

ERASMUS UNIVERSITY ROTTERDAM

Erasmus School of Economics bachelor's thesis

The impact of a higher bankruptcy risk on instances of earnings management: Evidence from Spain.

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Date: 10-07-2023

Abstract

This study examines the relationship between instances of earnings management and higher bankruptcy risk. The analysis utilizes a sample of 82 non-financial listed Spanish firms over a period of five years, for a total of 410 observations and employs a logistic and random effect model regression to investigate the hypotheses. The results indicate a significant negative association between instances of earnings management and higher bankruptcy risk, suggesting that firms facing a higher risk of bankruptcy are less likely to engage in earnings management practices. However, no statistically significant relationship was found when analyzing the impact of financial leverage on instances of earnings management in the context of higher bankruptcy risk. These findings have important implications, specifically for understanding the behaviour of Spanish firms that are facing financial distress and for contributing to the existing literature by adding the results of a European country. Limitations of this thesis include a sample that only includes non-financial firms and that is taken for a specific period. Future research could explore additional country-specific characteristics and employ different methodologies in order to further investigate the impact a higher bankruptcy risk has on instances of earnings management in different countries.

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Chapter 1. Introduction

1.1 Research problem and Motivation

The Financial Times recently published a report revealing a concerning trend in the European Union (EU) business landscape (Arnold & Jopson, 2022). According to the report, the number of EU businesses filing for bankruptcy during the fourth quarter of 2022 has reached its highest level in the past eight years. Spain, in particular, has experienced a significant increase in bankruptcy filings, with the number of firms filing for bankruptcy more than doubling during the second half of last year. An increased risk of bankruptcy may lead firms to practice upwards earnings management (Lara, Osma & Neophytou, 2009). Jamadar, Ong, Abdullah & Kamarudin (2019) have noted that earnings management is one of the key issues for investors and regulators, as it has been proven to reduce the informativeness of financial reporting done by firms. For these reasons, it is important to catch instances of earnings management early on. Considering the recent increase in the risk of bankruptcy faced by many European firms (Arnold & Jopson, 2022), it is necessary for auditors to exercise greater vigilance in detecting potential cases of earnings management in European firms, to ensure that accurate financial reporting is being performed.

The aim of this bachelor's thesis is to examine the relationship between a higher risk of bankruptcy and earnings management in Spanish firms. Specifically, the research question that will be investigated is: "*What is the effect of a higher risk of bankruptcy on instances of earnings management in Spanish firms?*".

A quantitative research approach will be employed using primary data. The data used will be obtained from publicly available financial statements of non-financial Spanish listed firms for a period of five years, namely from 2015 to 2019.

1.2 Key related literature and Contribution

This study will build upon the existing literature that exists on earnings management and financial distress, as well as the use of the Altman Z-score and the Beneish M-score as indicators of risk of bankruptcy and instance of earnings management, respectively.

The risk of bankruptcy, often referred to as the risk of insolvency, is the likelihood that a firm is unable to meet its debt obligations. In 1968 the Altman Z-score was first published by Edward Altman. With this paper, a new financial tool was developed with the intent to assess the likelihood that a firm will face bankruptcy in the coming years (Altman, 1968). The Z-score considers several financial ratios and assigns different weights to each one, ultimately leading to a final score. A score below 1.8 indicates a high risk of financial distress for a particular firm. Over time, many papers have studied the accuracy of this model. Altman et al. (2017) sought to offer evidence of the predictive power of the Z-score. Namely, their research supports the effectiveness of the Altman Z-Score model in predicting financial distress in most countries studied.

As mentioned earlier, earnings management reduces the informativeness of financial reporting, therefore it is a concerning issue for investors as well as regulators (Jamadar et al., 2022). A popular tool for detecting instances of earnings management is the Beneish M-score, created by Messod Beneish in 1999. Given that cases of earnings management can have detrimental effects if it goes undetected (e.g., the case of Enron, Healy & Palepu, 2003), Beneish (1999)

created this model with the aim of detecting instances of earnings management by using eight financial ratios. An M-score greater than -2.2 suggest that the company in question has a high chance of being a manipulator (Beneish, 1999). Since then, lots of researchers set out to analyze whether this model could also be applied in practice, such as Tarjo & Herawati (2015). Their results show that overall, the Beneish M-score model was successful in detecting instances of earnings management.

