should the bid be successful, this will generate generous returns on merger arbitrage trades (Chambers, et al., 2020). However, not all bidding contests end up this well for arbitrageurs. Some deals never complete, with bidders walking away from the deal and the target stock price decreasing to its pre-deal levels and continuing its life as an independent firm.

Last but not least, even though it might seem obvious, it must be mentioned that merger arbitrageurs incur the risk that the shareholders of at least one of the companies involved in the transaction do not approve the deal. Empirical evidence shows that after the shareholders of both the target and the acquiring firm approve the deal, the merger arbitrage spread tends to decline. This reflects the fact that another risk has been overcome (Chambers, et al., 2020).

## 3 Literature Review

Most academic literature on merger arbitrage focuses on the US stock market and uses M&A transactions from the late twentieth century to measure merger arbitrage returns. In the meantime, as a consequence of globalisation and financial crises, over the last two decades, there have been significant developments in financial markets and regulations. These changes have reasonably impacted the sphere of mergers and acquisitions. The first part of this chapter focuses on the existing literature on merger arbitrage and provides a detailed overview of the key aspects and risk-return characteristics of this strategy. The final part describes some of the limitations observed in prior studies.

### 3.1 The Efficient Market Hypothesis and its Developments

One of the most famous and discussed theories in neoclassical finance is the efficient markets hypothesis by Professor Eugene F. Fama in 1970. This theory suggests that capital markets are efficient and such efficiency can take three different forms: “weak”, “semi-strong”, and “strong”. Weak form efficiency advocates that markets reflect all past available information and therefore, traders cannot generate abnormal returns by looking at historical data on share prices. Thus, the weak form implies that stock prices follow a random walk. The semi-strong form suggests that, in addition to the conditions of the weak form, stock markets rapidly incorporate all new publicly available information. This entails that abnormal returns can only be earned by trading on private insider information. Finally, strong form efficiency argues that markets are perfectly informationally efficient. Here,

stock prices reflect all relevant public and private information and so nobody can beat the market and earn abnormal returns.

Neoclassical finance is based on the theory that capital markets are efficient and investors are rational. It assumes that investors create beliefs through Bayesian Updating and then take choices that satisfy the logical axioms that underpin the Expected Utility Theory (EUT). In the 1980s, further studies started considering the possibility that investors are not fully rational. Academics were trying to explain the litany of biases, heuristics, and inefficiencies that made financial markets inefficient (Hammond, 2015). This gave birth to the field of behavioural finance, i.e., the study of the influence of psychology on the behaviour of investors and financial analysts. The most revolutionary study in this regard was conducted by the psychologists Kahneman and Tversky (1979). They proposed a new model called Prospect Theory which tries to explain the violations of EUT and how people behave.

There is plenty of literature investigating the predictability of stock prices due to behavioural biases. Shleifer and Vishny (2003) present a model of mergers and acquisitions based on stock market misvaluation of the combining firms. The predictions of the model are based on the relative valuations of the merging firms and the market's perception of the synergies that will be created from the merger. Among other things, the model explains why the method of payment can predict long-term returns and why acquisitions occur in waves, where each wave is characterized by a different method of payment. Substantially, they found that in mergers and acquisitions there is a catering effect, in the sense that corporate managers know when mergers are perceived as synergistic and time them. In addition, they found that in periods of general overvaluation, merger activity increases and most of the deals see stock as a method of payment. These findings, together with the popular study of pecking order theory by Myers and Majluf (1984), can help explain why the acquiror's stock price moves in a specific direction after a merger announcement. According to pecking order theory, managers take advantage of the asymmetric distribution of information between them and investors. These two studies suggest that managers prefer to finance acquisitions with stock rather than cash whenever they feel like the stock of their firm is overvalued with respect to that of the target firm. On the other side, whenever managers



believe that their stock is worth more than what the market values it, they prefer to pay for the deal in cash. Therefore, when managers choose to pay for the transaction in stock over cash, this puts downward pressure on the acquiror's stock price and so merger arbitrageurs should short sell the acquiror's stock after the merger announcement.

To understand what arbitrage means, it was necessary to properly define the concept of market efficiency. The precondition for arbitrage is that markets are inefficient and so that there exists some exploitable mispricing in the stock market that allows arbitrageurs to make profits with no risk. Even if merger arbitrage does not fall within the traditional definition of arbitrage, it is still a very well-known and widely adopted investment technique that has made hedge funds earn excess returns through the years.

### 3.2 Profitability and Risk-Return Characteristics of Merger Arbitrage

Baker and Savasoglu (2002) are the authors of one of the most cited papers in merger arbitrage literature. In their work, the scholars constructed a diversified portfolio of risk arbitrage positions for 1,901 cash and stock mergers and acquisitions between 1981 and 1996. They developed a model where selling pressure, imperfect substitutes, and a small number of arbitrageurs combine to create an abnormal return to merger arbitrageurs. Their model predicts the following results. First, they found that excess returns increase with completion risk. Like Walkling (1985) and Schwert (2000), Baker and Savasoglu (2002) found that the best predictor of merger success is acquiror attitude, i.e., whether the takeover is friendly or hostile. Second, their results point out that excess returns increase with selling pressure by arbitrageurs which in their model is proxied by the target's size. Finally, even though the result is not strongly statistically significant as for the previous two coefficients,

Baker and Savasoglu (2002) noticed that a fall in risk arbitrage capital is followed by an increase in returns. Before undertaking the cross-section analysis, Baker and Savasoglu (2002) created portfolios including the stocks of the firms involved in the transaction two days after the deal was announced until withdrawal or successful completion of the deal. The results they obtained are consistent with previous literature. Merger arbitrage beats both the Capital Asset Pricing Model (CAPM) and the Fama-French three-factor model by generating abnormal returns of 0.6% and 0.9% per month with high statistical significance.

Mitchell and Pulvino (2001) conducted what is probably the most recognized study on the risk-return characteristics of merger arbitrage. They used a sample of 4,750 stock swap mergers, cash mergers, and cash tender offers over the period from 1963 to 1998. They also examined the risk-return profile of merger arbitrage hedge funds between 1990 and 1998. The authors wanted to investigate whether simulating merger arbitrage over their sample led to the same results reported in prior literature. Earlier studies indicated that merger arbitrageurs were able to generate substantial excess returns. However, at the same time, numerous articles in the popular press provided examples of large losses suffered by hedge funds. An example is the failure of Long Term Capital Management, one of the fastest-growing hedge funds in history. In their paper, Mitchell and Pulvino (2001) tried to empirically distinguish the causes of such abnormal returns. The scholars investigated three possible alternative explanations. First, financial markets exhibited systematic inefficiencies in pricing the stock of companies engaging in mergers and acquisitions. Second, previous studies did not take into account transaction costs and other practical limitations which prevent investors from earning such excessive returns. Finally, the third alternative explanation is that risk arbitrageurs receive a risk premium as compensation for bearing the risk that the deal will fail. To assess the effect of transaction costs, the authors constructed two different portfolios. The first portfolio return time series is a value-weighted average of risk arbitrage returns to individual mergers (VWRA) which excludes transaction costs and other limitations. The second one tries to mimic the returns from a hypothetical risk arbitrage index manager (RAIM) which includes direct and indirect transaction costs arising from trading not perfectly liquid securities. It is reasonable to believe that transaction costs have a significant impact on returns. In fact, this is what comes out of this study. To test the second alternative explanation that the extraordinary returns of this strategy are

compensation for the additional risks, Mitchell and Pulvino (2001) followed the suggestions of Glosten and Jagannathan (1994). The latter argue that arbitrage strategies should be tested using a contingent claims approach to evaluate the performance of trading strategies that present a nonlinear relationship with market returns due to the ability of fund managers to time the market. This adjustment corrected prior studies reporting excess returns by erroneously assuming that linear asset pricing models apply to risk arbitrage strategies. Following this line, Mitchell and Pulvino (2001) tried to answer why linear asset pricing models like the CAPM fail to fully capture the risk associated with risk arbitrage strategies. They tested whether the reason is that the returns on merger arbitrage investments are correlated with market returns in a nonlinear way. The results indicate that in flat and appreciating markets, the strategy generated returns of 50 basis points per month (6.2% per year) greater than the risk-free rate with an approximately zero market beta. On the other side, in months when the stock market experienced significant losses above 4%, the market beta of the risk arbitrage portfolio increased to 0.50. This translates into the RAIM portfolio generating modest positive returns in most market conditions, except that in bear markets. However, this is not enough to explain the large excess returns found in previous studies. A further test suggests that the primary explanation for the abnormal returns described in the literature is that transaction costs and other practical limitations must be taken into account. Using a contingent claim analysis Mitchell and Pulvino (2001) noticed that when transaction costs were included, the alpha declined from 74 basis points per month (9.25% per year) to 29 basis points per month (3.54% per year). However, Mitchell and Pulvino point out that the nonlinear relationship between merger arbitrage returns and market returns is not without consequence. Those who decide to invest in this strategy should be willing to incur negative returns in depreciating markets and limited positive returns in flat and appreciating markets (Mitchell & Pulvino, 2001).

More recently, Block (2006) provided contrasting evidence to the conclusions of Mitchell and Pulvino (2001). The research studied the returns for 23 different styles of hedge funds. Overall, during the twelve years from 1993 to 2004, the performance of the S&P 500 Index and that of the merger arbitrage index reached a tie, with a performance of 348.62% and 346.62%, respectively. However, the most meaningful numbers are between 2000 and 2002. During this period, the S&P 500 was down three consecutive years with a cumulative loss

of 38.47%, while the merger arbitrage index went up two out of the three years with a cumulative gain of 20.69%. Therefore, over this three-year bear market, the merger arbitrage index outperformed the S&P 500 by 59.16%. On the other side, during the seven-year bull market between 1993 and 1999, the S&P 500 outperformed the merger arbitrage index, with a cumulative return of 397.20% versus the 250.88% return generated by the merger arbitrage index (Block, 2006). In conclusion, in contrast to Mitchell and Pulvino (2001), the evidence provided by Block (2006) suggests that risk arbitrage funds are more attractive during neutral or bear markets rather than in bull market environments.

Claiming that there was a lack of evidence on the returns generated by risk arbitrage outside the US, Maheswaran and Yeoh (2005) decided to conduct a study analogous to that of Mitchell and Pulvino (2001) and Baker and Savasoglu (2002) over the Australian market for mergers and acquisitions. After creating portfolios with a sample of 193 M&A transactions from 1991 to 2001, they benchmarked returns against the CAPM and the Fama and French three-factor model. Maheswaran and Yeoh (2005) found that merger arbitrage generates statistically significant alpha before transaction costs, ranging from 0.84% to 1.20% per month. However, when including transaction costs, excess returns became insignificant. In contrast to Mitchell and Pulvino (2001), Maheswaran and Yeoh (2005) did not find any evidence of nonlinearity and concluded that merger arbitrage in Australia is a market-neutral investment strategy, i.e., risk arbitrage returns are not statistically sensitive to market systematic movements. Later, Hall et al. (2013) conducted a similar study to that of Maheswaran and Yeoh (2005). Their results contradict prior evidence about the profitability of merger arbitrage in the Australian market. They suggest that the strategy is not market neutral but positively related to market movements during downturns and inversely related to market movements during rising markets. Additionally, the authors claim that their study is more reliable than the previous one as it relies on a longer time frame, a larger sample size, and a sample made of both cash and stock offers.

In China, M&A activity has increased considerably over the past two decades. According to Bain & Company, M&A deals' market value climbed from \$3.3 trillion in 2000 to \$5.9 trillion in 2001 (Bain & Company, 2022). Despite Chinese markets being exposed to high levels of political uncertainty, economic reforms and robust growth played an important

role in boosting merger and acquisition activities. The complexity of Chinese rules and regulations governing these activities makes it more complicated to conduct a study of the return and risk characteristics of merger arbitrage strategy in this territory with respect to developed countries (Tuan, et al., 2007). For instance, many of the Chinese listed companies are largely owned by the state and state-held shares are non-circulating. When it comes to acquisitions, non-circulating shares are generally offered at a lower price than circulating shares. Differently from many studies conducted in developed markets, the results of Tuan et al. (2007) indicate that in China risk arbitrage does not generate extra returns from investing in the target firm after the deal announcement. A very interesting finding of their research concerns the presence of insider trading. They found supportive evidence by demonstrating that there is a significant positive cumulative abnormal return (CAR) in the pre-announcement period followed by a slightly negative CAR after the deal is publicly announced. The pre-announcement price drift together with no price jump on event day means that prices reflect insider information (Tuan, et al., 2007). Therefore, the authors conclude their paper by suggesting that the Chinese market is strong form efficient.

Very often, the companies involved in mergers and acquisitions are headquartered in different countries. These kinds of transactions are defined as cross-border and usually bring with them additional difficulties in terms of legal, cultural, and political systems with respect to domestic deals. Andrieş and Vîrlan (2017) studied emerging Europe domestic and cross-border transactions, and the relationship between the *ex-ante* indication and the *ex-post* completion in merger arbitrage portfolios. The findings of this research confirm the results of prior studies (Umber, 2010) in which no statistical difference in deal spreads and premiums was found between domestic and foreign acquisitions. Generally, deal spreads are considered to be a proxy for deal riskiness. In fact, at least in theory, risk and deal spread should move in the same direction because if investors consider the merger to be likely to succeed, they will buy the target's shares driving up the price close to the bid price. Therefore, investors should assess domestic and foreign bids as being equally risky and generating similar returns. However, this is not what the authors found in their study. After dividing the sample into two portfolios, one containing domestic bidders and the other including foreign bidders, Andrieş and Vîrlan (2017) analysed the returns of the portfolios and found higher returns corresponding to a higher level of risk in cross-border merger

arbitrage investments than in the domestic portfolio. As a final reflection, the authors conclude that deal spreads do not correctly reflect the level of risk in merger arbitrage strategies with emerging Europe targets.

Deal duration, measured as the number of trading days from merger announcement day to the date in which the merger is either completed or terminated, is an extremely important factor for merger arbitrageurs. The main reason is that it has a significant impact on the return generated by this strategy. Longer deals are more expensive (Andrieş & Virlan, 2017). The academic literature provides that there is a consistent pattern in the average duration of mergers and acquisitions. Mithcell and Pulvino (2001) found that for deals that ultimately fail, the average transaction duration is 39.2 days, while for those that ultimately succeed it is 64.2 days. Whereas, for the entire sample the average time from bid announcement to deal resolution is 59.3 days. In the US, according to Jetley and Ji (2010), the average duration of all mergers and acquisitions that were completed or failed between 1990 and 2007 was 129 calendar days. For deals that ultimately succeeded the average duration was 130 calendar days, while for those that failed the average duration shortened to 112 calendar days (Jetley & Ji, 2010). Evidence from the Chinese M&A market suggests that the average duration of transactions in the sample is about one month which includes 20-21 trading days (Tuan, et al., 2007). However, this study is barely indicative as it consists of only 22 tender offer bids from 2002 to 2006. Sudarsanam and Nguyen (2008) brag about being the first to provide evidence on the profitability and risk-return characteristics of merger arbitrage in the UK market. Among various statistics, the authors found that for the complete sample of 1105 UK cash and stock transactions from 1987 to 2007, the average duration was 79 trading days for cash mergers and 77 trading days for stock deals. Therefore, from prior studies, it is possible to conclude that successful deals last longer than unsuccessful ones and that there is no difference in duration between cash and stock mergers, on average.

Another important aspect of mergers and acquisitions is deal attitude. It is possible to distinguish two kinds of takeover attempts: friendly or hostile. Hostile takeovers occur when the bidding company attempts to take over a target company without the approval of the target firm's management or board. It is, therefore, reasonable to believe that friendly

takeovers are more likely to be successful as through negotiation the parties can achieve better terms. Many studies investigated the reliability of deal attitude as a predictor of deal success. The results from the regressions of Baker and Savasoglu (2002), Walkling (1985), and Schwert (2000) indicate that the acquiror's attitude is the best single predictor of merger success. Baker and Savasoglu (2002) found that, within their sample, the success rate for hostile deals and friendly deals were 38% and 82%, respectively. In Mitchell and Pulvino (2001), the results show that hostile deals present a 12.8% greater probability of failure than friendly deals. Branch and Yang (2003) report that a friendly negotiated takeover is 20.48 times more likely to be successful than a hostile offer. Jetley and Ji (2010) divided the whole sample going from 1990 to 2007 into three smaller six-year samples to account for different market conditions. They found that in all the three subperiods the failure rate for hostile deals was incredibly higher than the success rate. Therefore, all research papers lead to the conclusion that hostile deals are significantly less likely to succeed (Liu & Wu, 2014). However, this doesn't affect arbitrageurs' decision to invest in hostile M&A deals. Apparently, the number of arbitrageurs and changes in their holdings are not affected by the target management's reaction to the takeover bid (Hsieh & Walkling, 2005).

Mergers and acquisitions remarkably change the nature and the structure of the companies involved in the transaction. Therefore, it is natural to expect that, once an offer is made public, market participants will respond to such a managerial decision by assigning new prices to both the target and the bidding companies' shares (Jennings & Mazzeo, 1991). Since most of the bids come with a premium, the target's stock price usually increases. On the other side, it is not that simple to anticipate how investors in the acquiror will react following a merger announcement. What leads bidding firms to acquire other companies is the possibility to realize synergies. In M&A, the underlying concept of synergies is that the combined value of two entities is worth more than the sum of separately valued parts. This relies on the assumption that the post-deal performance, and so the implied valuation, will be positively impacted. Synergies can be defined as the cost savings, increments in revenues, and/or the financial advantages that can arise from mergers and acquisitions and that are used by acquiring firms to justify the premium offered. Rational managers buy other companies when synergies exceed the costs. Therefore, in theory, the bidder's share price will increase or stay the same through a merger. However, empirical evidence suggests

otherwise. Like prior studies, Giannopoulos et al. (2017) show that in the three years after a merger's announcement bidding firms suffer significant negative buy-and-hold abnormal returns. Behavioural finance explains this trend through the hubris hypothesis of corporate takeovers and overconfidence. Hubris predicts that the combined value of the target and the bidder firms should fall slightly and that the value of the bidding firm should decrease while that of the target should increase (Roll, 1986). This theory suggests that the true synergies in a merger are worth less than perceived by the managers of the acquiring firm. In other words, bidding firms affected by hubris simply pay too much for their targets. An article by Malmendier and Tate (2005) is a relevant piece in the growing research area of Behavioural Corporate Finance. Their study supports the hubris hypothesis suggesting that the overestimation of synergies is due to CEOs believing that they can successfully join the operations of the merged companies. However, this is difficult to achieve as it implies managing a bigger corporation, more employees, and multiple processes. Due to overconfidence, managers underestimate the operational risks of mergers and acquisitions. This leads to an overpayment for the target which is like entering a negative NPV project. For this reason, the acquirer company will suffer a reduction in value. Scholars conclude that overconfidence among CEOs can explain why so many managers destroy value (Malmendier & Tate, 2005).

The common view that acquirors in merger transactions tend to overpay for target firms is even more emphasized when stock is used as a method of payment. This view posits that those managers who decide to use stock as a method of payment, do so because they have privileged access to information and recognize that the shares of their company are overpriced. Therefore, they would use the over-valued currency at their disposal to purchase targets (Shleifer & Vishny, 2003). Mitchell et al. (2004) found that for their sample of acquirors over the period from 1994 to 2000, the stock price reaction to a merger announcement is -1.20%, which increases to -2.65% when stock is used as a consideration for the transaction. Therefore, from the perspective of acquiring firms' shareholders, these mergers are value-destroying decisions. However, Mitchell et al. (2004) suggest that about half of the negative announcement period stock price reaction to fixed-exchange-ratio stock mergers is due to downward price pressure caused by merger arbitrageurs short selling acquirors stock to lock in the arbitrage spread. In fact, after controlling for the estimated



price pressure effects due to arbitrageurs, the bidder stock price reaction is only -0.47% for the whole sample. Following these results, they conclude that the common belief that mergers destroy value is not sound after considering the behaviour of risk arbitrageurs. Liu and Wu (2014) complement the study of Mitchell et al. (2004) providing new supporting evidence in favour of merger arbitrage short selling price pressure explanation. The authors didn't find any abnormal short-selling activity before a deal was announced. On the other side, they found that around the announcement the short-selling activity increases substantially and explains more than 60% of the negative reaction in the bidder's stock price. This suggests that short sellers are not informed about upcoming mergers and that the increased short selling observed on announcement day is mainly driven by merger arbitrage needs (Liu & Wu, 2014). The authors conclude that these results help rule out over-valuation as an alternative explanation to the negative return in the acquiror stock price around the merger announcement.

