

**ERASMUS UNIVERSITY ROTTERDAM
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Overconfidence in takeovers

A European perspective

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ABSTRACT

This paper analyses the effect of overconfidence in Mergers & Acquisitions on firm performance via the number of acquisitions performed by the corresponding firm. The question is whether frequent acquiring firms have a significantly worse performance in comparison to their industry peers or other comparables. This has been done via two studies: one analyses the differences in performance between peer firms via the return on assets. One peer firm is classified as overconfident and one is not. The second study analyses the impact of acquiring or merging additional companies on stock returns. Even though the differences and signs of the coefficients were as expected, both results did not hold any statistical significance. This means the European M&A market is more complex than the used model and a more refined model may find the statistically significant relation between the amount of acquisitions and an inferior firm performance. Overconfidence will keep playing a big part in the financial literature in the future.

Keywords: Acquisitions, Mergers, Overconfidence, European Union

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CHAPTER 1 Introduction

The M&A traject is very susceptible to arbitrary rules and subjective calculations. The urge to take over a company as a manager can originate from two main driving factors: the synergy effects (Dhir and Mital, 2012) or hubris by the manager (Roll, 1986). From these starting points we can work toward conclusions which provides vital new insights in the European M&A market and explain why certain M&A deals destroy value and which role overconfidence plays in upper-management. Recent news of the takeover of Twitter (now X) by well-known entrepreneur Elon Musk is a good example of a potential overconfident manager who costs the shareholder a significant amount of value by overconfident actions. The takeover was widely perceived as value destructive and the Tesla stock plummeted. While this could be predicted the overconfident manager Musk still thought he would create value, as he did before numerous times. This shows the issue of overconfidence is still very relevant today and the results can be felt for investors all around the world.

Overconfidence is strongly related to the frequency of acquisitions and mergers the managers are engaging in (Ferris, Jayaraman & Sabherwal, 2013), which is why the frequency of acquisitions is a common proxy for overconfidence in the existing literature. Overconfidence is caused by a self-attribution bias (Doukas and Petmezas, 2007) (Brahma, Sanjukta, 2023) and results in lower wealth effects in comparison to low frequency acquisitions. The relation which will be looked into is the frequency of acquisitions in relation to firm performance. A positive experience from past acquisitions makes CEOs and management more likely to acquire again even if the new deals are destroying value (Billet and Qian, 2008). The phenomenon of overconfidence originates from an illusion of control, self enhancement tendencies, insensitivity to predictive accuracy and misconceptions from chance processes (Tversky, 1995) which causes the person to believe their M&A skills are better than average (Griffin and Brenner). The overconfidence results in overinvestments and an underestimation of risks accompanied with the transaction which leads to an overvaluation of their corporate project (Heaton, 2002).

CHAPTER 2 Theoretical Framework

2.1 M&A background

M&A stands for 'Mergers and Acquisitions' and entails transactions in which the ownership of a company or the operating units are transferred to another (predominantly private) corporate entity. 'Merger' is defined as a combination of two or more companies in which the assets and liabilities of the selling firm(s) are absorbed by the buying firm. An acquisition is the purchase of an asset such as a plant, a division or even an entire company (Serman, 2006). The process is characterised by negotiation, due diligence (Howson, 2003) and quantitative research about the company's assets and potential. A lot of finance and M&A firms have different approaches when valuing the company and are putting in their unique approaches.

The first transactions labelled as a merger or an acquisition stems from the late 19th and early 20th century in which firms merged horizontally with direct competitors to form monopolies in their respective industry. This 'age of Trust' came to an end when antitrust laws were introduced to promote competition within industries. M&A transformed and made a comeback in the form of vertical mergers where companies tried to take more control of their supply chain. However, this ended abruptly by the Great Depression which started in 1929. Decades later a new type of company appeared: the conglomerate. These firms acquired businesses in different industries and diversified their activities. In the 90's to the 00's the M&A deals began to take form into the concept we know today, where cross border acquisitions driven by globalisation and technological advancement were dominant. This transformed into a highly competitive global merger and acquisition marketplace where expanding the customer base, acquiring relevant technologies and tapping into new markets are the main motivations behind this type of transaction. To this day these motivations are the driving factor behind performing such a transaction.

The M&A business has been a relevant topic since these first horizontal mergers in the late 19th century accompanied with the dawn of synergies and scale efficiencies and is therefore subject to a vast amount of extensive research. The existing literature pictures a fractured existing body of knowledge about this phenomenon. The papers however point to some general metrics we can use for further research. The mergers and acquisitions cycle is relevant as a gauge of economic circumstances, they come in waves (Golbe, White; 1993) and are signalling important prospects for the state of the economy, like the cost of borrowing money and activity on the markets. However, the literature is not unambiguous about the profitability of M&A transactions of the acquiring firm. The aggregate of returns do not show a clear wealth gain of firms after the transaction. In the most extreme cases this is explained by a few 'megadeals' where the bidders heavily overvalued the target and negative synergies (Moeller et al;2005)

The dot com bubble in 2000 is an example where massive value destruction occurred due to bad M&A and misvaluation by the market. Outside of these external errors, which are misvaluations by the markets, other reasons behind value destruction can originate from internal errors. These internal errors come from within the firm and may explain the underperformance of returns after a M&A deal. An internal error in M&A can occur when the management or the CEO values targets incorrectly.

The centre of gravity of the research done about mergers and acquisitions is about the driving factors behind a value enhancing deal. This explains the importance of unravelling the mystery behind the relatively often unsuccessful M&A transaction. The motivation behind the decision to perform a merger is important when estimating whether the deal will gain value. While the main explanation of a acquisition or a merger is the creation of synergies (Bradley et al. 1988) (Dyer et al. 2004), other factors like agency issues (Eisenhard; 1989) or the previously stated hubris and behavioural bias by a manager can result in a decision to enter in the process of a merger or an acquisition. The hubris of a manager can for example result in an underestimation of the costs of a post acquisition/merger integration process and causes the firm to pay too much in a bidding process. A large free cash flow and relatively much cash on hand is an important factor which makes managers more prone to enter into a M&A transaction, often creating an agency problem with the shareholders who may rather have larger dividends instead of risky, sometimes unprofitable takeovers (Jensen; 1986).

Some papers argue those transactions are losing value for the acquiring shareholders (Argawal, A, Jaffe; 1992) and paint a picture where the acquiring shareholder loses and target shareholders win, particularly when the target firm is relatively large (Fuller, Netter; 2002). Specifically in an equity financed 3-year period takeover these effects are significant, but also in the long run the acquiring firm tends to underperform. There is not a significant difference between an acquisition or a merger with regard to abnormal returns (André, Kooli; 2004).

2.2 Overconfidence

The big question in the behavioural field is how people make choices. Diving into the decision making process of an investor or manager may explain why these economic agents deviate from a model of optimal decision making. The assumptions of rational decision making, which encompasses the axioms of full information, full knowledge and zero decision costs are difficult to meet in the real world. These axioms are violated in the actual financial markets and this explains why our theoretical rationality is disrupted by 'real life'. These disruptions manifest themselves in the form of behavioural biases, where overconfidence is an important factor in explaining irrational financial behaviour.

