Master thesis

"Time to take risks! CEO overconfidence in their propensity to undertake M&As and the role of economic business cycles"

Supervisor: A.M. Nadolska-Den Ouden A.

2nd examiner: dr. Wierenga M.

Max R. van Middendorp - S1080906

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Abstract

This research aims to improve the understanding of the impact of overconfidence on the risk-taking propensity of CEOs by assessing the propensity to undertake mergers and acquisitions (M&A). The study examines a sample of 258 observations from AEX-listed firms from 2005 to 2017. Furthermore, the research proposes that this relationship depends on the different phases of the business cycle, namely expansionary and recessionary periods. The theoretical framework guiding this research draws upon four behavioural perspectives: the hubris hypothesis, the mechanisms of overconfidence, the upper echelons theory, and the process perspective. To analyze the data, this study employs cross-sectional binomial logistic regression models. The main finding of the research suggests that higher levels of CEO overconfidence are positively related to risk-taking, reflected in the likelihood to undertake M&A. However, this relationship depends on the phases of the business cycle. During expansionary phases, the positive relationship is reinforced, while during a recessionary phase, the relation becomes negative. The findings offer valuable insights for both board directors and researchers seeking to understand the complex interplay between overconfidence, risk-taking behaviour, and macroeconomic cycles.

Keywords: Overconfidence, M&A, Economic business cycle, Upper echelon theory, Process perspective

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1. Introduction

The CEO is widely recognized as one of the most influential figures within the firm. They possess the ability to steer the company's trajectory through their decision-making process. A recent example of such a transformation is Facebook's shift into Meta, as CEO Mark Zuckerberg endeavours to transition the social media platform into a metaverse. Meta has employed a strategy of acquiring companies like Oculus and Mapillary, despite facing significant shareholder revolt (Kucheriavyi, 2022). Scholars have, in light of this risk-taking, questioned whether overconfident CEOs tend to undertake more mergers and acquisitions (M&A) than their rational counterparts (Brown & Sarma; 2007; Burkhard et al., 2022; Gu, 2023; Hoskisson, 2017; Malmendier & Tate, 2008).

Academic M&A literature proposes two main motives for executives to apply M&A as a strategic decision. The first motive arises due to agency conflicts, which claim that executives pursue acquisitions for the sake of firm growth rather than shareholder maximization. This arises from the desire for larger private benefits (Jensen, 1986). The second motive for executives to pursue M&A is managerial hubris (Roll, 1986), which suggests that managers are biased by overestimating future and potential synergies generated from M&A deals. Respectively, it is important to realize the 'CEO-centric' scope of this research. This paper acknowledges that overconfidence does not solely influence the decision to undertake M&A. While the CEO is in charge of the company, M&A include many antecedents, including, but not limited to, key figures in the organization, internal stakeholders, firm characteristics, technological capabilities, and environmental characteristics (Opoku-Mensah et al., 2019; Tidd & Trewhella, 1997).

Managerial hubris, which refers to overconfidence, is recognized as one of the most prevalent managerial biases (Heaton, 2002; Burkhard et al., 2022). The traditional definition of overconfidence refers to an excess of confidence in one's abilities, or judgement that is not justified. Similarly, CEO overconfidence refers to the established definition coined in psychology literature; the "better-than-average" effect (Larwood & Whittaker, 1977; Svenson, 1981). In plain English, this is the process in which an individual overestimates his/her relative skill to the average. Interestingly, overconfidence is not seen as an agency problem, as overconfident CEOs believe that they are acting in the best interest of the shareholder (Niu, 2010). According to this logic, CEO overconfidence stems from the illusion of control, a high degree of commitment to specific results and abstract reference points (Weinstein, 1980). In turn, this leads overconfident individuals to pursue risky endeavours including, but not limited to, M&A, research and development (R&D) investments, innovation, diversification, and financial leveraging. In this sense, strategic risk-taking is concerned with making significant decisions that have critical implications for a firm's future, particularly in terms of capital investments (Kolev & McNamara, 2022). Accordingly, a meta-analysis by Hoskisson et al. (2017) developed a theoretical framework for the types of managerial risk-taking. The authors conclude that overconfident executives take on excessive M&A risk in terms of transaction values and premiums. However, excessive risk-taking in the context of M&A may be broader. An explanation for this can be derived from the hubris hypothesis proposed by Roll (1986) which has only been infrequently subjected to direct empirical testing (Brown & Sarma, 2007). Due to this, much can still be theorized about the influences of overconfidence on the propensity to undertake M&A. To address this gap, this research introduces the propensity to undertake an M&A as an additional type of managerial risk-taking. Respectively, M&A propensity in the context of managerial risk-taking provides insights into how a CEO perceives risk and evaluates outcomes (Malmendier & Tate, 2008). Although scholars found that CEO overconfidence is associated with a higher probability to pursue M&As (Brown & Sarma, 2007; Malmendier & Tate, 2005). Large heterogeneity exists across studies of overconfidence (Burkhard et al., 2022; Hoskisson et al., 2017). A possible explanation may be the lack of a uniform academic standard for measuring CEO overconfidence (Brown & Sarma, 2007; Hayward & Hambrick, 1997; Malmendier & Tate, 2005). In this light, this research will adopt a different measure of overconfidence to evaluate if the positive relationship on M&A propensity holds. By doing so, this paper will contribute to the literature by emphasizing the importance of considering the cognitive biases of CEOs in understanding the decision-making process.

Interestingly, A meta-analysis by Hoskisson et al. (2017) adopting the Upper Echelons Theory (UET) process perspective found several moderating factors influencing the relationship between CEO characteristics and risk-taking. One of these moderating factors is the environment, which includes *environmental dynamism, complexity, and munificence*. Additionally, it is widely acknowledged by scholars that dynamic environments necessitate creativity and agility in decision-making (Glick et al., 1993; Hambrick et al., 1998). Accordingly, this paper introduces macroeconomic business cycles as an environmental factor. The definition of a business cycle refers to the fluctuating phases of economic growth and contraction. This can be identified by a recurring pattern of four phases; 1) a peak which ends a period of expansion, 2) a contraction period which follows after a peak, 3) a trough which ends a period of contraction, and 4) an expansion period which follows after a trough (Navarro et al., 2010; Reyes et al., 2022). To put this in context, the detrimental nature of economic recessions requires management to prepare accordingly for significant selection pressures due to market complexity and reduced environmental munificence (Latham & Braun, 2011; Reyes et al., 2022). While there is a substantial amount of literature on improving performance in the business cycle (Conti et al., 2020; Navarro et al., 2010; Urbano et al., 2019), the inclusion of psychological biases on decision-making remains largely unexplored in the current literature (Reyers et al., 2022). This research aims to contribute to the strategic decision-making literature and behavioural finance by evaluating whether the relationship between overconfidence and strategic risk-taking depends on its environment, responding to the call to include contextual factors in future research (Burkhard et al., 2022; Hoskisson et al., 2017; Reyes et al., 2022). In this respect, the research will further refine the UET process perspective by highlighting the need to consider situational factors, in our case macro-economic cycles, in understanding the outcomes of overconfident decision-making behaviour. Finally, this paper contributes to the theoretical domain by suggesting that traditional analysis of strategic decisions should incorporate the complexity of behavioural assumptions and contextual factors during the decision-making process for suggesting optimal strategies.

This study aims to examine how CEO overconfidence impacts the propensity to undertake M&A as a proxy for strategic risk-taking while taking the phases of the business cycles into account. By considering the UET process perspective, it can be argued that the main effect of CEO overconfidence on the propensity to undertake M&A varies under different phases of the business cycle. The sample for this research consists of 258 observations from companies listed on the AEX between 2005 and 2017, with each year scored based on whether an acquisition occurred. The primary objective is to investigate whether CEO overconfidence impacts the propensity to undertake M&A under the influence of business cycles. Thereby, the research question addressed in this paper is:

How does CEO overconfidence impact M&A propensity as a proxy for strategic risk-taking, and how does this relationship depend on expansionary and recessionary business cycles?

For practical relevance, this study aims to advance the understanding of how behavioural biases impact strategic decision-making and how these depend on dynamic environments. By understanding overconfidence from a behavioural perspective, firms can take on more rigorous evaluation criteria which mitigate biased decision-making. Additionally, providing insights into the risk-taking of the overconfident CEO depends on the phases of the business cycles. Firms can further refine their risk assessment and due diligence practices. Finally, when considering high-profile risk decisions, such as M&A, the introduction of investment policies which acknowledges behavioural elements as well as contextual dynamics may ensure a more objective evaluation of risk and rewards.

The structure of this paper is organized as follows. Section 2 provides the literature review, theoretical analysis, and proposed hypotheses. Section 3 outlines the methodology applied in this study. Section 4 presents the results. Section 5 includes the discussion, limitations, and directions for future research. Finally, Section 6 concludes this research.

2. Theory and hypothesis

2.1. CEO overconfidence and strategic risk taking

The relationship between CEO overconfidence in a firm's strategic risk-taking practices has been a well-studied phenomenon. In general, researchers agree that overconfidence increases a CEO's strategic risk-taking behaviour (Burkhard et al., 2022). CEOs believe that strategic outcomes are under their control. This results in overconfident CEOs being more committed to achieving high performance which is reflected in their behaviour. Moreover, risk-taking decisions are inherently uncertain and complicated (Jones, 1999) and their success is affected by external factors resulting in abstract reference points (Chen et al., 2014).

Scholars of behavioural economics and finance found that overconfidence biases a CEO's decisions, resulting in excessive investment in projects and underestimating risk (Trucco Vera, 2017). Additionally, more prominent research in behavioural economics and finance found that overconfidence demonstrated negative performance effects on projects, acquisitions, and predicting outcomes (Roll, 1986; Malmendier and Tate, 2005, 2008; Chen et al., 2015; Ho et al., 2016). Accordingly, overconfidence harms the quality of decisions taken while reducing the ability of decision-making (Russo & Schoemaker, 1992). However, some studies suggest that overconfidence may actually result in positive performance outcomes such as optimal risk investment policies, leading to better risk-taking decisions and a more effective investment policy for firms (Gervais et al., 2011; Hirshleifer et al., 2012). Despite these findings, in the studies of overconfidence in behavioural corporate finance we see several limitations. Most of the studies are focused on firm outcomes and propose overconfidence as a moderator. This research aims to evaluate overconfidence as an antecedent for risk-taking action. For this, we need additional theory explaining how psychological CEO characteristics explain strategic risk-taking.

2.1.1. Upper echelons theory

UET can help researchers explore how CEO attributes affect a firm's strategic decisions and firm performance (Hambrick, 2007). The executive's construct of reality is formed by two personality factors: psychological traits and observable experiences. These characteristics form the main focal point to get a better understanding of managerial risk-taking (Hoskisson et al., 2017). UET suggests that increasing complexity in decisions, for example, during large capital expenditures increases the role of the decision-maker's attributes (Ting et al., 2015). Furthermore, UET emphasizes that leaders are characterized by bounded reality and that they make decisions based on cognitive, social, and physiological characteristics (Burkhard et al., 2022; Ting et al., 2015). The bounded reality theory (Simon, 1990) hypothesizes limitations on the information-processing ability of an individual. Bounded rationality assumes that actors are goal-oriented while taking the cognitive constraints of the decision-maker into account. On top of that, the environment is perceived as uncertain which implies that one cannot estimate the result of their decisional consequences (Jones, 1999). Hambrick and Manson (1984) proposed examining observable background characteristics for instance, studies adopting this approach have found that CEO risk-taking propensity is influenced by CEO tenure, age, education, origin, and compensation (Jaw & Lin, 2009; Lee et al., 2018; Lee & Moon, 2016; Lin & Cheng, 2013; Zhang & Rajagopalan, 2010).