In the past, research on the relationship between the risk of bankruptcy and instances of earnings management has been primarily focused on Asian countries, such as China (Li, Abeysekera & Ma, 2011), as well as African countries (Egbunike & Igbinovia, 2018). However, these studies have resulted in conflicting conclusions, highlighting that the relationship between the threat of bankruptcy and earnings management may vary across continents. While Egbunike & Igbinovia (2018) found that the threat of bankruptcy has no significant impact on the likelihood of earnings management in Nigerian listed banks, with other factors being the main drivers, Li et al (2011) found that Chinese firms that face a greater risk of bankruptcy often make more use of earnings management in comparison to firms that did not experience financial distress. These differing findings suggest that the influence of bankruptcy risk on earnings management practices may be contingent upon the specific continent or region under consideration. Therefore, this study aims to further investigate and provide insights into this relationship, specifically focusing on the European country of Spain, to fill this gap in the literature.

1.3 Research Outline

The remaining parts of this thesis will be presented as follows. In Chapter 2, an extensive literature review will be performed on the past research done on the topic of bankruptcy risk as well as on instances of earnings management. Based on past studies, two hypotheses will be formulated. In Chapter 3, the research methodology will be presented. This will include an in-depth explanation of how the hypotheses will be tested as well as testing the assumptions needed. The hypothesis analysis will then be carried out in Chapter 4, where the summary statistics of the findings of this paper will be presented along with a discussion of the regression results. Finally, Chapter 5 will consist of the conclusions that can be drawn from the evidence provided in this paper followed by the research implications, limitations, and suggestions for future research on this topic.

Chapter 2. Literature Review

This literature review will analyze the existing research done in the areas of bankruptcy risk and instances of earnings management as well as the effect such risk has on instances of earnings management in different contexts. The existing literature will assist in the development of the hypotheses that this thesis aims to test.

2.1. The Risk of Bankruptcy

Before studying how the risk of bankruptcy affects instances of earnings management it is important to understand what bankruptcy is and the factors that may lead a firm to have a higher risk of bankruptcy.

Bankruptcy risk can be defined as a situation where a firm's liabilities exceed its assets. Because of this, predicting bankruptcy is crucial as it allows companies to take necessary measures to improve their financial planning, profitability, liquidity, and solvency efficiency, which can ultimately help firms avoid a financial crisis (Venkatarama et al., 2012). Many factors may contribute to a company's increased risk of bankruptcy, in this thesis, a few of those factors will be presented.

Darrat, Gray, Park, and Wu (2016), found that firm characteristics, namely the degree of firm complexity and the need for special knowledge, seem to affect the relationship that corporate governance has on the threat of bankruptcy. The study's findings indicate that companies with more extensive boards of directors and complex organizational structures are less likely to face bankruptcy risks. The opposite holds for firms with a less complex structure.

Another factor that influences the risk of bankruptcy is the level of debt a company takes on. Denis & Denis (1995) reported that 31% of firms that engaged in leveraged recapitalizations experienced financial distress after the recapitalization.

In addition to these internal factors, there are also some external factors that may contribute to a firm's risk of bankruptcy. Namely, the economic conditions, a recession, or an economic shutdown, as was the case during covid, can impact a firm's performance. Next to this, regulatory changes may also impact a firm's risk of bankruptcy. Spain, in particular, suspended the obligation to declare bankruptcy until June 2022 to avoid an avalanche of business failures. A new reform law aims to make the process of restricting debt more efficient (Elisei, 2023). Elisei (2023) further explains that the new law entails that struggling firms can more easily negotiate with their creditors and come up with a plan to restructure their debt in a more manageable way. The aim of this reform was to help prevent bankruptcies for firms in Spain after the COVID-19 pandemic.

2.2 Earnings Management

Understanding the concept of earnings management is essential for gaining a deeper insight into its occurrence and the potential consequences if a firm decides to engage in earnings management behaviour.