Sudarsanam and Nguyen (2008) found that, consistently with other studies, UK merger arbitrage portfolios generated significant positive risk-adjusted returns of 0.5-0.6% per month or 6.17-7.44% per year. However, the most important contribution of this study is to provide empirical evidence of the impact of takeover regulations on the risk-return characteristics of risk arbitrage strategies. According to the authors, the presence of a nonlinear relationship between strategy returns and market returns, as found by Mitchell and Pulvino (2001), is linked to the economic incentives to abandon the bid that the bidder has during market downturns. When the market is falling, the target stock price will probably follow. In such circumstances, Sudarsanam and Nguyen (2008) suggest two alternative scenarios as to why a deal may fail. The first case applies mainly to bids in which the bidder pays cash in exchange for the target stock. In this scenario, the bidder company may feel that it is overpaying for a depreciating asset and therefore might decide to abandon the deal. The second case applies to those deals which are highly leveraged, like a typical leveraged buy-out. In this scenario, the assets of the target are used as collateral for the debt. Consequently, if the target's assets depreciate it may be difficult for the bidder to obtain the necessary financing from the lenders under the right conditions. Therefore, if the bidder can easily abandon the deal, the risk that the deal fails increases substantially when the market is falling. In other words, the returns to the strategy will have a positive correlation with

falling market returns. However, it is not so straightforward for the bidder to renege on the bid as its ability to do so depends on the takeover regulation in the jurisdiction in which the bid is made. Thus, it could be supposed that in those jurisdictions where the bidder can easily walk away from the deal during a market downturn, the nonlinear pattern found in Mitchell and Pulvino (2001) will be stronger than in those where the bidder cannot. Sudarsanam and Nguyen (2008) found little evidence supporting the nonlinear risk-return pattern of the strategy in the UK. At the same time, other studies provide discordant evidence about the existence of such a relationship in the Australian market (Maheswaran & Yeoh, 2005; Hall et al., 2013) and strong favourable evidence in the US (Mitchell & Pulvino, 2001). Going deeper into the takeover regulation in each of these jurisdictions, under the US takeover law the bidder has the flexibility to include conditions in the offer, including the “Market Out Condition” which allows the bidder to terminate the bid during market downturns. On the other side, in Australia and the UK, the ability of the bidder to terminate the deal is subject to much more restrictions. UK takeover regulation makes it almost impossible for the bidder to renege on the deal during bear markets. This makes it an even stronger case to not expect the nonlinear pattern in the UK (Sudarsanam & Nguyen, 2008). Combining the evidence from these studies, the authors confirm the impact of takeover regulation on the risk-return characteristics of the strategy.

Although merger arbitrage strategies are mostly used by hedge funds and other institutional investors, they are increasingly being made accessible to retail investors through ETFs and mutual funds (Buehlmaier & Zechner, 2013). Despite being one of the most profitable trading strategies employed by event-driven hedge funds, very little attention was given to the determinants of risk arbitrage success. To fill this gap, Buehlmaier and Zechner (2013) investigate financial media as a key determinant of merger arbitrage success. Financial media, intended as financial newspapers and financial newswires, are important because they reveal information that is fundamental to the success of this strategy. The authors calculate two alternative measures of media information: media coverage and media content. The former simply counts the number of press articles for a given day and a given M&A deal. The latter directly calculates the media-implied likelihood of deal completion through an analysis of the words used in each press article. Buehlmaier and Zechner (2013) found strong evidence of a stock market underreaction to media content, in the sense that

information in financial media is not fully reflected in stock prices. Their tests show that the twelve trading days after announcement day generate annualized risk-adjusted alphas of 18.5% for deals with a high media-implied probability of success, while the alphas drop to 6% for deals with a low media-implied probability of deal completion. On the other side, the study leads to statistically insignificant results concerning the effect of media coverage on alphas. Therefore, the authors conclude that returns around announcement day seem to be unrelated to the probability of deal completion and may largely reflect other information such as an assessment of whether a completed deal would create or destroy value (Buehlmaier & Zechner, 2013).

Arbitrageurs, intended as a type of investor including portfolio managers, hedge fund managers, and whoever is managing someone else's money, are often victims of agency problems. The economists Shleifer and Vishny (1997) explain that professional arbitrage is conducted by a relatively small number of highly specialized investors that use other people's capital. This separation of ownership and control has several interesting implications for securities pricing, including the possibility that arbitrage becomes ineffective in extreme circumstances. Although such positions offer attractive expected returns, professional arbitrageurs may stay away from extremely volatile arbitrage positions because the volatility exposes arbitrageurs to the risk of losses and the need to liquidate the portfolio under pressure from investors in the fund (Shleifer & Vishny, 1997). For instance, this may happen when noise traders become more bullish about overpriced stocks or more bearish about underpriced stocks. The fact is that investors lack the knowledge to recognise arbitrage trades and only judge managers on returns. Therefore, when managers suffer losses of this kind, investors conclude that the manager is not good and withdraw their money from the fund. Their model predicts that large losses by arbitrageurs will result in the liquidation of arbitrage positions prematurely and at unfavourable prices. This allows mispricing to exist for prolonged periods, jeopardizing market efficiency. The withdrawal of funds under management in the aftermath of trading losses falls under the notion of performance-based arbitrage hypothesis (Shleifer & Vishny, 1997). Following this study, Officer (2007) examined the predictions of the performance-based arbitrage hypothesis for the merger arbitrage market. The research examines the general comovement in merger arbitrage spreads and the response of spreads to two liquidity events: large arbitrage losses

and substantial changes in deal flow. Large losses may cause arbitrageurs to be cautious about future arbitrage trades in the short run. As argued by Shleifer and Vishny (1997), the fear of future withdrawals may have the same effect as the actual withdrawal of capital. The second type of liquidity event assumes that the flow of merger arbitrage opportunities is not constant. Consequently, a significant change in the availability of opportunities may also cause changes to the pricing of current and future deals if the response by arbitrageurs will be limited due to capital constraints. The study shows little evidence of such effects. Officer (2007) suggests that arbitrage disasters have a significant negative impact on merger arbitrage returns, but all this loss is attributable to the disaster event itself and does not influence other deals. Furthermore, the author found that spreads on pending deals remain unchanged following large arbitrage losses while spreads on deals announced shortly after an arbitrage disaster appear to be about 1-2% wider than expected. Similarly, the study found little evidence of spread increases after the announcement of large deals. Therefore, Officer (2007) concludes that neither merger arbitrage returns, nor spreads seem to be significantly affected by these liquidity events. Finally, to identify the trading pattern of arbitrageurs, the research reveals that arbitrageurs' average ownership of the target firms' stock immediately following merger announcement ranges from 15% to 35% and that as much as 50% of the stock of acquisition targets is acquired by risk arbitrageurs, on average.

Studies conducted in recent years have reported a general decline in the excess returns generated by hedge funds. Many have looked into the reasons. Zhong (2008) found that the decrease in average alpha is not due to an increase in the number of hedge funds with unskilled managers, but it is due to a decrease in the proportion of funds that are capable of producing large average alphas. The author attributes this cause to the changes in fund characteristics and market conditions between the 1990s and the 2000s. More interestingly, Zhong (2008) found that fund-level capital inflows have a positive (negative) effect on funds' future performance for smaller (larger) funds, while strategy-level inflows always hurt funds' future performance. The evidence from this study is consistent with the predictions of the capacity constraint hypothesis which could explain these findings through the "unscalability" of managers' abilities and the limited profitable opportunities in the market (Zhong, 2008). Fung et al. (2008) try to find an answer to whether capital inflows adversely affect the ability of alpha producers to deliver alpha in the future. They found that

have-alpha funds that experience relatively high capital inflows are less likely to successively reclassify as have-alpha funds in the future while those experiencing lower capital inflows have a better chance of delivering alpha in the future. Jetley and Ji (2010) documented a significant decline in the arbitrage spread since the 1990s. They found that for mergers announced after 2001, the first-day arbitrage spread decreased by 520 basis points for deals announced in the period 1990-1995 and by 290 basis points for deals announced between 1996 and 2001. Not surprisingly, the authors also estimated that in line with the decrease in spreads after 2001, for the period between 2002 and 2007 the annual aggregate alphas of merger arbitrage hedge funds declined by 481 basis points. They suggest that their findings can be explained by an increased interest in risk arbitrage strategies and by a reduction in risk associated with mergers and acquisitions. Therefore, empirical evidence until now seems to agree that hedge fund alphas are adversely affected by capacity constraints (Jetley & Ji, 2010).

One of the most discussed topics in finance is whether financial markets are efficient or not. Those who agree with the efficient market hypothesis believe that stock prices follow a random walk. In other words, if markets are efficient then stock prices are unpredictable, and it is not possible to consistently generate abnormal returns. On the other side, those who believe that markets are irrational argue that stock prices are not completely unpredictable, and it is possible to systematically earn returns that beat the market through stock picking and market timing. Branch and Yang (2003) construct a prediction model for merger completion and test the impact of payment methods and merger types on the probability of merger success. The economic rationale behind their study is that if it is possible to predict which merger will be successful, it is also possible to generate risk-free returns by locking in the merger arbitrage spread. Unlike Mithcell and Pulvino (2001), the results of Branch and Yang (2003) suggest that when cash is used as a method of payment, the likelihood that a takeover attempt is successful is greater than in stock swap mergers. Furthermore, in stock swap merger attempts, collars tend to be more likely to succeed than mergers with fixed exchange ratios. The authors state that their prediction model, based on merger type and accounting and firm-specific information, is statistically significant according to both in-sample and out-of-sample tests. Branch and Yang (2003) conclude that their prediction

model can improve risk-adjusted returns of merger arbitrage strategies by assisting portfolio construction in identifying successful and unsuccessful bids.

### 3.3 Limitations of Earlier Literature on Merger Arbitrage

Many academic studies are subject to multiple limitations affecting the reliability of results. Merger arbitrage is no exception. Most of the research on this topic has excluded transaction costs from the analysis. Mitchell and Pulvino (2001) were among the first to argue that excluding transaction costs was the leading cause of the misleading large excess returns found in previous literature.

It is also important to make the right assumptions on which day merger arbitrageurs enter and liquidate their positions. Those studies assuming that merger arbitrageurs enter their trades on announcement day are potentially subject to distortions as it may take a few days for stock prices to adjust and reflect new information. On the other side, risk arbitrageurs seem to liquidate their positions quite slowly after the announcement of deal failure (Moore, et al., 2006). A possible explanation for this is that traders are risk averse and therefore refuse to consolidate losses by closing their positions and waiting for an improved or competing bid offer. However, in most prior studies it is often assumed that merger arbitrageurs sell their holdings within one or two days after the bid is turned down.

Nearly all earlier works have assumed that those who invest in risk arbitrage strategies have unlimited access to capital and no limitation on short selling. While this is a simplification for calculations dictated by the limited availability of data, it is unrealistic.

It is a known fact that mergers and acquisitions are cyclical and occur in waves which vary in number of deals and method of payment. It is well documented that when markets are

strong, there are much bigger merger waves than in market drawdowns. Therefore, those studies that assume merger arbitrageurs can actively balance their portfolios with no costs are unrealistic. This is because when the number of active mergers is low, investors won't be able to well diversify their holdings. In turn, this implies that the weight of each deal in the portfolio will be significantly higher than during big merger waves.

As theory suggests, merger arbitrageurs are exposed to high risks due to the profit and loss distribution. In fact, a merger arbitrageur can at most earn the merger arbitrage spread if the deal will be successful. On the other side, if the deal will not complete, investors might incur much higher losses. Therefore, the risk-return profile of this investment strategy, together with transaction costs and the uncertainty concerning deal duration, should dissuade merger arbitrageurs from entering trades whenever the post-announcement merger arbitrage spread is below a certain threshold. In this line, further research on the possibility to generate excess returns from merger arbitrage strategies should be conducted from the point of view of a professional investor and apply additional filters like a minimum threshold of spread to be exceeded before investing in a deal.

From a statistical point of view, as suggested by Mitchell and Pulvino (2001), linear asset pricing models such as the CAPM and the Fama-French three-factor model are not adequate to measure excess returns for this strategy. Mithcell and Pulvino (2001) show that merger arbitrage strategies have a nonlinear relationship with market movements and therefore should be used a contingent claims approach as suggested by Glisten and Jagannathan (1994). However, before doing so, scholars should verify the presence of such nonlinearity since its evidence is discordant around the world. For instance, studies conducted in the UK and Australian markets found little evidence of the nonlinearity between the strategy returns and the respective benchmark index (Sudarsanam & Nguyen, 2008; Maheswaran & Yeoh, 2005).

## 4 Research Question and Sub-Questions

This work intends to investigate the risk-return characteristics of merger arbitrage strategies in European markets. The main objective of this thesis is to determine whether merger arbitrage investors can generate large excessive returns over Western Europe stock markets. The following chapter answers three sub-questions that have been formed to provide a more structured answer to the research question.

**Question 1: Are there differences in the returns between all-cash, all-stock, and mixed deals?**

To my knowledge, there is little evidence in this field of study. Baker and Savasoglu (2002) mentioned that they decided to not separate the returns for cash and stock deals because their portfolio of only stock deals included few deals for the first period of their sample and no deals at all for several months. Therefore, this represents a research gap to be further investigated.

**Question 2: How do merger arbitrage strategy returns behave during financial crises?**

Even in this case, to my knowledge, there are no studies which directly face this topic. If we link a financial crisis to a severe market downturn, we could mention the research by Mitchell and Pulvino (2001), Maheswaran and Yeoh (2005), Sudarsanam and Nguyen (2008), and Hall et al. (2013) conducted over the US, the Australian, and the UK market. However, these studies report discordant results. Shleifer and Vishny (1997) proposed the performance-based arbitrage hypothesis according to which large losses by arbitrageurs will result in the liquidation of arbitrage positions prematurely, thus leaving arbitrage



opportunities unexploited. In this regard, Officer (2007) responded that merger markets are well functioning and there is no evidence in favour of the performance-based arbitrage hypothesis. Officer (2007) showed that neither merger arbitrage returns, nor spreads appear to be significantly affected by these liquidity events. This paper will overcome the absence of evidence in European markets concerning these themes.

### Question 3: Are there any differences between domestic and cross-border deals?

Cross-border transactions bring with them additional difficulties in terms of legal, cultural, and political systems with respect to domestic deals. Andrieş and Vîrlan (2017) and Umber (2010) studied emerging Europe domestic and cross-border transactions. The findings of their research suggest that there is no statistical difference in deal spreads and premiums between domestic and foreign acquisitions. In the following part, I will try to find evidence in Western European markets.

## 5 Research Data and Analysis

This thesis uses data downloaded from the Refinitiv Workspace deals screener. The data consists of all mergers and acquisitions announced between the 1<sup>st</sup> of January 2002 to the 31<sup>st</sup> of December 2021 which were classified as “effective” or “withdrawn” according to Refinitiv Workspace. This implies that some deals were not terminated within the time frame mentioned above. Since the year 2022 is not over at the time of this work, deals that did not conclude by the end of 2021 have been excluded from the analysis.

The data in this research are limited to the transactions in which the target firm is a public company listed in Western Europe stock markets. After adding all the filters and restrictions that I used for my analysis, the list of countries in which target firms are listed includes 19 states: Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Jersey, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and United Kingdom.

As a guarantee for higher liquidity in the stock market and lower transaction costs associated with the arbitrage investment strategy, I decided to add some major restrictions which drastically reduced the number of deals included in the study. Following the procedure adopted by Liu and Wu (2014), I imposed the following filters: the percentage of shares sought by acquirors is larger than 50%, the target companies are publicly traded, the share price of the target one day before the merger announcement is above \$1, the value of the deals is above \$20 million, and the target company market capitalization is above \$1 million. These filters are to reflect a possible real-life situation in which presumably merger arbitrageurs would choose to steer clear of highly illiquid stocks. This becomes even more important when short selling is involved as illiquid markets are usually associated with higher borrowing costs and adverse movements in the stock price may lead to short sellers getting margin calls.

Target firms included in this study are listed on European public markets and as such are quoted in their domestic currency. In this paper, all stock prices are reported in USD (\$) as the deal screener on Refinitiv Workspace uses historical daily exchange conversion rates to convert all currencies into USD.

There exists a vast range of instruments that the acquiror can use to acquire a target company. Considerations offered space from cash to combinations of complex derivatives. To make calculations more accurate, this study will only consider those deals which see a 100% cash payment, a 100% stock payment, or a 100% mixture of cash and stock to acquire target firms.

After applying the preliminary filters listed above, the total sample consists of 3128 deals before further screening. Several deals downloaded from Refinitiv Workspace were omitting fundamental variables or contained unreliable data. These deals were excluded from the analysis. Merger arbitrage is a risky strategy whose return is highly dependent on the duration of the deal. In this line, I decided to exclude those deals that showed a post-announcement merger arbitrage spread smaller than 5%, assuming that a potential maximum return below this figure would not justify the risks. More simply, a return of 3% matured in 10 days is good, but the same return earned in one year is poor. Finally, I deleted all withdrawn mergers and acquisitions with a positive return, even if this is not always unrealistic. This decision was driven by the fact that some calculations relied on theoretical assumptions due to a lack of data. Therefore, to reduce the number of errors I decided to include only deals with return characteristics similar to the theory. The stock price of the firms involved in withdrawn deals should revert to pre-announcement levels and so investors should lose money on their trades. With these additional filters, the final sample consists of 665 deals divided between all-stock, all-cash, and mixed deals. This significant decrease is in line with previous academic literature. For instance, Baker and Savasoglu (2002), Maheswaran and Yeoh (2005), and Giannopoulos et al. (2017) were left, respectively, with less than 45%, 40%, and 10% of their initial sample size.

## 5.1 Country Data: Western Europe M&A

The final sample includes 47 countries worldwide between acquiror and target companies. Of these, 392 deals (59%) were domestic, while the remaining 41% were classified as cross-border. Table 1 reports the number of domestic and cross-border deals per target company's home country. Looking at this table, it is possible to see that about 31% of the deals in the sample were conducted in the UK market. This result is not much of a surprise considering that the United Kingdom is the second most targeted country for mergers and acquisitions worldwide (Statista, 2022). Following the UK, the most targeted countries were France and Germany, representing about 16% and 10% of the total number of deals in the sample, respectively. The share owned by the remaining 16 countries in the sample is considerably smaller than in the United Kingdom and therefore will have a much smaller weight on the results.

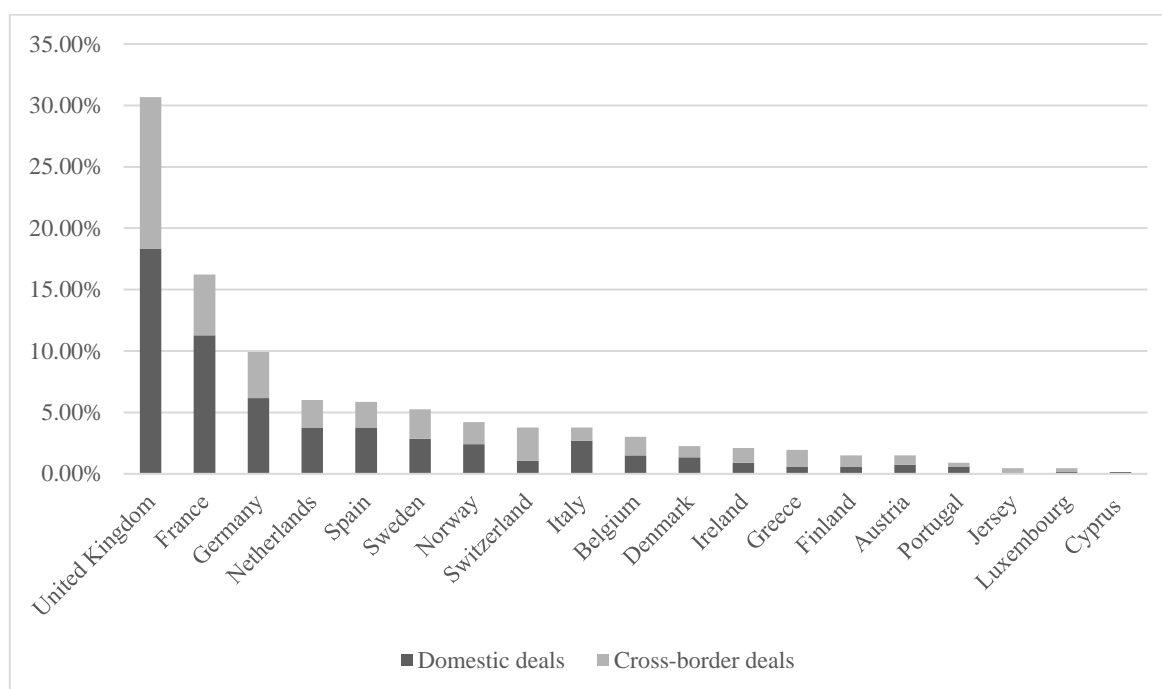
Table 1: Number of Domestic and Cross-Border Deals per Target Company's Home Country

<i>Target Country</i>	<i>Domestic deals</i>	<i>Cross-border deals</i>	<i>Total</i>
<i>Austria</i>	5	5	10
<i>Belgium</i>	10	10	20
<i>Cyprus</i>	1	0	1
<i>Denmark</i>	9	6	15
<i>Finland</i>	4	6	10
<i>France</i>	75	33	108
<i>Germany</i>	41	25	66
<i>Greece</i>	4	9	13
<i>Ireland</i>	6	8	14
<i>Italy</i>	18	7	25
<i>Jersey</i>	0	3	3
<i>Luxembourg</i>	1	2	3
<i>Netherlands</i>	25	15	40
<i>Norway</i>	16	12	28
<i>Portugal</i>	4	2	6
<i>Spain</i>	25	14	39
<i>Sweden</i>	19	16	35
<i>Switzerland</i>	7	18	25
<i>United Kingdom</i>	122	82	204
<b><i>Total</i></b>	<b>392</b>	<b>273</b>	<b>665</b>

Figure 2 shows that, in the final sample, the top 10 highest ranked countries by number of total deals had an enormous 89% share of the total. Not surprisingly, the remaining 9 countries are smaller and have smaller stock exchanges. The most reasonable explanation for such a smaller percentage of deals outside the first 10 countries brings us back to the strict limitations applied on minimum deal value and minimum target company market capitalization. Looking closer at the percentage of domestic and cross-border deals in the

sample, it is not possible to identify any clear preference given that only a slight majority of 59% of the deals are classified as domestic.