2.1.2. Mechanisms of CEO overconfidence enabling strategic risk-taking

This section tries to provide a clear understanding of the underlying mechanisms of overconfidence and how this relates to strategic risk-taking. In this section, I draw on a meta-analysis by Burkhard et al. (2022) who introduced three underlying mechanisms for overconfidence.

The *cognitive* mechanism emphasizes that CEO overconfidence involves weighing and sampling possible outcomes and assessing their relative attractiveness during judgement (Blanton et al., 2001; Chatterjee & Hambrick, 2007). Overconfidence can occur when people selectively focus on evidence that is consistent with a conclusion (Blanton et al., 2001). Supporting this premise, Burkhard et al. (2022) mention that overconfidence leads to inaccurate judgements of possible outcomes because CEOs tend to overestimate their control and chances of success. This is also supported in psychological literature which links overconfidence with the illusion of control and unrealistic optimism towards the future (Skala, 2008). According to Chen et al. (2015), overconfident CEOs underestimate the influence of the external environment due to these cognitive biases. CEOs who are excessively confident may struggle to make accurate assessments of the skills required to accomplish their goals. Their optimistic self-perceptions and beliefs about their circumstances may cause them to believe that certain outcomes are more attainable than they are (Burkhard et al., 2022). Thus, from the cognitive mechanism overconfidence leads to an increased sense of control which makes riskier decisions more likely to occur.

The *motivational* mechanism is grounded in social cognitive theory, which exposes the importance of self-efficacy beliefs in facilitating progress (Skala, 2008). Scholars in the motivational domain often express that overconfident individuals tend to exhibit a better-than-average belief. Which is associated with positive self-views and the overestimation of one's abilities while attributing failures to external factors or bad luck (Logg et al., 2018; Weinstein & Klein, 1995). Self-efficacy beliefs play a critical role in determining an individual's motivation which translates to the amount of effort someone will exert to achieve a certain goal, as well as their ability to persist in the face of setbacks (Bandura, 1989). According to Stone (1994), overconfidence can be partly derived from self-efficacy beliefs, as self-efficacy positively biases self-evaluation as a result of seeking confirming rather than non-proving evidence (Moores & Chang, 2009). This leads people to overestimate their ability to perform a task. Therefore, overconfident CEOs are more likely to set higher goals as they perceive themselves as better-than-average, while also allocating more effort to achieve these goals. Thus, from the *motivational* mechanism overconfidence leads to the overestimation of one's abilities and consequently higher goal setting which makes riskier decisions more likely to occur.

The *social* mechanism derives from role theory. Role theory by Biddle (1986) emphasizes its focus on the interactivity within social exchange patterns. A meta-analysis by Georgakakis et al. (2022) suggests that the main task of the CEO is to act as a leader of a firm who through his/her behaviour, leadership style, and psychological attributes can influence the behaviour of other upper echelons. Consequently, this makes internal stakeholders more likely to endorse strategic risk-taking (Anderson et al., 2012; Locke & Anderson, 2015). Moreover, people tend to participate less in a discussion when they interact with a powerful individual who exhibits confidence, which a CEO can utilize to control decision-making processes (Locke & Anderson, 2015). Thus, from the *social* mechanisms, overconfidence can give rise to a perception of being a capable leader even when facing risky strategies.

This perception can influence internal stakeholders to endorse risk-taking and support the plans of the CEO. Consequently, the likelihood of making riskier decisions increases.

2.1.3. Overconfidence and M&As

The theory in the previous sections summarizes the risk-taking process of overconfident executives. I also briefly touched upon how economic and finance scholars interpret this irrational behaviour of executives and the consensus remains largely with negative firm outcomes (Malmendier and Tate, 2005, 2008; Chen et al., 2015; Ho et al., 2016). However, the question remains as to how overconfidence influences the propensity to undertake M&A. This section seeks to evaluate the scholarly progress on the relationship between overconfidence and M&A propensity and will conclude with the first hypothesis.

According to Brown and Sarma (2007) and Malmendier and Tate (2008) CEO overconfidence has a significant impact on corporate acquisition decisions for various reasons. Firstly, research indicates that overconfident CEOs are more likely to pursue diversifying acquisitions than their rational counterparts. Consequently, such acquisitions have often been linked to the existence of managerial overconfidence (Malmendier & Tate, 2005; Brown & Sarma, 2007) Overall, their results suggested that the probability of overconfident CEOs undertaking acquisitions was 1.6 percentage points higher (Brown & Sarma, 2007). Secondly, according to Malmendier and Tate (2008), overconfident CEOs experience 65% more odds to make an acquisition. Finally, the most recent research on overconfidence and M&A propensity conducted by Gu (2023) found that overconfidence promotes the propensity to pursue business opportunities for M&A in emerging markets. The argument presented by the authors is that the decision-making behaviour of M&A is inevitably influenced by the characteristics of the executives involved. This is because executives are not purely rational in their decision-making process and are subject to cognitive biases, particularly overconfidence, which can lead to overestimation of success and underestimation of control and failure. This perspective is supported by research on M&A, which has consistently highlighted overconfidence as a persistent bias that is indicative of *bounded rationality* (Gu, 2023; Hambrick & Manson, 1984; Hossain, 2021; Jones, 1999).

Next, this paper draws on the mechanisms of CEO overconfidence (see Section 2.1.2) proposed by Burkhard et al. (2022). To explain why overconfident CEOs are more likely to undertake a M&A. Firstly, The *cognitive* dimension. Ho et al. (2016) discovered that overconfident CEOs are more likely to increase their leverage during expansions compared to their rational peers, which supports the idea that overconfident CEOs overestimate their control and chances of success due to inaccurate perceptions of possible outcomes. Additionally, Chen et al. (2015) argue that overconfident individuals underestimate the influence of the external environment due to their cognitive biases. Lastly, Mueller and Brettel (2012) demonstrated that overconfidence affects investment behaviour of individuals. Secondly, The *motivational* dimension emphasizes that overconfident CEOs hesitate to consult others about the decision-making process as they suffer from the better-than-average effect. This translates into the belief that others cannot make the same high-quality decisions (Kausel et al., 2015). Therefore, as a result of self-efficacy beliefs CEOs will engage in higher goal setting which can induce a higher propensity to undertake M&A. Thirdly, the *social* dimension emphasizes that overconfident individuals can leverage their perception of competent and persuasive leaders, which makes internal stakeholders more likely to endorse strategic risk-taking practices (Anderson et al., 2012; Locke & Anderson, 2015). Overconfident individuals can thus opt for a centralized decision-making style (Reyers et al., 2022). This process involves the CEO attracting like-minded executives in terms of values and beliefs (Van der Steen, 2005). This type of decision-making will allow the CEO to invest in risky projects, such as M&A, without much resistance from opposing executives.

In sum, scholars found that the propensity to undertake M&A is higher when CEOs are overconfident due to the underestimation of risk and overestimation of future outcomes which biases their decision-making. Overconfident CEOs engage in excessive risk-taking due to multiple factors that align with the underlying mechanisms of overconfidence, as proposed in Section 2.1.2, and with the premises of UET. Firstly, the *cognitive* dimension of overconfidence leads to overestimation in future outcomes, control, and chances of success resulting in more risk-taking. Secondly, the *social* dimension of overconfidence indicates that CEOs have high self-efficacy beliefs resulting in the overestimation of their abilities and high goal setting, thus leading to more risk-taking. Thirdly, the *motivational* dimension of overconfidence increases the likelihood that internal stakeholders endorse the risk-taking practices of the CEO while providing continued support to the CEO. Finally, *bounded rationality* assumes that complex decisions, such as M&A, magnify the importance of the decision-maker's attributes. This in turn will result in more risk-taking if the CEO is overconfident. Therefore, I hypothesize the following:

H1: *Firms with overconfident CEOs will experience a higher propensity to undertake M&A than those with non-overconfident CEOs.*

2.2. Business cycles in the literature

From an international business perspective, the business cycle is an interesting phenomenon to include when analyzing M&A propensity. Respectively, a significant number of M&A transactions have a cross-border nature (Financier Worldwide, 2023). According to Berge (2012) "the degree to which business cycles are now internationally synchronized has increased significantly over the past 20 years, due in part to closer economic ties between countries" (p. 30). Business cycles are identified as the *peaks* and *troughs* that frame the cyclical movement of the economy. Therefore, expansions occur between a through and a peak, and recessions occur between a peak and a trough. An expansion is the normal state of the economy and is expected to last for several years. During a recession, there is a significant decline in economic activity for more than a few months to more than a year.

Financial crises highlight the importance of understanding how businesses deal with the changing macro environment. The financial literature seems to agree that business cycles can indeed be associated with changing behaviour. Previous research found that managerial risk-taking depends on the state of the economy (Arif & Lee, 2014; Habib & Hasan, 2017). For example, periods of *expansion* consisting of high growth forecasts and easier access to capital are more likely to be accompanied by high risk-taking. Contrasting to this, periods of *contraction* might result in less optimal risk-taking (Mclean & Zhao, 2014).

Interestingly, UET never gave significant attention to business cycles and researchers also seem to agree with the lack of unification in business cycle research. There is a substantial amount of literature on improving performance in the business cycle (Conti et al., 2020; Navarro et al., 2010; Urbano et al., 2019), yet the inclusion of psychological biases on decision-making is unexplored in the current literature (Reyers et al., 2022). Additionally, Sirola (2020) argues that the state of the economy shapes individual concerns and behaviour in profound ways. Therefore, this is a fundamental shortcoming in UET as its process perspective emphasizes *contextual factors* that moderate the connections between CEO attributes and risk propensity (Burkhard et al., 2022). A meta-analysis by Hoskisson et al. (2017) found several moderating factors influencing the relationship between CEO characteristics and risk-taking. One of these factors is the environment which consists of environmental dynamism, complexity, and munificence. The business cycle in this respect affects the evolution of an industry's competitive dynamics, thus altering the level of environmental resources and, as a result, competitive pressure (Reyers et al., 2022; Urbano et al., 2019). For example, the detrimental nature of economic recessions requires management to prepare accordingly for significant selection pressures due to market complexity and reduced environmental munificence (Latham & Braun, 2011). From this I expect business cycles to have a moderating effect on the relationship between overconfidence and M&A propensity. The following sections will elaborate on the type of relationships expected during a *recessionary phase* and an *expansionary phase.*

2.2.1. The effect of CEO overconfidence on M&A propensity during expansions

Expansion years can be characterized by the availability of capital in the markets. For example, during Covid-19 in 2020, central banks collectively lowered interest rates to 0% meaning businesses could freely borrow money to fund their capital investment endeavours. Large capital injections, such as those during 2020, are also associated with GDP growth. For example, world GDP growth rates grew by 5.87% in 2021, which is the highest economic growth since 1973 (Macrotrends, n.d.). An increase in credit generally goes hand in hand with an increase in real output, consumption, and rising share prices until it reaches its turning point (Reyers et al., 2022).

The dynamic nature of economic business cycles has been associated with different investment patterns (Mueller & Brettel, 2012; Reyes et al., 2022). Respectively, business cycles affect the evolution of an industries competitive dynamics, altering the levels of environmental munificence and consequently, competitive pressures. In turn, during periods of expansion, the mechanisms of overconfidence are reinforced as numerous investment opportunities are at hand, which leads overconfident CEOs to increase their investments more than their rational peers, as they expect greater returns and perceive lower risk. Earlier research found that during expansionary phases performance is enhanced which translates to positive feedback resulting from the decisions of overconfident CEOs (Reyes et al., 2022). This allows the CEO to bring their overconfident bias into action.