After conducting extensive research into the occurrence of earnings management, academics have yet to reach an agreement on the definition of earnings management. Beneish (2001) documented the three most common definitions that academics have utilized when it comes to earnings management. Firstly, Davidson, Stickney, and Weil (1987), defined earnings management as the process where deliberate steps are taken to bring about a desired level of

reported earnings, this is all done within the constraints set forth by the generally accepted accounting principles (GAAP) of the given country. In addition, an alternative definition was presented by Schipper (1989). Namely, managing earnings involves intentionally interfering with the process of external reporting. This definition also includes “real” earnings management, which involves the timing of an investment or operating decision in order to modify a share of the reported earnings or the entire amount. Finally, Healy and Wahlen (1999), state that earnings management takes place when managers exercise their discretion in financial reporting and structuring transactions to modify financial reports with the purpose of either deceiving certain stakeholders regarding the actual economic performance of the company or affecting contractual results that rely on reported accounting figures. In his paper, Beneish (2001) aimed to highlight the importance of having a clear and concise definition of earnings management. This is crucial in order to accurately measure and identify it. The various definitions that have been proposed by previous literature highlight different aspects of instances of earnings management, including the intention, the choice of how to account for it and deception. By considering the methods employed as well as the intention behind such practices, it is possible to better comprehend the importance of detecting earnings management activities.

Detecting instances of earnings management is very important for all stakeholders involved. Investors require precise financial data to make informed decisions regarding whether to invest in a particular firm. Financial markets also depend on the transparency of firms to report accurate amounts in their financial statements. When firms manage their earnings, they may undermine the public's trust in the integrity of financial markets (Mayer, 2008). There are two perspectives to classify earnings management, the opportunistic perspective, where managers aim to deceive investors, and the information perspective, where managerial discretion is used to disclose to investors their private expectations about the firm's future (Holthausen & Lefwich, 1983). The most popular perspective that firms take when managing their earnings is that of the opportunistic perspective, where a manager may feel pressure to report better earnings. When it comes to how exactly managers manipulate earnings, there are several ways. Burgstahler & Dichev (1997) find that companies that manipulate earnings tend to report small increases in earnings and positive income more frequently than small decreases in income or losses. The study also found that firms use cash flow from operations and changes in working capital to boost their earnings. Another way that firms try to manipulate their earnings is through managing their accruals (McNichols, 2000). Accrual adjustments may be manipulated when managers alter estimates for items such as inventory, bad debt or warranties.

2.3 Theoretical Foundation

2.3.1 The Beneish M-score Model

This thesis relies greatly on the models that were crafted by Messod Beneish in 1997 and 1999. Since its introduction, this model has been a widely used tool to catch instances of earnings management early on. The reason for selecting the M-score model is that it has been tested by multiple authors, e.g. (Kamal, Salleh & Ahmad, 2016) (Tarjo & Herawati, 2015), and found to be a reliable predictor of earnings manipulation.

In order to detect whether a firm is an earnings manipulator, Beneish (1999) took a sample of 74 companies that have manipulated their earnings. These companies were then matched to