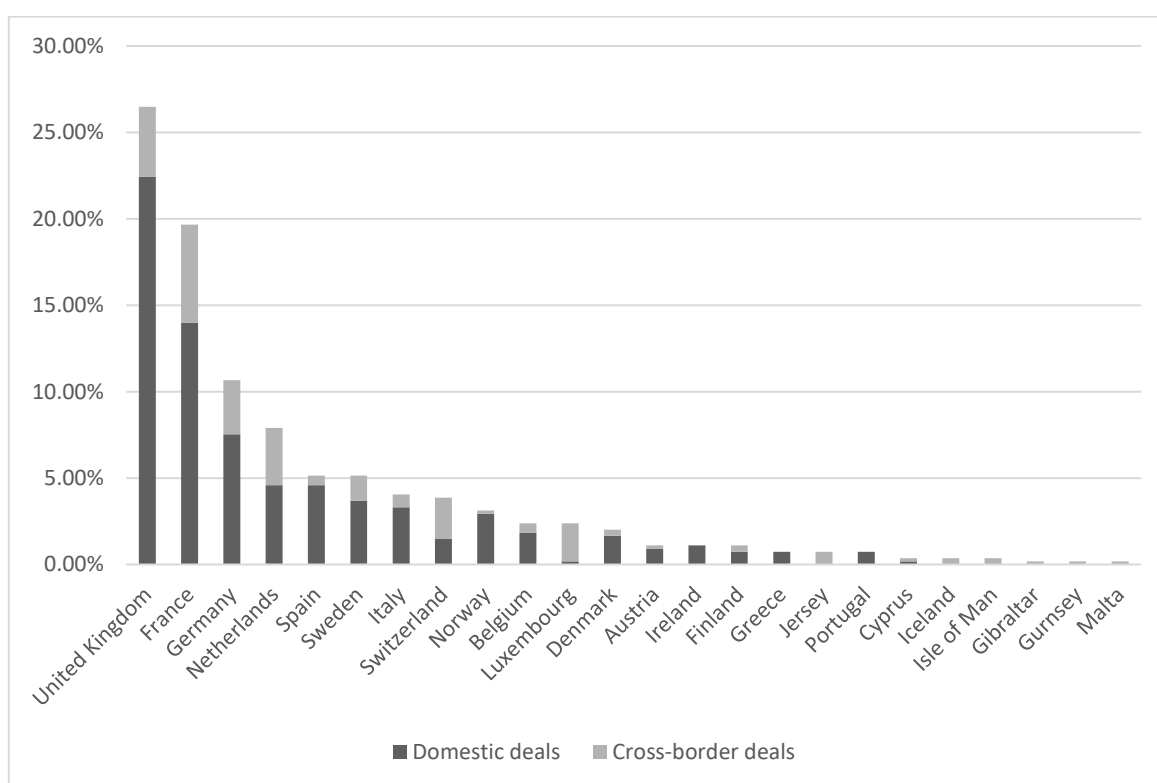
*Figure 2: Percentage of Domestic and Cross-Border Deals per Target Company Home Country*



It would also be interesting to verify whether there exists some clear pattern in European acquirors behaviour. From Figure 3 we can see that the ranking of home countries of target and acquiror companies are similar and present only a few exceptions. The ranking by number of deals remains the same for the first five positions, with the United Kingdom being the highest ranked, followed by France and Germany. This new sample includes 24 European countries, five more with respect to the sample of target companies. In all these additional countries, taxes on capital gains are very low or inexistent. A possible explanation is that these countries did not fall within the sample of target companies because of the minimum requirements imposed on deal value and target companies' market capitalization but appear within the list of acquiror companies because many firms and investment funds

use to incorporate in such jurisdictions to benefit from the advantageous taxing regimes. However, this finding has very little significance as the additional companies bottom the ranking by representing only 1.29% of the total number of deals. If we consider only the 19 European countries which were included in both samples, we can observe an interesting difference between the two samples. Figure 3 shows how domestic and cross-border deals distribute for each acquiror company's home country. From this graph, we can notice that the distribution between domestic and cross-border deals within a single country is much more heterogeneous with respect to Figure 2. Here, domestic deals constitute 79% of the sample, thus suggesting that European acquiror companies prefer domestic deals over cross-border deals.

*Figure 3: Percentage of Domestic and Cross-Border Deals per Acquiror Company Home Country*



*(Deals with non-European acquiror companies were excluded)*

## 5.2 Deal Data: All-Cash Deals, All-Stock Deals, Mixed Deals

After summarizing the country-level statistics, in this second part, the focus will be on deal types. The sample includes three kinds of deals which differ in the method of payment. Hereafter, the paper will refer to these deals as cash deals, stock deals, and mixed deals. A deal is classified as a cash deal when the acquiror offers to acquire a specific quantity of the target company's stock for a fixed price in cash. Stock deals are classified as such when the acquiror firm offers to the target firm shareholders to swap the target company shares for the acquiror company shares at a predetermined exchange ratio. Mixed deals are a hybrid between these two means of payment. In mixed deals, the acquiror offers to target shareholders to buy their shares in part with cash and in part with its stock at predetermined terms. Mixed deals require slightly more complicated calculations than cash and stock deals, and for this reason, have been excluded from the analysis in most academic studies. The final sample of 665 deals consists of 586 cash deals, 39 stock deals, and 40 mixed deals.

Table 2 provides a summary of the statistics about the number of deals divided by deal type in each announcement year of the sample. It is well documented that mergers occur in waves. Academics have identified six completed waves of mergers which occurred between the following time intervals: 1897-1904, 1916-1929, 1965-1969, 1984-1989, 1990-2000, and 2003-2007 (M&C Partners, 2022). In his thesis, Ching (2019) argues that we are currently living in the seventh wave which started in 2010. While it is possible to observe the effects of the sixth wave in the final sample of this study, there is not a clear pattern for what regards the seventh wave. The cause of this incongruence could be attributed to the fact that the study conducted by the author focuses on the US market. Though it is widely accepted that merger waves exist, there is no consensus on what drives these waves. About the sixth wave, some academics believe that the main driver was the abundant liquidity in the market (Alexandridis, et al., 2012) while others sustain that the high liquidity adversely affected the M&A market by generating distortions in target companies' stock prices (Cordeiro, 2014). However, both authors agree that what ended the sixth wave were the



economic downturns of the financial crisis in 2008. At the end of 2007, investors and corporate managers started to become sceptical about credit markets and in particular about the less transparent Mortgage Backed Securities. As a consequence, in 2008 credit lines dried up and financing became scarce and expensive, leading the western world into recession and halting M&A activity (Alexandridis et al, 2012; Corderio, 2014). Figure 4 plots the annual change in the number of deals included in this study. The sharp drop in the number of deals between 2008 and 2009, representing a decrease of 57%, suggests that the halt in M&A activity arrived in Europe with one year of delay. After this merger wave, there was a huge decline in the total number of deals but in this study, there is no evidence of the presence of the seventh wave. Additionally, right after the financial crisis of 2007-2008, Europe was hit by the European sovereign debt crisis from 2009 until the mid to late 2010s. The two financial crises led to huge financial losses for companies and investors which translated into fear and distrust towards the financial system. As suggested by the renowned expression “Whatever it takes” pronounced on July 26, 2012, by the former president of the ECB Mario Draghi, countries in the Euro area were rescued by a significantly accommodating monetary policy. In the aftermath of the European sovereign debt crisis, short-term interest rates in the Euro area were close to zero. Still, despite the extremely low interest rates, no evidence of the seventh merger wave can be identified in the sample of this study. Going back to Figure 4, the outstanding 110% increase in number of deals between 2020 and 2021 deserves more attention. In 2020 the world was hit by the Covid-19 pandemic, one of the most terrifying black swans in financial markets history. Economies all over the world froze following people being forced to quarantine for extended periods. To help local economies survive the pandemic, central banks all over the world started expansionary monetary policies which lowered interest rates and injected liquidity into the financial system. The huge increase in the number of deals between 2020 and 2021 could therefore be attributed to the enormous availability of liquidity which led to the rally of everything in financial markets. With easy access to capital, low interest rates, and a recovering global economy, dealmakers around the world announced \$5.1 trillion worth of M&A transactions in 2021, up from \$3.8 trillion in 2020 (KPMG, 2022).

The biggest slice of the total deals in the sample is made of cash deals followed by mixed deals and stock deals, representing a share of 87%, 7%, and 6%, respectively. The

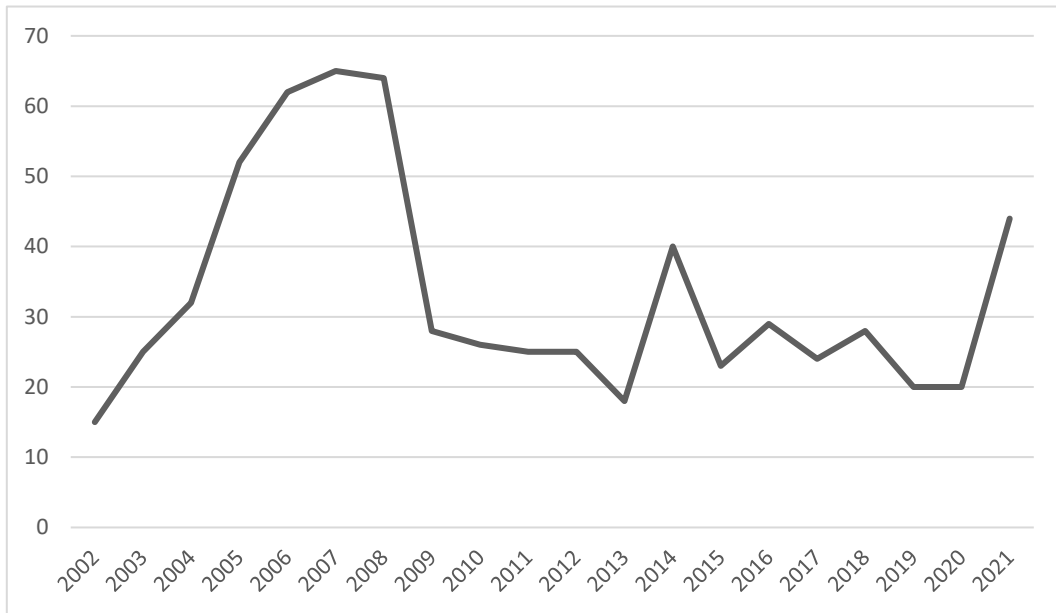
distribution across deal types is in line with prior studies. The share of cash deals is slightly larger than the 73% share reported by Mitchell and Pulvino (2001) and than the 75% share in Sudarsanam and Nguyen (2008). However, it is important to remember that not all studies relied on similar samples. Some papers focused solely on one or two of the three types of deals, while others, like Branch and Yang (2006) had more stock deals than cash offers in their sample. Different deal-type distributions are not without consequences. For instance, Branch and Yang (2006) reported positive betas for cash deals and negative betas for stock deals during market downturns. It is important to compare the results of this work to those studies which relied on a sample similar to the one used in this study in terms of deal type distribution. Following the findings by Mithcell and Pulvino (2001), merger arbitrage returns in this study should predict a positive correlation between risk arbitrage returns and stock market returns in down markets.

Going back to the merger waves argument, as was anticipated earlier, the number of deals announced between 2004 and 2008 is much higher than in the rest of the sample. It will be interesting to verify whether merger waves are positively correlated with merger arbitrage returns. If this should be the case, a possible explanation could be found in behavioural finance where, according to the model presented by Shleifer and Vishny (2003), corporate managers know when mergers are perceived as synergistic and time them. When mergers are perceived as synergistic, the market reacts positively and merger arbitrageurs will profit from their trades.

Table 2: Number of Deals by Announcement Year

	<i>Cash</i>	<i>Stock</i>	<i>Mixed</i>	<i>All</i>	<i>Cash</i>	<i>Stock</i>	<i>Mixed</i>
2002	13	1	1	15	87%	7%	7%
2003	20	0	5	25	80%	0%	20%
2004	30	1	1	32	94%	3%	3%
2005	43	6	3	52	83%	12%	6%
2006	58	1	3	62	94%	2%	5%
2007	56	3	6	65	86%	5%	9%
2008	57	4	3	64	89%	6%	5%
2009	25	3	0	28	83%	10%	7%
2010	23	1	2	26	85%	4%	11%
2011	24	1	0	25	96%	4%	0%
2012	21	4	0	25	84%	16%	0%
2013	12	2	4	18	67%	11%	22%
2014	33	3	4	40	80%	7%	12%
2015	20	2	1	23	87%	9%	4%
2016	26	1	2	29	87%	3%	10%
2017	19	2	3	24	79%	8%	13%
2018	25	2	1	28	89%	7%	4%
2019	18	2	0	20	90%	10%	0%
2020	19	0	1	20	90%	0%	10%
2021	44	0	0	44	100%	0%	0%
<b>Total</b>	<b>586</b>	<b>39</b>	<b>40</b>	<b>665</b>	<b>87%</b>	<b>6%</b>	<b>7%</b>

Figure 4: Total number of Deals Announced per Year



In Table 3 are summarized the statistics concerning deal duration. The average and median duration of the deals in the sample have been grouped both by announcement year and by deal type. Whenever the table presents a blank spot, it is because the sample of stock deals and mixed deals included in this study is small and for some years there are no deals. The statistics for stock deals and mixed deals are very similar. On average, the running time for stock deals was 107 days, which is slightly longer than the average 106 days of mixed deals and significantly shorter than the average 148 days it took cash deals to complete. For 13 out of the 17 years in which the two deal types are comparable, cash deals had a longer duration than stock deals, on average. Similarly, for 13 out of the 15 years in which the two deal types are comparable, cash deals lasted longer than mixed deals. However, for some years the duration of cash deals was shorter than that of stock deals and mixed deals. As the rightmost columns in Table 3 suggest, the change in average deal duration is much more volatile than the change in median deal duration. This could be easily seen in Figure 5 which plots the average and median duration for every year in the sample. The difference in variation is because, in relatively small samples like the one used in this study, even a single

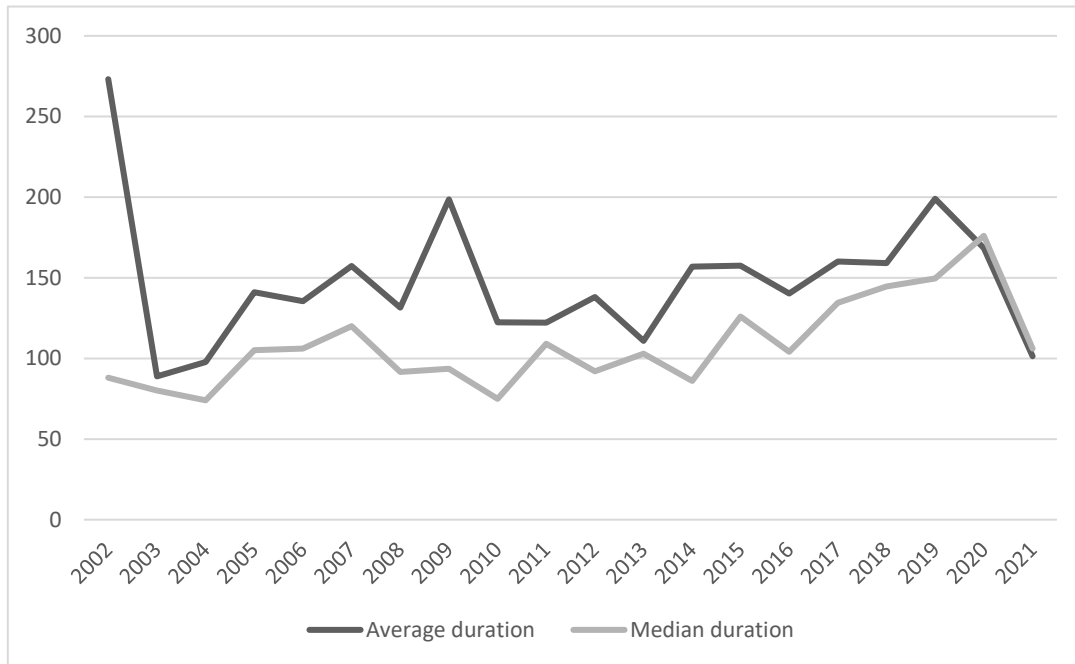
extreme value could have a significant effect on the sample average. Therefore, in this case, the median could be a better statistic to analyse deals' duration. Looking at both the average and the median duration, mixed and stock deals behave very similarly and have a median duration quite longer than that of cash deals. However, what is interesting is that while for stock deals and mixed deals the median duration is longer than the average duration, for cash deals it is the other way around. This suggests that the distribution of durations across all the years in the sample is positively skewed for cash deals and negatively skewed for stock deals and mixed deals.

As was anticipated earlier, deal duration is one of the most important variables to determine the effective return generated by a merger arbitrage trade. This is because merger arbitrageurs liquidate their positions, and so realize gains or losses, only after deal resolution. The main characteristic of merger arbitrage trades is that the return sought by arbitrageurs is given by the post-announcement merger arbitrage spread which is locked in at investment inception. Therefore, assuming that a deal will conclude successfully at the pre-agreed terms, after a deal is initiated, the only variable affecting annualized deal returns is deal duration. Hence, merger arbitrageurs thrive with short-duration deals.