Overall, the argumentation is consistent with Reyers et al. (2022) and Burkhard et al. (2022) that the overconfidence mechanism will be reinforced during expansionary periods. Additionally, due to the availability of capital, industry munificence, and reduced selection pressures overconfident CEOs will have more discretion to take excessive risks, thus I hypothesize the following:

H2: *During expansionary periods, firms with overconfident CEOs experience a higher propensity to undertake M&A than those with non-overconfident CEOs.*

2.2.2. The effect of CEO overconfidence on M&A propensity during recessions

Recessions can be characterized by declines in investments, imports, exports, equity prices, job shedding, severe imbalances between supply and demand, shifts in ownership and a decrease in consumer confidence which makes consumers reluctant to increase their debt (Geroski & Gregg, 1993; Claessens et al., 2009). Credit contractions, which happen after a sustained period of careless and inappropriate lending, have a severely strong adverse effect on investments, therefore, firms with high debt positions are more likely to be negatively affected by crisis events (Claessens et al., 2009).

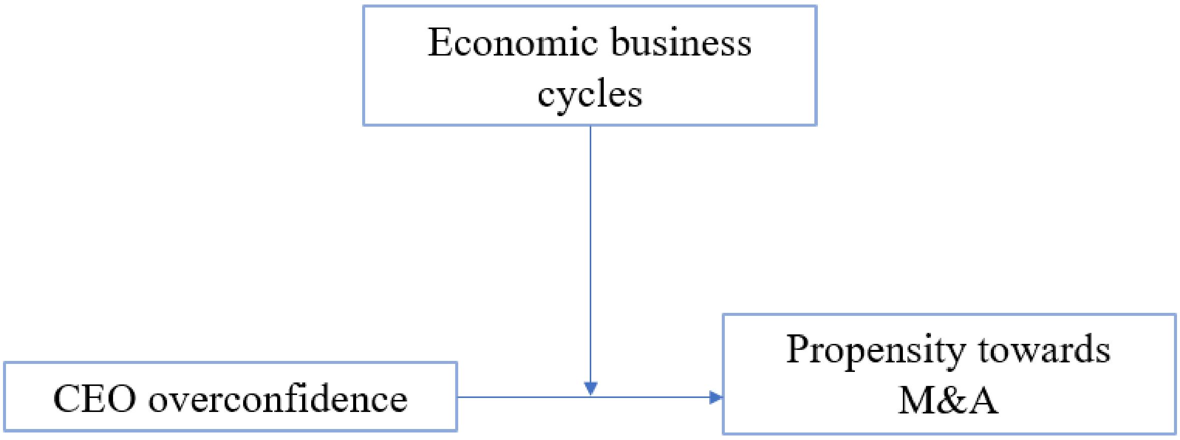
One might expect after reading Section 2.2.1 that overconfident CEOs would have a higher propensity to undertake M&A compared to their rational peers and thus disregard most environmental dynamics during a recession. However, research suggests that environmental dynamics in the instance of a recession can serve as a reversing factor in the risk-taking behaviour of overconfident CEOs. There are multiple reasons why researchers adopting a UET process perspective argue a shift in the relationship of the risk-taking propensity of overconfident CEOs. According to Mueller and Brettel (2012), overconfidence reduces a manager’s ability to perceive risk correctly. When executives have a high amount of internal funding during an expansionary period overconfident executives are encouraged to undertake M&A (Mueller & Brettel, 2012). As mentioned earlier, overconfident CEOs are influenced by the mechanisms of CEO overconfidence (Burkhard et al., 2022) and thus tend to overinvest during expansionary periods due to an overestimation of targets and an underestimation of risks. This in turn reduces organizational flexibility (Mintzberg, 1980; Trucco Vera, 2017). Organizational flexibility is concerned with the issue of overinvestment during recessionary phases which causes firms to be less able to adapt and modify their functioning (Tang et al., 2018). In this sense during recessions, overinvestment behaviour present during expansions results in reversing effects making it difficult for firms to adapt and modify their strategies.

In sum, the effect of overconfident CEOs on the propensity to undertake M&A during a recession highlights the decreases in organizational flexibility and financial flexibility due to mechanisms of overconfidence and the increase of leverage during expansionary periods. The unfavourable position caused by overinvestment reduces the options of overconfident CEOs to undertake M&A during recessionary periods resulting in a contrasting effect. Therefore, this paper proposes the following two hypotheses:

H3: *During recessionary periods, firms with overconfident CEOs experience a low propensity to undertake M&A relative to their rational peers.*

Figure 1

Conceptual framework



3. Data and measurement

3.1. Sample, data collection and analysis

The Netherlands Code of Conduct for Research Integrity (2018) served as the foundation for the ethical evaluation of this research. See Appendix A for a description of how the research integrity is reflected in this research. The hypotheses in this study were tested on a sample of firms that were listed on the AEX stock exchange between 2005 and 2017. The selection of AEX-listed firms is based on the availability of data needed for the dependent variable. Additionally, the choice for the observation period was influenced by the accessibility of digitalized annual report data and a lack of accessibility to annual report databases of earlier periods. This study will examine how the likelihood of M&A is influenced by CEO overconfidence at the two different phases of the business cycle. Observations will be included if they meet the following criteria: (i) the firm was listed on the AEX stock exchange between 2005 and 2017; (ii) the firm will be included from its listing year up until its delisting year; and (iii) the firm in question has data available about its M&A activity during the period of observation. Additionally, financial firms (SIC 6000-6999) will be excluded due to their complex regulatory framework and specific risk profiles. To ensure meaningful deals, the transaction value of respective M&A should be at least 1 million USD and should be categorized as majority-stake acquisitions after the completion of the deal. The above-mentioned criteria resulted in a list of 35 unique firms, which can be found in Appendix B, and 60 unique CEOs which can be found in Appendix C. The study adopts a cross-sectional method rather than a panel method due to the extremely unbalanced characteristics of the dataset. In this sense, acquisitions will be the unit of analysis of participants on the AEX stock exchange between 2005 and 2017 and will result in 258 observations, respectively. Between 2005 and 2017 the European economy was dominated by expansions from its founding in 1999 but had two recessions: the Great Recession of 2008 to 2009, and the European Sovereign Debt Crisis of 2011 to 2012.

Data will be gathered from six different sources: BoardEx, Refinitiv, ECB Statistical Data Warehouse, NBER, annual reports, and the zephyr database. Information about *CEO attributes* will be collected from BoardEx. This database provides information on CEO attributes such as age, gender, and tenure. Additionally, if data is missing in the BoardEx database, annual reports will be consulted as they often include this information. *Firm characteristics* will be collected from Refinitiv as this database provides financial data, including firm size, return on assets, and leverage for a large sample of public companies worldwide. To evaluate *interest rates* this paper used the ECB Statistical Data Warehouse. The independent variable *overconfidence* will be collected by analysing annual reports of AEX-listed firms. AEX-listed firms are required by Dutch law to report the compensation structure of top executives and thus contain all necessary details about fixed salary, and cash bonuses. *M&A propensity* will be collected through the zephyr database. Finally, this paper will collect information about EU *recessions* and *expansions* from the NBER.

The data will be analyzed using the statistical program SPSS version 28. The dataset will be checked on descriptive statistics, the assumption of multicollinearity, and the assumption of linearity of independent variables and log odds. After data inspection, all continuous variables will be standardized to ensure comparability between variables. The variables are then included in a binomial logistic regression analysis to determine the best model. The significance level for model fit will be set at 0.05 and significant relationships may vary from 10%, 5%, and 1% significance levels. Finally, a robustness analysis of influential observations will be executed to ensure the results of the logistic model hold.

3.2. Dependent variable: M&A propensity

The propensity to undertake M&A will be coded as a dummy variable that represents whether M&A have taken place in a given year. Therefore, the coding of M&A propensity is such that if a company acquired another company during the respective year, it is denoted as 1, and if not 0. Given the dummy nature of the dependent variable, the hypotheses use a maximum likelihood estimator.

Limitations of this measure are mostly concerned with the binary nature of the dependent variable. It will be hard to distinguish between firms that did only one versus five acquisitions in a respective year. Nevertheless, earlier research by Brown and Sarma (2007) confirmed the validity and reliability of the dichotomous measure.

3.3. Independent variable: CEO overconfidence

There is no uniform academic standard for measuring CEO overconfidence (Brown & Sarma, 2007; Hayward & Hambrick, 1997; Malmendier & Tate, 2005). Therefore, one of the key challenges in this study is the operationalization of CEO overconfidence/hubris. This study adopts the operationalization introduced by Hayward and Hambrick (1997) who argue that a CEO's relative compensation compared to other top managers can be used as a proxy for CEO overconfidence. The authors argue a larger gap in compensation reveals that the CEO believes his/her contribution is extremely valuable and thus indicates a higher likelihood of hubris. Previous research tested whether the salary-based evaluation method was able to capture the characteristics of the hubris hypothesis. Zhang et al. (2020) confirmed that CEOs tend to be more hubristic when their salary is much higher than other top managers (Brown & Sarma, 2007). Additionally, the researchers applied the measure of CEO compensation as a robustness check against the CEO media praise measure which resulted in similar results.

To measure CEO overconfidence using the salary-based method this paper adopts the approach introduced by Hayward and Hambrick (1997), a measure which is calculated using the CEO's cash compensation divided by the compensation of the second-highest paid officer. Cash compensation in this research is defined as the annual fixed cash salary + short-term cash bonus. Dutch law obliges public companies to list the compensation structures of their executives and thus data will be collected from the annual reports of each company.

3.4. Moderating variable: firm business cycles

The economic business cycle is operationalized as a dummy variable that takes the value of 1 during a recession and 0 otherwise (Reyes et al., 2022). Recession data from the NBER is released every month and has to be transformed as the observations are based on years. This means that a year will be classified as a recession if the year contains at least two consecutive quarters of GDP contraction. Thus, in the applied period of 2005 to 2017, the following years can be considered as recession years: 2008- to 2009, and 2011 to 2012.

3.5. Control variables

This paper controls for several variables at the CEO level, firm level, and macroeconomic level. At the CEO level, individual characteristics of the CEO should be controlled, since these characteristics are directly observable and may be used as a selection criterion for the choice of CEO for the board (Reyes et al., 2022). More specifically, this paper controls for tenure, age, and gender as many researchers seem to agree that these variables affect risk-taking (Benischke et al., 2019; Burkhard et al., 2022; Connelly et al., 2020; Jeong & Harrison, 2017). Respectively, *CEO Age* (AGE) will be measured as a numerical value that identifies the CEO's birth year and is subtracted from the fiscal year. *CEO Gender* will be a dummy and takes the value of 0 if the CEO is female and 1 if the CEO is male. *CEO tenure* will be defined as the number of years the CEO carries the position within the firm.

This paper also accounts for firm-specific variables, which the literature documents as having a high correlation with CEO overconfidence (Hatoum et al., 2022). Therefore, by introducing these controls the effect of the CEO's overconfidence on the firm's decision-making in M&A can be further isolated. In addition, firm size, leverage, and return on assets are important factors that can influence a firm's strategies and decisions (Reyes et al., 2022; Sen & Tumarkin, 2015). Respectively, *firm size* (SIZE) will be measured in total assets. *Return on assets* (ROA) is calculated as the net profit divided by the total assets of the firm. The *firm leverage ratio* (LEVERAGE) is measured by the total financial debt divided by total assets.

Finally, this paper controls the macroeconomic level by including interest rates (INTEREST), since the ECB can influence borrowing costs and spending decisions of businesses through interest rates (Reyes et al., 2022). An overview of all the variables applied in this research can be found in Appendix D.

