

Predicting Bankruptcy Risk Using Altman's Z-Score and Determinants of CEO Power

Proposal

Master Thesis in Business Administration

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1 Introduction

“The concept of risk is as old as mankind” (Garaczi, 2013). However, it looks like we are facing an intense period of increased risk and uncertainty. This is caused by a radical shift in the risk landscape, which entails the emergence of new risks and new types of risks. According to a Bain (2021) study, this shift is brought about by events such as disease, climate change, technological disruptions and aging populations (Schwedel et al., 2021). In recent years, risk has materialized itself particularly in many businesses all over the world that have faced liquidity issues and bankruptcy threats (Famiglietti & Leibovici, 2020). The COVID-19 pandemic has caused a seismic shift in what risk truly means, with the economy being as unstable as ever (Borio, 2020). Furthermore, other geopolitical tensions such as those arising from the 2020 US Presidential Elections and the war in Ukraine have put strenuous pressure on the economy (Celasun et al., n.d.).

According to data from Standard&Poor (hereinafter referred to as: S&P) Global Market Intelligence, a risk that businesses are currently facing in the global economy (and have always been facing), is the risk of bankruptcy (Michael O’Connor, 2021). Here, bankruptcy refers to the legal proceeding whereby a business is unable to pay their outstanding debts (Platt & Platt, 2006). Under Chapter 7 of the U.S. Bankruptcy Code, a bankrupt company must “[stop] all operations and [go] completely out of business” (Masulis & Zhang, 2017). Although bankruptcy has been a persistent issue in recent years, the number of companies that filed for bankruptcy in 2019-2020 was significantly higher than now, in 2022 (Michael O’Connor, 2021). However, predictions for high bankruptcy frequencies lie in 2023, which is less than a year away (Charlsy Panzino, 2022). Next year, scholars predict that the Federal Reserve will finally increase interest rates and federal stimulus money will wind down (Sonenshine, 2022). In short, measures to combat the negative economic effects of the Corona Virus will come to an end, and it is predicted that so will the financial well-being of many companies (Sonenshine, 2022).

If one is able to better predict the risk of bankruptcy within a company, it may follow that this prediction can aid in risk management and ultimately help keep the company afloat and completely avoid the bankruptcy risk. This paper aims to identify if the CEO may influence the risk of bankruptcy in a company. More specifically, this paper will analyze factors that may trigger bankruptcy, specifically in relation to the power of the CEO of a company. The hypothesized determinants of CEO power that this paper will analyze are: 1) CEO duality; 2) CEO’s attendance of board meetings; 3) CEO voting power; and 4) CEO tenure. This paper will ultimately analyze whether these factors, in combination or alone, may have an inherent effect on the risk of bankruptcy in a company.

The first listed variable is CEO Duality, and this will be analyzed due to the frequent, yet divided, academic debate on this topic. Here, CEO Duality refers to when the CEO is also the Chairman of the company’s board. Although many governance experts advise against CEO duality, a majority of S&P500 firms have CEO duality (Goergen et al., 2019). CEO duality is criticized for giving the CEO too much power, reducing the monitoring effect of the board and, consequently,

leading to poor business decisions (Elsayed, 2007). This paper therefore takes CEO duality into account when assessing a firm's risk of bankruptcy.

Secondly, CEO's attendance of board meetings will also be assessed. CEO's are required to attend board meetings, and report to the board during these meetings (Lorsch & Zelleke, 2005). An important role of CEO's at board meetings is to make recommendations to the board and help make operational decisions (Sherman, 2018). A high CEO presence in board meetings may be linked to higher CEO power, and high CEO power has the ability to affect a firm's vitality. However, it can also be inferred that a lack of attendance of board meetings could have a negative influence on the decisions made by a firm, since the CEO lacks the opportunity to be effectively monitored during these meetings (Barros & Sarmiento, 2020). This is why CEO attendance of board meetings has been chosen as an independent variable.

CEO voting power is also a fairly clear determinant of CEO power. According to the Harvard Law School on Corporate Governance, "higher levels of CEO voting power concentration correlate with several negative governance indicators, including dual class share structures, diminished board leadership independence, classified boards, lower levels of gender diversity in the boardroom and in the C-Suite, and lower levels of board refreshment" (Papadopoulos, 2019). Due to all of these effects, CEO voting power has been chosen as it is hypothesized to have a strong effect on a company's risk of bankruptcy.