Table 3: Average and Median Duration for Each Deal Type

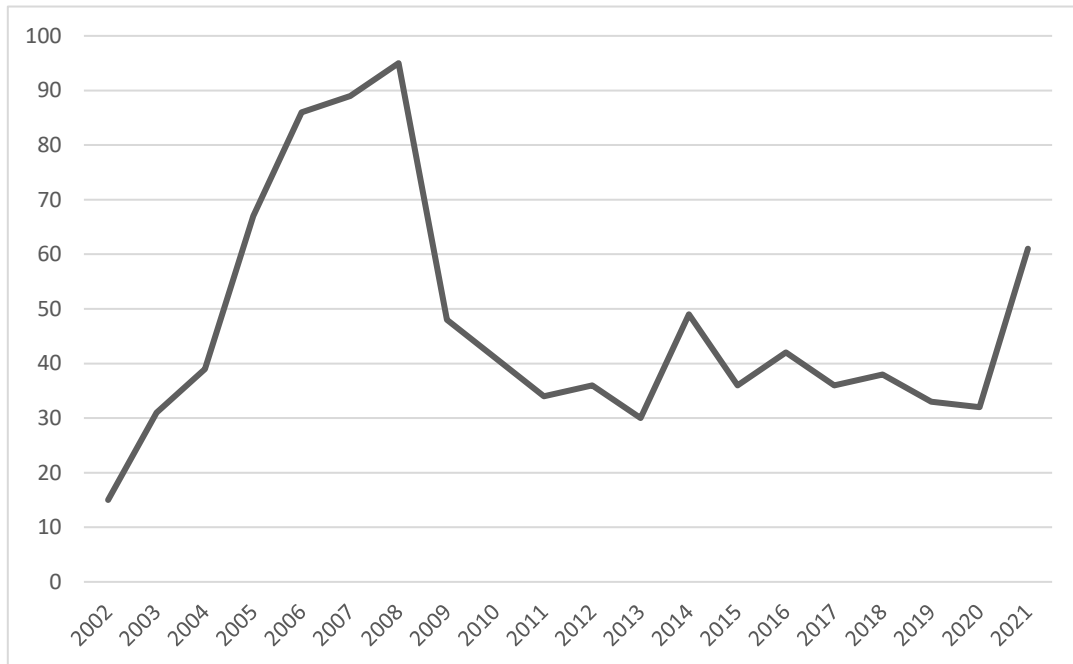
	<i>CASH</i>		<i>STOCK</i>		<i>MIXED</i>		<i>ALL</i>	
	Average	Median	Average	Median	Average	Median	Average	Median
2002	296	71	88	88	163	163	273	88
2003	89	80			90	80	89	80
2004	103	77	24	24	12	12	98	74
2005	148	109	107	103	103	79	141	105
2006	135	104	159	159	128	156	135	106
2007	163	120	90	72	137	166	157	120
2008	139	92	52	47	100	124	132	92
2009	211	94	91	82			199	94
2010	120	70	168	168	127	144	122	75
2011	121	109	154	154			122	109
2012	139	87	136	150			138	92
2013	118	103	80	80	106	110	111	103
2014	170	86	121	135	92	67	157	86
2015	161	125	140	140	120	120	158	126
2016	144	93	142	142	109	132	140	104
2017	176	141	134	134	79	85	160	135
2018	164	141	166	166	29	29	159	145
2019	216	183	48	48			199	150
2020	173	178			126	126	168	176
2021	101	106					101	106
<b>TOTAL</b>	<b>148</b>	<b>107</b>	<b>107</b>	<b>126</b>	<b>106</b>	<b>122</b>	<b>143</b>	<b>107</b>

Figure 5: Average and Median Duration per Year



In Figure 4 it is possible to see the effect of the sixth merger wave on the number of deals announced. A similar effect can be seen in the number of active running deals which are plotted in Figure 6. Active running deals are all those deals that have been announced before or during a specific year and that concluded within or after that year. Active running deals could be interpreted as a measure of diversification opportunities for merger arbitrageurs in the sense that a higher number of active running deals means that an investor has more investment opportunities and therefore can diversify his/her portfolio. Therefore, if we look at the number of deals announced per year, it is no surprise that the graphs in Figure 4 and Figure 6 are very similar to each other and that the peak of pending deals was in 2008 when 95 deals were running at the same time, at least for part of the year. The drop in the number of deals after 2008 would have decreased the possibility for merger arbitrageurs to diversify their portfolios.

Figure 6: Active Running Deals per Year



Jetley and Ji (2010) documented a significant decline in the arbitrage spread since the 1990s. They found that for mergers announced after 2001, the first-day arbitrage spread decreased by 520 basis points compared to deals announced in the period 1990-1995 and by 290 basis points with respect to deals announced between 1996 and 2001. In this paper, like in Jetley and Ji (2010), I calculated the post-announcement merger arbitrage spread one day after the announcement. For this part of the analysis, it is important to remember that all merger arbitrage opportunities with a spread smaller than 5% were excluded from the sample used in this study. The rationale is that a merger arbitrageur wouldn't enter a merger arbitrage trade if the spread at inception does not justify the much higher loss potential. Additionally, to avoid the inclusion of erroneous data, I also excluded all merger arbitrage opportunities with outlier returns, where for outlier it is meant all those deals with a spread and realized return outside the [-100%; +100%] range. This led to a reduction of 19 deals in the total sample.



This paper focuses on three types of M&A deals, each with a different type of consideration offered. Consequently, the merger arbitrage spread of each deal type is calculated differently.

When the consideration offered is 100% cash, the acquiror offers a fixed amount of cash per target company share. In this case, merger arbitrageurs try to take advantage of the spread between the offer price and the target company stock price. To do so, merger arbitrageurs simply enter a long position on the target company stock. Therefore, as in Jetley and Ji (2010), the formula I used to calculate cash deals arbitrage spread is the following:

$$S_{cash} = \frac{P_{offer} - P_{target,t}}{P_{target,t}}$$

Where  $S_{cash}$  is equal to the cash deal arbitrage spread,  $P_{offer}$  is the cash price offered by the acquiror per target company's share, and  $P_{target,t}$  is the target stock closing price on the day in which the arbitrageur enters the trade which in this study is assumed to be one day after the announcement.

When the acquiror offers to finance the acquisition completely with its stock, the trade is slightly more complicated. As it was discussed earlier in this study, to lock in the merger arbitrage spread the arbitrageur will have to simultaneously take a long position on the target company stock and a short position on the bidding company stock, where the number of target company shares to be shorted is fixed by the exchange ratio. Again, the formula used to calculate stock deals arbitrage spread is the same as in Jetley and Ji (2010):

$$S_{stock} = \frac{(P_{acquiror,t})(ER) - P_{target,t}}{P_{target,t}}$$

Where  $S_{stock}$  is equal to the arbitrage spread for stock deals,  $P_{acquiror,t}$  is the closing price of the acquiror company stock on one day after the announcement,  $ER$  is the exchange ratio, and  $P_{target,t}$  is the target stock closing price on one day after the announcement.

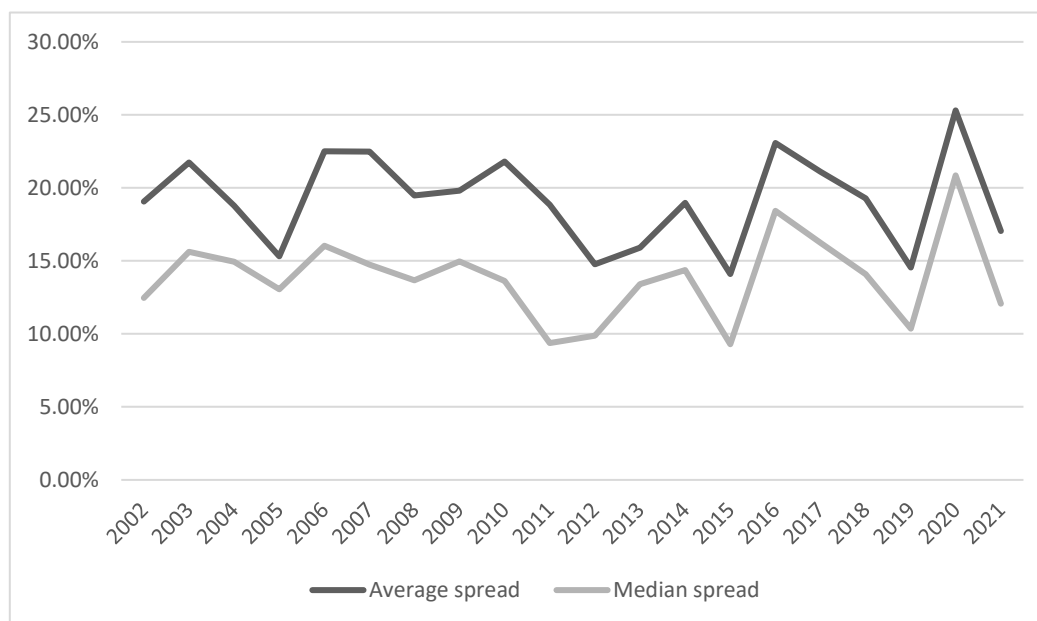
The third type of deal is a hybrid of the previous two. In mixed deals, the acquiror offers to pay for the acquisition in part with cash and in part with its stock. The trade entered by mixed merger arbitrageurs is analogous to the one entered for stock mergers. The only difference is that, given two bids with the same premium, a stock deal and a mixed deal, the exchange ratio implied in the offer of the mixed deal will be lower, being part of the consideration in cash. The formula used to calculate the spread on mixed merger arbitrage strategies is the following:

$$S_{mixed} = \frac{P_{offer} + (P_{acquiror,t})(ER) - P_{target,t}}{P_{target,t}}$$

Where  $S_{mixed}$  is the merger arbitrage spread for mixed deals while the rest of the inputs are the same as those used in the calculations for cash and stock merger arbitrage spreads.

The distribution of merger arbitrage spreads appears to be positively skewed both when we consider the whole sample and when we divide it by deal type. Figure 7 tracks the change in average and median spread between 2002 and 2021. For the whole sample, the average and median arbitrage spreads are 19.50% and 14.17%, respectively. As in Figure 7, also when we divide the total sample by deal type, no meaningful trend can be identified. From the data arises that the merger arbitrage spread of cash and mixed deals is approximately 7.3% larger than for stock deals. More interestingly, to check whether there exists some change in merger arbitrage spread between the pre- and post-crises periods, I divided the sample into two subgroups. The first subgroup goes from 2003 to 2007 and the second one goes from 2009 to 2013. Evidence suggests that after the financial crises that hit Europe between 2008 and the mid-2010s, the average merger arbitrage spread decreased by 200 bps. A possible explanation could be that before 2008, during the sixth merger wave, capital markets were distorted by optimism and overconfidence which translated into corporate managers overvaluing target companies and offering higher premiums.

Figure 7: Average and Median Deal Spread



Like in Andrieş and Vîrlan (2017), I decided to investigate the relationship between spreads and returns on merger arbitrage investments. According to theory, merger arbitrage spreads and returns should move in the same direction as spreads work as a proxy for deal completion risk. The results I obtained are in part similar to those of prior research. Like in (Umber, 2010), no statistical difference in deal spreads was found between domestic and foreign acquisitions. This points out that investors perceive domestic and cross-border deals as equally risky and generating similar returns. Successively, I calculated returns on both groups. In contrast to Andrieş and Vîrlan (2017), I did not notice any significant difference in risk and returns between the two groups. Therefore, evidence from this study suggests that cross-border deals are not riskier than domestic deals and that spreads correctly reflect the level of risk in merger arbitrage strategies.

One of the most interesting aspects of this study will be to investigate whether there exists any trend in the success rate between years and across deal types. Additionally, like in prior

literature, I will try to identify any variable which helps to predict the likelihood of success of mergers and acquisitions.

Table 4 illustrates the success rates for each deal type every year. Results suggest that most of the deals announced between 2001 and 2021 were successfully completed, thus confirming prior empirical evidence. The year with the lowest success rate was 2014 and the year with the highest success rate was 2005 with respectively 60% and 93% of the deals concluded being effective. For the rest of the sample, as in Jetley and Ji (2010), the success rate is relatively stable. Due to the limited number of mixed and stock deals, the statistics for the total sample are highly dependent on cash deals. In general, no trend can be identified between years and across deal types. We can only mention that in our sample, like in Sudarsanam and Nguyen (2008), the success rate for stock deals and cash deals is almost indistinguishable. Stock deals and cash deals are the most successful, followed by mixed deals with success rates of 79%, 77%, and 68%, respectively. Therefore, from this study appears that higher M&A activity is not linked to higher success rates as the significant constant increase in the number of deals announced between 2002 and 2008 is not associated with any particular change in the success rate which remains stable through the period.

At this point, it would be interesting to see if there are some features which systematically differ between successful and unsuccessful deals. The focus will be on deal duration and merger arbitrage spread.

Starting from the former, in Figure 8 are plotted the average durations for effective and withdrawn deals. Like Mitchell and Pulvino (2001) and Jetley and Ji (2010), evidence from this study suggests that effective deals last longer than unsuccessful ones, on average. Table 4 presents the average duration of effective and withdrawn deals for each deal type. For all three deal types, effective deals last longer than withdrawn deals. As in Sudarsanam and Nguyen (2008), cash deals have a longer average duration than stock and mixed deals. Even more interesting, it appears that stock and mixed deals behave very similarly in terms of average duration for both effective and withdrawn deals.

Table 4: Average Duration Effective vs Withdrawn

	<b>Cash</b>	<b>Stock</b>	<b>Mixed</b>	<b>All</b>
<b>Effective</b>	154	114	115	149
<b>Withdrawn</b>	131	80	78	108

Figure 8: Average duration Effective vs Withdrawn

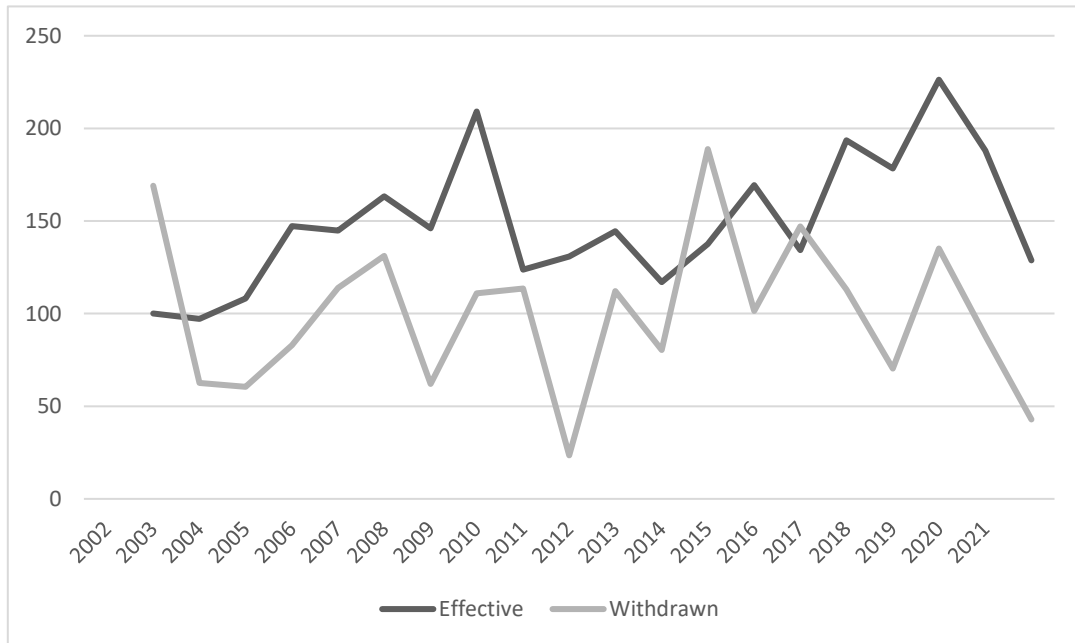


Table 5: Success Rate by Deal Type

	CASH		STOCK		MIXED		ALL					
	Effective	Withdrawn	Success Rate	Effective	Withdrawn	Success Rate	Effective	Withdrawn	Success Rate			
2002	7	1	88%	1	0	100%	0	0	0%	8	1	89%
2003	14	4	78%	0	0	0%	4	2	67%	18	6	75%
2004	16	6	73%	0	1	0%	1	0	100%	17	7	71%
2005	35	3	92%	3	0	100%	2	0	100%	40	3	93%
2006	39	16	71%	3	0	100%	3	1	75%	45	17	73%
2007	37	13	74%	4	0	100%	4	0	100%	45	13	78%
2008	57	11	84%	4	0	100%	4	1	80%	65	12	84%
2009	26	4	87%	2	0	100%	0	0	0%	28	4	88%
2010	23	5	82%	1	1	50%	1	0	100%	25	6	81%
2011	16	6	73%	0	0	0%	1	0	100%	17	6	74%
2012	18	4	82%	2	0	100%	0	0	0%	20	4	83%
2013	13	1	93%	2	2	50%	4	0	100%	19	3	86%
2014	17	12	59%	3	1	75%	1	1	50%	21	14	60%
2015	16	5	76%	1	0	100%	1	1	50%	18	6	75%
2016	16	9	64%	2	0	100%	0	2	0%	18	11	62%
2017	15	7	68%	0	1	0%	1	2	33%	16	10	62%
2018	16	4	80%	2	1	67%	0	2	0%	18	7	72%
2019	15	6	71%	0	1	0%	0	0	0%	15	7	68%
2020	9	4	69%	1	0	100%	0	0	0%	10	4	71%
2021	45	15	75%	0	0	0%	0	1	0%	45	16	74%
Total	450	136	77%	31	8	79%	27	13	68%	508	157	76%

The most important skill for merger arbitrageurs is to correctly assess the likelihood of success of mergers and acquisitions. The success of this strategy lies in the success of the deal, and it is therefore essential for arbitrageurs to identify those variables which help to predict which deals will be successful. Besides their business and legal expertise, arbitrageurs could also rely on other indicators intrinsic to the transaction. One of these predictors could be the merger arbitrage spread.

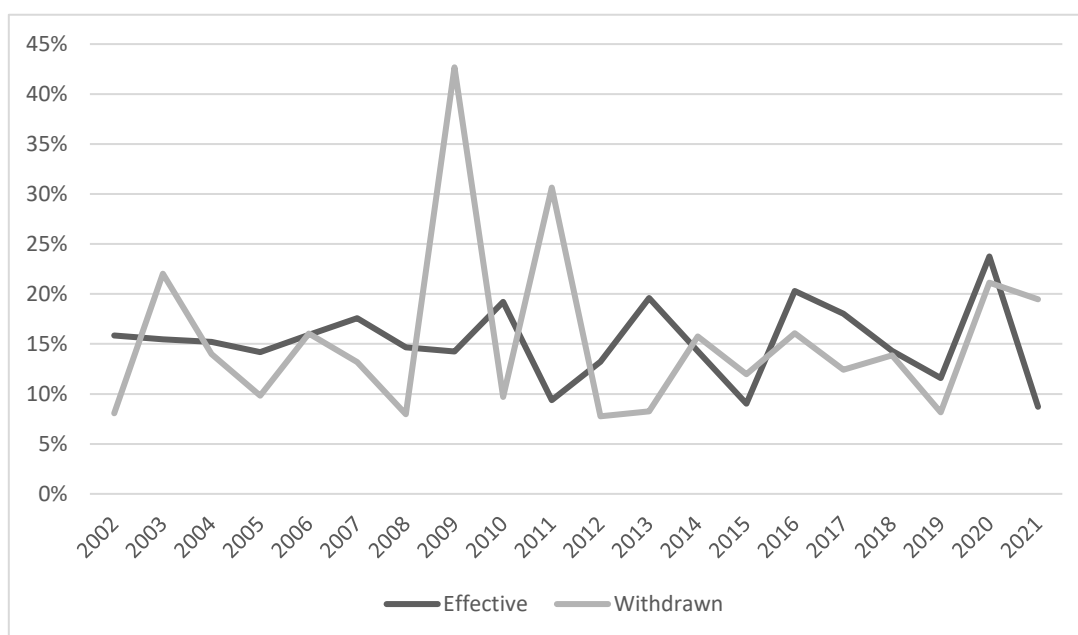
As we can see from Figure 9, there is no particular trend in merger arbitrage spreads over time. However, while the median merger arbitrage spread of successful deals is relatively stable through the sample period, the median spread of unsuccessful deals is much more volatile and presents two huge spikes in 2009 and 2011, which are the years after the outbreak of the two financial crises in Europe. For unsuccessful deals, between 2008 and 2009 the average merger arbitrage spread increased by over 19% while in 2011 the average spread increased by over 20% compared to 2010. The increase in merger arbitrage spread during financial turmoils suggests that arbitrageurs are able to distinguish risky deals from less risky ones. During periods of high uncertainty, it is reasonable to assume that investors will reduce their risk exposure and invest only in those deals that they believe to be safer. Under this assumption, merger arbitrageurs will deploy a higher proportion of their capital on safer deals and less on risky deals. As a result, as Jetley and Ji (2010) documented, the decrease in arbitrage spread of successful deals in parallel with the increase in the arbitrage spread of unsuccessful deals during financial crises can be attributed to capacity constraints. Therefore, this study suggests that during financial turmoils investors are more cautious and stay away from risky deals which results in higher spreads for unsuccessful deals and lower spreads for successful ones. Also in this case, results suggest that arbitrageurs can properly assess the riskiness of the deals and that these risks are correctly proxied by the spread. As pointed out in Table 6, when we consider the whole sample period, median spreads of cash and mixed deals are wider than for stock deals for both successful and failed deals. As for before, the reason for using the median instead of the average is because there are some unrealistic outliers in the sample which make results far from reality. By using the median, the precision improves. In small samples, outliers have a heavy weight on the average and do not affect the median. The existence of such unrealistic spreads in the sample is probably attributable to some errors in the database. Finally, to explain the slightly higher spreads it

is important to not forget that only deals with a first-day merger arbitrage spread above 5% were included in the sample.