3.6. Analysis approach

The effect of overconfidence and business cycles on the dependent variable is tested with a binomial logistic regression. Since the propensity to undertake M&A is a dichotomous variable the maximum likelihood estimation of logistic regression is most applicable to test the hypotheses. The model will be built using the enter function in SPSS and will be done in the following way:

Block 1:

$$\text{M\&A propensity} = \beta_0 + \beta_1\text{Size} + \beta_2\text{ROA} + \beta_3\text{Leverage} + \beta_4\text{AGE} + \beta_5\text{Interest\_Rate} + \beta_6\text{Tenure} + \beta_7\text{Gender}_i + \varepsilon$$

Block 2:

$$\text{M\&A propensity} = \beta_0 + \beta_1\text{Overconfidence} + \beta_2\text{Recessions} + \beta_3\text{Size} + \beta_4\text{ROA} + \beta_5\text{Leverage} + \beta_6\text{AGE} + \beta_7\text{Interest\_Rate} + \beta_8\text{Tenure} + \beta_9\text{Gender}_i + \varepsilon$$

Block 3:

$$\text{M\&A propensity} = \beta_0 + \beta_1\text{Overconfidence} + \beta_2\text{Recessions} + \beta_3\text{Overconfidence*Recessions} + \beta_4\text{Size} + \beta_5\text{ROA} + \beta_6\text{Leverage} + \beta_7\text{AGE} + \beta_8\text{Interest\_Rate} + \beta_9\text{Tenure} + \beta_{10}\text{Gender}_i + \varepsilon$$

4. Results

The analysis section is composed of two parts. In the first part, descriptive statistics will be presented to provide a general understanding of the dataset. In the second part, the statistical analyses will be reported in the following order: correlation test, assumptions for logistic regression, the logistic regression model and answering the hypothesis individually. Additionally, a robustness test was performed which can be reviewed in Appendix E.

4.1. Descriptive statistics

This paragraph reviews the descriptive statistics of the dataset used to analyse the hypotheses. For a more detailed analysis of the data please refer to Appendix F. Table 1 shows descriptive statistics of the dependent, independent and control variables applied in the analysis.

Table 1

Descriptive statistics

							Percentiles		
	N	Mean	Median	SD	Min	Max	25th	50th	75th
Oc	224	1.649	1.555	0.653	0.55	6.26	1.3496	1.555	1.7825
SIZE (000s)	251	27749	11699	56339	691.1	376213	5417	11699	23188
ROA	251	5.430	5.250	7.941	-31.92	50.13	1.980	5.250	8.320
LEVERAGE	238	42.715	36.260	24.821	0	219.36	27.222	36.260	57.570
INTEREST	258	3.356	3.140	1.424	1.34	5.83	2.32	3.14	4.61
TENURE	258	4.49	4	3.766	0	21	2	4	6
AGE	255	54.79	55	5.267	33	69	51	55	58
RECESSION	258	Na	Na	Na	0	1	0	0	1
M&A	258	Na	Na	Na	0	1	0	1	1
GENDER	258	Na	Na	Na	0	1	1	1	1

Note: This table shows the descriptive statistics of the dependent and independent variables. Secondly, it shows the control variables on the individual, firm and environmental levels. Note that with dichotomous variables the Mean, Median, and SD are indicated by Na. Thirdly, All variables are defined in Appendix A.

From 2005 to 2017, the AEX consisted of 35 unique firms, although only ten firms were listed on the AEX for the entire period (Ahold N.V., Akzo Novel N.V., ASML, DSM, Heineken, KPN, Philips, Reed Elsevier, Royal Shell PLC, Unilever, and Wolters Kluwer). A list of all firms included in the dataset can be found in Appendix B. Data was collected only during the period when the firm was listed on the AEX. Within this sample, there were a total of 60 different CEOs. A list of all CEOs included in the dataset can be found in Appendix C.

4.2. Statistical analyses

To answer each hypothesis, a binomial logistic regression was performed. For each regression, parameter estimates, *p*-values, and the exponential of β (odds ratio) are reported.

4.2.1. Preliminary analysis

The logistic model applied in this research utilizes the logistic distribution as its probability function. To estimate the model coefficients, the log-likelihood estimation function is utilized. To ensure comparability, all variables were standardized using Z-scores. Next, the assumptions of multicollinearity and linearity of independent variables and log odds will be tested before continuing with the logistic regression analysis.

To evaluate the assumption of multicollinearity Spearman's rank correlation matrix, VIF values, and tolerance levels are analysed (See Appendix G). First, a preliminary correlation analysis was conducted by checking the bivariate correlations between all categorical and continuous variables (see Table 10, Appendix G). The highest correlation was found between overconfidence and firm size (.396, *$p < 0.01$),* which is below the assumption threshold of 0.7. Additionally, the significant correlation found between overconfidence and the firm variables' size and ROA confirms the argument made by Hatoum et al. (2022) that firm-level variables have a high correlation with CEO overconfidence. Secondly, the VIF values and tolerance levels were evaluated which did not violate the assumption of multicollinearity (See Table 11, Appendix G).

To evaluate the assumption of linearity of independent variables and log odds, the Box-Tidwell test is applied. All continuous independent variables were transformed using the natural logarithm. In cases where continuous variables had negative scores a constant of 50 was added to ensure all data is included. A logistic regression was then performed, which included all independent variables as well as the interaction term between each independent variable and the natural log of the independent variable. No variables violated the assumption of linearity of independent variables and log odds (see Table 12, Appendix G). As a result, the model development can begin using the binomial logistic regression analysis.

4.2.2. Logistic regression analyses

To assess the impact of overconfidence on the likelihood of M&A, this paper employs a logistic regression analysis. The dependent variable is a binary variable taking the value of 1 if a firm completed an acquisition in the observation year, and 0 otherwise. The logistic model has been built using a hierarchical enter function in which the first model consists of the control variables, the second model adds the main effects and the third model adds the interaction effect. To test if each new model is significantly better than the previous one the Omnibus tests of model coefficients are consulted.

Each addition proved as a significant contribution to the model. The final model includes the interaction effect, and this addition was also significant $X^2(1, N = 211) = 8.016$, $p < 0.01$. Additionally, the new model was also significant $X^2(10, N = 211) = 31.602$, $p < 0.001$. Therefore, one can reject the null hypothesis that there is no improvement in model fit. As each hierarchical step improved the model fit significantly, Model 3 will be used to interpret the results.

In Table 2 the results can be reviewed. The following can be said as a rough estimate of the effect size. The model explained 18.7% of *Nagelkerke* R^2 of the variance in the propensity to M&A. The classification results of the logistic regression analysis in Table 3 show that Model 3 classifies 46.1% correctly of the events in which M&A did not happen and 75.4% of the events in which M&A did occur. Additionally, the classification success of the model is 63%. To review the complete model-building process see Appendix H. Additionally, all results proved robust against influential observations (see Appendix E). To review the complete model-building process for the robustness test see Appendix I.

Table 2

Logistic regression model results

Variable	Step 1	Exp(β)	Step 2	Exp(β)	Step 3	Exp(β)
Constant	-.579 (.311)	.561	-.389 (.511)	.678	-.467 (.436)	.627
Oc			.284 (.126)	1.328	.659 (.021)**	1.932
RECESSION			-.608 (.074)*	.544	-.817 (.026)**	.442
Oc * RECESSION					-1.435 (0.015)**	.238
SIZE (000s)	.035 (.802)	1.035	.022 (.877)	1.022	.008 (.954)	1.008
ROA	.019 (.911)	1.019	-.094 (.593)	.910	.140 (.496)	1.150
LEVERAGE	.140 (.396)	1.150	.128 (.444)	1.137	.159 (.358)	1.172
AGE	.306 (.087)*	1.359	.260 (.152)	1.297	.325 (.085)*	1.384
INTEREST	.503 (.002)***	1.654	.637 (.001)***	1.891	.615 (.001)***	1.850
TENURE	.151 (.301)	1.163	.141 (.334)	1.152	.075 (.618)	1.078
GENDER	1.087 (.069)*	2.964	1.124 (.067)*	3.077	1.235 (.047)**	3.438
Chi-square	16.944 (7, p < 0.05)		23.586 (9, p < 0.01)		31.602 (10, p < 0.001)	
-2LL statistic	270.482		263.740		255.724	
Nagelkerke R^2	.104		.142		.187	

Note. Results for the estimation using logistic regression. The dependent variable is binary where 1 indicates that the firm completed an acquisition. All variable definitions can be found in Appendix D. Sample size is 211 after the exclusion of missing values. *Significant at 10%; **Significant at 5%; ***significant at 1%; *p*-values in parentheses.

Table 3

Classification table

M&A propensity = 1		predicted		
		0	1	Percentage correct
Observed	0	41	48	46.1
	1	30	92	75.4
Overall Percentage				63.0

Note. This table demonstrates the classification of correct cases in Model 3.

4.2.3. Hypothesis testing

Testing CEO overconfidence and the propensity to undertake an M&A

H1 predicted that overconfident CEOs experience a higher propensity to undertake M&A than CEOs with lower overconfidence. This hypothesis has been tested before (Brown and Sarma, 2007; Malmendier and Tate, 2005) and is supported in the final model. It was found that holding everything else constant, the odds of M&A increased by 1.932 (95% CI [1.10, 3.37]) for each unit increase in a CEO's overconfidence.

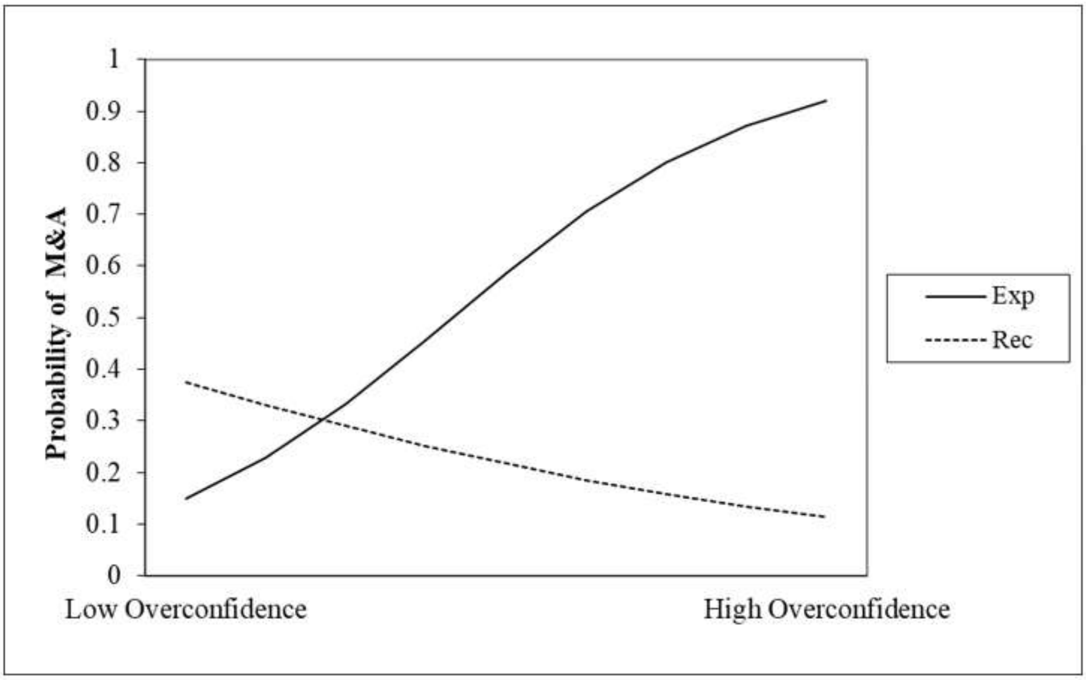
Testing the moderation effect of business cycles

H2 predicted that during an expansion, overconfident CEOs experience a higher propensity to undertake M&A than CEOs with lower overconfidence. The interaction effect was significant with a B coefficient of -1.435 (*p*-value= 0.015). Odds ratios for interaction terms are difficult to interpret due to the properties of the odds ratio. Therefore, Figure 2 visualizes the findings in a plot which is computed using the unstandardised regression coefficients (B) of the independent variable, moderator, interaction term and constant (see Table 2). From the plot, one can interpret this during an expansionary phase (Exp) and keeping everything else constant. CEOs with a higher level of overconfidence experience a higher likelihood to undertake M&A.