Lastly, CEO tenure has been chosen as an independent variable. Analyzing CEO tenure in the context of firm performance is quite common in academic literature (Dikolli et al., 2014; A. D. Henderson et al., 2006; Simsek, 2007). It has been argued that a high CEO tenure (i.e.: high length of time as CEO in a company) causes a buildup of power (Adams et al., 2005). By staying in the company for so long, the CEO is more likely to get a seat on the board, which gives him/her further power (Graham et al., 2020). Furthermore, CEO's with higher tenure are more likely to be older, which may mean that the CEO acts more conservatively, be more risk-adverse or not in line with the current environment (Belenzon et al., 2019; He et al., 2022). Therefore, the firm may under-perform.

This paper will conduct a regression analysis and decision-tree to assess the potential effect of determinants of CEO power on the risk of bankruptcy within a company. It will specifically focus on the four features listed above. Finally, future improvements will also be proposed that may lower the risk of bankruptcy, such as that when a 'risky' factor is predicted, further action could be taken such as the replacement of this factor with a 'non-risky' counterpart. Future improvements will be based on re-organizing the power structure within the firm in order to mitigate the effects of the determinants of CEO power. For example, if this paper concludes that CEO duality is a significant common factor influencing the risk of bankruptcy, the suggestion will be to remove the CEO from his/her position of power as Chairman of the board. These suggestions aim to have a long-term effect and also a beneficial effect on the power structures within a company. According to Ertugrul and Krishnan, 2011, 49% of firms that dismiss their CEOs do so in the absence of negative industry-adjusted stock

returns prior to dismissal (Ertugrul & Krishnan, 2011). However, after the CEO dismissal, the studied firms experienced a short-lived decline in performance. If a firm is facing bankruptcy, this decline in performance, even if it is short-lived, may be the final factor contributing to bankruptcy. For this reason, this paper does not seek to suggest to fire CEOs with too much power when facing bankruptcy. Rather, it seeks to give a general guideline for how CEO power should be structured within a company.

This paper aims to fill a gap in the current academic literature on the relationship between CEO power and the risk of bankruptcy. To measure the risk of bankruptcy, Altman's Z-score is used as a proxy (Altman et al., 2017). The vast majority of papers analyzed have looked at CEO power and connected this to the performance of a company. Even though the performance of a company and the risk of bankruptcy are likely to be correlated, there is a clear distinction between risk of bankruptcy and firm performance. Many papers that analyze firm performance use the Tobin's Q ratio. However, James Tobin (the creator of Tobin's Q) himself did not intend for Tobin's Q to be used as a proxy for firm value (Bartlett & Partnoy, 2020). Instead, Tobin's Q was meant to determine measures whether a firm or an aggregate market is relatively over- or undervalued.. Bartlett and Partnoy, 2020 argue that scholars have researched some of the most relevant area's in corporate governance based on a flawed assumption: that Tobin's Q (the ratio of the market value of a firm's securities to their book value) is a valid measure of the value of the firm. This paper, on the other hand, looks at the Altman's Z-Score as a proxy for bankruptcy risk instead of Tobin's Q as a proxy for firm performance. By doing so, the issue of misusing Tobin's Q is circumvented, and the CEO power is approached from a novel angle.

Many recent articles that have connected CEO characteristics to bankruptcy have done so under the 'corporate governance' realm (Annisa et al., 2021; Li et al., 2021; Mariano et al., 2021). Thus, CEO's themselves were not central to their research. Rather, board size, gender ratios, or board independence (of which CEO duality is a contributing factor) were analyzed in comparison to bankruptcy (Basterretxea et al., 2022; Darrat et al., 2016; Fich & Slezak, 2008; Lajili & Zéghal, 2010). Academic articles that specifically linked CEO's to bankruptcy have focused on how bankruptcy affects the CEO (Eckbo et al., 2012; Grindaker et al., 2021; Thorburn, 2000). For example, an article from 2016 showed how costly bankruptcy could be for the CEO of a company (Eckbo et al., 2016). Another article from 2007 discussed how to pay CEOs when the firm is facing bankruptcy (M. T. Henderson, 2007). Thus, by focusing on only the CEO themselves and their direct impact on the risk of bankruptcy, this paper aims to fill a gap in the current literature.