Table 6: Median Merger Arbitrage Spread by Deal Type

	<b>Cash</b>	<b>Stock</b>	<b>Mixed</b>	<b>All</b>
<i>Effective</i>	15%	9%	13%	15%
<i>Withdrawn</i>	14%	10%	15%	14%

Figure 9: Median Merger Arbitrage Spread Effective vs Withdrawn





## 6 Portfolio Returns

Now that all the most relevant features of the deals included in this research have been described, it is time to assess whether merger arbitrage strategies represent an opportunity for arbitrageurs to consistently generate excess returns.

### 6.1 Portfolio Construction

Like for the analysis of merger arbitrage spreads, I decided to further restrict the sample by excluding all those deals generating returns outside the range [-100%; +100%] and with a deal duration longer than 180 days. The rationale behind this decision was to eliminate all erroneous data from the sample. These erroneous data could originate from errors in the deals screener of Refinitiv Workspace or from the assumptions made to calculate returns which will be discussed later on. These restrictions decreased the sample to 646 deals.

#### 6.1.1 Calculating Deal Returns

Due to some technical limitations, this part of the study will take a few assumptions to calculate returns. However, even though these assumptions can be considered a simplification, they are still founded on a solid theoretical basis.

In prior academic studies, it is assumed that merger arbitrageurs enter their trades one or two days after the announcement rather than on the announcement date. This assumption is made to avoid any potential distortion in prices. Like Mitchell and Pulvino (2001) and Sudarsanam and Nguyen (2008), this paper assumes arbitrageurs enter their trades one day after the announcement and hold the position in their portfolio until the resolution date. For successful deals, the resolution date is the date on which the bid is declared to be effective. For unsuccessful bids, the resolution date is the day on which the bid is withdrawn. Using one day after the announcement date as the beginning of the trade is consistent with the view of Moore et al. (2006) which suggests merger arbitrageurs only trade on public information. Similarly, using the deal withdrawal date as the resolution date for investments in failed transactions ensures that investors in unsuccessful deals only exit their positions after the deal failure is publicly announced.

The formula used to calculate returns changes according to the consideration offered. What is worth for each deal type is that the return realized by successful deals equals the merger arbitrage spread calculated at trade initiation. The formulas used for each deal type are summarized in Table 7.

The merger arbitrage strategy of cash merger arbitrageurs is very simple and consists in taking a long position on the target firm's stock and closing the position on the resolution date. This implies that when a deal is successful, the investor will sell his/her shares in the target company at the bid price. On the other side, when a deal is withdrawn, the merger arbitrageur will not receive the bid price but will close the position by selling the target company's shares at the market price. Therefore, for unsuccessful cash deals will be used the formula described below:

$$R_{cash} = \frac{P_{target,T} - P_{target,t}}{P_{target,t}}$$

Where  $P_{target,t}$  is the target firm stock price at trade initiation and  $P_{target,T}$  is the target firm stock price on resolution day.

For stock deals, the trade is a bit more complicated. The stock merger arbitrage strategy consists in simultaneously taking a long position in the target firm stock and a short position in the acquiror firm stock, where the short position is determined by the exchange ratio implied in the bid offer. If a stock deal is successful, for each target firm share in their possession, merger arbitrageurs will receive a quantity of acquiror firm shares determined by the exchange ratio. When the stock deal is unsuccessful, the return will be exactly equal to the return on a portfolio made of a long position on the target firm stock and a short position on the acquiror firm stock. Therefore, the formula used to calculate returns for stock deals is:

$$R_{stock} = \frac{P_{target,T} - P_{target,t}}{P_{target,t}} + (ER) \frac{P_{acquiror,t} - P_{acquiror,T}}{P_{acquiror,t}}$$

Where  $ER$  is the exchange ratio,  $P_{acquiror,t}$  is the acquiror firm stock price on one day after the announcement, and  $P_{acquiror,T}$  is the acquiror firm stock price after a deal was publicly withdrawn. Finding a value for this latter element was more complicated. The deals screener of Refinitiv Workspace only provided the acquiror firm stock price on the following dates: 10 days, 4 weeks, 60 days, 90 days, and 180 days after the announcement date. Therefore, at this stage, I was forced to make the additional assumptions I mentioned at the beginning of the chapter. Intuitively, for unsuccessful deals having a duration shorter than 10 days I used the acquiror firm stock price 10 days after the announcement, and so on. Even though this assumption might seem approximative, it still relies on the suggestions of Moore et al. (2006). The academics proved that only less than 10% of merger arbitrageurs sell their shares right after a deal withdrawn is publicly announced while the rest seems to liquidate their positions quite slowly. The most plausible reason is merger arbitrageurs waiting for an improved or competing offer after the takeover attempt has been turned down.

The merger arbitrage strategy for mixed deals is the same as that for stock deals. However, since the consideration is a hybrid between cash and stock, the formula used to calculate returns will differ in the case of successful deals. Target firm shareholders will receive part of the consideration in cash and part in stock of the acquiror firm.

Table 7: Formulas Used for Deal Returns

<i>Effective</i>	<i>Withdrawn</i>
$R_{cash} = \frac{P_{offer} - P_{target,t}}{P_{target,t}}$	$R_{cash} = \frac{P_{target,T} - P_{target,t}}{P_{target,t}}$
$R_{stock} = \frac{(P_{acquiror,t})(ER) - P_{target,t}}{P_{target,t}}$	$R_{stock} = \frac{P_{target,T} - P_{target,t}}{P_{target,t}} + (ER) \frac{P_{acquiror,t} - P_{acquiror,T}}{P_{acquiror,t}}$
$R_{mixed} = \frac{P_{offer} + (P_{acquiror,t})(ER) - P_{target,t}}{P_{target,t}}$	$R_{mixed} = \frac{P_{target,T} - P_{target,t}}{P_{target,t}} + (ER) \frac{P_{acquiror,t} - P_{acquiror,T}}{P_{acquiror,t}}$

### 6.1.2 Calculating Annual Returns

The purpose of this study is to assess whether merger arbitrageurs can consistently earn large returns. After dividing deals by resolution year, returns were calculated and summed.

As summarized in Table 8, by investing in every single deal in the sample, a merger arbitrageur would have invested in 646 deals generating an average return of 11% each. In other words, if a big merger arbitrageur like a hedge fund had the resources to invest in all these deals between 2002 and 2021, it would have generated a return of approximately 6919%. However, this is probably unrealistic. Even a big hedge fund hardly has enough capital and human resources to invest in so many deals in such a short amount of time. To provide more realistic statistics, I have decided to consider not more than twelve deals per

year. Instead of being chosen randomly, these deals represent the twelve median returns in the sample. Results are illustrated in Table 9. Between 2002 and 2021, a hedge fund could have invested in 236 deals generating an average return of 8% each. These numbers translate into an average annual return of approximately 150%.

From the data, it appears that success rate combined with M&A activity are the most influencing factors for total returns. A high success rate is likely to imply that the higher the number of deals in a year the higher will be the return generated by the strategy unless specific cases in which the fewer withdrawn deals generate large enough negative returns to outweigh the positive returns. In fact, as suggested in Figure 10, the highest annual return was by far in 2008. The ranking of the top three years by annual return sees 2008, 2007, and 2021 in this order. Similarly, the ranking of the top three years by number of deals features 2008, 2021/2006, and 2007 with respectively 75, 60, and 56 deals terminating. To better understand this, just consider that excluding these four years, the average number of deals concluded per year drops to 25. By no surprise, the years just mentioned coincide with the sixth merger wave and the post-Covid-19 pandemic expansionary monetary policies. Also, this result makes economic sense as more deals imply more investment opportunities and thus higher diversification. At this point, it could be interesting to verify whether there exists a relationship between single deals return and M&A activity. By considering Figure 11 and Figure 12 at the same time, we can only notice a weak relationship between the two factors. While merger arbitrage strategies in 2007 and 2008 averagely performed well above the mean, deals in 2006 and 2021 generated an average return of 9.26% and 9.75%, respectively. The top three years in terms of M&A activity rank respectively as first, third and ninth by average return per deal.

Table 8: Total Sample Summary Statistics

<b>Total Sample Return</b>	6919%
<b>Total No. of Deals</b>	646
<b>Average Return per Deal</b>	11%
<b>Total Sample Average Return per Year</b>	346%

Table 9: Median Returns Summary Statistics

<b>Total Sample Return</b>	1799%
<b>Total No. of Deals</b>	236
<b>Average Return per Deal</b>	8%
<b>Total Sample Average Return per Year</b>	150%

Figure 10: Annual Deals Return

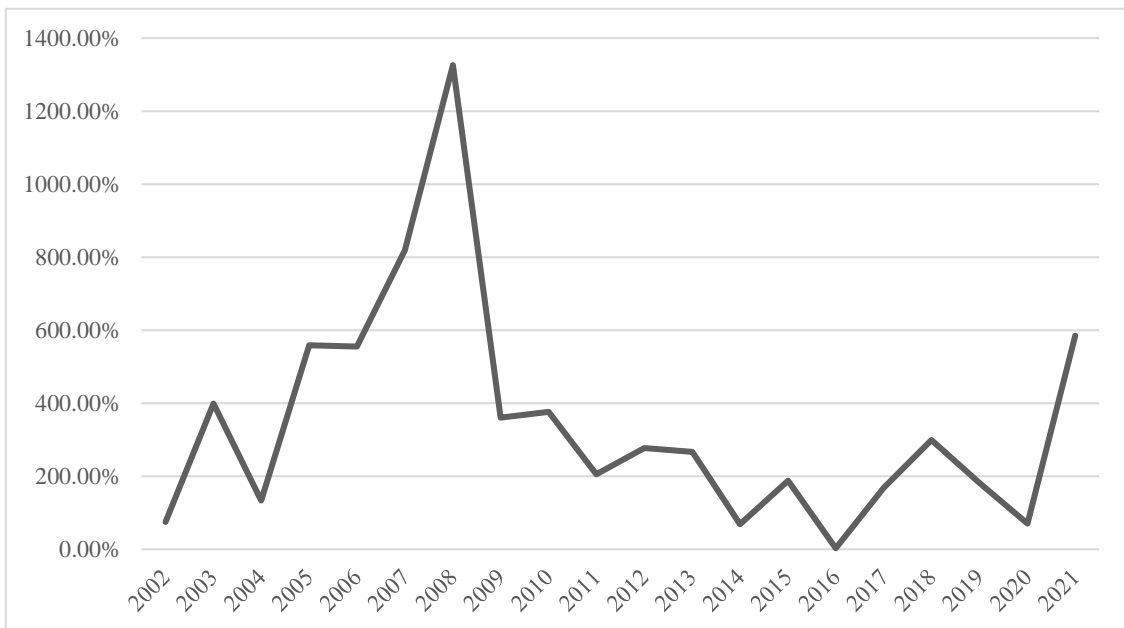


Figure 11: No. of Deals per Resolution Year

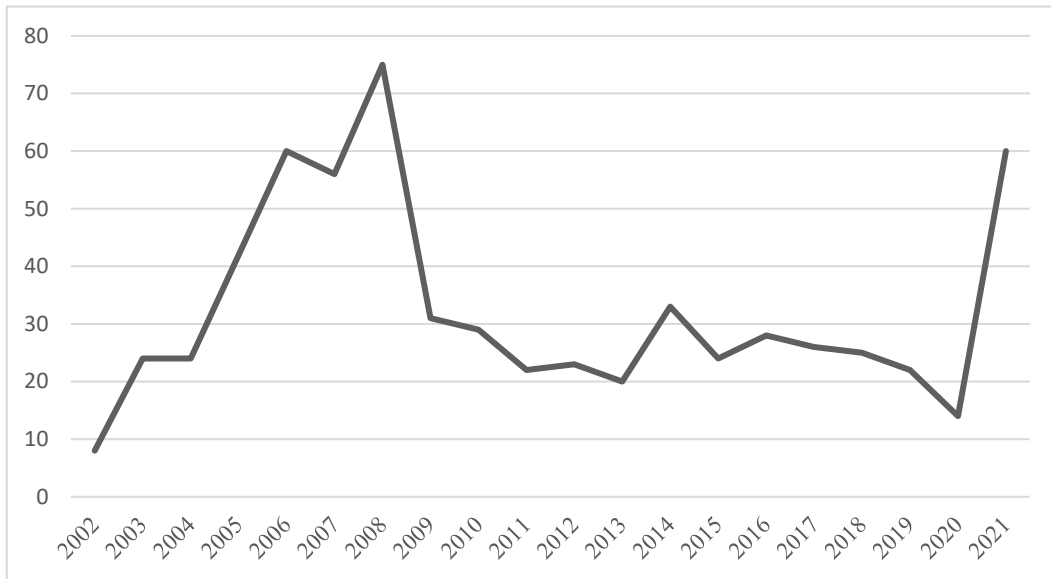
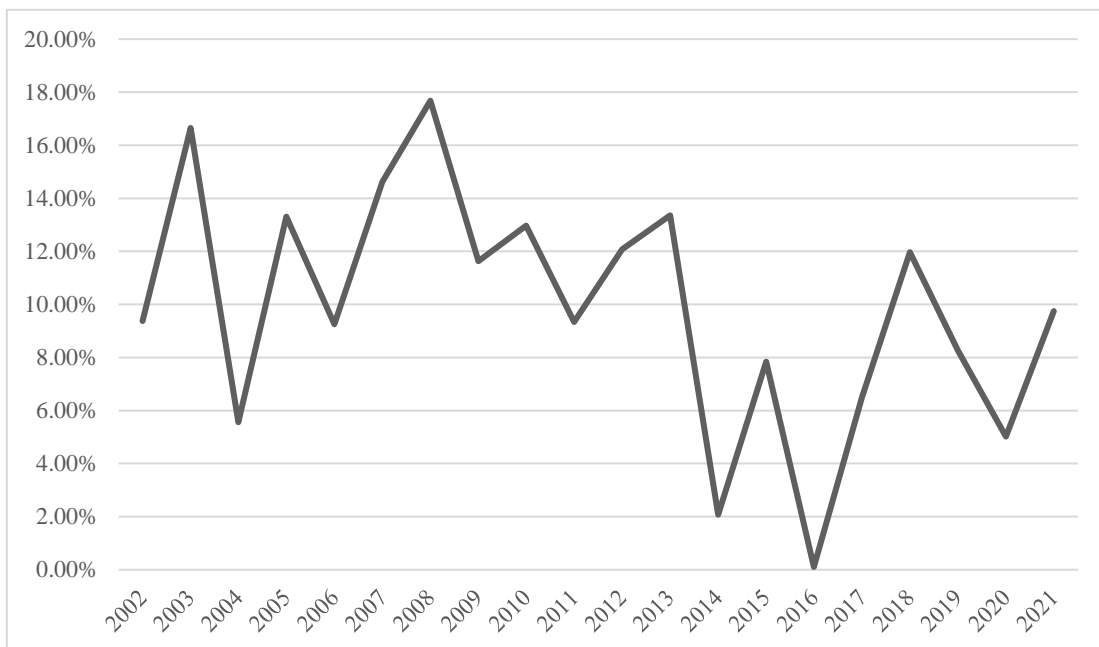


Figure 12: Average Return per Deal



Like most prior academic studies, this thesis will also investigate how deal returns are affected by duration, merger arbitrage spread, and deal value. To find evidence in this regard, I calculated the average return for those deals belonging to the top and bottom 30% in each of the categories just mentioned. Table 10 will help summarize what follows. These results match in part the evidence from prior studies. Like in Jetley and Ji (2010), merger arbitrage returns seem to be positively correlated with merger arbitrage spreads. Similarly, also longer deal duration is associated with higher returns which matches earlier studies reporting that successful deals usually last longer (Mithell and Pulvino, 2010; Sudarsanam and Nguyen 2008). On the other side, the evidence from this study confirms the lack of an absolute resolution concerning deal value. For instance, some academics like Baker and Savasoglu (2002) suggest that higher deal value leads to higher arbitrage returns, while others like Andrieş and Vîrlan (2017) found a beta equal to zero when regressing deals spread on deals value. If we empathize with merger arbitrageurs, the only variables which would interest us as predictors are deal value and merger arbitrage spread. Even if duration seems to affect returns, this factor will remain unknown until termination. Therefore, if merger arbitrageurs consider only spreads and deal value, they should prefer merger arbitrage opportunities with wider spreads and be insensitive about deal value.

*Table 10: Average Deal Return in the Top and Bottom Duration, Spread, and Deal Value Buckets*

<b>Duration</b>		<b>Spread</b>		<b>Deal Value</b>	
30 <sup>th</sup> percentile (68)	70 <sup>th</sup> percentile (152)	30 <sup>th</sup> percentile (9%)	70 <sup>th</sup> percentile (22%)	30 <sup>th</sup> percentile (174 m)	70 <sup>th</sup> percentile (1098m)
<b><i>Average Return</i></b>		<b><i>Average Return</i></b>		<b><i>Average Return</i></b>	
2.78%	18%	1%	27%	12%	10%



## 6.2 Comparing Profitability between Deal Types

To conclude the analysis of merger arbitrage returns I divided the whole sample into three groups according to the merger arbitrage strategy employed. The statistics for each merger arbitrage strategy are summarized in Tables 11-12-13.

Again, we can see how the most impacting variable on the annual returns of merger arbitrageurs is M&A activity. As the number of announced deals increases, merger arbitrageurs can better diversify their portfolios and benefit from high success rates. Moreover, the finding that cash deals generate higher returns than stock deals and mixed deals confirms earlier works by Branch and Yang (2006) and Wang and Wedge (2012). Additionally, we can observe a significant heterogeneity between the size of the cash deals sample and the size of the stock and mixed deals sample. In particular, the portfolio of cash deals counts 568 transactions against the 39 deals in each of the remaining two samples. This implies that the results concerning the whole sample are heavily influenced by cash deals. Concerning a small sample, the statistics for stock deals and mixed deals could have a higher margin of error and therefore should be considered more cautiously.

In this work, the empirical evidence about the returns generated by merger arbitrage strategies is similar to older studies but quite different from more recent ones. For instance, Jindra and Walkling (1999), like several prior studies, found that merger arbitrage strategies generated annual excess returns above 100%. Some years later, Mitchell and Pulvino (2001) and Baker and Savasoglu (2002), two of the most respected and cited papers on this topic, were among the first to report lower but more accurate returns. Mitchell and Pulvino (2001) justified the abnormal excess returns found in previous studies by suggesting that those results were unrealistic and imprecise as, among other things, were not taking transaction costs into account.

*Table 11: Summary Statistics: Cash Deals*

<b><i>Total Sample Return</i></b>	6350%
<b><i>Total No. of Deals</i></b>	568
<b><i>Average Return per Deal</i></b>	11%
<b><i>Total Sample Average Return per Year</i></b>	317%

*Table 12: Summary Statistics: Stock Deals*

<b><i>Total Sample Return</i></b>	221%
<b><i>Total No. of Deals</i></b>	39
<b><i>Average Return per Deal</i></b>	6%
<b><i>Total Sample Average Return per Year</i></b>	13%

*Table 13: Summary Statistics: Mixed Deals*

<b><i>Total Sample Return</i></b>	348%
<b><i>Total No. of Deals</i></b>	39
<b><i>Average Return per Deal</i></b>	9%
<b><i>Total Sample Average Return per Year</i></b>	23%

## 7 Real-Life Merger Arbitrage Simulations: William Hill - 888, Luxottica - Essilor, Twitter - Musk

The previous chapter described the empirical evidence concerning the returns generated by the whole sample of deals. However, the results are approximative as I had to rely on some assumptions when performing computations. To provide a more precise and realistic demonstration of how this strategy works, in this chapter I will simulate the investment in one real-life M&A for each deal type. Here, I will reduce the number of assumptions by using more precise figures and sticking to common practice when calculating the return on a single deal. Prior academic studies used similar methodologies to calculate returns. I will stick to the formulas used by Sudarsanam and Nguyen (2008). Additionally, like in the previous part of this study, I will follow the theoretical assumption that merger arbitrageurs enter their trades one day after the announcement and liquidate their positions one day after the resolution date or with some delay.