H3 predicted that during a recession overconfident CEOs experience a lower propensity to undertake M&A than CEOs with lower overconfidence. This hypothesis has received no direct attention in prior literature, owing to the lack of macro business cycle research in M&A and risk-taking literature. Yet, established theories in organizational and strategy research pointed towards considering this hypothesis and therefore either the exclusion or confirmation of such as relationship could be extremely insightful. The final model supports the predicted hypothesis, that overconfident CEOs experience a lower propensity to undertake M&A during a recession. The interaction effect was significant with a B coefficient of -1.435 (p-value= 0.15). From the plot in Figure 2, one can interpret this during a recessionary phase (Res) and keeping everything else constant. CEOs with a higher level of overconfidence experience a lower likelihood to undertake M&A than CEOs with lower levels of overconfidence.

Figure 2

Two-way interaction plot: overconfidence on M&A propensity during macroeconomic cycles.



Note. This figure demonstrates the interaction between overconfidence and the macroeconomic business cycle. The abbreviation 'Exp' refers to an expansionary phase, while the abbreviation 'Rec' refers to a recessionary phase.

5. Discussion

This study set out to answer the following question: how does CEO overconfidence impact M&A propensity as a proxy for strategic risk-taking, and how does this relationship depend on expansionary and recessionary business cycles?

In general, CEO overconfidence is associated with higher levels of risk-taking which were reflected in the propensity to undertake M&A. However, under the evaluation of the UET process perspective, it becomes clear that the decision-making of overconfident CEOs depends on the environment. Consequently, during expansionary phases, the effect of CEO overconfidence is reinforced which results in a higher risk-taking propensity. However, during recessionary phases, the positive effects of CEO overconfidence diminish as the environmental context constraints the decision-making options of the CEO resulting in a lower likelihood to undertake M&A. All main findings are reported in Table 4 below. The remainder of this section discusses and interprets the main findings, implications, limitations, and directions for future research.

Table 4

Summary of findings.

H1: Firms with overconfident CEOs will experience a higher propensity to undertake M&A than those with non-overconfident CEOs. Result: Supported
H2: During expansionary periods, firms with overconfident CEOs experience a higher propensity to undertake M&A than those with non-overconfident CEOs. Result: Supported
H3: During recessionary periods, firms with overconfident CEOs experience a higher/equal propensity to undertake M&A relative to their rational peers. Result: Supported

Note. Summary results of tested hypotheses.

5.1. Main findings

5.1.1. CEO overconfidence and the propensity to undertake M&A

In line with hypothesis 1, the results indicate a significant positive effect of overconfidence on the M&A propensity. This finding is in line with previous research that found a significant positive impact of CEO overconfidence on the likelihood of undertaking an acquisition decision relative to other CEOs (Brown & Sarma, 2007; Malmendier & Tate, 2008). The overconfidence hypothesis first coined in psychology literature and later in behavioural finance, corporate finance, and strategic decision-making literature reveals that overconfident individuals tend to overestimate their abilities relative to the average. Consequently, the positive significant effect in the results confirms the existence of the "better-than-average" effect. The aforementioned literature emphasizes that overconfidence reduces the ability to accurately perceive risk. In this light, the *cognitive* dimension of overconfidence biases CEOs to the extent that they underestimate the risks associated with M&A deals and overestimate future outcomes, increasing the likelihood to pursue such transactions (Burkhard et al., 2022; Malmendier & Tate, 2005; Mueller & Brettel, 2012). Indeed, the hubris hypothesis posits that the measure adopted in this study of relative CEO compensation can lead to psychological effects, resulting in hubris. CEOs who are driven by their self-perception and self-attribution derived from the *motivational* mechanism of overconfidence, are more likely to invest heavily than other CEOs (Burkhard et al., 2022; Hayward & Hambrick, 1997; Jiang et al., 2011; Larwoord & Whittaker, 1997; Roll, 1986). In this light, the results show that measuring CEO overconfidence indirectly, through relative CEO compensation, is linked to the "better-than-average" effect. Additionally, this paper contributes to the debate on overconfidence emphasizing the importance of considering a CEO's cognitive biases in decision-making.

Overall, the relationship between overconfidence on the propensity to undertake M&A is highlighted by the interplay of risk perception, biases caused by hubris, self-perception, and self-attribution which are represented in the mechanisms of overconfidence introduced by Burkhard et al. (2022). These factors contribute to the understanding of how overconfidence increases a CEO's tendency to pursue M&A.

5.1.2. The impact of expansions on CEO overconfidence and risk-taking

In line with hypothesis 2, the results indicate that during expansionary phases of the business cycle, overconfident CEO experience a reinforced effect in the propensity to undertake an M&A (see Figure 2). This finding is in line with previous research reporting that the effects of overconfidence are reinforced during expansionary periods (Brown & Sarma, 2007; Mueller & Brettel, 2012; Reyes et al., 2022). The first argument derives from the corporate finance perspective, which argues that overconfident CEOs tend to overinvest when they have abundant internal funds (Malmendier & Tate, 2005). Likely contributors are the availability of free cash flow during expansionary phases which lead overconfident CEOs to undertake M&A more frequently than other CEOs. Consequently, during expansion phases when numerous investment projects are at hand, overconfident managers scale up investments. Overconfidence among CEOs has several explanations. Firstly, cognitive mechanisms lead CEOs to overestimate future returns and perceive lower risks during economic upswings (Mueller & Brettel, 2012; Burkhard et al., 2022). Secondly, the UET process perspective suggests that economic expansions reinforce industry growth, reducing competitive pressures and encouraging risky decision-making by overconfident CEOs (Reyes et al., 2022). Thirdly, the social mechanism emphasizes the perception of overconfident CEOs as competent and persuasive leaders, leading to the endorsement of their riskier strategies by internal stakeholders (Burkhard et al., 2022; Anderson et al., 2012; Locke & Anderson, 2015). Overconfident CEOs may also opt for centralized decision-making during an expansion, further amplifying their bias (Reyes et al., 2022). Additionally, the explained variance of the model in this research supports the idea that various factors not included in this research also influence this relationship such as board vigilance, CEO attributes, business environment, and corporate governance systems, which warrant further research (Brown & Sarma, 2007; Burkhard et al., 2022; Malmendier & Tate, 2008; Gu, 2023). The findings in this research suggest that the above-mentioned explanations for overconfidence are reinforced during the expansionary phases of the business cycle indicated by a significant positive relationship.

Overall, during periods of economic expansions, overconfident CEOs are more likely to engage in M&A owing to their higher investment levels which are driven by abundant internal funds, low selection pressures, and faster decision-making capabilities. These factors collectively contribute to the significant positive effect of overconfidence on the likelihood of undertaking M&A during an expansionary phase of the business cycle.

5.1.3. The impact of recessions on CEO overconfidence and risk taking

In line with hypothesis 3, the results indicate that during recessionary phases of the business cycle, overconfident CEO experience a negative effect on the propensity to undertake an M&A (see Figure 2). Findings in similar research investigate the performance effects of overconfidence during a recession, which deviates from risk-taking propensity. However, plausible explanations are given as to why this phenomenon may be occurring. Firstly, the study by Reyes et al. (2022) found that the reinforcing effects of overconfidence diminish during a recessionary period. From a UET process perspective, one may argue that recessions mitigate or reduce industry growth causing *environmental dynamism*. As a result, this reduces resource *munificence* and increases rivalry among competitors (*complexity)* or even bankruptcies (Garcia-Sanches et al., 2014). Aside from the environmental context of UET, earlier research found that recessions show changes in absolute prices as well as prices among inputs and outputs, supporting the above-mentioned mechanism (Reyes et al. 2022). Secondly, from a behavioural perspective, overconfidence is associated with the *cognitive* mechanism, resulting in high expectations of future performance and underestimation of risks. During expansions, this drives overconfident CEOs to engage in overinvestment behaviour (Gervais et al., 2011; Hirshleifer & Luo, 2011; Malmendier & Tate, 2008). However, during recessions, this behaviour results in reversing effects. Consequently, overinvestment threatens organizational flexibility, making it difficult for firms to adapt and modify their strategies (Tang et al., 2018). As a result, the negative effects of overconfidence arise during recessions due to increased levels of organizational complexity (Reyes et al., 2022).

Overall, overconfidence has a negative effect on the likelihood of undertaking M&A during a recession due to financing constraints derived from a lack of resource munificence, and overinvestment behaviour. Consequently, overinvestment behaviour threatens organizational flexibility due to increased levels of organizational complexity. In this respect recession bring about the negative aspects of overconfident CEO decisions, reducing the options for how these CEOs can manage recessions and thus reducing the likelihood of undertaking M&A.

5.2. Implications

5.2.1. Theoretical implications

Based on the findings and discussion, this research introduces important theoretical implications. Firstly, this study explored the relationship between CEO overconfidence and the likelihood of pursuing M&A as a proxy for risk-taking propensity. The findings in this study indicate that overconfidence is positively related to the propensity to take risks. This finding contributes to the theoretical framework of Hoskisson et al. (2017) by emphasizing the need to include M&A propensity as a proxy for excessive risk-taking.

Secondly, this study evaluated whether the relationship between overconfidence and strategic risk-taking depends on its contextual environment. In this respect, the study responded to the call to include contextual factors in future research (Burkhard et al., 2022; Hoskisson et al., 2017; Reyes et al., 2022). The findings suggest that the relationship depends on the phases of the business cycle. During expansions, overconfident CEOs are more likely to engage in risk-taking due to the abundance of resources, reduced complexity, and centralized decision-making practices (Burkhard et al., 2022; Hoskisson, 2017; Reyes et al., 2022). In contrast, during recessions, overconfident CEOs face limitations imposed on them due to the opposing mechanisms which allowed them to undertake increased risk during expansions. In this respect, the findings in the research further refine the UET process perspective by introducing business cycles as an important environmental contextual factor moderating the effect of overconfidence and highlighting the need to consider situational factors in understanding the outcomes of overconfident decision-making behaviour.

Lastly, most studies in strategic management literature take the stand of a rational decision-maker and therefore suggest optimal strategies to lead within the business cycle (Conti et al., 2020; Navarro et al., 2010; Urbano et al., 2019). In contrast, this research acknowledges behavioural assumptions during managerial decision-making and proposes the need for a more comprehensive understanding of these complex dynamics. As a result, firms with overconfident CEOs may experience challenges in adapting or modifying their strategies in dynamic environments. Therefore, traditional analysis of strategic decisions should incorporate the complexity of behavioural assumptions and contextual factors during the decision-making process for suggesting optimal strategies.

5.2.2. Managerial implications

The findings represented in this research also provide several implications for practitioners. The first implication suggests that firms should recognize the cognitive biases of overconfident CEOs. By understanding overconfidence from a behavioural perspective firms can take on a more structured approach during the assessment of risk and future outcomes. In this sense, the board could implement policies which mitigate the influence of overconfidence and improve the quality of strategic decision-making. For example, by introducing more diverse decision-making teams, corporate governance initiatives, or assignment of outside directors (Park et al., 2018). The second implication emphasizes that the influence of overconfidence depends on environmental dynamics, more specifically the phases of the business cycle. During expansionary periods, when resources are abundant and competitive pressures are less present, overconfident CEOs have a higher likelihood of pursuing M&A. In contrast, during recessions, firms should be aware of the risks associated with this overinvestment behaviour and consider the reversing effects. Therefore, understanding the influence of dynamic contextual factors can inform decision-makers and help them adapt their risk-taking strategies. Consequently, in line with the process perspective firms should introduce rigorous risk assessment and due diligence practices. When considering decisions involving many risks such as M&A, an investment policy should require decision-makers to evaluate synergies, industry dynamics, and market conditions. To ensure an assessment led by objective KPIs, firms should introduce risk assessment practices which can evaluate risks and rewards in dynamic environments.