Overconfidence is the psychological theory which comprises several behavioural factors which lean to self enhancement tendencies. This phenomenon is particularly present when a task is cognitively complex and expectations are relatively high (Stone, 1994). The most prominent factors are miscalibration, the better-than-average effect, illusion of control (Skala, 2008), insensitivity to predictive accuracy (Block, Harper, 1991) and misconceptions from chance processes (Tversky, 1995). This overconfidence is often reinforced by a self attribution bias (Doukas and Petmezas, 2007) (Brahma, Sanjukta, 2023), which prevents an accurate self-assessment (Hirshleifer, 2001). Especially when it comes to short term success in the past the human mind finds it difficult to proportionally attribute good returns to its own abilities (Menzly, 2006). It causes a person to connect its own actions to positive outcomes while connecting negative outcomes to its actions to circumstances beyond the control of the individual.

This overconfidence can be identified as a so-called 'heuristic', which reduces the complex task of assessing probabilities and predicting values to simpler judgemental operations, which are more intuitive. (Kahneman, Tversky, 1982). A heuristic is a comprehensive term that describes different experience-based rules of thumb we use to make decisions. Kahneman describes them as 'mental shortcuts'. With this phenomenon behavioural economics try to explain the discrepancies between the theoretical ideal economic actor and its human 'real life' counterpart. He describes how we take these shortcuts everyday in our life: when we interact with a person, when we negotiate, when we make estimates or predictions and when we have to absorb a relatively large amount of information. According to Thaler the work of Kahneman and Tversky led to one big idea: a systematic bias that was previously unexplained. With regards to quantified outcomes, overconfidence encapsulates several heuristics which are caused by the limited ability to have all the relevant information and to process this information. This results in an underestimation of variation and a biased picture of possible outcomes when making a decision. Overconfidence is an internal process that relates to how we assess the accuracy of our stored knowledge and our perceptual models (Moriarty, 2015, chapter 2.5) and influences the individuals' perception of the infallibility of their own judgement (Caputo, 2013). The perception we have of our knowledge goes further than the actual knowledge. When the combination of factors stated before occur, the subject is prone to believe its information and its capability to process this information is strong enough to justify a certain action. In the M&A context the action will be a merger or an acquisition. This illusion of knowledge is an important factor in the miscalibration of the manager, where the risk and volatility of potential outcomes are severely underestimated. Important to note is that this contradicts the theory of rationality, where deviations from rationality are temporary and caused by emotions, temporary shocks or other irregularities. This does not hold when literature points out that the behavioural biases are systematic, persistent deviations from rationality and therefore a clear anomaly from the rational choice theory.

These findings point out that even though the incentives of the managers and the shareholders are aligned and there are no agency costs, managers can still take action against the interest of the shareholder. Incentivising the board may not be as effective because these actions are performed because of the beliefs of the manager, not because it has a different interest than the shareholders. The correction of intrinsic mistakes can be a lot harder than a correction of interest on a certain outcome.

As stated before, the ability to assess the correctness of our knowledge and estimations is poorly calibrated. This influences decision making and affects many fields of profession such as negotiation, where the overconfident party is much less willing to make concessions and keeps to his original, often too ambitious, goal. This results in suboptimal outcomes, where it could be more beneficial for both parties to strike a deal in the 'middle' (Neale et al., 1986). Another field of work which is susceptible to overconfidence is entrepreneurship (Cooper et al., 1988). Entrepreneurs are found to perceive the prospects of their own firm very favourably, while the amount of optimism is not a good predictor of success. Relatively poor prepared entrepreneurs are just as optimistic in comparison to their better prepared colleagues with more experience and a better background according to research. This originates from the fact that entrepreneurs often have distinctive characteristics which causes them to take the risks necessary to start their own entrepreneurial career. The need of an individual to become self-employed has a high dependency on the person's stance towards risk, need for independence and its estimation of their own capabilities to minimise the probabilities of negative outcomes (Douglas, Shepherd, 2002). Another category which is prone to overconfidence is the world of investment and finance (Heaton, 2002). Overconfidence in finance often translates to an overestimation of a firm's (predominantly risky) securities and management thus believing that capital markets undervalue those assets, while underestimating the inherent insecurity that is accompanied with the type of financial assets. When attracting funds for a project the management is more likely to use external financing instead of raising capital from shareholders. This can prevent funding projects with a positive net value because of the perceived undervaluation by the market of the firm's own assets. Furthermore, the firm will overvalue their own projects and overinvest in certain negative net present value projects. It has to be emphasised that this process is not a conscious decision by the manager, but a systematic bias that unconsciously systematically deviates from the optimal allocation of investments.

Arbitrage by rational agents is weakened by the typical context in which firms perform business. The market of relatively big and established firms typically requires high transaction costs for arbitrage, for example by taking control of the board or a takeover. This makes firms more vulnerable to long term systematic over- or underinvestment in certain cash flows because of the behavioural bias overconfidence. This phenomenon is further enhanced because managerial optimism predicts takeover resistance, making arbitrage even more costly (Malmendier, Tate, 2001). A possible solution to break this cycle is the option to hire outsiders, who can draw the attention of the management to the underlying factors causing their overconfidence.

2.3.1 Overconfidence and the performance of M&A's

The existing literature shows the effects of overconfidence have broad and consequential implications to outcomes in a corporate context. Finance and M&A are complex and sometimes arbitrary processes where overconfidence is able to flourish. This influences the returns for the acquiring firm and is one of the most significant motivations behind capital allocation within a firm (Graham, Harvey, Puri; 2009). These types of deals are done because a manager believes it is better at creating value in comparison to the target firm and is almost always instigated by the Chief Officers. Overconfidence is found at the highest levels of the corporate ladder and correlates with 'power' within the firm (Hwang, Kim, 2020). CEO's perform too many mergers and acquisitions and literature states that the driving factor behind the frequency of acquisitions is explained by overconfidence of these high level employees (Ferris et al., 2013). Especially finance professionals who perform at a high level within their firm are prone to take more risk and are overly optimistic in forecasting future stock prices (Broihanne, 2014) and overestimate the accuracy of their predictions.

The fact that these financial agents are vulnerable to overconfidence can cause overinvestment by firms (Heaton, 2002) and destruction to a firm's value (Malmendier, Tate, 2005). Motivations to conduct a merger or acquisition are not always purely motivated by rational inputs such as market value, EBITDA, market efficiency, future prospects and free cash flow discounting, but can also be influenced by hubris from the manager of the firm (Roll, 1986) among other 'wrong' motivations. This distortion of reality can increase the frequency of diversifying and non-diversifying acquisitions of the firm (Ferris, Sayaraman, 2013)(Dhir et al. 2012). Diversifying acquisitions in particular have a strong relationship with overconfidence and a decrease in firm value, this is due the fact that the risks tend to be higher and the required expertise of entering a different industry is often not at a sufficient level.

These findings are inconsistent with the assumption the managers of the firm are the agents of the shareholders with the main goal to enhance the value and pursue the interests of these shareholders. This assumption conflicts with the value destruction that results from overconfidence and is therefore an interesting factor to look at when analysing M&A deals. The addition of a behavioural aspect to this

world of finance can explain the inefficiencies and contradictions with respect to the standard axioms of finance and offers an addition to the theory of the rational 'homo economicus' (Bloomfield, 2010). From the non-experienced financial to professional asset managers at Black Rock: financial behavioural biases and heuristics influence decision making and have an impact on the returns. By adding the biases and heuristics to the financial theory of rational choice, we come closer to the practical reality and further away from the mathematical construct of a rational economic agent. Adding the psyche of the human brain and its shortcomings may give new insights about the inefficiencies in a M&A transaction. When the existence of biases is acknowledged and if it is possible to measure this phenomenon, it can be beneficial to act upon it to prevent sub optimal allocation or value destruction due to financial irrational behaviour.