The positions taken by merger arbitrageurs when dealing with mixed deals are the same as for stock deals. As such, the formula used to calculate the return on these types of deals will be the same. To calculate the daily return on stock deals Sudarsanam and Nguyen (2008) used the formula below which I will also apply to mixed deals:

$$R_{stock/mixed,t} = \frac{(P_t^T + D_t^T - P_{t-1}^T) - (ER)(P_t^B + D_t^B - P_{t-1}^B - r_{f,t-1}P_{t-1}^B)}{P_{t-1}^T - (ER)[P_{t-1}^B - P_{t-2}^B(1 + r_{f,t-2})]}$$

For cash mergers, as anticipated several times, the trade and so the formula is much easier. It is exactly the same formula used to calculate the return on a long position on a stock. Therefore, the equation to calculate the daily return to a position on a cash deal is:

$$R_{cash,t} = \frac{P_t^T + D_t^T - P_{t-1}^T}{P_{t-1}^T}$$

Where superscripts T and D refer to “target” and “bidder”, respectively. Intuitively,  $P$  stands for price,  $D$  stands for dividend,  $ER$  stands for exchange ratio, and  $r_f$  stands for risk-free rate. Daily risk-free rates for European markets were downloaded from a dataset available on Damodaran Online, while dividends were taken from Yahoo Finance.

Stock deals and mixed deals involve taking short positions on the bidder’s stock price. In practice, arbitrageurs must put the short proceeds as cash collateral on which they may earn interest. Assuming that the rate of return on the cash collateral is the risk-free rate and that the amount of the cash collateral is marked to market on daily basis, the interest on the cash collateral on day  $t$  is  $r_{f,t-1}P_{i,t-1}^B$  for each bidder share shorted (Sudarsanam & Nguyen, 2008).

After calculating daily returns, the overall return generated by the investment in a single deal was calculated as follows:

$$R_{deal} = \prod_{t=1}^j (1 + R_{daily,t}) - 1$$

Where 1 is the day after the announcement date, and  $j$  is the day on which the positions are liquidated.

## 7.1 Mixed Deal: William Hill – 888 Holdings

As part of a three-way deal, on July 25, 2016, the online betting group 888 Holdings PLC (888) publicly announced its intent to acquire the British bookkeeper William Hill (WMH) for 199 pence in cash and 0.725 shares per target share, valuing the firm at 364 pence a

share (Reuters, 2016). This offer represented a premium of 16% with respect to the closing price of WMH on the day before the announcement, and a premium of 29% and 36% relative to the average price one week and one month before the announcement, respectively.

At the time of the offer, WMH was facing several challenges. The firm was set to lose its leading market position due to a series of mergers that intensified competition, with the most threatening being the one between Ladbrokes and Coral. Additionally, gambling was facing higher taxes and tighter regulation. Given the difficult times, William Hill issued two profit warnings in the semester before the takeover attempt by 888 Holdings and fired the former CEO James Henderson in July for failing to capitalize on a growing online betting market.

Even though the takeover attempt seemed strategic, WMH's board unanimously rejected the proposal as the 16% premium "substantially undervalued" the British bookmaker and was not enough to compensate shareholders for the risks concerning the hardly realizable synergies (The Guardian, 2016).

Looking at Figure 13, the sharp drop of 7.9% in the stock price of WMH just a week after the deal announcement suggests that investors were not expecting a successful outcome from the transaction due to the tussle between the companies.

On August 14, William Hill disclosed to have received an unsolicited proposal from 888 and the casino operator Rank, after turning down an approach on August 8. Still, according to the British bookmaker, the revised offer (199 pence in cash plus 0.86% of a share from a proposed combination of 888 and Rank) included too low of a premium. Since this announcement, the share price of WMH plummeted until August 18, the date on which it was publicly announced that William Hill rejected the £3.16 billion bid by the smaller rivals 888 Holdings and Rank Group (The Guardian, 2016).

Going back to merger arbitrage, this is a mixed merger type of deal. Therefore, to invest in this transaction, a merger arbitrageur would have had to short 0.725 shares of 888 for every share of WMH in his/her possession to lock in the first-day merger arbitrage spread of 14%. The daily returns generated by such trade are illustrated in Figure 15. If the trader closed the positions one day after the resolution date, the investment would have generated a return of 0.90% or an average daily return of 0.08%. This return would have been realized in

nineteen days. This translates into an annualized return of about 17% ( $0.90\% * 365/19$ ). Instead, if the investor exited the positions at the end of the month following resolution, the trade would have returned -3.74%. Therefore, by waiting in the hope of an improved bid, the arbitrageur would have lost money.

As theory suggests, from Figure 13 and Figure 14 we can see how during the life of the deal the stock price of the target somewhat increased while that of the bidder decreased. Moreover, after the resolution date, the stock prices of both firms went back to their pre-announcement level. Interestingly, from Figure 13 we can observe that the stock price of WMH started increasing sharply well before the deal announcement. In fact, from the 19<sup>th</sup> to the 25<sup>th</sup> of July the target stock price went up over 22%. This suggests that merger arbitrageurs who invested in this deal traded on rumours or insider information.

Figure 13: WMH Historical Prices (at the end of the trading day)

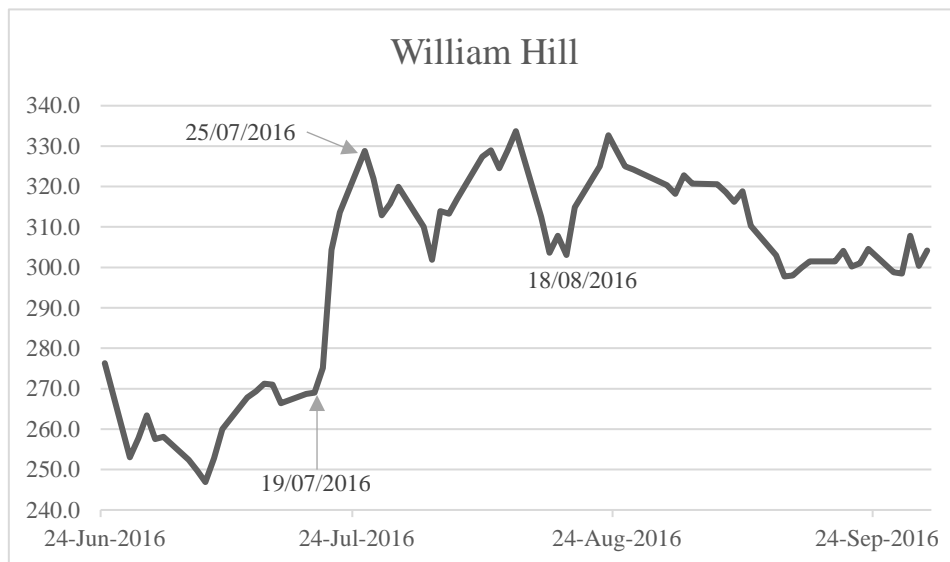
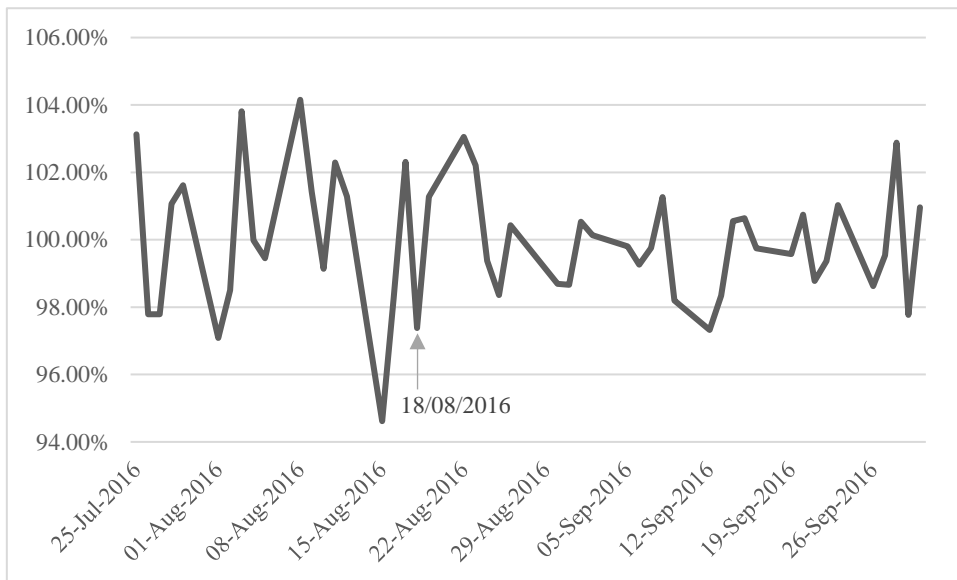


Figure 14: 888 Historical Prices (at the end of the trading day)



Figure 15: WMH - 888 Merger Arbitrage Daily Returns



## 7.2 Stock Deal: Luxottica – Essilor

On January 16, 2017, the Italian eyewear producer Luxottica (LUX) and France's Essilor (ESSI) agreed to a €46 billion merger to create a global eyewear powerhouse capable of generating more than €15 billion in annual revenues. The all-stock merger bid offer implied an exchange ratio of 0.461 and brought together the world's top eyewear maker owning brands like Ray-Ban, Oakley and Oliver Peoples, with the leading lens manufacturer Essilor (Reuters, 2017). The transaction was defined by Leonardo Del Vecchio, the founder of Luxottica, as highly synergistic. Frames and lenses, the two naturally complementary products in the eyewear industry would have been "designed, manufactured and distributed under the same roof".

Jefferies analysts estimated that the eyewear industry was growing at a pace of 2% - 4% per year due to the strong demand dictated by an ageing global population and increased awareness about eye care (Reuters, 2017). Additionally, the merger avoided growing competition between the two groups and was expected to boost operating profits in the medium term. At the time of the merger, Luxottica was investing in lens manufacturing and Essilor was acquiring online retailers. In this line, analysts of J.P.Morgan Cazenove stated that the strategic rationale of the deal was strong (Reuters, 2017).

Del Vecchio was very confident that there would not have been problems obtaining approval from competition authorities and that the marriage would have worked. The market reacted positively to the merger announcement with shares in Luxottica up 8.25% and Essilor up 11.85% at the end of the day. According to analysts, the offer represented a great opportunity for Essilor shareholders as the share exchange ratio implied a discount of 5% to Luxottica's closing price on the day before the announcement. Even the spread with respect to the average price of Luxottica over the week or the month before the announcement date represented a discount of 3% and 6%, respectively.

To implement a merger arbitrage strategy exploiting this deal, a merger arbitrageur would have had to short 0.461 shares of Essilor for each share of Luxottica in his/her possession



to lock in the 1.6% merger arbitrage spread on February 15, the first date with a reasonable positive spread. By doing so, the investment would have generated a return of 3.50% and an average daily return of 0.01% if the positions were liquidated on the day after resolution. The successful conclusion of the transaction was publicly announced on October 1, 2018. This implies that the 3.50% return would have been realized in 415 days which translates into an annualized return of 3.08% ( $3.50\% * 365/415$ ). The most interesting thing about this deal is that after the announcement date the stock prices of LUX and ESSI were almost perfectly positively correlated. This can be easily seen by comparing the graphs in Figure 16 and Figure 17 which are almost identical.

*Figure 16: LUX Historical Prices (at the end of the trading day)*

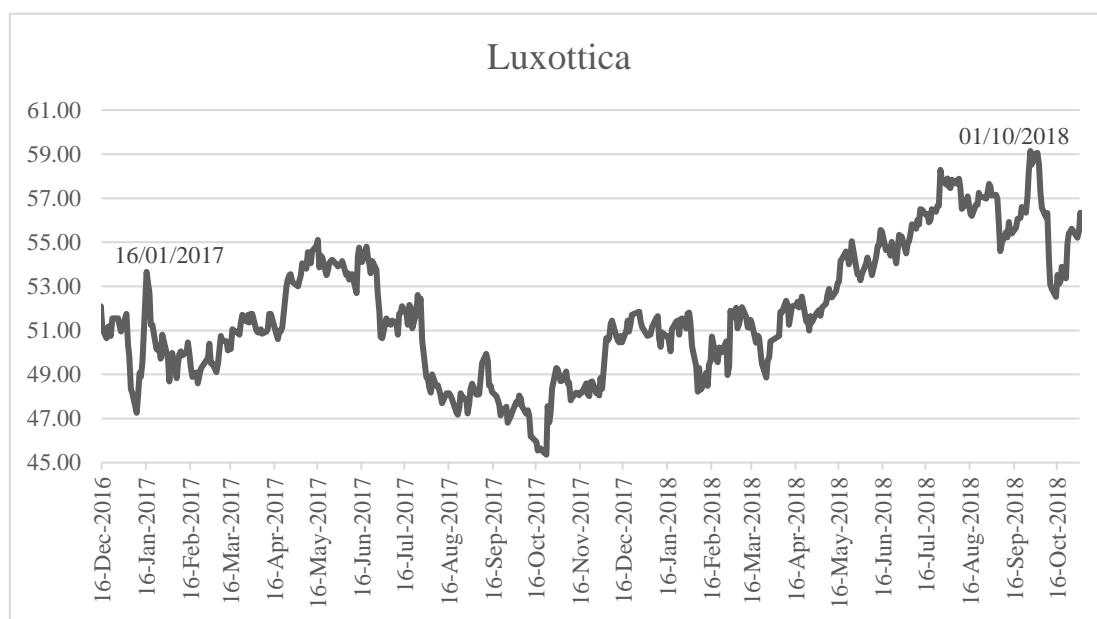
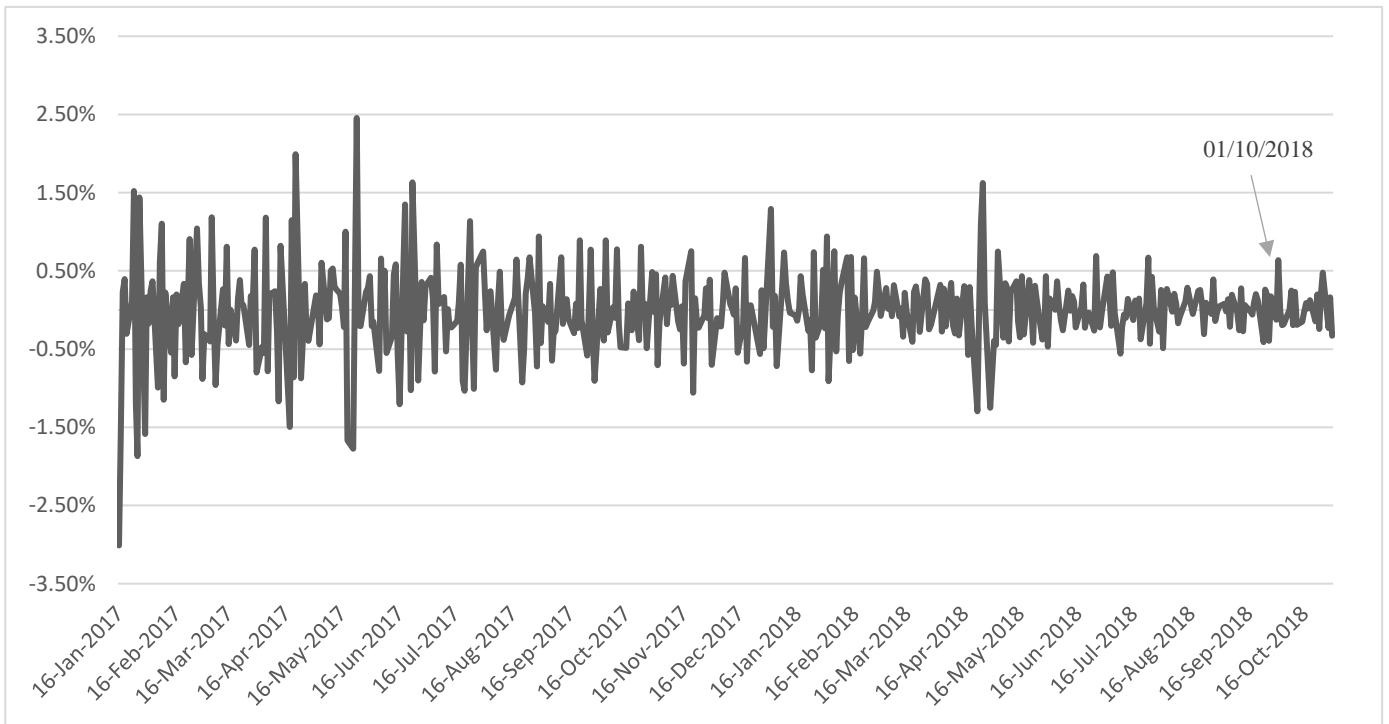


Figure 17: ESSI Historical Prices (at the end of the trading day)



Figure 18: LUX - ESSI Merger Arbitrage Daily Returns



## 7.2 Cash Deal: Twitter – Musk

The Elon Musk – Twitter saga can be described as a bumpy road heading towards Musk possibly owning Twitter. At the time of this work, the deal is not officially terminated yet. To better comprehend the dispute, below is a timeline of the most salient events.

On January 31, 2022, Musk began quietly building up his Twitter stake, but it would be months before he disclosed this fact to the public.

On March 14, Musk's Twitter stake topped 5%. Crossing this threshold, he should have disclosed this fact to the SEC within 10 days. However, this did not happen. He waited for 21 days to do so and during that time he kept buying Twitter shares (The Economic Times, 2022).

On March 24, Musk started asking whether Twitter should change by making pointed statements about the platform from his account. In particular, he took two polls: "Twitter algorithm should be open source" (YES or NO?) and "Free speech is essential to a functioning democracy. Do you believe Twitter rigorously adheres to this principle?" (CNN Business, 2022).

On March 26, Musk met with Twitter co-founder and former CEO Jack Dorsey to discuss the future of social media (The Economic Times, 2022).

On April 3, the Twitter board met with representatives of the law firm Wilson Sonsini and J.P.Morgan to discuss the possibility of Musk taking a seat on the company's board. According to filings, Twitter leadership discussed wanting Musk to agree to a standstill agreement which would have limited the possibility for him to make public proposals without the consent of the Twitter board (CNN Business, 2022).

On April 4, Elon Musk reached a 9.2% share of Twitter and became the social media's largest individual shareholder. News of the purchase surprised the world and made Twitter shares soar by more than 20% (The Economic Times, 2022).

The very next day, on April 5, Twitter CEO Parag Agrawal announced Musk will join Twitter's board of directors. Musk's term on the board was set to go through 2024 under the agreement that he could not acquire more than 14.9% of Twitter shares while he remained on the board (CNN Business, 2022).

A few days later, on April 10, there was a plot twist. Agrawal publicly announced that Musk decided to not join the company board. This reversal opened the door for Musk to keep increasing his stake in the company and to tweet his many thoughts about the company (CNN Business, 2022).

Finally, on April 14, Musk shocked the industry by making an offer to buy the remaining stake in Twitter at a valuation of \$44 billion or \$54.20 a share and take it private. The offer represents a 38% premium over the company's closing price on April 1, the last trading day before Musk publicly disclosed that he became Twitter's biggest shareholder. In his offer letter, Musk wrote: "I invested in Twitter as I believe in its potential to be the platform for free speech around the globe, and I believe free speech is a societal imperative for a functioning democracy. However, since making my investment I now realize the company will neither thrive nor serve this societal imperative in its current form. Twitter needs to be transformed as a private company" and added "Twitter has extraordinary potential. I will unlock it" (CNN Business, 2022).

Musk's takeover attempt won't be friendly. On April 15, Twitter's board adopted a poison pill defence allowing existing shareholders to buy more stock at super low prices in an attempt to dilute Musk's stake and push up the price of his bid (CNBC, 2022).

On April 21, Musk disclosed to be available to negotiate after not receiving any formal response from Twitter to his acquisition letter. The billionaire topped the bid by lining up \$46.5 billion in financing from the deal, including two debt commitment letters from Morgan Stanley and other financial institutions (\$25.5 billion) and one equity commitment letter from himself (\$21 billion). However, it is important to point out that much of Musk's wealth is made of Tesla stock. For this reason, even though Musk is the richest person in the world, many speculate that it could be challenging for Musk to raise debt against the historically volatile stock (CNN Business, 2022).

After a few days, on April 25, Twitter accepted Musk's \$44 billion offer making the deal one of the largest acquisitions in recent times (CNBC, 2022).

In the three days after the Twitter board agreed to the sale, filings reveal that Musk sold \$8.5 billion worth of Tesla stock. The reason was not disclosed but it is reasonable to believe that Musk started raising funds to buy Twitter (CNN Business, 2022).

On May 4, Musk procured \$7 billion more for the deal from high-profile investors like Oracle founder Larry Ellison, the crypto platform Binance, and VC firm Sequoia Capital (The Economic Times, 2022).

On May 13, there was another plot twist in the saga. Linking to a Reuters report about Twitter's most recent disclosure about its amount of spam and fake accounts, Musk tweeted: "Twitter deal temporarily on hold pending details supporting calculation that spam/fake accounts do indeed represent less than 5% of users". Following this tweet, the shares of the social media site dropped by more than 10%. A few hours after announcing the hold, Musk wrote to be "still committed to acquisition" (CNN Business, 2022).