5.3. Limitations and opportunities for future research

While this study led to interesting results, there are also several limitations to it. First and most important, the differences in the availability of information across databases led to several revisions on the composition of the overconfidence variable. The original variable based on a news-based measure of Hayward and Hambrick (1997) was not feasible to construct due to limited access to the necessary data. Alternative measures such as option-based (Malmendier & Tate, 2005), CEO tweets (Lee et al., 2017), and operation-based measures (Ahmed & Duellman, 2013) were considered but were not accessible due to resource and time constraints. As a solution, the researcher used the relative CEO compensation measure, which had been employed in previous studies as a proxy for CEO overconfidence. However, this may limit the generalizability of the results to other countries and non-listed firms. Furthermore, different proxies of CEO overconfidence could yield different results. Therefore, future research should consider using multiple proxies to refine the measurement of CEO overconfidence and examine its impact on the results.

Second, it is important to address the limitation of the CEO overconfidence proxy. The operationalization of the overconfidence variable could potentially limit the interpretation of the results. As with other constructs used to examine the psychological characteristics of CEOs rely on proxies to measure overconfidence. While these proxies have proved to be valid, they do not directly capture the true level of a CEO's overconfidence (Burkhard et al., 2022). The assessment of CEO overconfidence with a direct measure is a challenge due to the difficulties introduced in the data collection process. Nevertheless, the recommendation for future research would be to step away from the established proxies of overconfidence and implement experimental methods. For example, through surveys or interviews.

Third, this study applied a cross-sectional method to analyse the data, mainly due to the unbalanced nature of the dataset. Due to the cross-sectional nature of this paper, casualty is hard to determine. The interpretations in this paper thus mostly stem from the theoretical framework developed within it and have confluence with the findings of the statistical analysis. Therefore, the interpretations in this research are open for discussion and further examination (Eggert & Helm, 2011). Building up on this, future research may adopt a panel data approach to develop a greater understanding of the causal inferences proposed in the results of this study.

The final limitation relates to the analysis of differences across industries. While the study did collect the respective SIC codes for the sample, the sample size was not large enough to conduct a test for differences across industries within the logistic regression. Research by Brown and Sarma (2007) argues that it is important to consider industry effects because some industries might attract overconfident CEOs more than others. In such cases, one could argue that the proxy of overconfidence picks up on industry effects (Brown & Sarma, 2007). On top of that, certain industries may experience more M&A than other industries, which could potentially influence the results. Therefore, the interpretations made in this study may not be generalizable across different industries. This paper recommends that future research controls for differences across industries to evaluate if the findings in this study hold.

6. Conclusions

Overall, it is widely acknowledged that CEO overconfidence is associated with higher levels of risk-taking. However, when considering the UET process perspective, it becomes evident that the decision-making of overconfident CEOs is contingent upon the business environment. During expansionary phases, CEO overconfidence is reinforced, due to biased decision making which leads to the underestimation of risk and overestimation of rewards, leading to an increased risk-taking propensity. This is reinforced by an environment characterized by resource abundance, low competitive pressures, and favourable market conditions. Conversely, during recessionary phases, the positive effects of CEO overconfidence diminish. The environmental context constrains the decision-making options of overconfident CEOs, resulting in a lower likelihood of undertaking M&A. Factors such as reduced industry growth, reduced resource munificence, increased rivalry, and organizational complexity dynamics limit the opportunities for risk-taking activities.

In summary, CEO overconfidence has a significant impact on risk-taking propensity, with the effects varying depending on the business cycle. Understanding the interplay between CEO overconfidence and the business cycle provides valuable insights into the dynamics of strategic risk-taking and decision-making in organizations.

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8. Appendices

Appendix A – Research Ethics

This section discusses the ethical considerations for conducting this research. The Netherlands Code of Conduct for Research Integrity (2018) served as the foundation for the ethical evaluation of this research, bound by self-regulation. Accordingly, the Dutch code of conduct for research integrity should guide individual researchers and follow five widely supported principles. These five principles are honesty, scrupulousness, transparency, independence, and responsibility.

Honesty refers to accurately reporting the research process while taking alternative perspectives seriously. This indicates that the researcher must understand the margins of uncertainty, refrain from making unfounded claims and refrain from falsifying data or sources to represent results in favour of the researcher. Scrupulousness refers to the practice of using scientific methods while exercising considerable effort in designing, reporting, and discussing the research. Transparency refers to the practice of clearly communicating the data on which the research is based, how the data was obtained, and how the results were achieved. Additionally, if external stakeholders played a part in the research this must also be reported. Independence requires that all stages of the research proposal and research are independently guided and not intervened by non-scientific or non-scholarly considerations such as commercial or political ones. Responsibility refers to the acknowledgement that the researcher does not operate in isolation, and thus should take the interest of human and or animal subjects into account. This thesis incorporates only secondary data and therefore this concern will be less of an issue. Additionally, more relevant to the principle of responsibility is conducting research that is scientifically and/or societally relevant. Respectively, all principles were considered during the construction of this research. For a more detailed explanation please refer to Chapter 3 of The Netherlands Code of Conduct of Research Integrity (2018).

Appendix B – Companies in data set

Table 5

Overview of companies in data set

Company
1 Aalberts NV
2 Ahold N.V
3 Air France-KLM
4 Akzo Nobel NV
5 ArcelorMittal SA
6 ASML
7 Boskalis Westminster
8 Corporate Express NV
9 Corus Group (TATA STEEL)
10 DSM
11 Fugro NV
12 Gemalto NV
13 Heineken
14 KPN
15 PostNL NV
16 Philips
17 Randstad
18 Reed Elsevier / RelX
19 Royal Shell PLC
20 SBM offshore
21 Tom Tom NV
22 Unilever
23 VNU
24 Wolters Kluwer
25 Wereldhaven NV
26 Vedior
27 USG people
28 TNT express / FedEx
29 TELE 2
30 OCI
31 NUMICO
32 BAM group
33 Hagemeyer
34 Getronics
35 CORIO

Appendix C – CEOs in data set

Table 6

Overview of CEOs in data set

CEO	Year of Birth	Company	CEO start date
Wim Pelsma	1963	Aalberts NV	2012
Anders Moberg	1950	Ahold N.V	2003
John Rishton	1958	Ahold N.V	2008
Dick Boer	1957	Ahold N.V	2011
Pierre-Henri Gourgeon	1946	Air France-KLM	2009
Doctor Jean-Cyril Spinetta	1943	Air France-KLM	2004
Alexandre De Juniac	1962	Air France-KLM	2013
Doctor Hans Wijers	1951	Akzo Nobel NV	2003
Ton Büchner	1965	Akzo Nobel NV	2012
Thierry Vanlancker	1964	Akzo Nobel NV	2017
Lakshmi Mittal	1950	ArcelorMittal SA	2006
Eric Meurice	1956	ASML	2004
Peter Wennink	1957	ASML	2013
Doctor Peter Berdowski	1957	Boskalis Westminster	2006
Frans Koffrie	1952	Corporate Express NV	1998
Peter Ventress	1960	Corporate Express NV	2007
Philippe varin	1952	Corus Group (TATA STEEL)	2003
Peter Elverding	1948	DSM	1999
Feike Sijbesma	1959	DSM	2007
Klaas Wester	1964	Fugro NV	2005
Paul van Riel	1956	Fugro NV	2012
Olivier Piou	1958	Gemalto NV	2004
Philippe Vallée	1964	Gemalto NV	2016
Jean-François van Boxmeer	1961	Heineken	2005
Ad Scheepbouwer	1944	KPN	2001
Eelco Blok	1957	KPN	2011
Peter Bakker	1961	PostNL NV	2001
Harry Koorstra	1951	PostNL NV	2011
Herna Verhagen	1966	PostNL NV	2012
Gerard Kleisterlee	1946	Philips	2001
Frans van Houten	1946	Philips	2011
Ben Noteboom	1958	Randstad	2003
Jacques van den Broek	1960	Randstad	2014
Sir Crispin Davis	1949	Reed Elsevier / RelX	1999
Erik Engström	1963	Reed Elsevier / RelX	2009
Doctor Jeroen Van der Veer	1947	Royal Shell PLC	2004
Peter Voser	1958	Royal Shell PLC	2009

Ben van Beurden	1958	Royal Shell PLC	2014
Doctor Didier Keller	1946	SBM offshore	2004
Tony Mace	1952	SBM offshore	2008
Bruno Chabas	1964	SBM offshore	2012
Harold Goddijn	1960	Tom Tom NV	1991
Patrick Cescau	1948	Unilever	2005
Paul Polman	1956	Unilever	2009
Rob van den Bergh	1950	VNU	2000
Nancy McKinstry	1959	Wolters Kluwer	2003
Hans Pars	1962	Wereldhaven NV	2009
Zach Miles	1949	Vedior	2004
Tex Gunning	1950	Vedior	2007
Rob Zandbergen	1958	USG people	2009
Marie-Christine Lombard	1958	TNT express / FedEx	2011
Per Borgklint	1972	TELE 2	2002
Nassef Sawiris	1961	OCI	2013
Jan Bennink	1956	NUMICO	2002
Joop van Oosten	1948	BAM group	2005
Nico De Vries	1951	BAM group	2010
Rudi De Becker	1946	Hagemeyer	2003
Klaas Wagenaar	Missing	Getronics	2003
Gerard Groener	1958	CORIO	2008

Appendix D - Variable descriptions

Table 7

Overview of the variable description

Variable name	Definition
Panel 1: DV	
M&A propensity	Binary variable equal to 1 if the firm made at least one successful merger and acquisition during a particular year.
Panel 2: IV	
Overconfidence (oc)	A scale variable is calculated by taking the sum of the CEO's annual cash compensation (Fixed annual salary + Short term bonus) / the sum of annual cash compensation for the second highest paid officer in the firm.
Panel 3: Moderator	
Firm business cycles	The dummy variable is equal to 1 if there is a recession during a particular year. Determined by two consecutive quarters of GDP contraction.
Panel 4: Controls	
1. AGE	1. The numerical value of the age of the CEO (Annual report date – Date of birth)
2. GENDER	2. A dummy variable which takes the value of 0 if the CEO is female and 1 if the CEO is male
3. TENURE	3. Defined as the number of years the CEO carries the position within the firm
4. SIZE	4. Measured in total assets
5. ROA	5. Calculated as the net profit divided by the total assets of the firm
6. LEVERAGE	6. Calculated as the total financial debt divided by the total assets of the firm.
7. INTEREST	7. Calculated as the average interest rate of each observation year.

Note. This table describes the dependent variable (DP), independent variable (IV), moderator, and control variables (CV) applied in this research.

Appendix E – Detailed analysis of robustness

The binary logistic regression model presented above is based on real-world data which means the data also contains influential observations i.e., outliers. It is well known that the maximum likelihood estimator (MLE) can be severely affected by outlying observations (Nurunnabi et al., 2010). To test the robustness of the results all variables containing influential observations are transformed using the log function also referred to as log scaling. In this sense, the distribution of the data is based on a narrower scale, which ultimately decreases the effect of influential observations on the MLE model. Consequently, the robustness test will help to determine whether the model presented in Table 2 is heavily influenced by outlying observations.