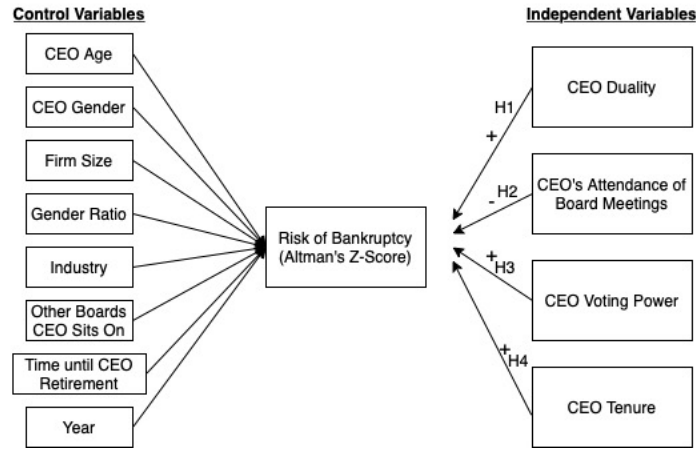


Figure 1: Hypothesis visualized (year has to be changed)

2 Hypothesis Development

2.1 CEO Duality

Academics specializing in corporate governance and strategic management have focused heavily in recent years on the concept of 'CEO Duality' (Chowdhury & Doukas, 2022). Here, the term CEO Duality refers to when the CEO of a company is also the chairman of the company's board (Daily & Dalton, 1994). This dual leadership structure has previously been a large source of debate with certain scholars deeming CEO duality to remove the checks and balances vital for proper performance of the CEO, and thus the company (Krause et al., 2014). CEOs are expected to report to the Board, and have their progress (or lack thereof) monitored by the board (Fernandes et al., 2021; Krause et al., 2014). When a CEO forms part of the Board, problems arise when the CEO is not fulfilling his/her corporate duties. This paper will therefore analyze CEO duality in the context of bankrupt companies in order to determine if there is a positive relationship between the two variables.

CEO duality is commonly used as a proxy for CEO power because it has the potential to give one individual a vast abundance of power in a company. One study found that 'dominant' CEOs within the company are more likely to be linked to bankruptcy than 'weaker' CEOs (Hambrick & D'Aveni, 1992). A reason for this could be because CEOs that sit on the Board may be able to influence their own annual compensation scheme (Banerjee et al., 2020). A CEO with dual leadership may have control over the value of their cash bonus at the end of the year, or the stocks granted following subjectively 'good' performance. Too many benefits may be bestowed upon the CEO if the CEO can choose to give themselves their own benefits (Banerjee et al., 2020).

However, is important to note that certain scholars argue that CEO duality

may be a positive feature for companies (Finkelstein & D'aveni, 1994). This is because CEOs holding both positions of leadership may retain unity of command which may, in turn, enhance the business' effectiveness (Banerjee et al., 2020). When the CEO is entrenched at the top of the organization, there is an 'unambiguous leadership clarifying decision-making authority' and stakeholders receive reassurance that the business operations are running seamlessly and smoothly (Finkelstein & D'aveni, 1994). CEO duality removes confusion about who really is in charge of the company which has been proven to facilitate strategic direction (Daily & Dalton, 1994).

Whilst the view that CEOs with power may lead to streamlined decision-making may have some merit, if the CEO does not make the right decisions, this will be difficult to monitor or correct (Chowdhury & Doukas, 2022). Furthermore, not only does the monitoring of the CEO and his/her performance decrease significantly, but CEOs that have a 'seat' at the board may fill the board with so-called 'allies' (Kim & Lee, 2018). This further consolidates their power by increasing the chance that other board members will then vote in their favor (Gulati & Westphal, 1999). Academic research has already established the disadvantages of having CEOs with too much power, prompting one scholar to conceptualize CEO duality as a 'double-edged sword' (Finkelstein & D'aveni, 1994). Therefore, this paper seeks to analyze if the CEO also being the chairman of the company is so detrimental, it may lead to bankruptcy of the company.