2,332 Compustat non-manipulators by the SIC industry and year. The author then made a comparison between the financial characteristics of the manipulating and non-manipulating firms with industry-matched codes. The evidence found by Beneish (1999) indicated that the probability of earnings manipulation is increased with unusual increases in receivables, deteriorating gross margins, decreasing asset quality, sales growth and increasing accruals. From these results, Beneish (1999) was able to create a model for detecting earnings manipulation using the sample of manipulating firms and their industry-matched nonmanipulating firms for the period of 1982-1988. The author then tested the model's performance on a holdout sample from the 1989-92 period and found it to work as expected. The final M-score model makes a comparison between a firm's financial data from the current year and the prior year. Ultimately, eight different ratios are used to calculate the M-score: Firstly, firms may be tempted to prematurely recognize revenue to inflate their profits, this is done by increasing the receivable days. For this reason, the *Days' Sales in Receivables Index (DSI)*, is calculated, this index is a measure of the ratio of days' sales in receivables when comparing it to previous years. The *Gross Margin Index (GI)* is also included as a decreasing gross margin creates an incentive for firms to inflate their profits each year. This index measures the changes in gross margin compared to the previous year. Additionally, the *Sales Growth Index (SI)* is also calculated, this index is used to measure the change in sales revenue from the prior year. Although this index is not directly related to a firm's earnings, high sales growth can create pressure for firms to maintain the same growth trend. This pressure increases the chances that a firm becomes a manipulator (Holthausen & Lefwich, 1983). The *Depreciation Index (DI)*, which measures the changes made to the rate of depreciation from the prior year, is also included. The main purpose of this index is to ensure that a firm has not adopted another depreciation method that is income increasing. The *Sales, General and Administrative expenses Index (SGI)* is the next ratio calculated. This ratio is included as financial analysts may interpret a disproportionate increase in turnover as a poor future prospect, this creates pressure on a firm to manage its earnings upwards. It measures the ratio of sales, general and administrative expenses to the preceding year. Penultimately, the *Leverage index (LI)* is derived. This index measures the ratio of total debt to total assets compared to the year prior, capturing the motivation that debt covenant provides for earnings manipulation. Finally, the *Total accruals to total assets (TAI)*, are evaluated to measure the manager's ability to alter earnings using discretionary accounting choices. The change in working capital (excluding cash) is adjusted for depreciation, to compute the firm's total accruals.

Each index is then assigned weights according to how influential they are when checking for an earnings manipulator. The final model is as follows:

$$M\ Score = -4.84 + 0.92 * DSI + 0.528 * GI + 0.404 * SI + 0.115 * DI - 0.172 * SGI + 4.679 * TAI + 0.327 * LI$$

The M-score has the characteristics of probability. A higher M-score implies a higher likelihood of earnings manipulation. A threshold of -2.2 is utilized, thus a score higher than this indicates that there is a high likelihood of that firm being a manipulator. The threshold of -2.2 is employed as it has been found to be the most effective threshold to separate firms that manage their earnings from those that do not (Beneish, 1999). This was found by examining the distribution of M-scores of manipulating firms and comparing it to the sample of non-manipulating firms.

2.3.2 Altman Z-score Model

In 1968 Edward Altman sought to create a model that will aid in detecting whether a company is facing operating or financial difficulties. To develop this model, Altman (1968) took a sample of 66 corporations and divided them into two groups with 33 firms each. The first group consisted of bankrupt firms that filed for bankruptcy in the period of 1946-1965, while the second group contained non-bankrupt firms for the same period. Within each group, the firms were further categorized based on industry and firm size, excluding smaller firms from the sample. Data pertaining to the financials of the selected firms were collected from a year prior to those firms filing for bankruptcy. From previous literature, the author selected five ratios based on their popularity in the literature, potential relevancy to the study of the risk of bankruptcy and a few 'new' ratios developed by Altman (1968). The first ratio used in this model is the *Working capital to Total assets ratio*. This ratio is frequently found in studies done on determinants of corporate problems; it measures the net current assets of a firm in comparison to its total assets. The *Retained earnings to Total assets* ratio is also included, it measures the cumulative profitability over time of a firm. This ratio is one of the before mentioned 'new' ratios created by Altman, the age of a firm is considered in this ratio as it is assumed that younger firms have a higher risk of bankruptcy. *Earnings before interest and tax to Total assets* ratio is the third ratio included, its purpose is to measure the productivity of a firm's total assets. The *Market value of equity to Total liabilities* ratio is the penultimate ratio included in the model, it measures how much a company's equity position can decline before its liabilities exceed its assets and therefore make it insolvent. This ratio adds a new market value dimension that was found to be very effective. Finally, the Ratio of *Sales to Total assets* is included: its purpose is to measure the ability of the firm's management in handling competitive conditions.