To successfully scale the variables three assumptions were checked; (i) positive skewness, (ii) no negative values, and (iii) no zero values were evaluated. Firstly, all variables were identified to be positively skewed. Secondly, the variable ROA contained negative values which was resolved by adding a constant of 32.92. Finally, the variables' leverage and tenure contained a 0 value, therefore a constant of 1 was added. To ensure comparability, all variables were standardized using Z-scores.

To assess the robustness of the model the same procedure was applied as in Section 4.2.2. The results of the robustness test can be reviewed in Table 8. The first model which is compared with the null model was significant $X^2(7, N = 211) = 23.245$, $p < 0.05$. The higher Chi-square statistic can be mainly attributed to the Tenure variable as it changed from insignificant ($p = .301$) to significant at the 10% level ($p < .091$). The next model includes the main effects, and this addition was significant $X^2(2, N = 211) = 6.146$, $p < 0.05$. Additionally, the new model was also significant $X^2(9, N = 211) = 29.392$, $p < 0.001$. As a result of the robustness test, the significance level of the model increased from 1% ($p <$ 01) to 0.1% ($p < 0.001$). The final model includes the interaction effect and this addition was also significant $X^2(1, N = 211) = 7.659$, $p < 0.05$. As a result of the robustness test, the addition of the interaction effect decreased the significance from the 1% level to the 5% level. This decrease is mainly attributed to the AGE variable as it changed from significant at the 10% level to insignificant ($p = .145$). Additionally, the new model was also significant $X^2(10, N = 211) = 31.602$, $p < 0.001$. The final model explained 21.7% of *Nagelkerke* R^2 of the variance in the propensity to M&A, which is 3 per cent points higher than the model without the transformed influential observations. The classification results of the logistic regression analysis in Table 9 show that Model 3 classifies 46.1% correctly of the events in which M&A did not happen and 76.2% of the events in which M&A did occur. Additionally, the classification success of the model is 63.5%. To review the complete model-building process Appendix I should be consulted.

All in all, the robustness test indicates that the logistic regression model used in the study was not severely influenced by influential observations. However, the robustness check improved the explained variance of the model by 3 per cent points, while the directions of the hypothesized relationships remained the same (see Figure 3).

Table 8

Robustness test for logistic regression presented in Table 4.

Variable	Step 1	Exp(β)	Step 2	Exp(β)	Step 3	Exp(β)
Constant	-.548 (.311)	.578	-.378 (.516)	.678	-.436 (.460)	.627
Oc			.227 (.162)	1.255	.522 (.017)**	1.685
RECESSION			-.642 (.063)*	.685	-.806 (.025)**	.446
Oc * RECESSIONS					-1.086 (0.011)**	.338
SIZE (000s)	.250 (.127)	1.285	.213 (.211)	1.237	.205 (.246)	1.227
ROA	-0.055 (.766)	0.946	-.169 (.418)	.845	.028 (.890)	1.029
LEVERAGE	.270 (.091)*	1.310	.265 (.108)	1.304	.246 (.155)	1.279
AGE	.278 (.138)	1.320	.245 (.196)	1.278	.288 (.145)	1.333
INTEREST	.542 (.001)***	1.719	.660 (.001)***	1.935	.663 (.001)***	1.941
TENURE	.250 (.091)*	1.284	.210 (.164)	1.234	.174 (.265)	1.190
GENDER	1.095 (.061)*	2.988	1.162 (.052)*	3.196	1.216 (.044)**	3.372
Chi-square	23.245 (7, p < 0.05)		29.392 (9, p < 0.001)		37.051 (10, p < 0.001)	
-2LL statistic	264.080		257.934		250.275	
Nagelkerke R^2	.140		.175		.217	

Note. Results for the estimation using logistic regression. The dependent variable is binary where 1 indicates that the firm completed an acquisition. All variable definitions can be found in Appendix D. Sample size is 211 after the exclusion of missing values. *Significant at 10%; **Significant at 5%; ***significant at 1%; *p*-values in parentheses.

Table 9

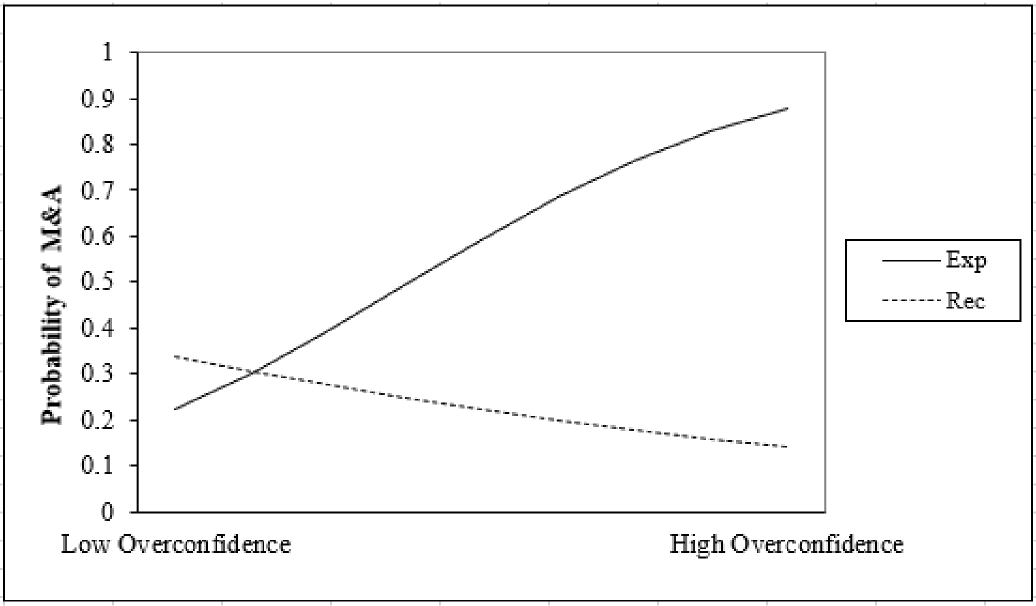
Classification table.

M&A propensity = 1		Predicted		
		0	1	Percentage correct
Observed	0	41	48	46.1
	1	29	93	76.2
Overall Percentage				63.5

Note. This table demonstrates the classification of correct cases in Model 3.

Figure 3

Interaction plot between CEO overconfidence and macro-economic cycles.



Note. This figure demonstrates the interaction between overconfidence and the macroeconomic business cycle. The abbreviation 'Exp' refers to an expansionary phase, while the abbreviation 'Rec' refers to a recessionary phase.

Appendix F – Detailed analysis of descriptive statistics

CEOs of AEX-listed firms: From 2005 to 2017, the AEX consisted of 35 unique firms, although only ten firms were listed on the AEX for the entire period (Ahold N.V., Akzo Novel N.V., ASML, DSM, Heineken, KPN, Philips, Reed Elsevier, Royal Shell PLC, Unilever, and Wolters Kluwer). A list of all firms included in the dataset can be found in Appendix B. Data was collected only during the period when the firm was listed on the AEX. Within this sample, there were a total of 60 different CEOs. When analyzing the characteristics of the CEOs, the following can be reported. The average CEO was found to be 54.8 years old, with a median of 55. The youngest CEO in the dataset is 33 and the oldest CEO is 69 years old. When examining the tenure, the average duration of AEX CEOs is 4.49, with a median of 4. The shortest observed tenure starts at 0 as tenure only counts once an executive becomes CEO. The longest observed tenure is observed at 21 years. Additionally, an image illustrating the differences between male and female CEOs is shown in Figure 4. Unfortunately, in line with social controversy, one can observe that the AEX companies in this period lacked an evenly distributed amount of male and female leaders. With females representing only 6.6% of the observed cases.

Figure 4

Descriptive statistics of CEOs of AEX-listed firms between 2005 and 2017.

Overconfidence Among CEOs: To measure CEO overconfidence, this paper analyzed the cash compensation of the CEO compared to the cash compensation of the second highest-paid officer. This resulted in a continuous variable with a low value indicating low overconfidence and a high value indicating high overconfidence. The following statistic can be reported. On average CEOs had a relative compensation ratio of 1.65, with a median of 1.55. The lowest ratio was 0.55 and the highest ratio was 6.26.

M&As and Economic cycles: To analyse the dependent variable 'propensity to undertake M&A' a dichotomous variable was created which consisted of 258 observations which were either classified as did undertake M&A or did not undertake M&A. In total, 142 cases were classified as did undertake M&A (55%) and 116 cases were classified as did not undertake M&A (45%). To get a better understanding of the data, a comparison is made between M&A propensity during an expansion and a recession. The observations during a recession were 81, while the observations during an expansion were 176. A higher number of observations during an expansion is expected as in general the Western economy experiences more expansionary years than recessionary years (Reyes et al., 2022).

In Figure 5 the M&A frequencies are displayed during the recessionary periods using a pie chart. The frequencies are displayed for both categories of M&A propensity. During a recession, 81 observations were recorded of which 41 (50%) undertook M&A and 41 were recorded as did not undertake M&A. In Figure 6, the frequency of M&A is displayed during the expansionary periods using a pie chart. The frequencies are calculated for both categories of M&A propensity. During an expansion, 176 observations were recorded of which 101 were counted as M&A and the other 75 were recorded as not M&A.

Figure 5

M&A propensity during recessions

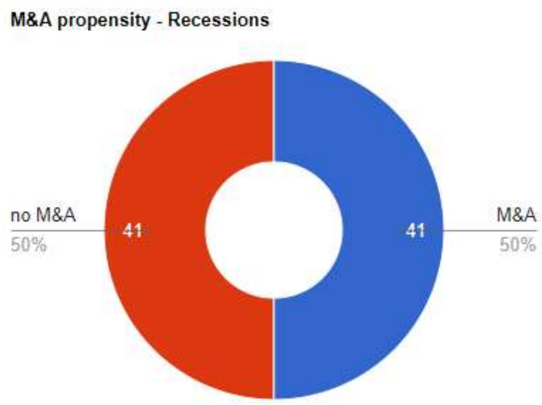
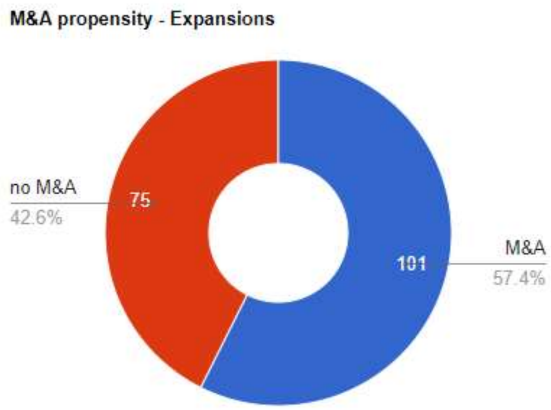


Figure 6

M&A propensity during expansions



Appendix G – SPSS output for assumptions

Table 10

Correlation coefficients

Variable	1	2	3	4	5	6	7	8	9	10
1 Oc	1									
2 SIZE	.396**	1								
3 ROA	.245**	.078	1							
4 LEVERAGE	.058	-.095	-.125	1						
5 AGE	.084	.374**	-.044	-.199**	1					
6 INTEREST	-.054	-.172**	.158*	.020	-.170*	1				
7 RECESSION	-.185**	-.016	-.146	.074	-.143*	.340**	1			
8 GENDER	-.010	.208**	-.004	-.251**	.191**	.038	-.020	1		
9 M&A PROP	.126	.104	.071	.016	.033	.090	-.069	.105	1	
10 TENURE	.178**	.041	-.006	.016	.207**	-.148*	-.057	-.112	.067	1

Note. All variables are defined in Appendix A. Spearman's rank correlation.