H1= CEO Duality leads to higher bankruptcy risk

2.2 CEO's Attendance of Board Meetings

Another factor that may increase the risk of bankruptcy is whether or not the CEO attended more than 75% of company board meetings. A 2016 study found that, up to 3 years prior to the bankruptcy of the company, certain directors showed up to less than 75% of board meetings arora2018financially. Arora implied that this may have been one of the reasons as to why the company went bankrupt arora2018financially. Attending a meeting may not show extreme effort (as people can show up to meetings but essentially not do anything nor contribute to the discussion). However, showing up shows an arguably higher level of effort than not showing up. If the directors were not even present at the meeting, it is logical to assume that they contributed less than a present, albeit passive, participant at the meeting (Arora, 2018).

Although Arora's study focuses on the involvement of directors at board meetings, this paper will look at the CEO's involvement at board meetings. Typically, all Officers at companies (e.g.: CEO, CFO, COO) are expected to be present at board meetings and report to the Board of Directors. Adams and Ferreira (2009) also argue that board meetings are key channels through which monitoring of the company and its Officers can occur (Adams & Ferreira, 2009). If a CEO is not present, this important means of monitoring and analysis becomes less effective. This logic is also seen in numerous other academic articles which all deem board meetings (and therefore attendance of participants) to be

important proxies for the monitoring and livelihood of companies (DeBoskey et al., 2019). For this reason, the attendance of CEOs at board meetings will also be taken into account when determining a company's risk of bankruptcy (Adams & Ferreira, 2009; DeBoskey et al., 2019).

H2= When a CEO attends less than 75% of board meetings, this leads to a higher bankruptcy risk for the company

2.3 CEO Voting Power

CEO power concentration can be identified through two different features: 1) CEO voting power; and 2) CEO ownership of company stock (Papadopoulos, 2019). This hypothesis will focus on CEO voting power because this feature is frequently criticized in academic discourse. CEO voting power gives direct insight into the ability of a CEO to make decisions and plans within a company (Lewellyn & Fainshmidt, 2017). It has already been proven that CEOs with high voting power do not generate higher economic return within their company (Papadopoulos, 2019). In fact, high voting power of a CEO correlates to several negative corporate governance indicators. These include: low levels of board refreshment; low levels of gender diversity in the board room; and diminished board independence (Papadopoulos, 2019). This may be because the board votes on who becomes a board member, and so a CEO with voting power has direct influence on their fellow board members (Fredrickson et al., 1988). This links to the CEO duality hypothesis argument, whereby it was stated that CEOs may elect 'allies' who align with their interests and do not act independently of the CEO.

Another study by Perlitz and Seger (1994) showed that companies with higher voting power of CEOs (amongst two other factors) had significantly lower profit and growth than companies with lower voting power of CEOs (Chang Aik Leng, 2004; Seger & Perlitz, 1994). A reason for this could be because CEOs may be more likely to vote in favor of their personal interests (Fredrickson et al., 1988). A study from 2017 has shown that, when shareholders are able to vote, they are most likely to vote against misaligned CEO pay compensation (Sanchez-Marin et al., 2017). However, it is reasonable to assume that a CEO will vote in favor of their compensation even if it is misaligned (i.e.: too high). This potential fruitless loss of money away from the company and to the CEO may be one reason as to why companies that give their CEOs high voting power have lower profit and growth. Therefore, this paper hypothesizes that CEOs with high voting power may contribute to the bankruptcy of a company. Hence:

H3= A higher CEO voting power will lead to a higher risk of bankruptcy for the company

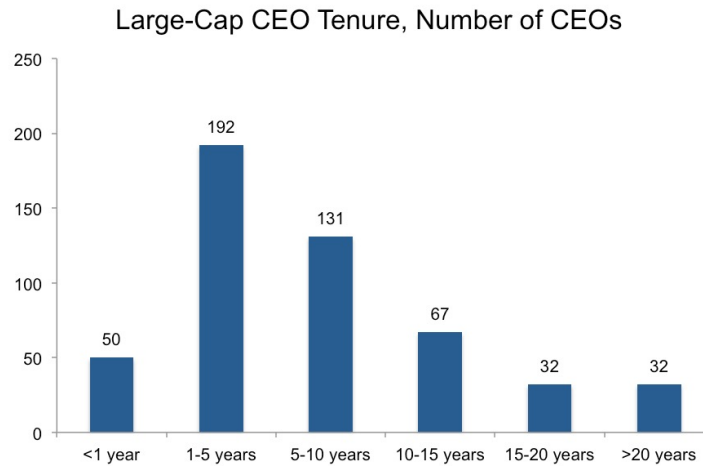


Figure 2: Number of years CEOs were employed at a large-cap firm (Schulhofer et al., 2018)