The final multivariate discriminant function was formulated as follows:

$$Z \text{ Score} = 0.012 * X_1 + 0.014 * X_2 + 0.033 * X_3 + 0.006 * X_4 + 0.999 * X_5$$

Where:

X_1 = Working capital/Total assets

X_2 = Retained earnings/Total assets

X_3 = Earnings before interest and taxes/Total assets

X_4 = Market values of equity/Book value of total debt

X_5 = Sales/Total assets

The evaluation of a firm's bankruptcy risk results in a final Z score, which can be classified into three distinct categories. Specifically, a score below 1.8 signifies poor performance and a higher risk of bankruptcy. On the other hand, a score ranging from 1.8 to 3.00 indicates satisfactory financial performance and a low probability of bankruptcy. Finally, a score exceeding 3.00 suggests that the firm is in a healthy financial position, with no indication of bankruptcy risk.

The Altman Z-score model, employed in this thesis, has demonstrated accuracy in forecasting the probability of a firm's future bankruptcy. Previous studies have found a high prediction accuracy when using the model, ranging from a 75% to 90% accuracy (Altman et al, 2017) (Salimi, 2015), proving that although this model was developed in 1968 it is still applicable today.

2.4 Prior Literature

Several studies have aimed to investigate the relationship between bankruptcy risk and earnings management, primarily focusing on Asian countries such as China and Indonesia. In a study of Chinese listed firms, Chen, Chen & Huang (2010) intended on investigating the earnings management behaviour among Chinese listed firms that were experiencing financial distress. A sample of 74 financially distressed companies was taken covering a period of 2002-2006. Here, the definition used for financial distress is based on the trading status classification of a firm in the Chinese stock market. A multivariate ordinary least squares regression (OLS) analysis was performed. The proxy for earnings management was based on a firm's discretionary accruals, specifically the direction of accruals management that was employed across different years. Based on the empirical results, the authors conclude that the risk of being de-listed (a higher risk of bankruptcy) led firms to adopt different earnings management behaviour, thus indicating a positive relationship between the two. These results are in line with what Li, Abeysekera & Ma (2011) found in a study on 987 Chinese firms for the period of 2003 to 2007. The results show that firms that were experiencing financial distress were more likely to participate in opportunistic earnings management.

Nareswara and Dewiyanti (2022) discovered contrasting findings in a separate investigation conducted in Indonesia, another Asian country. The authors took a sample of 404 firms listed on the Indonesia Stock Exchange for the financial period of 2020. Here, the measurement of earnings management is different compared to that used by Chen, Chen & Huang (2010). This study utilized four different proxies to detect instances of earnings management. The first two proxies were derived from earnings before extraordinary items were scaled by the total assets. The third proxy was based on the calculation of current accruals. Finally, the fourth proxy used was measured using the Jones model, where discretionary accruals are calculated as the residuals of an accrual-based estimation. The Altman Z-score was the model used as a proxy for measuring the risk of bankruptcy in each firm. The findings of this paper indicate that none of the established proxies for earnings management has a statistically significant correlation with the threat of bankruptcy as measured by the Altman Z-score. These results are consistent with their initial hypothesis that there is no significant effect.

In a different study done in the continent of Africa, Egbunike and Igbinovia (2018) set out to examine the causal-effect relationship between the threat of bankruptcy and the probability of earnings management in Nigerian firms. This study encompasses all deposit money banks listed on the Nigerian Stock Exchange; however, it specifically focuses on 14 of these banks during the period of 2011-2015. This study is different from those previously discussed as it focuses only on financial institutions, namely, banks. The three most widely used models of binary regression were utilized in this study. The logit, probit and gompit models. Earnings management, the dependent variable, was measured by the Beneish M-score, while the Altman Z-score was used as a measure for the independent variable, the threat of bankruptcy. The study did not find sufficient evidence to reject the null hypothesis, therefore the authors concluded that the likelihood of an upward earnings manipulation in Nigerian listed banks is not affected by the threat of bankruptcy.