2.3.2 Acquisitiveness as a sign of overconfidence

There have been several proxies for overconfidence in the academic literature. The percentage of males in the board (Brahma, Sanjukta, 2023), specific merger characteristics such as payments in cash (Ferris et al, 2013) or taking the difference between the mean subjective probability of certain values and the proportion that is correct (Olsson, 2014). Odean (2001) argues in his paper 'Learning to be overconfident' that the amount of 'long holder' stocks kept by managers as compensation for their services is related to overconfidence, because it deviates from rational diversification thus hinting at strong trust in its own abilities and the performance of the stocks of the company. This trust is stronger than his trust in the valuation of the market.

In this paper the frequency of acquisitions will quantify overconfidence (Billet, Qian, 2005). Literature points to a strong relation between overconfidence and the frequency of acquisitions (Ravenspor, 1993) and can therefore be used as a proxy, which is common practice in academic research about this behavioural bias (Brahma et al. 2023)(Doukas, Petmezas, 2007). The belief stems from the fact that taking on multiple acquisitions (and/or mergers) in a very short period is a poor strategy and indicates irrational investment behaviour. The decision to perform relative risky deals despite the possible and realistic downsides points to other driving motivations besides increasing the objective firm value. The managers instigating these multiple transactions in a short period of time tend to overestimate their ability to to select investments which generate profit and their capability to capitalise on the synergy gains created by the deal. Overconfidence results in a subjective probability estimation by the management of different scenarios and financial outcomes. The perceived risk by an overconfident management results in the underestimation of the riskiness of assets and financial decisions, which causes the management to deviate from a rational amount of mergers and acquisitions. It is therefore expected that overconfident managers/firms will underperform in comparison to their 'rational' counterpart and will create less value for shareholders. Although the corporate culture in the mainland of Europe is different from England, the United States or Asian countries, which are studied in previous literature, it is expected the results will show overconfidence as a significant factor in corporate acquisitions.

CHAPTER 3 Empirical Strategy

This research will consist of two different studies where acquiring firms stationed in the European Union will be researched. The EU countries will be comparable because the firms all have to play by the same merger and acquisition rules laid down in legislation and directives by the European Commission with regard to competition laws and regulations. EU countries have to get approval from the commission which will test whether the merger or acquisition complies with the rules and thresholds laid down in the corresponding directives and regulations. These regulations are predominantly drafted to enhance competition between firms and to prevent a very dominant position for one firm within an industry in the Union. Another reason why the EU can be considered a separate block and can be compared with each other is because of the financial culture. The native English speaking part of the western world has an Anglo-Saxon financial culture, where the Chicago School and free market are dominant. This contrasts to the mainland of Europe, where the Rhineland model is the prevailing doctrine. In this school of thought corporations are more restrained to regulations and the workers are more protected, thus incorporating social policies while retaining a free market.

Overconfidence will be studied via two different approaches/studies. One approach (Study 1) looks at a more recent and smaller dataset of firms to dive more closely into the characteristics of each overconfident firm. Important factors are the operating revenue, the profit/loss ratios, total assets, cash flow shareholders funds and number of employees. The overconfident firms will be matched with a peer firm, which in this case is a firm that is very similar in these characteristics, but not in its M&A behaviour. This way the difference in M&A behaviour can be studied.

In the second approach (Study 2) we will compare stock returns from firms in comparison to firms who acquire or merge more. The emphasis of the dataset of the second approach lies more in the law of big numbers. From this larger dataset we try to get an overview from the effects of additional acquiring in a longer period on the annual stock returns of a firm. These two different studies give a more diverse image of the effects of overconfidence. One study dives into the firm's characteristics and similarities (Study 1) while the other study gives a more aggregate and zoomed out overview of the effects of overconfidence (Study 2). The studies will be looked into separately in this paper.

CHAPTER 4 Data & Method Study 1

4.1 Study 1 Data

4.1.1 Sample description

The first sample consists of ‘acquirer companies’ in the EU which are meeting certain standards. The data is collected from Orbis M&A (previously Zephyr). With the help of the Orbis M&A data the total M&A data in Europe is available. The requirements for the merger and acquisition deals to be taken into account are a minimum deal value of 500,000,000 US dollars and the acquirer has to be located in the European Union (or Switzerland). Deals over the last 8 years with a status of being ‘completed’ are included in the dataset. The dataset consists of completed M&A deals from 1 January 2015 to the 26th of June 2023. This timeframe was chosen to represent times in which the M&A environment was both unfavourable and favourable and is considered to be enough time for a firm to show its overconfidence through multiple transactions. Both the European debt crisis, low interest rates and strict monetary policy from the ECB are captured in this timeframe, giving a representable period to measure M&A performance.

These requirements lead to a dataset of 1152 deals. The firms are active in a wide range of industries and consist of all firms within the 27 state European Union. The vast majority of the firms performing the transactions do not meet the requirements to be considered an overconfident firm, and will be characterised as ‘normal firms’. The overconfident firms give a diverse image as several European industries are represented, such as oil and gas, financial services, telecom, transportation, utilities, wholesale, leisure, exchanges and investment firms. Most overconfident acquirers have completed 4 or 5 M&A transitions in the determined period. From the 1152 recorded deals, 1018 were identified as ‘infrequent deals’, which means the deals were not from an acquirer who performed 4 or more acquisitions in the determined period. 134 deals were frequent deals. From the 1054 different firms included in the dataset, 1028 were non-frequent acquirers and 26 were frequent acquirers. From the 26 frequent acquirers, 11 firms performed 4 acquisitions in the specified timeframe. 8 firms performed 5 acquisitions, 3 firms performed 6 acquisitions, and 2, 1 and 1 firms performed 7, 8 and 10 acquisitions respectively. There will be no distinction between horizontal or vertical mergers, or inside and outside industry transactions.

There are 26 frequent acquirers who will each be paired with a peer firm. A peer firm is a firm that is so similar in financial and operational perspective they can serve as comparables in financial analysis, performance evaluation and strategy. These peers will be selected based on the industry, the number of employees, cashflows and the D/E ratio. 2 to 4 firms are matched with the frequent acquiring firm. The peers must be from the same industry or an industry which is very closely related to the main operation of the frequent acquiring firm. The other characteristics are as similar as possible. Whether a firm gets the predicate 'peer' does not have a strict requirement, but will be determined in the amount of similarity combined with the least amount of M&A transactions performed by the corresponding peers. This is done to create the biggest possible contrast in the amount of acquisitions and the least in the other characteristics. Missing values will be looked at further via Morningstar, Hargreaves Lansdown, global data and annual reports from the researched companies. These sources are especially used when determining the return on assets, because the more common databases do not always provide sufficient information for certain characteristics. Companies which do not disclose their financials for more than half the period of measurement will be excluded from the dataset. The data is processed with Stata, R and Excel.

In conclusion, at first several overconfident companies in Europe have been selected. In the next step peer firms are included and the most similar firm is selected. Finally the average Return on Assets are compared. Further specification about the variables can be found in the next section.

4.1.2 Variables

-Variables comparing peer firms

Overconfidence: This variable takes a binary form of overconfident (≥ 4 acquisitions = 1) or not (< 4 acquisitions = 0) based on the amount of acquisitions a firm has performed. Given the fact large mergers/acquisitions are more prone to overconfidence, transactions will only be counted if they exceed the deal value of 500,000,000 US dollars within the 8 year period.

Amount of acquisitions/mergers of peer firms: This represents the amount of acquisitions/mergers done by the peers of the overconfident firms in a period of 5 years, from 2018 to 2022. Only acquisitions/mergers with a deal value above 10.000.000 US dollars will be counted. The term acquisition or merger will be used interchangeably.