On May 14, Musk was accused by Twitter's legal team of breaking a nondisclosure agreement. The attorneys claimed that Musk violated their NDA by revealing that the bot check sample size was 100 (CNN Business, 2022).

On May 17, Musk announced that his acquisition cannot move forward until more information about the spread of fake accounts is made available to him, complaining that Twitter falsified numbers in filings. In a tweet, Musk suggested that Twitter is "20% fake/spam accounts". On the other side, through a statement, Twitter disclosed its intention to remain committed to completing the transaction on the agreed price and terms (CNN Business, 2022).

On June 6, Musk threatened to walk away from the deal alleging that the social media platform is breaching the merger agreement by not providing the data he has requested on Twitter spam bots and stating that the lack of information gives him the right to terminate the merger agreement (CNN Business, 2022).

On July 8, the threat became real. Still claiming that Twitter failed to provide him with the necessary data to evaluate the number of spam and fake accounts, Musk moved to terminate the deal through a letter from one of his lawyers addressed to the social media company's top attorney. Still, the Twitter board was not having it and replied that it remains "...committed to closing the transaction on the price and terms agreed upon with Mr Musk and plans to pursue legal action to enforce the merger agreement". While Musk is now officially seeking to walk away from the transaction, this saga is far from over. Under the terms of the contract, Musk agreed to pay \$1 billion if he backs out but the social media company can still seek to hold Musk to his original deal by suing him for walking away. Twitter has reason to hold Musk to his original terms. The stock has fallen considerably since the board announced it had accepted Musk's offer to buy the company at \$54.20 per share. On that day the stock ended the trading day at \$51.70 per share. As of July 8, Twitter shares closed at \$36.81. However, also Musk is paying attention to the stock price as he "is considering whether the company's declining business prospects and financial outlook constitute a Company Material Adverse Effect giving Mr Musk a separate and distinct basis for terminating the Merger Agreement" (CNBC, 2022).

As promised by Twitter attorneys, on July 12, the social media company sued Musk in Delaware court in an attempt to force him to complete the deal. In the lawsuit, Twitter painted Musk as a non-serious potential buyer and alleged that the Tesla billionaire has "disdain" for the company and that "Musk's strategy is ... a model of bad faith" (CNN Business, 2022).

As of the last update on August 19, Twitter's lawsuit against Musk over his move to terminate their \$44 billion acquisition agreement will go to trial on October 17. The decision came after Judge Kathaleen St. Jude McCormick ruled in favour of the social media company arguing that proceedings could be expedited and take place in October to limit damages to Twitter's business and ensure that the deal can be completed before October 24, the date on which the parties had previously agreed to close the deal (CNN Business, 2022).

James Clayton, a North American technology reporter, provides an interesting interpretation of the Twitter-Musk saga. According to a plausible theory, Musk is still interested in buying Twitter and is just trying to knock down the price. Musk's legal team wants the trial to

happen next year and as a stalling strategy, they claimed that they need more time to dig through data on spam/fake accounts. Musk's assertion that Twitter has more fake accounts than it claims is a hugely damaging accusation for the social media platform. The fact is that Twitter revenues are almost entirely based on ads. Therefore, the fewer real people on the platform, the lower revenues it can make as bots don't have money. Because of the huge reputational hit suffered by Twitter, it is in the interest of the company that this process is sorted quickly. The best-case scenario for the firm is that Musk buys Twitter for \$54.20 a share and that this happens as soon as possible. Right now, we could say that the judgement is good news for Twitter as the judge sided with Twitter's lawyers asserting that a ruling needs to be reached quickly. On the other side, the judgement heaps more pressure on Musk who is facing the prospect of buying a company he no longer wishes to acquire (BBC, 2022).

Going back to merger arbitrage, on the day after the announcement, merger arbitrageurs saw the possibility to lock in a merger arbitrage spread of 12%. Investors who decided to invest in this deal by entering their trades on the day after the announcement date and exiting their positions on July 11, the trading day after Musk disclosed his intention to walk away from the deal, would have lost 32.61%. Now, let's assume that some investors decided to keep their positions open as they believe that the deal will successfully complete, especially following the judgement of the Delaware Court in favour of Twitter. Right now, the odds seem to be in favour of the social media company which might succeed in forcing the Tesla billionaire to stick to the merger agreement and buy Twitter for \$54.20 a share in cash. In this case, as of August 19, the return of the merger arbitrage trade would have been -2.42%. As illustrated in Figure 19 and Figure 20, after July 11, the stock price of Twitter has been constantly increasing, thus generating a positive return for merger arbitrageurs. From the Twitter-Musk saga, we can see how merger arbitrage strategies are highly exposed to event risk and that the outcome of such investments can overturn in a short period. This case study highlights how important is that merger arbitrageurs have 360-degree knowledge and expertise in the world of M&A.

Figure 19: TWTR Historical Prices (at the end of the trading day)

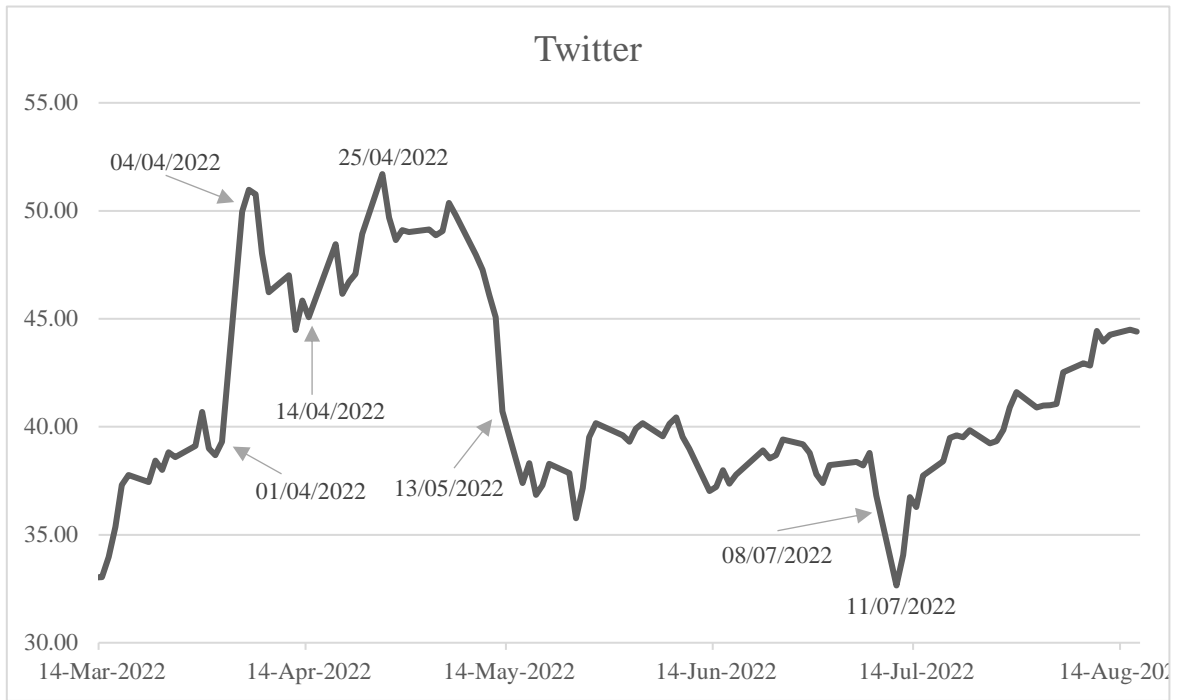
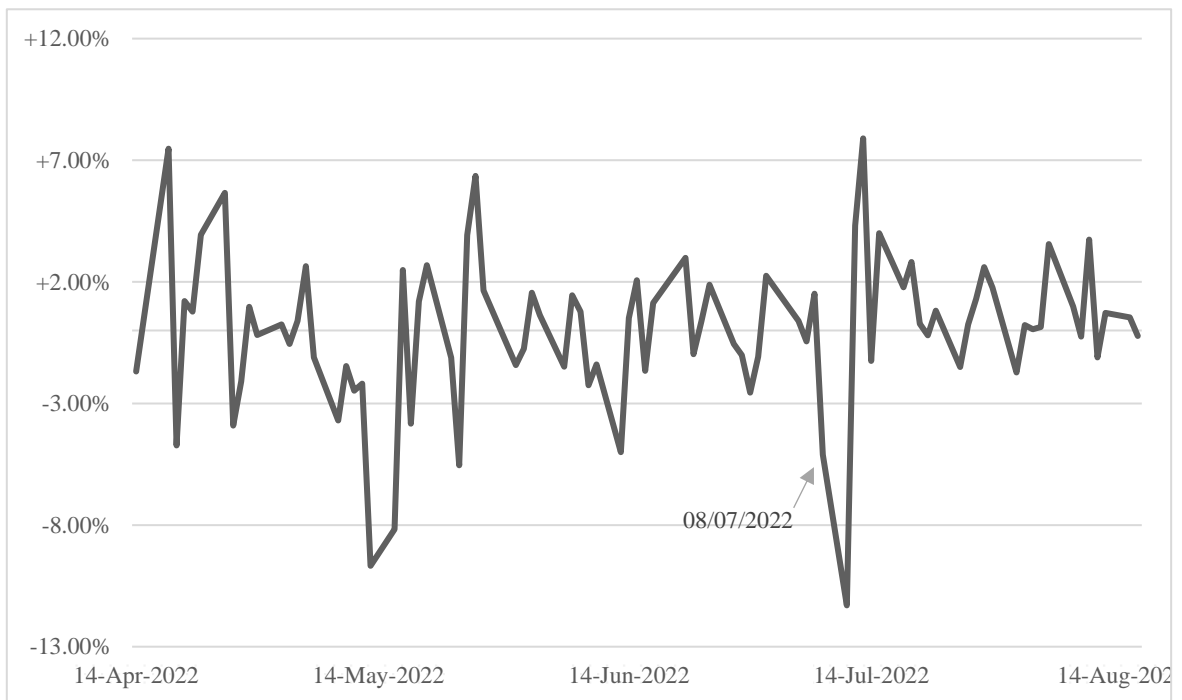


Figure 20: TWTR Merger Arbitrage Daily Returns





## 8 Conclusion

This thesis examines the profitability and characteristics of merger arbitrage strategies between 2002 and 2021. The objective was to answer the main research question: *Do merger arbitrage strategies consistently generate large returns?*

The sample of this study is limited to those deals involving a target company listed in some Western European country. However, this doesn't mean that the acquiror can't be listed somewhere outside Europe. Evidence shows that most of the deals in the sample are domestic and even more interesting that European acquirors tend to prefer acquiring domestic companies.

The analysis was conducted over deals in which the consideration offered was either fully in cash, fully in stock, or a hybrid of the two. All the transactions seeing other securities or derivatives as methods of payment were excluded. Also in this case, the sample confirms prior literature. As in Mitchell and Pulvino (2001) and Sudarsanam and Nguyen (2008), cash deals represent a huge portion of the total sample.

Many have argued about the fact that mergers and acquisitions occur in waves. It is agreed that since 1897 there have been seven merger waves with the last one starting in 2010 (Ching, 2019). While the sample confirms the effect of the sixth merger wave, there is no evidence of a consistent increase in merger activity after 2010.

Being one of the most influencing factors on the real profitability of merger arbitrage strategies, this study examined the duration of the deals in the sample. The results relative to the duration of each deal type vary depending on if expressed in median or average terms. The median is likely to be more accurate in this case. If this is true, we can conclude that stock and mixed deals had a longer duration. Evidence from prior research is discordant on this topic.

The other fundamental variable affecting the profitability of these strategies is the size of the merger arbitrage spread at the time of trade initiation. In this paper, it was assumed that

trades are entered on the first day after the takeover attempt is publicly announced. The sample doesn't highlight any particular trend in spreads over time and across deal types. Like in Umer (2010), when the total sample was divided between domestic and cross-border deals, no significant difference in spreads was recorded. Further, I wanted to investigate the relationship between spreads and returns. At this time, my findings differ from those of Andrieş and Vîrlan (2017). Domestic and foreign deals do not present any significant difference in returns. Therefore, evidence from this study suggests that cross-border deals are not riskier than domestic deals and that spreads correctly assess this risk.

Above all, for these strategies to be profitable, it is important that the underlying deal successfully completes. As empirical evidence suggests, also in this study the success rate is well above 50%. The proportion of successful deals remains stable through the sample period while the success rate varies across deal types. In particular, like in Sudarsanam and Nguyen (2008), the percentage of successful deals is indistinguishable between stock deals and cash deals which present a higher success rate than mixed deals.

For merger arbitrageurs would be extremely useful to identify some features which systematically differ between successful and unsuccessful deals. Results from this research conclude that effective deals last longer than withdrawn ones, confirming prior studies (Mitchell and Pulvino, 2001; Jetley and Ji, 2010). Moreover, like in Sudarsanam and Nguyen (2008), cash deals have a longer average duration than stock and mixed deals. However, it is possible to know the duration of a transaction only after it concludes. To forecast the likelihood of success for a deal, arbitrageurs need ex-ante variables like the first-day arbitrage spread. Findings show that spreads of unsuccessful deals increase during times of turmoil while the spread of successful deals decreases. As documented by Jetley and Ji (2010), this inverse relationship during financial downturns can be attributed to the higher risk aversion of investors who prefer to invest in less risky deals. Additionally, cash and mixed deals seem to have wider spreads than stock deals for both successful and failed deals.

The study revealed that for the underlying sample period there are some differences in returns between deal types. Cash deals generated the highest return per deal, followed by mixed deals and stock deals, respectively. The finding that cash deals generate higher

returns than stock deals confirms earlier evidence by Branch & Yang (2006) and Wang & Wedge (2012). To answer the main research question, it was assumed that a merger arbitrageur like a hedge fund can invest in at most twelve deals per year. Under this assumption and further adjustments, results from this thesis are in line with older academic papers (Jindra and Walkling, 1999). According to this simulation, a merger arbitrageur would have been able to generate an average annual return of 150% throughout the sample period. However, this result does not coincide with more recent findings (Mitchell and Pulvino, 2001). Furthermore, from this study we can conclude that wider spreads and longer duration are associated with future higher returns.

The final part of the research analysed the relationship between developments in the deal and movements in the stock price of the firms involved in the transaction. Such a relationship exists and is strong. Prices reflect new information about the underlying deal in a very fast fashion. This implies that the market value of the target and acquiror company deviates from its fundamental value while the M&A is still on and that such deviations are a consequence of speculators entering and exiting positions based on their assessment of the likelihood of success of the transaction. This points out how much the performance of merger arbitrageurs is heavily reliant on what in jargon is called event risk. Event risk is very difficult to predict and sometimes almost impossible if not in possession of insider information. This confirms how important it is for merger arbitrageurs to know the business, financial and legal dynamics linked to such events in order to be successful.

## 8.1 Limitations and Future Research Directions

Evidence from this study seems to confirm prior academic literature about the consistent profitability of this strategy. However, these results should be interpreted with caution as this research presents some limitations. First, transaction costs were excluded and capital

constraints were considered but in an approximative way. Including improved measures for these factors would probably change results and significantly improve their quality. In this line, although future research should account for these factors, I recognise that it could be very hard, especially when it comes to estimating total costs. Implementing this strategy could involve some professional consulting fees which managers might be willing to pay to properly assess the likelihood of success of these deals. For instance, a hedge fund could pay a legal team to forecast the decision of regulators when it comes to antitrust issues. Additionally, calculating transaction costs in Europe would be even harder than in the US as these costs are likely to vary between countries. Also, many countries adopt different currencies. Therefore, future research should include commissions and transaction costs associated with the currency exchange.

Other limitations concern how returns were calculated for the first part of the thesis. Besides transaction costs, dividends were not accounted for and returns on each deal were not calculated on a daily basis. On the other side, in the final part of the study calculations are much more precise. Dividends were accounted for, and returns were calculated daily and then multiplied to get the total return on a deal.

A relevant restriction applied to the sample was to include only those deals with a first-day merger arbitrage spread above 5%. The rationale is that merger arbitrageurs might consider smaller spreads not being enough to compensate for the large loss potential. However, this is a limitation of this study as investors could wait until the spread widens before entering trades. Therefore, future studies should also consider negative first-day spread deals and include them in the portfolio whenever the spread becomes wide enough.

Even though multiple countries were included in the study, it was not analysed any potential difference in returns between countries or across areas. For instance, it could be interesting to see if merger arbitrage leads to systematically different returns in Northern Europe versus Southern Europe. Additionally, future research should compare the performance of these strategies in developed and emerging markets.

Also, this thesis did not focus on the effect of deal attitude on the performance of merger arbitrage. Prior studies agree that hostile deals are riskier than friendly deals. Thus, it would be interesting to see if a higher risk premium is associated with foreign deals.

To my knowledge, studies about the profitability and characteristics of merger arbitrage strategies in European countries are very few. This work includes a variety of European countries and leaves the stage open to future research. It remains important to keep conducting research to check over developments in new and existing trends as the future is unknown and there are still a lot of research gaps to be filled.

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## **European Evidence on the Profitability and Characteristics of Merger Arbitrage**

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### **Summary**

#### **Part 1**

We currently live in a world characterised by extremely low interest rates, relatively low returns from traditional asset classes and at the same time high investment risks and less available diversification. Nowadays, to generate the same returns as thirty years ago, it would take a globally well-diversified portfolio with significantly higher volatility. Consequently, investors reacted by adding alternative investments to their portfolios. This allowed portfolio managers to generate higher risk-adjusted returns by investing in an expanded efficient frontier. Investment managers generated alpha by accessing opportunities outside the traditional space and reduced risk by diversifying into alternatives with risk-return characteristics that have a low correlation with those of traditional investments. One of the reasons for the growth in the alternative investments industry is the evolution of the investment ecosystem. The number of companies listed on public markets has reduced in the last decade, mostly in the US and to a lesser extent in the UK and Europe. The growth and interest in private markets have increased constantly over the last ten years and have accelerated recently, driven by investors looking to further diversify their investment portfolios. In the current economic environment, with flat or declining markets and high volatility, it is not enough for asset managers to justify poor returns

by merely stating that despite their poor performance they still equaled comparative market matrices. It becomes necessary for portfolio managers to identify market-neutral investment strategies that provide adequate returns regardless of the direction of the economy. The term hedge originally derives from the investment strategy of hedging against market movements. In fact, hedge funds' intent is to maximize returns and eliminate risks by taking long and/or short positions within the market to take advantage of market imperfections irrespective of any market movement.

This thesis will focus on merger arbitrage, the best-known strategy adopted by event-driven hedge funds. These funds take advantage of mispriced securities during both the anticipation and the realization of events by entering positions in the securities of the companies affected by the transaction. These investors are exposed to a combination of sensitivities to equity markets, credit markets and idiosyncratic corporate-specific events. The underlying assumption is that prices may not fully and quickly adapt to information associated with such events and therefore try to capture the risk premium associated with the opportunity.

Merger arbitrage funds attempt to profit from merger activity with minimal risk by taking positions in the target company and occasionally in the acquiror company. However, this strategy involves some risk and therefore it is not a pure arbitrage. In fact, merger arbitrage is also commonly known as risk arbitrage because on the one hand it exploits pricing discrepancies in the market for corporate control but on the other hand, the sought return is not risk-free. Therefore, after the announcement of a takeover attempt, the target will typically trade at a discount to the bid price. The size of the discount depends on how the market perceives the bid as likely to succeed. The strategy of arbitrageurs consists in entering trades that lock in the discount, also known as merger arbitrage spread. If a bid is successful, arbitrageurs will earn a return equal to the spread. If the bid is unsuccessful, the return on the positions taken will typically be negative.

The specific trading positions entered by merger arbitrageurs depend on the method of payment offered by the acquiror company to target shareholders. The primary means of payment used in mergers are cash-for-stock, stock-or-stock, or a hybrid of the two.

In a pure cash deal, the bidder offers a fixed amount of cash in exchange for all or part of the target company stock. In this case, the investment strategy is very simple and consists in taking a long position in the target stock after the deal is announced and holding it until merger

consummation. If the bid is successful, the arbitrageur sells the target's common stock to the bidder at the offer price.