In addition to research done on the direct impact of bankruptcy risk on instances of earnings management prior literature has also focused greatly on what factors may influence a firm's decision to manage its earnings. One of these factors is a higher degree of financial leverage

(Denis & Denis, 1995). Abbaspour & Moghaddam (2017), studied this relationship in the context of the Tehran stock exchange from 2010 to 2015 and found a significant positive effect of higher financial leverage on instances of earnings management. Another study by Ardison et al. (2012) found contrasting results. While making use of the same proxy for earnings management, namely the discretionary accruals model, no significant effect could be found in a sample of Brazilian firms. In a separate study, a diverse sample containing firms from different countries, Jelinek (2007), made use of the Jensen (1986) control hypothesis as the main explanation for the author's findings. Namely, the paper's results suggest a negative relationship between financial leverage increases and earnings management practices. The control hypothesis for debt creation provides further explanation as it states that debt creation effectively bonds managers to their promise to pay out future cashflows (Jensen, 1986). By making this promise, managers have less free cash flow available at their discretion, thus making it more difficult for managers to manage earnings. Zamri et al. (2013) also found similar results in a study of 749 Malaysian firms. Here, a different model for approximating earnings was used, however, the results showed the same negative relationship between financial leverage and earnings management practices. These findings also supported the view that leverage limits the earnings management activities of a given firm.

It is worth noting that these previous studies were not analyzed with firms that have a higher risk of bankruptcy risk in mind. However, it is still important to review such sources as they provide insight into how financial leverage affects whether a firm manages its earnings or not.

2.5 Hypothesis Development

Upon reviewing the existing literature, it is worth noting that a relationship between a higher bankruptcy risk and instances of earnings management appears to be present. This is also grounded in the theory that managers under pressure are more likely to engage in earnings manipulation (Healy & Wahlen, 1999). However, there exists a lack of research in the European market when it comes to the threat of bankruptcy and instances of earnings management. As seen in prior studies, mostly Asian countries (Chen, Chen & Huang, 2010) (Nareswara & Dewiyanti, 2022) and African countries (Egbunike & Igbinovia, 2018) have previously been studied. This thesis aims to fill this gap by studying the European country of Spain. Considering that many prior studies corroborate a positive relationship between the risk of bankruptcy and earnings management as well as the theory by Healy & Wahlen (1999), the following hypothesis will be tested:

H1: Firms facing the threat of bankruptcy are more likely to engage in earnings management.

In addition to testing whether a relationship exists between a higher bankruptcy risk and earnings management, it is also important to consider and test the factors that may affect a firm's decision to manage its earnings. As previously mentioned, one of these factors is a higher level of financial leverage (Denis & Denis, 1995). In general, there are two views on what the true impact of leverage is on instances of earnings management. On one side, previous literature has found a positive relationship between the two variables such as that in Abbaspour & Moghaddam (2017) and Khanh & Phung (2019). In addition to these findings, other researchers have also found a negative relationship, such as that of Jelinek (2007) and Zamri et al. (2013). Jensen (1986) also provided insight as to how debt creation restricts managers' ability to

manipulate earnings. This is due to a higher level of principal and interest payments that need to be made. Based on these arguments in favour of a negative relationship, the second hypothesis that will be tested is formulated as follows:

H2: Firms with higher levels of financial leverage are less likely to engage in earnings management in response to higher bankruptcy risk.

Given the lack of research done on how higher leveraged firms behave in the context of higher bankruptcy risk, this second hypothesis aims to provide more information on this relationship.

Table 1

Overview of prior studies on bankruptcy risk and instances of earnings management.

Author(s) (Year)	Time period	Sample	Research design	Result
Agrawal & Chatterjee (2015)	2009-2014	150 Indian firms	Regression analysis	Significant negative relationship
Chen, Chen, and Huang (2010)	2002-2006	74 Chinese listed companies	Regression analysis	Significant positive relationship
Egbunike & Igbinovia (2018)	2011-2015	14 Nigerian listed banks	Regression analysis	No significant relationship
Hassanpour & Ardakani (2017)	2010-2014	133 listed Iranian firms	Regression analysis	Significant positive relationship
Li, Abeysekera & Ma (2011)	2003-2007	987 Chinese listed firms	Regression analysis	Significant positive relationship
Nareswara & Dewiyanti (2022)	2020	404 listed Indonesian firms	Regression analysis	No significant relationship
Usheva & Vagner (2021)	2020	172 Slovakian firms	Importance-performance analysis	Positive relationship

Table 2

Overview of prior studies on the impact of financial leverage on instances of earnings management.