Firm performance: Firm performance will be calculated through returns on assets (ROA). The return on assets is a widely used ratio in financial statements and evaluations. It measures the profitability of a firm

relative to its total assets and thus gives an idea how efficiently the company's assets are allocated to generate earnings by the management of the firm. When the return on assets is rising the company is generating more money with less investment.

It consists of the Net income, which is calculated by subtracting the total expenses from total revenues. The Net income is divided by the Total assets, which is the sum of the company's current and noncurrent assets. This variable should, as many financial ratios, be used in comparison to the industry norms and several time periods have to be accounted for..

The assets are an important component in this research, because the acquiring firm incorporates previously 'foreign' assets in the firm and its returns can be compared to assets of firms which have been in the firm for a longer period.

$$\text{Return on assets} = \frac{\text{Net income}}{\text{Total assets}}$$

Difference in ROA: The 5 year average ROA of the normal firm is subtracted with the 5 year average ROA in the overconfident firm to look at the difference in performance of companies which are overconfident and companies who are not.

- variables selecting peer firms

Operating revenue: Revenue that is generated from the core operations of the firm. Can be useful for financial ratios and comparing size between firms.

P/L before tax (th USD): Measure of a company's profitability before taking taxes into account. It is calculated by subtracting all the costs and expenses from the revenue, without subtracting the cost of income tax. It shows the operational profitability without the influence of taxes.

Cash flow: The operating, investing and financing cash flows combined are the cash flow of the firm. It's a key indicator for the financial health of a company and its ability to cover expenses, pay back creditors, invest in innovation and provide a return to its investors. Cash flow shows the change in a company's cash position for a given period.

Total assets: Everything a company owns that has value. Tangible and intangible items that the company can use to produce goods or services, sell to pay off debt or use for operational activities. The assets can be divided into current assets and noncurrent assets. Current assets can be converted in cash within one

year or operating cycle. Non current assets can not easily be converted into cash and particularly include long term investments and intangible assets. The amount of revenue generated from the assets is an important ratio to determine firm performance.

Shareholders funds: The amount of claims on a company's assets investors have, it represents the ownership stake shareholders have in a company. This funds the equity of the firm together with debts and other financial obligations.

Employees: The amount of employees makes it possible to differentiate firms with a capital intensive production chain or a labor intensive production chain. This is an important factor in evaluating whether companies are similar.

SIC Code: The 3 digit code that identifies the industry a firm is active in. This is a crucial aspect when comparing firms. When firms perform in the same industry they are more comparable on the variables stated above.

4.1.3 Descriptive Statistics

The group of overconfident firms are relatively big and influential in the European market, this is clear when looking at the operating revenue (M = 36 billion, SD 4 billion), the Cash flow (M = 54 billion, SD = 7 billion) and the total assets of the companies (M = 262 billion, SD = 56 billion). This can be explained due to the high threshold for an acquisition to be accounted for in the dataset. This filters out the smaller firms who can not afford such big takeover sums.

4.2 Study 1 Method

After collecting the data we will look at the first dataset. First a suitable peer firm for each overconfident firm is selected and there will be taken a look at the impact of being a multiple acquirer. Swiss companies are included which can be justified because of the geographical relation and similarity in antitakeover policy.

After the scope of the data is determined, the next step is connecting each overconfident firm to a ‘peer’ firm which is comparable/similar. This will be done via different metrics, namely SIC code, firm value, operating revenue, P/L before tax, cash flow, total assets and number of employees. The peers will be matched based on data from 2019. From the firms which are the most similar in these aspects, the firm with the lowest amount of M&A transactions will be selected for the dataset. An example is added in the appendix (A). The M&A transaction will only be counted if the value exceeds 10 million dollars and is performed in the last 5 years. Peers who are defined as overconfident following the required values will be excluded from the peer group. From there on we will compare all the overconfident firms with the regular peers and look at the performance.

The comparison will be done via the return on assets (ROA) over the last 5 years, using net income. This is a common metric to quantify the firm’s and management’s performance. It can be seen as a metric of the efficiency of allocation resources and can be compared to alternative uses of resources as well as a comparison between similar firms. The averages of the return on assets of the overconfident group will be compared to the averages of the normal group.

$$Avg\ return\ on\ assets(5\ yr) = \sum_{i=t}^5 \left(\frac{Net\ income(t)}{Total\ assets(t)} \right)$$

The average return on assets over the five year period of the overconfident firms and their corresponding peer firms is as follows:

| stats | ROA_2018 | ROA_2019 | ROA_2020 | ROA_2021 | ROA_2022 | avg_ROA |
|-------|---------------|---------------|-----------------|-----------------|----------------|----------------|
| mean | 4.8334 | 4.9966 | 3.780408 | 7.885918 | 3.86551 | 5.00898 |

Table 1: Return on investment statistics of the initial overconfident group and the accompanied peer groups over time. $n = 50$, SD average = 0.66.

The Return On Assets will be compared for each firm. The following table shows a few examples of overconfident European firms and their corresponding firm which will be the comparable benchmark for the overconfident firm:

| company | ROA_2018 | ROA_2019 | ROA_2020 |
|-------------------------|-------------|--------------|--------------|
| TOTALENERGIES_SE | 4.46 | 4.12 | -2.72 |
| ROA_2021 | ROA_2022 | avg_ROA | |
| 5.46 | 6.76 | 3.616 | |

| company | ROA_2018 | ROA_2019 | ROA_2020 |
|------------------|-------------|--------------|--------------|
| SHELL_PLC | 5.85 | 3.92 | -5.72 |
| ROA_2021 | ROA_2022 | avg_ROA | |
| 4.97 | 9.55 | 3.714 | |

| company | ROA_2018 | ROA_2019 | ROA_2020 |
|---------------|-------------|-------------|------------|
| AXA_SA | .12 | .72 | .61 |
| ROA_2021 | ROA_2022 | avg_ROA | |
| 1.19 | 1.25 | .778 | |

| company | ROA_2018 | ROA_2019 | ROA_2020 |
|----------------------------------|---------------|--------------|--------------|
| ZURICH_INSURANCE_GROUP_AG | 11.9 | 11.87 | 10.98 |
| ROA_2021 | ROA_2022 | avg_ROA | |
| 12.2 | -14.85 | 6.42 | |

Table 2: Example of two overconfident companies (1st and 3rd) and the corresponding peer firms (2nd and 4th). The table describes the return on assets (%) from 2018 to 2022. Company's name, yearly return on assets and the averages are displayed.

After the ROA and the differences are calculated, two groups are formed where the first group is the original overconfident group. The peer firms are assigned to the second group.

We have to look if the two groups are statistically significantly different, especially whether the return on assets of the not overconfident comparable peer firms is higher.

This will be done via a two sample t-test to estimate whether the two groups have the same mean or not. The formula is as follows:

$$t = \frac{(\overline{x_1} - \overline{x_2}) - (\mu_1 - \mu_2)}{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)^{.5}}$$

The t statistic translates to the distance to the under the null hypothesis assumed median expressed in standard deviations. A t statistic can be transformed into a P value, which represents the chance the value occurs while the null hypothesis is true. We will put the minimum p value at 0.05(**), as is customary in statistical practice. When the P value is below 0.05 the assumed similarity in median is deemed to be improbable and we will reject the hypothesis, thus stating that means of the overconfident and the normal group differ in the population as a whole.