2.4 CEO Tenure

Another factor that can potentially influence the risk of bankruptcy within a company is the length of a CEO's tenure. In this context, CEO tenure refers to the CEOs accumulation of expertise in their role and this can be measured through the length of time the individual holds the position of CEO at a company (Darouichi et al., 2021). The average tenure for a CEO that is a non-founder of the company they are employed at is 5 years (Eckbo et al., 2016). The reason for this relatively short tenure length could lie in the fact that shorter CEO tenures may lead to higher economic performance of the company (Darouichi et al., 2021). This is because, in the first couple of years of employment, the Board of Directors is much more concerned with CEO performance (Darouichi et al., 2021). In light of this scrutinization from the Board, CEOs find themselves risking dismissal and loss of pay (Khan et al., 2021). These career-related concerns manifest themselves in a more hardworking CEO in order to alleviate these concerns and secure their position at the company.

Proponents of long CEO tenure state that CEOs that have held their position for long periods of time are better for the wellbeing and survival of a company (Fizel & Louie, 1990). This is because those CEOs possess familiarity with the company they work for, and have learnt over time exactly how to run that specific business most optimally (Musteen et al., 2006). However, it must be noted that the majority of academic literature found refutes this assertion. CEOs with short tenure create more financial gain for their company (Darouichi et al., 2021). Although it has not been proven that this gain is long-term, the short-term gain is higher for short-term CEOs (Fizel & Louie, 1990). For this reason, this paper hypothesizes that CEOs with early tenure decrease the risk of bankruptcy in a

company. This is due to increased board monitoring; career-related fears; and the need to prove oneself. Thus:

H4= CEO tenure increases the risk of bankruptcy in a company

3 Theoretical Background

The papers used in this literature review have been obtained by searching Scopus and Google Scholar. In order to ensure accuracy and reliability, papers with more citations were favored over papers with less. After finding and analyzing a relevant article, the citations within the article were scanned in order to find other promising articles. This method is known as snow-balling, and was the primary method used for the collection of relevant literature.

3.1 Altman's Z-Score

In 1968, Dr. Edward Altman created the world-famous Altman Z-Score model for bankruptcy prediction of companies (Altman et al., 2017). Altman used his expertise on corporate bankruptcy, credit risk analysis, and distressed debt to produce a formula that could give individuals insight into the financial well-being of a firm proportional to its chance of bankruptcy (Ko et al., 2017). Altman's Z-Score became internationally recognized, and was even used by Altman himself in his testimony for the U.S. House of Representatives Finance Committee's deliberations (Altman et al., 2019). Although Altman has updated his Z-Score (most recently in 2019), his "original" Z-Score is the one that garnered international attention and it most frequently used (Altman et al., 2019). For this reason, that is the Z-Score that this paper will focus on.

Altman's Z-Score uses discriminate analysis to predict bankruptcy (Altman et al., 2017). What made Altman's Z-Score so widely used was that Altman utilized basic financial ratios in his formula, which many companies had readily available (Calandro, 2007). These inputs were thus easy to acquire for the general population, unlike the inputs in most other finance theory which is much harder to collect and interpret (Calandro, 2007). Furthermore, Altman's Z-Score was also proven to have very high accuracy when analyzing companies based in the United States of America (Altman et al., 2019). Since this paper is focusing on SP1500 companies, the geographic nature of these companies also make the Z-Score suitable. The 5 variables required for Altman's Z-Score are shown below. These independent variables predict the risk that, in at most two years, the analyzed company will face bankruptcy (MacCarthy, 2017):

The formula used to create the Z-Score is shown in equation 1. (it is the summation of the 5 independent variables listed above) (Altman et al., 2017):

$$Z = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + X_5 \quad (1)$$

Variable	Definition	Weighting Factor
X_1 ----	$\frac{\text{Working Capital}}{\text{Total Assets}}$	1.2
X_2 ----	$\frac{\text{Retained Earnings}}{\text{Total Assets}}$	1.4
X_3 ----	$\frac{\text{EBIT}}{\text{Total Assets}}$	3.3
X_4 ----	$\frac{\text{Market Value of Equity}}{\text{Book Value of Total Liabilities}}$	0.6
X_5 ----	$\frac{\text{Sales}}{\text{Total Assets}}$	1.0