Table 11

Multicollinearity test (VIF & Tolerance)

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-.577	.430		-1.342	.181		
	X1 CEOPAY	.093	.052	.124	1.777	.077	.940	1.064
	X2 SIZE	6.263E-11	.000	.008	.107	.915	.909	1.101
	X3 ROA %	-.002	.005	-.025	-.359	.720	.925	1.081
	X4 Leverage (%)	4.300E-5	.001	.002	.031	.975	.921	1.086
	X6 AGE	.013	.007	.126	1.788	.075	.915	1.093
	X8 interest rate	.085	.025	.237	3.394	< .001	.936	1.068
	X10 tenure	.005	.009	.040	.580	.563	.944	1.059

a. Dependent Variable: Y = M&A propensity

Table 12

Test of linearity of independent variables and log odds

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	X1 CEOPAY	.394	1.533	.066	1	.797	1.483	.073	29.924
	X2 SIZE	.000	.000	.775	1	.379	1.000	1.000	1.000
	X3 ROA %	-.083	.203	.167	1	.683	.920	.618	1.370
	X4 Leverage (%)	.220	.193	1.299	1	.254	1.246	.854	1.818
	X5 Recession(1)	-.577	.370	2.428	1	.119	.562	.272	1.160
	X6 AGE	-6.016	3.600	2.793	1	.095	.002	.000	2.827
	X7 Gender(1)	.959	.636	2.277	1	.131	2.610	.751	9.074
	X8 interest rate	-.085	1.329	.004	1	.949	.919	.068	12.439
	X10 tenure	1.549	1.896	.668	1	.414	4.706	.115	193.283
	Ln_CEOPAY by X1 CEOPAY	-.041	.764	.003	1	.957	.960	.215	4.290
	Ln_SIZE by X2 SIZE	.000	.000	.760	1	.383	1.000	1.000	1.000
	Ln_ROA by X3 ROA %	.018	.049	.125	1	.723	1.018	.924	1.121
	Ln_Leverage by X4 Leverage (%)	-.042	.038	1.193	1	.275	.959	.890	1.034
	Ln_age by X6 AGE	1.214	.722	2.830	1	.092	3.367	.818	13.848
	Ln_Interest by X8 interest rate	.202	.595	.115	1	.734	1.224	.381	3.924
	Ln_tenure by X10 tenure	-.363	.455	.636	1	.425	.696	.285	1.697
	Constant	59.925	38.894	2.374	1	.123	1.059E+26		

a. Variable(s) entered on step 1: X1 CEOPAY, X2 SIZE, X3 ROA %, X4 Leverage (%), X5 Recession, X6 AGE, X7 Gender, X8 interest rate, X10 tenure, Ln_CEOPAY * X1 CEOPAY , Ln_SIZE * X2 SIZE , Ln_ROA * X3 ROA % , Ln_Leverage * X4 Leverage (%) , Ln_age * X6 AGE , Ln_Interest * X8 interest rate , Ln_tenure * X10 tenure .

Appendix H – SPSS output for logistic regression model

Table 13

Omnibus test of model coefficients block 1

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	16.944	7	.018
	Block	16.944	7	.018
	Model	16.944	7	.018

Table 14

Model summary block 1

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	270.382[a]	.077	.104

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

Table 15

Variables in equation block 1

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	Zscore: X2 SIZE	.035	.139	.063	1	.802	1.035	.788	1.360
	Zscore: X3 ROA %	.019	.167	.013	1	.911	1.019	.735	1.413
	Zscore: X4 Leverage (%)	.140	.165	.720	1	.396	1.150	.832	1.590
	Zscore: X6 AGE	.306	.179	2.934	1	.087	1.359	.957	1.929
	Zscore: X8 interest rate	.503	.165	9.244	1	.002	1.654	1.196	2.288
	Zscore: X10 tenure	.151	.146	1.071	1	.301	1.163	.874	1.549
	X7 Gender(1)	1.087	.597	3.313	1	.069	2.964	.920	9.552
	Constant	-.579	.570	1.028	1	.311	.561		

a. Variable(s) entered on step 1: Zscore: X2 SIZE, Zscore: X3 ROA %, Zscore: X4 Leverage (%), Zscore: X6 AGE, Zscore: X8 interest rate, Zscore: X10 tenure, X7 Gender.

Table 16

Omnibus test of model coefficients block 2

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	6.642	2	.036
	Block	6.642	2	.036
	Model	23.586	9	.005

Table 17

Model summary block 2

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	263.740[a]	.106	.142

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

Table 18

Variables in equation block 2

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	Zscore: X2 SIZE	.022	.141	.024	1	.877	1.022	.775	1.347
	Zscore: X3 ROA %	-.094	.175	.286	1	.593	.910	.646	1.284
	Zscore: X4 Leverage (%)	.128	.167	.586	1	.444	1.137	.819	1.578
	Zscore: X6 AGE	.260	.182	2.049	1	.152	1.297	.908	1.852
	Zscore: X8 interest rate	.637	.180	12.534	1	<.001	1.891	1.329	2.690
	Zscore: X10 tenure	.141	.146	.934	1	.334	1.152	.865	1.535
	X7 Gender(1)	1.124	.613	3.359	1	.067	3.077	.925	10.235
	X5 Recession(1)	-.608	.340	3.199	1	.074	.544	.280	1.060
	Zscore: X1 CEOPAY	.284	.186	2.337	1	.126	1.328	.923	1.911
	Constant	-.389	.592	.432	1	.511	.678		

a. Variable(s) entered on step 1: X5 Recession, Zscore: X1 CEOPAY.

Table 19

Omnibus test of model coefficients block 3

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	8.016	1	.005
	Block	8.016	1	.005
	Model	31.602	10	<.001

Table 20

Model summary block 3

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	255.724[a]	.139	.187

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Table 21

Variables in equation model 3

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	Zscore: X2 SIZE	.008	.144	.003	1	.954	1.008	.760	1.338
	Zscore: X3 ROA %	.140	.205	.463	1	.496	1.150	.769	1.718
	Zscore: X4 Leverage (%)	.159	.173	.844	1	.358	1.172	.835	1.646
	Zscore: X6 AGE	.325	.189	2.961	1	.085	1.384	.956	2.006
	Zscore: X8 interest rate	.615	.182	11.414	1	<.001	1.850	1.295	2.643
	Zscore: X10 tenure	.075	.150	.249	1	.618	1.078	.803	1.446
	X7 Gender(1)	1.235	.621	3.954	1	.047	3.438	1.018	11.616
	X5 Recession(1)	-.817	.368	4.930	1	.026	.442	.215	.909
	Zscore: X1 CEOPAY	.659	.285	5.352	1	.021	1.932	1.106	3.375
	X5 Recession(1) by Zscore: X1 CEOPAY	-1.435	.587	5.970	1	.015	.238	.075	.753
	Constant	-.467	.600	.607	1	.436	.627		

a. Variable(s) entered on step 1: X5 Recession * Zscore: X1 CEOPAY .

Appendix I – SPSS output robustness test

Table 22

Omnibus test of model coefficients block 1

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	23.245	7	.002
	Block	23.245	7	.002
	Model	23.245	7	.002

Table 23

Model summary block 1

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	264.080[a]	.104	.140

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

Table 24

Variables in equation block 1

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Zscore(Log_Size)	.250	.164	2.326	1	.127	1.285
	Zscore(Log_ROA)	-.055	.185	.089	1	.766	.946
	Zscore(Log_Leverage)	.270	.160	2.861	1	.091	1.310
	Zscore: X6 AGE	.278	.188	2.198	1	.138	1.320
	Zscore: X8 interest rate	.542	.170	10.197	1	.001	1.719
	Zscore(Log_Tenure)	.250	.148	2.859	1	.091	1.284
	X7 Gender(1)	1.095	.584	3.508	1	.061	2.988
	Constant	-.548	.563	.946	1	.331	.578

a. Variable(s) entered on step 1: Zscore(Log_Size), Zscore(Log_ROA), Zscore(Log_Leverage), Zscore: X6 AGE, Zscore: X8 interest rate, Zscore(Log_Tenure), X7 Gender.

Table 25

Omnibus test of model coefficients block 2

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	6.146	2	.046
	Block	6.146	2	.046
	Model	29.392	9	<.001

Table 26

Model summary block 2

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	257.934[a]	.130	.175

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

Table 27

Variables in equation block 2

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Zscore(Log_Size)	.213	.170	1.564	1	.211	1.237
	Zscore(Log_ROA)	-.169	.208	.657	1	.418	.845
	Zscore(Log_Leverage)	.265	.165	2.582	1	.108	1.304
	Zscore: X6 AGE	.245	.190	1.669	1	.196	1.278
	Zscore: X8 interest rate	.660	.184	12.925	1	<.001	1.935
	Zscore(Log_Tenure)	.210	.151	1.933	1	.164	1.234
	X7 Gender(1)	1.162	.599	3.764	1	.052	3.196
	X5 Recession(1)	-.642	.345	3.458	1	.063	.526
	Zscore(Log_CEOAPAY)	.227	.162	1.953	1	.162	1.255
	Constant	-.378	.582	.423	1	.516	.685

a. Variable(s) entered on step 1: X5 Recession, Zscore(Log_CEOAPAY).

Table 28

Omnibus test of model coefficients block 3

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	7.659	1	.006
	Block	7.659	1	.006
	Model	37.051	10	<.001

Table 29

Model summary block 3

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	250.275[a]	.161	.217

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

Table 30

Variables in equation block 3

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Zscore(Log_Size)	.205	.176	1.347	1	.246	1.227
	Zscore(Log_ROA)	.028	.203	.019	1	.890	1.029
	Zscore(Log_Leverage)	.246	.173	2.025	1	.155	1.279
	Zscore: X6 AGE	.288	.197	2.124	1	.145	1.333
	Zscore: X8 interest rate	.663	.185	12.826	1	<.001	1.941
	Zscore(Log_Tenure)	.174	.156	1.241	1	.265	1.190
	X7 Gender(1)	1.216	.604	4.044	1	.044	3.372
	X5 Recession(1)	-.806	.359	5.057	1	.025	.446
	Zscore(Log_CEOAPAY)	.522	.218	5.712	1	.017	1.685
	X5 Recession(1) by Zscore (Log_CEOAPAY)	-1.086	.426	6.501	1	.011	.338
	Constant	-.436	.590	.547	1	.460	.647

a. Variable(s) entered on step 1: X5 Recession * Zscore(Log_CEOAPAY) .

Appendix J – Research planning

Week 1 (May 1-7):

- Obtain access to the relevant databases
- Finalize your research question and hypotheses if necessary
- Start collecting data from the databases

Week 2 (May 8-14):

- Continue collecting data from the databases
- Begin data cleaning and preparation for analysis
- Develop a detailed plan for data analysis

Week 3 (May 15-21):

- Continue data cleaning and preparation for analysis
- Conduct any necessary data analysis, such as descriptive statistics or preliminary data exploration
- Start drafting the results section of the thesis

Week 4 (May 22-28):

- Continue data cleaning and preparation for analysis, as necessary
- Conduct more advanced data analysis, such as factor analysis and regression analysis
- Refine and revise the results section of the thesis

Week 5 (May 29-June 4):

- Complete data cleaning and preparation for analysis
- **Milestone 1:** Finish data analysis and finalize the results section of the thesis
- Begin drafting the discussion and conclusion section of the thesis

Week 6 (June 5-11):

- Begin drafting the implications, reflection, and recommendation section of the thesis
- **Milestone 2:** Make any necessary revisions to previous sections of the thesis

Week 7 (June 12-18):

- **Milestone 3:** Finalize the implications, reflection, and recommendation section of the thesis
- Complete the discussion and conclusion section of the thesis
- Edit and revise the entire thesis
- Ensure the formatting, referencing, and citation style are consistent and correct

Week 8 (June 19-20):

- Complete any remaining revisions and final touches to the thesis
- **Milestone 5:** Submit the final version of the thesis to your supervisor or committee