4.3 Study 1 Results

When comparing the overconfident and peer groups the numbers are as follows:

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|----------|-----|---------|-----------|-------|--------|
| avg_ROA | 25 | 4.78268 | 6.589157 | -.484 | 28.506 |

Table 3: The table describes the mean of the averages of returns on assets of the **overconfident group** in the last 5 years. The minimum value is represented by CELLNEX TELECOM S.A. with the lowest average ROA. The maximum value is represented by NOVO NORDISK A/S with the highest average ROA.

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|----------|-----|---------|-----------|-------|--------|
| avg_ROA | 25 | 5.23528 | 3.927313 | -.364 | 12.028 |

Table 4: The table describes the mean of the averages of returns on assets of the **peer group** in the last 5 years. The minimum ROA is represented by NOVOMATIC AG, the maximum is represented by Boehringer Ingelheim GmbH.

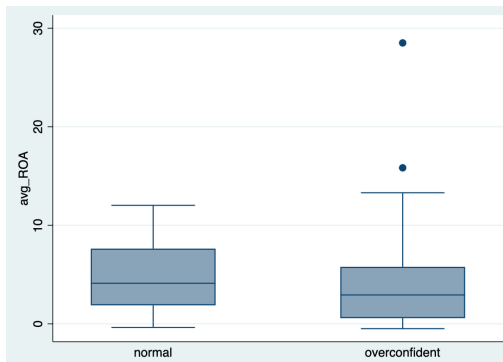


Figure 1: Histogram of the mean, 1st quartile, 3rd quartile, maximum, minimum and outliers. Visual comparison of 'normal' and 'overconfident' groups.

The tables show a difference in standard deviation, as the mean of the ROA regarding the overconfident group is 4.78 and the mean of the peer group is 5.24. The histogram visualises this difference, as the length of the box plot is wider in the overconfident group. Homoscedasticity is one of the assumptions of a two sample t-test and needs to be tested. The Levene's test with stata input 'robvar' performs a robust test of the equality of variances in the different groups and is relatively resistant against departures from normality. Three different approaches of the Levene's test are performed with differences in robustness and efficiency, which is a tradeoff. This way the same test can be performed with data of different distributions, because each test looks at a different reference point when estimating the two means.

The hypothesis of the Levene's test are:

$$H_0: \sigma^2_1 = \sigma^2_2$$

$$H_a: \sigma^2_1 \neq \sigma^2_2$$

Levene's test for equality of variances between groups

| group | Summary of avg_ROA | | Freq. |
|--------------|--------------------|-----------|-------|
| | Mean | Std. Dev. | |
| normal | 5.23528 | 3.9273129 | 25 |
| overconfid.. | 4.78268 | 6.589157 | 25 |
| Total | 5.00898 | 5.3732885 | 50 |

W0 = 1.01906905 df(1, 48) Pr > F = **0.31780184**
W50 = 0.32934743 df(1, 48) Pr > F = **0.56872314**
W10 = 0.36262730 df(1, 48) Pr > F = **0.54988492**

Table 5: The standard deviation is 3,93 for the 'normal' group and 6,59 for the 'overconfident' group. Three versions of Levene's test are performed (W0, W50, W10). W0 uses the absolute deviations from the observations from the group mean. W50 uses the absolute deviations from the observations from the group median, this is considered more robust than W0 but less efficient when the data is normal distributed. W10 uses the absolute deviations from the 10th percentile. All versions do not reject the null hypothesis(**) ($>0,05=P$).

There is no evidence against the assumption of equal variances, meaning the t test with equal variances can be performed. Here the difference between the means is tested. The t statistic and p values have to be looked at with special interest. The test has two groups of 25 observations. From the normal group (M (normal) = 5.24, SD (normal) = 3.93) and the overconfident group (M (overconfident) = 4.78, SD(overconfident) = 6.59) the T test is performed, with the null hypothesis stating $M(\text{normal}) - M(\text{overconfident}) = 0$. The alternative hypothesis is stating the difference in mean is not zero. There was no significant effect for being overconfident, $t(48) = 0.30, p > .05$. This means the null hypothesis can not be rejected and no statistical evidence is found that shows the two groups have a different mean. The relatively large standard deviation can be a reason the high p value and the low t statistic occurs. The table of the two sample t-test can be found in Appendix B.

CHAPTER 5 Data & Method Study 2

5.1 Study 2 Data

5.1.1 sample description

The second dataset will consist of publicly listed companies which are acquirers stationed in the European Union. The data is gathered from EIKON (which is more suitable for stock data) and Orbis M&A. Missing data of the deal value, annual returns or the financials of a specific firm are looked up on the firm's financial report, Morningstar, Marketscreener.com, Yahoo Finance and Bloomberg. The firms are publicly traded in one of the stock exchanges in the European Union, or/and are traded at a European stock market. The minimum deal value is 500,000,000 US Dollars once again over a time period of 20 years. This is a relatively large timeframe, which is needed for enough data points to decide whether there is a difference between the frequent acquirers and very frequent acquirers. This is because the relatively strict requirement of a deal value of 500 million dollars still needs to be accompanied with sufficient different amounts of acquisitions and data points to comply with the law of large numbers. This way the statistical significance is increased and comes closer to the actual value of the population. The reason 2002 is the starting point is because of the history of M&A, where 2002 can be considered the starting point of 'modern' M&A and therefore the transactions are more comparable to the transactions we have now. Out of the 779 firms included in the dataset, 95 can be considered frequent acquirers, which is around 12% of the firms included. From the 95 overconfident acquirers, 86 performed 4 to 9 acquisitions in the specified period. 11 firms performed 10-15 acquisitions in the same period. There are 1229 merger or acquisition deals which meet the requirements stated above. 604 of these deals can be labelled as a deal from a frequent acquirer, which is 49%. This portrays the potential impact if overconfidence is related to value destruction, because the chance of a firm transaction being overconfident in this setting is significant, even when the number of overconfident firms are considerably lower.

After considering the ratios of overconfidence within firms and in the volume of deals, it is time to consider the performance of the overconfident firms. The data of interest is the change in stock price over 20 years and the annual change in stock price of the overconfident firms. The data already includes dividends and compounding effects; it is therefore not necessary to introduce log returns for the regression.

5.1.2 Variables

Overconfidence: As is the case in Study 1, this is a variable with a binary outcome. (≥ 4 acquisitions = 1; < 4 acquisitions = 0). Due to the longer time horizon there are more firms which comply with the barrier of 4 acquisitions and there is more variation between the amount of M&A deals performed. This makes the data more suitable to perform regressions and also compare stocks from overconfident firms over time.

Amount of acquisitions: The amount of acquisitions performed by a firm within a 20 year period with a minimum value of 500.000.000 US dollars. Only overconfident firms are included in the dataset so the minimum value of this variable is 4. This variable makes it possible to measure how much value a firm loses when it does even more transactions when already labelled as overconfident.

Cumulative abnormal returns(in percentage): The cumulative abnormal returns (CAR) quantifies the total impact of being overconfident on the stock price. The 'abnormal' return is the amount over or under the expected return and represents the difference between the expected and actual return. The abnormal return is calculated yearly from 2002 to 2022. The cumulative abnormal return is the sum of these 'abnormal' returns. In the context of this research we look at how returns deviate from the expectation while having an overconfident management. We look at this variable to investigate if there may be a relation between the amount of acquisitions and the stock performance.

Expected returns(in percentage): The 'normal' group is represented by an index. This assumes the stock market values the firms correctly and the aggregate of returns is a good indication of a rational firm which is not prone to overconfidence. The index is the S&P 500, which is often the benchmark for stock performance given its international exposure and a good reflection of the global market (De, 2013)

Actual returns: the realised returns that refers to the gain or loss made over the year. It represents the difference in value from the first to the last day of the year.