In a stock offer deal, the acquiror doesn't finance the acquisition with cash but rather offers to finance the whole takeover with its stock. With this method of payment, there are additional variables to be considered. At the time of the announcement, the offer comes with a premium in terms of acquiror firm shares value. Therefore, like for cash deals, the target company share price is expected to move towards the bid value. The trading strategy still consists in taking a long position in the target stock which is expected to further appreciate should the deal be successful. When deals turn out to be effective, merger arbitrageurs will receive a specific number of acquiror shares per share of target stock that they own. The number of bidder shares that will be swapped per target share is determined by the exchange ratio implied in the offer. At this point, to consolidate the profit arising from the premium offered, arbitrageurs must act and protect themselves from an eventual drop in the bidder's stock price. Arbitrageurs in stock-for-stock mergers typically take offsetting hedged positions in the shares of the two firms based on the exchange ratio. The easiest way to do so is shorting the acquiror's stock while simultaneously purchasing the target company's stock. This typical stock merger arbitrage strategy seeks to lock in the price spread between the ratio-adjusted current market prices of the merger partners upon the successful completion of the transaction.

For mixed deals, the strategy is analogous to that for stock deals. The only difference will be the source of return which in mixed deals is part in cash and part in bidder's stock.

Almost all merger arbitrage hedge funds tend to be discretionary and focus on company idiosyncratic factors. Implementing this strategy requires that fund managers have solid expertise in corporate events and the necessary skills to conduct a fundamental in-depth approach. This is because this strategy tends to be exposed to several sources of event risk that will affect the likelihood of success of a deal. The most relevant are regulatory risks and financing risks. Risks also include defensive actions taken by the management of the target company, bidding wars, and simply that one of the two parties involved in the transaction will walk away from the deal. An important aspect of merger arbitrage is that these strategies are extremely time sensitive. Merger arbitrageurs usually have only a few days to evaluate whether the deal will be successful before the arbitrage spread reduces. In such a short loss of time, they have to review current and prior financial statements, filings within the regulatory authority,

management structures, strategic reasons for the merger, regulatory issues, proxy statements, cost savings, press releases, and the competitive positions of the merged company within the industry in which it competes. Evaluation of risks is a crucial step before entering the arbitrage trade. Arbitrageurs will take positions only after assessing that the rate of return they calculated is enough to compensate for the event risk associated with the deal. In some cases, even if less frequently, investors may even speculate that the deal will fail by taking inverted positions with respect to traditional merger arbitrage. The primary reason which leads regulators to reject a merger proposal is the threat that the merger may lead to reduced competition in a given market. Deals could also be disallowed for nationalistic or tax-related reasons. Cross-border mergers are more exposed to these risks, especially when the merging parties belong to industries like national defence and commodity production which tend to be extremely politically sensitive. Financing risk is another source of uncertainty concerning deal completion. It could be defined as the economic dispersion which may arise in case of failure of an acquiring firm to raise the necessary funding to complete a deal. Several sources also include third-party bidders and bidding wars among the risks linked to merger arbitrage strategies. In general, bidding wars are beneficial to merger arbitrageurs. During negotiations, bidders will offer higher premiums to beat the competition and this, in turn, will drive up the stock price of the target and bring down the price of the original bidder. Should the bid be successful, this will generate generous returns on merger arbitrage trades. However, not all bidding contests end up this well for arbitrageurs. Some deals never complete, with bidders walking away from the deal and the target stock price decreasing to its pre-deal levels.

This work intends to investigate the risk-return characteristics of merger arbitrage strategies in European markets. The main objective of this thesis is to determine whether merger arbitrage investors can systematically generate large returns over Western Europe stock markets. The sample used in this research consists of all mergers and acquisitions announced between the 1<sup>st</sup> of January 2002 to the 31<sup>st</sup> of December 2021 that were either effective or withdrawn. The data in this research are limited to the transactions in which the target firm is a public company listed in Western Europe stock markets. As a guarantee for higher liquidity in the stock market and lower transaction costs associated with the arbitrage investment strategy, I decided to add some major restrictions which drastically reduced the number of deals included in the study. Following the procedure adopted in past studies, I imposed the following filters: the percentage of shares sought by acquirors is larger than 50%, the target companies are publicly traded, the

share price of the target one day before the merger announcement is above \$1, the value of the deals is above \$20 million, and the target company market capitalization is above \$1 million. These filters are to reflect a possible real-life situation in which presumably merger arbitrageurs would choose to steer clear of highly illiquid stocks. This becomes even more important when short selling is involved as illiquid markets are usually associated with higher borrowing costs and adverse movements in the stock price may lead to short sellers getting margin calls. Target firms included in this study are listed on European public markets and as such are quoted in their domestic currency. However, all stock prices are reported in USD as the data provider uses historical daily exchange conversion rates to convert all currencies into USD. Moreover, merger arbitrage returns are highly dependent on the duration of the deal. In this line, I decided to exclude those deals that showed a post-announcement merger arbitrage spread smaller than 5%, assuming that a potential maximum return below this figure would not justify the risks. More simply, a return of 3% matured in 10 days is good, but the same return earned in one year is poor. With all these filters, the final sample consists of 665 deals divided between all-stock (6%), all-cash (87%), and mixed deals (7%).

The final sample includes 47 countries worldwide between acquiror and target companies. Of these, 392 deals (59%) were domestic, while the remaining 273 (41%) were classified as cross-border. Domestic deals refer to those transactions in which the company being acquired is listed on some European stock market. Looking closer at the percentage of domestic and foreign deals for each target country, it is not possible to notice any clear trend. On the other side, from the perspective of European acquirors, it was identified a clear preference for domestic deals. In fact, 79% of the deals involving a European acquiror saw a domestic counterparty.

It is well documented that mergers occur in waves. Academics have identified six completed waves of mergers which occurred in the following time intervals: 1897-1904, 1916-1929, 1965-1969, 1984-1989, 1990-2000, and 2003-2007. More recently, some have argued that we are currently living in the seventh wave which started in 2010. While it is possible to observe the effects of the sixth wave in this study, there is not a clear pattern for what regards the seventh wave. The sharp drop in the number of deals between 2008 and 2009, representing a decrease of 57%, seems to confirm the common agreement that what ended the sixth merger wave were the economic downturns of the financial crisis in 2008. Even more interesting, is the outstanding 110% increase in the number of deals between 2020 and 2021. This can probably be attributed to the accommodating monetary policy of central banks in the aftermath of the Covid-19

pandemic. With easy access to capital, low interest rates, and a recovering global economy, dealmakers around the world announced \$5.1 trillion worth of M&A transactions in 2021, up from \$3.8 trillion in 2020.

For what concerns deals' duration, the average running time for stock deals was 107 days, which is slightly longer than the average 106 days of mixed deals and significantly shorter than the average 148 days it took cash deals to complete. However, since the sample of stock deals and mixed deals is relatively small, the median would be a more reliable statistic to analyse deals' duration. In fact, results change significantly. Cash deals present a much shorter duration than stock deals and mixed deals. Deal duration is one of the most important variables to determine the effective return generated by a merger arbitrage trade. This is because merger arbitrageurs liquidate their positions, and so realize gains or losses, only after deal resolution. The main characteristic of merger arbitrage trades is that the return sought by arbitrageurs is given by the post-announcement merger arbitrage spread which is locked in at investment inception. Therefore, assuming that a deal will conclude successfully at the pre-agreed terms, after a deal is initiated the only variable affecting annualized deal returns is deal duration. Hence, merger arbitrageurs thrive with short-duration deals.

For each kind of deal, the strategy employed differs. In the same way, the formula used to calculate spreads will differ as well. To avoid the inclusion of potentially erroneous data, this study excluded all deals having a spread and a realized return outside the [-100%; +100%] range.

When the consideration offered is 100% cash, merger arbitrageurs simply enter a long position on the target company stock. Therefore, the formula employed is the following:

$$S_{cash} = \frac{P_{offer} - P_{target,t}}{P_{target,t}}$$

Where  $S_{cash}$  is equal to the cash deal arbitrage spread,  $P_{offer}$  is the cash price offered by the acquiror per target company's share, and  $P_{target,t}$  is the target stock closing price on the day in which the arbitrageur enters the trade which in this study is assumed to be one day after the announcement.



When the acquiror offers to finance the acquisition completely with its stock, the trade is slightly more complicated. To lock in the merger arbitrage spread the arbitrageur will have to simultaneously take a long position on the target company stock and a short position on the bidding company stock, where the number of target company shares to be shorted is fixed by the exchange ratio. Therefore, the formula used for stock deals' spread is:

$$S_{stock} = \frac{(P_{acquiror,t})(ER) - P_{target,t}}{P_{target,t}}$$

Where  $S_{stock}$  is equal to the arbitrage spread for stock deals,  $P_{acquiror,t}$  is the closing price of the acquiror company stock on one day after the announcement,  $ER$  is the exchange ratio, and  $P_{target,t}$  is the target stock closing price on one day after the announcement.

The third type of deal is a hybrid of the previous two. The trade entered by mixed merger arbitrageurs is analogous to the one entered for stock mergers. However, if the deals will be successful, target shareholders will receive part of the premium in cash. Therefore, the formula used will be:

$$S_{mixed} = \frac{P_{offer} + (P_{acquiror,t})(ER) - P_{target,t}}{P_{target,t}}$$

Where  $S_{mixed}$  is the merger arbitrage spread for mixed deals while the rest of the inputs are the same as those used in the calculations for cash and stock merger arbitrage spreads.

For the whole sample, the average and median arbitrage spreads are 19.50% and 14.17%, respectively. The spread for cash deals and mixed deals is similar and significantly larger than for stock deals. Interestingly, when the total sample was divided in two sub-groups, one accounting for the period before the global financial crisis and one for the years afterwards, the average merger arbitrage spread in the second period decreased by 200 bps. A possible explanation could be that before 2008, during the sixth merger wave, capital markets were distorted by optimism and overconfidence which translated into corporate managers overvaluing target companies and offering higher premiums.

Like in previous studies, this work also examined the relationship between spreads and returns on merger arbitrage trades. According to theory, merger arbitrage spreads and returns should

move in the same direction as spreads work as a proxy for deal completion risk. As suggested by academic literature, no statistical difference in deal spreads was found between domestic and foreign acquisitions. This points out that investors perceive domestic and cross-border deals as equally risky and generating similar returns. Successively, I calculated returns on both groups. At this time, results differ from prior works. No significant difference in risk and returns was found between the two groups. At this point, evidence from this study suggests that cross-border deals are not riskier than domestic deals and that spreads correctly reflect the level of risk in merger arbitrage strategies.

In this study, most of the deals were successful, thus confirming empirical evidence. In general, no trend can be identified between years and across deal types. Stock deals and cash deals are the most successful, followed by mixed deals with success rates of 79%, 77%, and 68%, respectively. Moreover, from this research appears that higher M&A activity is not linked to higher success rates as the significant constant increase in the number of deals announced between 2002 and 2008 is not associated with any particular change in the success rate which remains stable through the period.

At this point, it was interesting to see if there are some features which systematically differ between successful and unsuccessful deals. The focus was on deal duration and merger arbitrage spread.

Like in most prior studies, results suggest that effective deals last longer than unsuccessful ones, which stays true also when the sample is divided by deal type. Additionally, it was found that cash deals have a longer duration than stock deals and mixed deals which present very similar numbers. Also in this case, results are in line with empirical evidence.

The success of merger arbitrage lies in the success of the deal, and it is therefore essential for arbitrageurs to identify those variables which help to predict which deals will be successful. Besides their business and legal expertise, arbitrageurs could also rely on other indicators intrinsic to the transaction. One of these predictors could be the merger arbitrage spread. Evidence from this study shows that the merger arbitrage spread is much more volatile for unsuccessful deals than for successful deals, and that during financial turmoils the spread increases substantially. This suggests that arbitrageurs are able to distinguish risky deals from less risky ones. During periods of high uncertainty, it is reasonable to assume that investors will reduce their risk exposure and invest only in those deals that they believe to be safer. Under this

assumption, merger arbitrageurs will deploy a higher proportion of their capital on safer deals and less on risky deals. Also in this case, results suggest that risks are correctly proxied by the spread.

In prior academic studies, it is assumed that merger arbitrageurs enter their trades one or two days after the announcement rather than on the announcement date. This assumption is made to avoid any potential distortion in prices. Like in most prior studies, this paper assumes arbitrageurs enter their trades one day after the announcement and hold the position in their portfolio until the resolution date. For successful deals, the resolution date is the date on which the bid is declared to be effective. For unsuccessful bids, the resolution date is the day on which the bid is withdrawn. Using one day after the announcement date as the beginning of the trade is consistent with the view that merger arbitrageurs only trade on public information. Similarly, using the deal withdrawal date as the resolution date for investments in failed transactions ensures that investors in unsuccessful deals only exit their positions after the deal failure is publicly announced. The return on successful merger arbitrage investments is always equal to the merger arbitrage spread. On the other side, target shareholders in failed transactions will not receive the bid price and so won't earn the spread.

For unsuccessful cash deals, the formula used was:

$$R_{cash} = \frac{P_{target,T} - P_{target,t}}{P_{target,t}}$$

Where  $P_{target,t}$  is the target firm stock price at trade initiation and  $P_{target,T}$  is the target firm stock price on resolution day.

For unsuccessful stock deals, as for mixed deals, the return will be exactly equal to the return on a portfolio made of a long position on the target firm and a short position on the acquiror firm stock:

$$R_{stock} = \frac{P_{target,T} - P_{target,t}}{P_{target,t}} + (ER) \frac{P_{acquiror,t} - P_{acquiror,T}}{P_{acquiror,t}}$$

Where  $ER$  is the exchange ratio,  $P_{acquiror,t}$  is the acquiror firm stock price on one day after the announcement, and  $P_{acquiror,T}$  is the acquiror firm stock price after a deal was publicly withdrawn.

The purpose of this study is to assess whether merger arbitrageurs can consistently earn large returns. After dividing deals by resolution year, returns were calculated and summed. By investing in every single deal in the sample, a merger arbitrageur would have invested in 646 deals generating an average return of 11% per deal. However, this is probably unrealistic. Even a big hedge fund hardly has enough capital and human resources to invest in so many deals in such a short amount of time. To provide more realistic statistics, I have decided to consider not more than twelve deals per year. Instead of being chosen randomly, these deals represent the twelve median returns in the sample. Between 2002 and 2021, a hedge fund could have invested in 236 deals generating an average return of 8% each. These numbers translate into an average annual return of approximately 150%. When comparing returns for each deal type, it appears that M&A activity is the factor which drives up returns the most, and that cash deals generate higher returns than stock deals and mixed deals. Also in this case, results are in line with prior works. In this work, the empirical evidence about the returns generated by merger arbitrage strategies is similar to older studies but quite different from more recent ones. The first studies on this topic found that merger arbitrage strategies generated annual excess returns above 100% while most recent ones found substantially lower returns. The most plausible cause is that modern studies accounted for transaction costs which translates into more accurate estimates.

Like most prior academic studies, this thesis also investigated how deal returns are affected by duration, merger arbitrage spread, and deal value. To find evidence in this regard, I calculated the average return for those deals belonging to the top and bottom 30% in each of the categories just mentioned. Merger arbitrage returns seem to be positively correlated with merger arbitrage spreads. Similarly, also longer deal duration is associated with higher returns. Both results match earlier studies. On the other side, the evidence from this study confirms the lack of an absolute resolution concerning deal value. If we empathize with merger arbitrageurs, the only variables which would interest us as predictors of success are deal value and merger arbitrage spread. Even if duration seems to affect returns, this factor will remain unknown until termination. Therefore, if merger arbitrageurs consider only spreads and deal value, they should prefer merger arbitrage opportunities with wider spreads and be insensitive about deal value.

## Part 2

Even though previous results are based on solid theoretical assumptions, the analysis in the first part presents some limitations. The sample was too big to verify the correctness of all the data downloaded from the database. To provide a more precise and realistic demonstration of how this strategy works, in this part was simulated the investment in one real-life M&A for each deal type. Here, the number of assumptions was reduced thanks to more precise data and calculating returns on a daily basis.

The formula used to calculate returns on stock deals and mixed deals is:

$$R_{stock/mixed,t} = \frac{(P_t^T + D_t^T - P_{t-1}^T) - (ER)(P_t^B + D_t^B - P_{t-1}^B - r_{f,t-1}P_{t-1}^B)}{P_{t-1}^T - (ER)[P_{t-1}^B - P_{t-2}^B(1 + r_{f,t-2})]}$$

For cash mergers, as anticipated several times, the trade and so the formula is much easier. It is exactly the same formula used to calculate the return on a long position on a stock. Therefore, the equation to calculate the daily return to a position on a cash deal is:

$$R_{cash,t} = \frac{P_t^T + D_t^T - P_{t-1}^T}{P_{t-1}^T}$$

Where superscripts T and D refer to “target” and “bidder”, respectively. Intuitively,  $P$  stands for price,  $D$  stands for dividend,  $ER$  stands for exchange ratio, and  $r_f$  stands for risk-free rate. Stock deals and mixed deals involve taking short positions on the bidder’s stock price. In practice, arbitrageurs must put the short proceeds as cash collateral on which they may earn interest. Assuming that the rate of return on the cash collateral is the risk-free rate and that the amount of the cash collateral is marked to market on daily basis, the interest on the cash collateral on day  $t$  is  $r_{f,t-1}P_{i,t-1}^B$  for each bidder share shorted.

After calculating daily returns, the overall return generated by the investment in a single deal was calculated as follows:

$$R_{deal} = \prod_{t=1}^j (1 + R_{daily,t}) - 1$$

Where  $1$  is the day after the announcement date, and  $j$  is the day on which the positions are liquidated.

The deals scrutinized for each deal type are the William Hill takeover attempt by 888 Holdings (mixed deal) in 2016, the merger between Luxottica and Essilor (stock deal) in 2017-2018, and the Twitter-Musk saga (cash deal) initiated in 2022 and still on at the time of this thesis.

For each deal, besides calculating relevant statistics as in the first part of the study, was closely analysed the relationship between developments in the deal and movements in the stock price of the firms involved in the transaction. Results show that such a relationship exists and is strong. Prices reflect new information about the underlying deal in a very fast fashion. This implies that the market value of the target and acquiror company deviates from its fundamental value while the transaction is still on and that such deviations are a consequence of speculators entering and exiting positions based on their assessment of the likelihood of success of the transaction. This points out how much the performance of merger arbitrageurs is heavily reliant on what in jargon is called event risk. Event risk is very difficult to predict and sometimes almost impossible if not in possession of insider information. This confirms how important it is for merger arbitrageurs to know the business, financial and legal dynamics linked to such events in order to be successful.

## **Limitations and Future Research Directions**

Evidence from this study seems to confirm prior academic literature about the consistent profitability of this strategy. However, these results should be interpreted with caution as this research presents some limitations. First, transaction costs were excluded and capital constraints were considered but in an approximative way. Including improved measures for these factors would probably change results and significantly improve their quality. In this line, although future research should account for these factors, I recognise that it could be very hard, especially when it comes to estimating total costs. Implementing this strategy could involve some professional consulting fees which managers might be willing to pay to properly assess the likelihood of success of these deals. For instance, a hedge fund could pay a legal team to forecast the decision of regulators when it comes to antitrust issues. Additionally, calculating transaction costs in Europe would be even harder than in the US as these costs are likely to vary between countries. Also, many countries adopt different currencies. Therefore, future research should include commissions and transaction costs associated with the currency exchange.

Other limitations concern how returns were calculated for the first part of the thesis. Besides transaction costs, dividends were not accounted for and returns on each deal were not calculated on a daily basis. On the other side, in the final part of the study calculations are much more precise. Dividends were accounted for, and returns were calculated daily and then multiplied to get the total return on a deal.

A relevant restriction applied to the sample was to include only those deals with a first-day merger arbitrage spread above 5%. The rationale is that merger arbitrageurs might consider smaller spreads not being enough to compensate for the large loss potential. However, this is a limitation of this study as investors could wait until the spread widens before entering trades. Therefore, future studies should also consider negative first-fay spread deals and include them in the portfolio whenever the spread becomes wide enough.

Even though multiple countries were included in the study, it was not analysed any potential difference in returns between countries or across areas. For instance, it could be interesting to see if merger arbitrage leads to systematically different returns in Northern Europe versus Southern Europe. Additionally, future research should compare the performance of these strategies in developed and emerging markets.

Also, this thesis did not focus on the effect of deal attitude on the performance of merger arbitrage. Prior studies agree that hostile deals are riskier than friendly deals. Thus, it would be interesting to see if a higher risk premium is associated with foreign deals.

To my knowledge, studies about the profitability and characteristics of merger arbitrage strategies in European countries are very few. This work includes a variety of European countries and leaves the stage open to future research. It remains important to keep conducting research to check over developments in new and existing trends as the future is unknown and there are still a lot of research gaps to be filled.