Author(s) (Year)	Time period	Sample	Research design	Result
Abbaspour & Moghaddam (2017)	2010-2015	14 listed Iranian banks.	Regression analysis	Significant positive effect
Ardison et.al (2012)	1994-2010	147 listed Brazilian firms.	Regression analysis	No significant relationship
Jelinek (2007)	1992-2002	246 listed global firms	Regression analysis	Significant negative relationship
Khanh & Phung (2019)	2010-2016	241 listed Vietnamese firms	GMM regression analysis	Significant positive relationship
Zamri et al (2013)	2006-2011	749 listed Malaysian firms	Regression analysis	Significant negative relationship

Chapter 3. Methodology

This chapter aims to elaborate on how the two hypotheses will be tested and why certain measures were chosen.

3.1 Research Design

In order to analyze the hypotheses mentioned in the previous chapter, this thesis will require a mathematical model specification. Eighty-two non-financial Spanish listed firms will be randomly selected from the Orbis database, this database will provide the company names that will be studied in this thesis. Only non-financial listed firms are included in this sample given that the models used in this thesis, namely the Altman Z-score and the Beneish M-score model, were designed to be used on non-financial institutions. The financial data from 2014 to 2019 of these Spanish-listed firms will be collected from the Bloomberg database, a database that includes data for over 129 countries and 150 stock exchanges as well as from Eikon DataStream, another database with data on over 600 public firms worldwide. Making use of panel data that observes a sample of firms over time, namely 2014 to 2019, providing various observations on each firm has a higher chance of crafting a reliable model compared to using data on one singular year (Hsiao, 1986). The period 2014 to 2019 was chosen seeing that these years have the most recent and complete data available. Using a more recent period also allows for a view of the current trends in Spain regarding whether firms will manage their earnings or not.

There are many ways in which the relationship between bankruptcy risk and earnings management has been studied in the past. Taking previous research into account, this thesis will make use of regression analysis. Particularly, a logistic regression and a Random Effects (RE) model regression.

3.2 Variable Measurement

3.2.1 Measurement for Bankruptcy Risk

Over the years, researchers have developed different models with the aim of detecting whether a firm will face bankruptcy in the near future. One of those models is the Altman Z-score, developed by Altman (1968). As mentioned in the previous chapter, this model is calculated by taking five different ratios, namely, the working capital/total assets ratio, retained earnings/total assets ratio, earnings before interest and tax (EBIT)/total assets ratio, the market value of equity/total liabilities ratio and finally, total sales/total assets ratio. For this thesis, the Altman Z-score will be used as a proxy for bankruptcy risk. Many studies have also taken this approach and used the Altman Z-Score as a proxy, such as Egbunike & Igbonivia (2018) as well as Chen, Chen & Huang (2010). Seeing that this proxy is often used in previous literature and has been tested throughout the years with positive results, it can be concluded that it is an appropriate measure for the risk of bankruptcy. A dummy variable named *DummyBankruptcy* will be developed which takes on a value of 1 if a firm has a higher risk of bankruptcy and 0 if not. For a firm to be considered at risk for bankruptcy, a Z-score below 1.8 is required.

3.2.2 Measurement for Instances of Earnings Management

Additionally, the Beneish M-score will be calculated as a proxy for instances of earnings management. As noted earlier, this model has also been proven to work effectively, see Kamal,

Salleh & Ahmad (2016) and Tarjo & Herawati (2015). This model considers eight financial ratios, namely, the day's sales in receivables index, the asset quality index, the sales growth index, the depreciation index, the sales general and administrative expenses index, the leverage index, and total accruals to total assets. The M-score will serve as a proxy for earnings management in this thesis. A dummy variable, DummyEM, will be developed which takes a value of 1 if a firm has managed its earnings and 0 if a firm has not. In order for a firm to be suspected of managing its earnings, an M-score above -2.2 is needed. Thus, all firms with an M-score above -2.2 will take on the value of 1 in the variable DummyEM. This type of measurement for earnings management, namely the Beneish M-score, is in line with previous research such as Egbunike & Igbinovia (2018) where the M-score was also used as a measure for earnings management.