Firm size: The turnover of the company in the year the acquisition was performed. Used as a control variable, thus held constant for each datapoint. The firm size will account for a part of the difference in stock returns between firms. This variable plays a role in the explanation of returns by firms in the Fama-French factor model.

Value company: The market value of a share multiplied by the amount of shares outstanding. This is the market capitalisation and the valuation of equity of the company by the market. This is an important benchmark to quantify the value and size of a company and can be compared with other firms. This variable plays a role in the explanation of returns by firms in the Fama-French factor model.

5.2 Study 2 Method

For the relatively large amount of overconfident transactions and firms in comparison to the first dataset (study 1), an abnormal return table is appropriate for the amount of data points and from there on perform a regression analysis to further investigate the relation between the amount of acquisitions and firm performance. For the abnormal return table the average annual return of the overconfident firms will be subtracted by the expected return. The actual returns are the average annual stock returns from the 76 overconfident companies in Europe. The returns are dividend adjusted and cumulation is accounted for. The stock market is assumed to be an accurate estimator of the value creation and efficiency within the average firm, thus the expected returns will be represented by the returns of the S&P 500. This index counts as a benchmark for the average firm. The returns of the S&P 500 from 2002 to 2022 are laid down in the table:

Annual average S&P Returns (2002-2022)

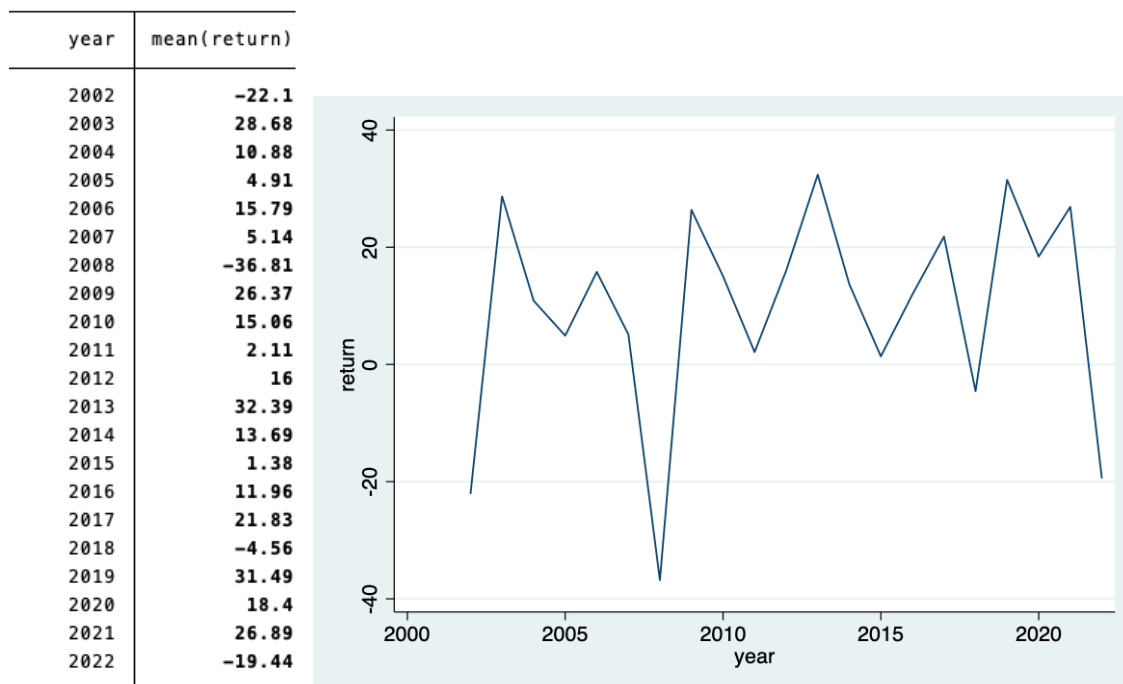


Table 6: Stock returns of the S&P 500 over the last 20 years. Predominantly positive returns with the exception of economic crises, when the returns are very negative. The dotcom bubble, housing market crisis and European debt crisis are visible.

Figure 2: The graph shows the visualisation of the S&P 500 the from 2002 to 2020.

The point of interest is the effect acquisitions have on the 20 year stock performance. A first look at the S&P 500 and the most 'extreme'/overconfident acquisition firms gives an image of the differences between the average listed firm and the listed firms labelled as very overconfident. The most extreme cases show the potential relationship in the most evident way as it is expected that each M&A transaction has a negative impact on stock returns. It is therefore appropriate to look at a possible difference between very overconfident firms and non-overconfident firms. Below is a graph to compare the returns. The group of most extreme acquisition cases consists of firms who performed 11 or more acquisitions or mergers in the period from 2002 to 2022 with a minimum deal value of 500 million US Dollars, which we will call extreme overconfident firms. The average return over the past 20 years for the frequent acquirers is 7,66%. For the extreme firms this is lower when outlier DSV is excluded (Appendix B): 4.61%. The average return of the S&P 500 in the corresponding period was 9,53%.

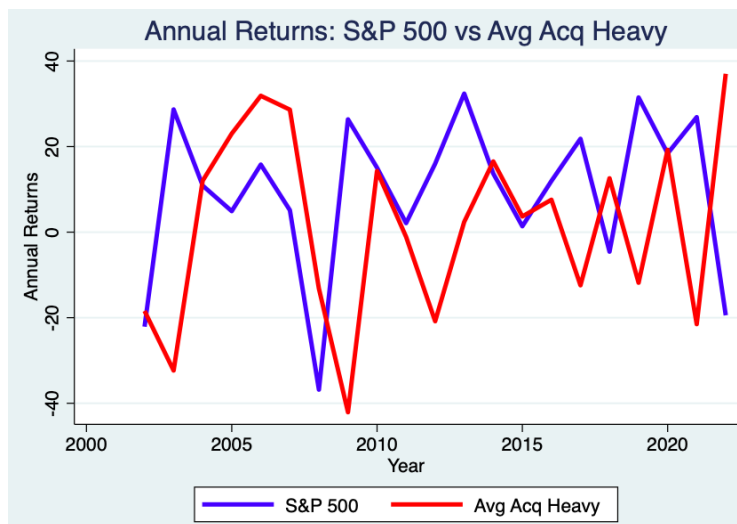


Figure 3: Annual returns, S&P 500 vs 11< acquirers, visualisation in the past 20 years. The returns seem to be systematically lower in comparison to the benchmark.

There seems to be a difference in the returns in the extreme overconfident group and the S&P 500. When the broader overconfident group is analysed we see a lower mean for the overconfident group ($M = 7.66$, $SD = 2,44$) in comparison to the S&P 500 ($M = 9.53$, $SD = 1,34$). This relation will be investigated further.

After comparing the returns over time, the correlation between the amount of acquisitions and returns needs to be investigated. This will be done by the amount of acquisitions as an independent variable and the annual returns (not subtracted by the benchmark) as an dependent variable. First we have to put the overconfident numbers in a broader context with abnormal returns.