Figure 3: Original Z-Score Component Definitions and Weightings (Altman, 1968)

$Z > 2.99$ – “Safe” Zone

$1.81 > Z < 2.99$ – “Grey” Zone

$Z < 1.81$ – “Distress” Zone

Figure 4: Original Z-Score Zones (Altman, 1968)

Based on the final number given through the formula, one can predict the risk of bankruptcy of a company within the next two years. The final number would be compared to fig. 3:

4 Data and Methods

In this section the data, methods and experiment setup will be described. Additionally, descriptive statistics of all variables will be shown, and the two Analysis method used in this study will be explained.

4.1 Data Gathering and Description

This paper uses two key databases. All of the used databases are accessed through Wharton Research Data Services (WRDS) (**wrds**). The first database is BoardEx (**boardEx**). More specifically, the Organization Summary - Analytics table (`boardex_na_na_wrds_org_summary`). This database contains key information regarding the characteristics of board members and the boards of companies.

The second database is Compustat / Capital IQ, which contains two further tables that will be used: 'Compustat Executive Compensation - Annual Compensation' and 'Compustat Daily Updates - Fundamentals Annual'. Executive Compensation (ExecuComp) (`comp_execucomp_anncomp`) will be used in order to collect data regarding the CEOs of companies, such as: CEO tenure, CEO gender and CEO attendance of meetings. Fundamentals Annual (`comp_na_daily_all_funda`) will be used in order to create Altman's Z-Score, since this database contains key financial statistics.

These databases will be joined based on company identifiers, such as GVKEY, which stands for Global Company Key and is a unique identifier for companies within the WRDS database. After joining the data, selection criteria will be applied. In terms of time, this study considers data between 1990 and 2021. Secondly, this study only looks at firms that are included in the S&P Composite 1500. The SP Composite 1500 Index is an index of US stocks made by Standard Poor's (Global, 2020) which consists of all stocks in the SP 500, SP 400, and SP 600. Approximately 90% of the market capitalization is covered by U.S. stocks (Global, 2020).

Some variables require some extra steps to construct. For example, CEO duality will be measured by using the Compustat datasets and combining fields to see if the CEO also holds the position of Chairman of the company's board. CEO attendance of board meetings will be measured using the BoardEx database, and is a binary variable with either "yes" or "no" as the outcome. The "yes" indicates that the CEO has been present for more than 75% of board meetings, and "no" indicates that the CEO has been present for less than 75% of board meetings. This will be converted to a binary dummy variable. CEO voting power will be measured as a percentage and will also be found in the BoardEx dataset. CEO tenure will be measured in years, and will be calculated by subtracting the current year that the CEO is in their role from the CEO's starting date in their position. The dependent variable (risk of bankruptcy) will be measured by calculating Altman's Z-Score based data from the Annual Fundamentals database.

4.2 Methods

After collecting and cleaning all data, the data will be analysed. A linear regression analysis will be used to quantify the relationship between the bankruptcy risk, for which Altman's Z-score is taken as a proxy, and the hypothesized determinants, namely: 1) CEO duality; 2) CEO's attendance of board meetings; 3) CEO voting power; and 4) CEO tenure.

This analysis will be controlled for: year; industry; firm size; CEO age; time to the CEO's retirement; total number of other boards the CEO sits on; gender ratio on the board; and the gender of the CEO.

5 Empirical Context

This thesis will be written in collaboration with Deloitte¹, during a thesis-internship at Deloitte. Deloitte is one of the leading consultancy providers worldwide, and a coach from Deloitte will be the main point of contact for this thesis.

6 Results

7 Conclusion

8 Limitations

To decrease the risk of endogeneity, this paper included control variables in the regression model. However, there is a possibility there are missed control variables, which are not included in this study. Furthermore, this thesis does not attempt to imply a causal relationship, merely the correlation of excessive CEO power and Bankruptcy risk.

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¹<https://www2.deloitte.com/nl/nl.html>

In this section the results of the analysis will be shown. They will at least consist of a regression table, a co linearity table and maybe a decision tree

Write conclusion

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