The equation is as follows:

$$\begin{aligned} \text{Returns} &= \beta_0 - \beta_1(\text{acquisitions} - 4) + \varepsilon \\ \text{AR} &= \text{Returns} - \text{Expected returns} \end{aligned}$$

AR are the abnormal returns, CAR are the sum of abnormal returns: the cumulative abnormal returns. The constant can not be interpreted, because the dataset does not have any firms which are not overconfident. Beta 1 is the variable of interest, it shows the impact of every extra acquisition above 4 on the stock returns. The error term shows the part of the abnormal returns which is not explained. This unexplained variance can be a specific economic environment, firm size, industry sector or many other variables that may be relevant to the returns of the firm. To make the coefficient of beta 1 more accurate, the minimisation of unexplained variance is attempted by adding control variables. This way a better and more precise understanding can be derived from the coefficient of the number of acquisitions on the returns of a firm.

$$\text{Returns} = \beta_0 - \beta_1(\text{acquisitions} - 4) + \beta \text{Control Variables} + \varepsilon$$

Subsequently, a regression will be performed with the amount of mergers and acquisitions as the independent variable against the dependent variable of stock returns, which represents the firm performance over the years. The explanatory power and coefficient of the amount of acquisitions from 4 or more will be looked at. The control variables will be in line with the Fama and French three factor model, where the model tries to explain returns on stocks with two different factors, in addition to the CAPM model. The first factor is the market capitalization, which can be an important predictor of returns. The other factor is the Book to Market ratio, where the main factor is whether the stock is a 'Value stock' which means a high Book to Market ratio, or a 'Growth stock' which is a stock with a relatively high market price in comparison to the value of its assets in the books. (Fama et al.; 1992).

In their three factor model they incorporate the return differences from small and large firms and the return difference between value and growth firms. This adds on the price of capital and explains a part of the returns on stocks. A value firm has a high book-to-market ratio. This model is proved to be valuable in explaining cross section stock returns and is widely used in asset pricing research (Chen. H; 2017). This ratio is calculated by the two ratio's book value per share and market price at t. The three factor model is as follows:

$$E(R_i) - R_f = \alpha_i + \beta_i(RMRF) + s_i(SMB) + h_i(HML) + \epsilon_i$$

This model will be incorporated via the control variables 'Firm size' and 'Value company'. The third factor 'market risk' is accounted for when we compare it to the S&P, but could be relevant in the regression. The prediction is that a low book to market ratio and a low market capitalisation have a positive influence on the stock returns.

5.3 Study 2 Results

The graph of annual returns from the extreme overconfident firms indicates there may be a relation which is worth investigating, because in almost all cases the frequent acquirer has inferior returns in comparison to the S&P 500. The next step is taking the average annual returns of all the 73 overconfident European firms over time and comparing it to the expected returns, to see if the group will under or over perform in comparison to the benchmark. The relative performance graph of annualised abnormal returns visualises how a portfolio which consists of the 73 overconfident firms performs in comparison to the S&P 500.

The average difference is 1,21%, which means a shareholder would have 1,21 percent more return if he or she invested in the index instead of an overconfident firm. The data shows the difference between the index and the return of the overconfident firms can fluctuate quite a lot. The annual difference between the overconfident firm returns in stocks and the S&P 500 is as follows:

Abnormal returns overconfident firms

| | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|-------------------|------|------|------|------|------|------|------|------|------|------|------|
| AVG OVERCONF FIRM | -3 | -20 | 36 | 24 | 28 | 22 | 8 | -38 | 35 | 11 | -10 |
| S&P 500 | -22 | 29 | 11 | 5 | 16 | 5 | -37 | 26 | 15 | 2 | 16 |
| Difference | -19 | 49 | -25 | -19 | -13 | -17 | -45 | 65 | -20 | -8 | 26 |

Created with Datawrapper

| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|-------------------|------|------|------|------|------|------|------|------|------|------|
| AVG OVERCONF FIRM | 12 | 25 | 1 | 7 | 3 | 13 | -14 | 18 | -0 | 18 |
| S&P 500 | 32 | 14 | 1 | 12 | 22 | -5 | 31 | 18 | 27 | -19 |
| Difference | 21 | -11 | 0 | 5 | 19 | -17 | 45 | 0 | 27 | -37 |

Created with Datawrapper

Table 7: The annual returns of the overconfident firms, the S&P 500 and the differences between the two values.

When looking at the annual differences, there is not a clear direction where the differences deviate to to be seen. The abnormal returns are seemingly random, given some outliers. Whether this is really the case can be tested via a regression with the appropriate control variables. The extreme acquirer returns raised suspicion of a possible gradual effect on returns of acquiring firms in how much firms they acquire. When separating the returns on stocks by amount of acquisitions , we get the following table:

Average return sorted by # of acquisitions

| | | | | | |
|------------|------------|------------|------------|------------|------------|
| 4 average | 5 average | 6 average | 7 average | 8 average | 9 average |
| 6,070 | 8,695 | 11,899 | 9,160 | 7,747 | 9,708 |
| 10 average | 11 average | 12 average | 13 average | 14 average | 15 average |
| 2,785 | 5,964 | -1,268 | 9,754 | 16,286 | 0,753 |

Table 8: Average returns of the last 20 years, sorted by amount of acquisitions/mergers. Returns seem to be inferior when acquisitions are numerous, except for the average of acquiring 14 firms.

Before we can regress we have to make sure the assumption linearity which is tested with the augmented component-plus-residual-plot and independence of errors is met given the random walk of stocks. An omitted variable test did not show any significant deviations from the null hypothesis of there not being a correlation between the error term and an independent variable. These tests can be found in Appendix B. The assumptions for linear regression laid down in the Gauss-Markov theorem are assumed. Next we will look at whether the coefficient is actually significantly negative, thus if an increasing amount of acquisitions has a negative impact on the cumulative abnormal returns. Firm Size is added as a control variable. This is done to account for the small minus big effect, which is from the Fama French three factor model. It is important to keep in mind the independent variable is a discrete variable. The value can only take on whole numbers which is important when interpreting the coefficient. The num_acquisitions coefficient has to be interpreted as the change in return on stocks when the company acquires one extra company in the defined period above, when the firm already acquired 4 or more firms.

Regression models, effect of number of acquisitions on stock returns

| VARIABLES | (1) Model 1 | (2) Model 2 |
|------------------|---------------------|---------------------|
| num_acquisitions | -0.350 (0.398) | -0.381 (0.397) |
| FirmSize | -0.0120 (0.0191) | -0.0288 (0.0233) |
| Valuecompany | | 0.454 (0.361) |
| Constant | 10.13*** (3.050) | 10.39*** (3.044) |
| Observations | 70 | 70 |
| R-squared | 0.015 | 0.038 |

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

*Table 9: MODEL 1: The coefficient of the number of acquisitions is negative, but not significant**. Neither is the coefficient from the control variable. R-squared shows that only a small amount of the variance is explained by the control variables and the independent variable.*

*MODEL2: Now both Fama French model variables are added in addition to the number of acquisitions: The turnover of the company and the Value of the company. While the coefficient of num_acquisitions is negative, it is not significant**. The constant is significant***. The constant cannot be interpreted, as firmsize and valuecompany are not suitable to become zero.*

With both the size and the value of the firm incorporated as a control variable, the coefficients have the expected direction, but are not significant. The R-squared is very low thus not a lot of the variance is explained. When the value of the company is added the coefficient of interest gets slightly more negative, but this does not bring any statistical significant changes in the results. The relation between the number of acquisitions and stock returns over the period 2002-2022 is insignificant.

CHAPTER 6 Discussion

The results in both studies were not in line with the expectations from the previously discussed literature. This can stem from different reasons. One is that the M&A culture in mainland Europe is significantly different from the more free market approach in England and the United States. This could mean the M&A market is much more efficient in these areas. The research has shown that it is not yet clear whether the overconfidence in M&A has the same effects as in the papers of Doukas (2007), Tate (2005), Heaton (2002), Billet, Qian, 2005) and others. Another factor can be that not all relevant factors are incorporated. While the third factor of the Fama and French three factor model could be incorporated, other control variables like industry (on SIC code) or a dummy variable may influence the result and would make the relation significant. The insignificant results will not eliminate my suspicion of the destructive factor of overconfidence in the arbitrary world of mergers and acquisitions. Another explanation can be that the thresholds for being included in the dataset were too strict given the high merger or acquisitions value needed. When the number of firms are higher there may have been a statistical significance to observe. The fact of having an insignificant relationship will not be considered enough proof that overconfidence and its consequences are absent in the EU and Swiss capital markets.

Considering the first study, it could be a sample that is too small to show such results on that level. The relation may be significant when more firms and peer firms are researched, while lowering the thresholds for a transaction to be counted as an acquisition or a merger. Especially in the paper by Doukas and Petmezas the amount of observations were much larger due to an event study with panel data.

CHAPTER 7 Conclusion

This paper aimed to show a relationship in overconfidence and underperformance in relatively large and influential firms in the mainland of Europe, predominantly the European Union. Whereas other financially important areas in the world have been studied, the European Union was under-represented in the relevant financial literature about behavioral biases and the consequences on financial transactions. With an important financial foothold in the world economy it is therefore important to look into this subject. Especially the Mergers and Acquisitions market, which is an economic activity with a lot of impact but without standardised metrics of valuation and comes down to negotiation and available information.

The measurement of overconfidence is done via the proxy of the amount of acquisitions. The first study was done via a two sample t test to look at the differences in return on assets. The second study by looking at differences in stock performance when acquiring more companies via a regression. The differences in both studies seemed to point in the direction of underperformance, but did not hold any statistical significance. This is why we can not conclude we can deviate from the null hypothesis entailing that there is no difference in the firms' performance whether a firm performs 4 or more acquisition deals or if a firm performs less than that threshold. Study 1 zoomed in on fewer firms but went into more detail about the firms' characteristics and similarities, while taking the individual number of M&A transactions into account. When the peers were paired and the difference was taken into account, a significant relation was not found after conducting a two sample t test. The second study aimed to discover a statistical significance in gradual underperformance when a firm took one more acquisition or merger. With a longer time horizon and a dependent variable of stock returns instead of return on assets (study 1) the dataset had an extensive and diverse group of influential European firms. After looking at the abnormal returns and a comparison with the most extreme acquirers in the dataset there was a suspicion of a potential relation. With firm value (market capitalisation) and firm size (turnover) accounted for the coefficient was calculated. After regressing the inflation corrected average returns against the number of acquisitions the expected significant relation did not exist.

What we can conclude from these results is that it can not be denied overconfidence has an influential impact on the transactions of firms, but there is a hint that more variables and factors may play a role in the performance of these firms which makes it difficult to measure the exact effect of these transactions. Especially because R squared did show there is still a lot of unexplained variance in the stock performance in the second study. The arbitrary and sometimes irrational merger and acquisition market may need more specific modelling or controlling to really capture these effects with statistical significance, while the theory and aggregated differences already point in the expected direction.

This paper creates awareness for the managers in Europe to look out for the potential pitfalls they can manoeuvre their firms into and is seeking to prevent an emotional decision above rational quantitative estimations when performing transactions in the world of M&A.

7.1 Limitations

For further research it may be better to include more firms, especially for the first study. The actual number of overconfident firms that were compared were not as numerous as I would like, namely because of time constraints given the time intensive efforts to collect a lot of characteristics for each overconfident firm. Maybe the comparison can include even more characteristics from the firm, such as a transparency score and other leading scores from research agencies to even further account for other omitted factors. Another issue is the fact that the P/L before taxes may not have been a good characteristic when selecting peer firms, because that variable is predictive for the profitability of the company. This is not desirable when we search for differences in this profitability via the Return on Assets.

As for study 2, the limitation is that a lot of the variance is still not explained. This may be solved by adding dummy's, more control variables and maybe even some interaction effects.

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For the return on assets several sources were useful: Orbis, Yahoo finance, WSJ Annual report van RSW, DBG, hergreaves lansdown: Zurich insurance, morningstar Vivendi SE,

APPENDIX B Statistical checks study 2

| acquiror_name | mean | min | max |
|------------------|----------|--------|--------|
| BANCO DE SABADEL | -1.5555 | -65.96 | 68.93 |
| BNP PARIBAS SA | 6.86 | -59.24 | 90.14 |
| DANONE SA | 2.957619 | -29.67 | 29.06 |
| DSV A/S | 27.85571 | -49.44 | 111.97 |
| S&P 500 | 9.526667 | -36.81 | 32.39 |
| TELEFONAKTIEBOLA | 4.059048 | -85.18 | 111.48 |
| VEOLIA ENVIRONNE | 5.808572 | -64.45 | 68.97 |
| Total | 7.995274 | -85.18 | 111.97 |

Table 12: The average of the annual returns of the heavy acquirers in comparison to the S&P 500 (alphabetical order). Apart from the outlier DSV, the companies have a lower mean of returns in comparison to the benchmark. Could hint at a possible needed exclusion for DSV.

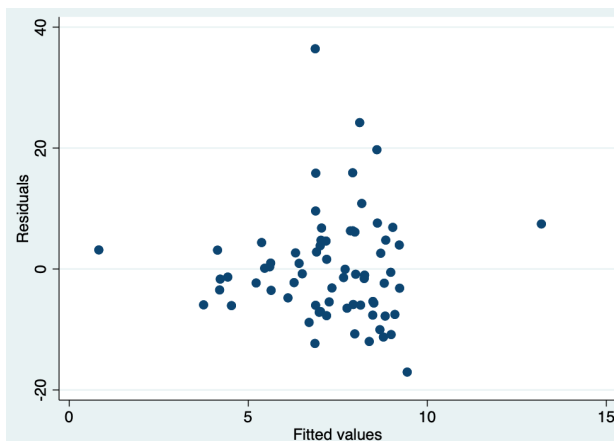


Figure 5: Test for heteroskedasticity by plotting residuals in a box plot. The expectations of a random cloud of residual values are met thus heteroskedasticity can be assumed.

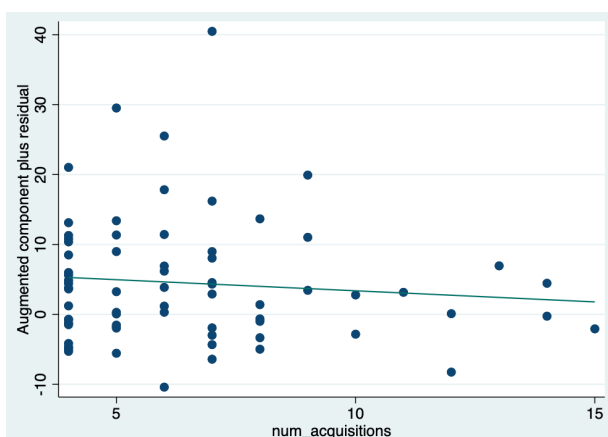


Figure 6: Test for linearity of the dependent variable num_acquisitions and the returns. No hints to another relation are found.

| Variable | VIF | 1/VIF |
|--------------|-------------|-----------------|
| FirmSize | 1.52 | 0.658519 |
| Valuecompany | 1.49 | 0.669113 |
| num_acquis~s | 1.02 | 0.979825 |
| Mean VIF | 1.34 | |

Table 20: The VIF test for multicollinearity between the variables in study 2. Values close to 1 indicate very low multicollinearity. From 5 we have to look at a potential effect between predictors. The values are close to one so it can be assumed that multicollinearity is very improbable.