3.2.3 Control Variables

While conducting the analysis needed for this thesis, it is important to consider potential confounding variables, that could influence the relationship between the variables of interest (i.e., Altman Z-score, Beneish M-score) and may need to be controlled for in the analysis.

Leverage, profitability, and firm size will be utilized as control variables in this thesis. Leverage will be used to test the second hypothesis (**H2**) which tests whether financial leverage in combination with a higher bankruptcy risk has a significant negative effect on instances of earnings management. Financial leverage has been recorded as a variable that influences both bankruptcy risk and instances of earnings management (Denis & Denis, 1995) and must thus be accounted for. Profitability is also included as a different control variable as it is a factor that may influence a firm's financial health. Therefore, it is possible that firms that are financially healthy may have a different motive behind their financial behaviour and thus how capable it is to manage their earnings. The measure for profitability used in this thesis is a firm's Return on Assets, which takes the total net income divided by the total assets of a given firm. Another control variable is firm size, which is calculated by taking the log of a firm's total assets. This variable is included as it influences a firm's resource availability as well as the organizational complexity. Organizational complexity, in particular, has been studied as one of the factors influencing a firm's potential bankruptcy risk, (Darrat, Gray, Park, and Wu, 2016). Additionally, larger firms face more scrutiny from investors. This extra pressure may lead management to adopt earnings management practices (Beneish, 1999).

3.3 Data Analysis Method

This thesis makes use of panel data, as financial information from the same sample of Spanish firms is studied over multiple years. Two regressions will be used in this study, namely logistic regression, and a Random Effects Model regression. The variables used are specified in **Table 3**.

The first hypothesis which aims to test the significance of the relationship between a higher bankruptcy risk and instances of earnings management, uses a binary variable as its independent variable, namely DummyEM. Given that the independent variable is a binary variable, a logistic regression will be utilized to investigate **H1**. A logistic regression is a statistical technique to analyze the relationship between a binary variable and an independent variable or multiple independent variables. Furthermore, this model estimates the probability

or odds, of a given outcome occurring. In this thesis in particular, the outcome that is analyzed is the odds of a company managing its earnings while also controlling for financial leverage, a firm's profitability as well as firm size. A logistic regression was chosen as previous literature has also made use of such a model in order to make conclusions about the probabilities of whether a firm will manage its earnings or not, see Egbunike & Igbinoia (2018) and Agrawal & Chatterjee (2015). For this thesis, the chosen model is preferred due to its ability to provide insights into what the odds are of a firm managing its earnings. This will offer a more precise answer to the primary research question posed in this thesis. The regression analysis results will thus, provide insights into whether the risk of bankruptcy, as indicated by the Altman Z-score, has a significant positive influence on the instances of earnings management as indicated by the Beneish M-score. Thus, in order to test the first hypothesis (**H1**), the following baseline regression will be utilized:

$$\begin{aligned} \text{DummyEM} = & \beta_{0i,t} \text{Constant} + \beta_{1i,t} \text{DummyBankruptcy} + \beta_{2i,t} \text{Leverage} + \beta_{3i,t} \text{ROA} \\ & + \beta_{4i,t} \text{Size} + \varepsilon_{i,t} \end{aligned}$$

Before testing the second hypothesis which hypothesizes that the amount of financial leverage has a significant effect on earnings management in the context of higher bankruptcy risk, it is necessary to determine the appropriate model to study this relationship. Given that the dataset selected is panel data with observations of the same variables over a period of five years, the Hausman test was conducted to determine what model fits the dataset the best. The results of this test are given in **Appendix 4**, with the results showing that a Random Effects (RE) model is more suitable. An interaction effect between *DummyBankruptcy* and *Leverage* is then added, with *DummyBankruptcy* taking the value of 1 if a firm is facing financial distress. The RE model will then be employed to examine whether there is a statistically significant association between the Beneish M-score, which is the proxy for earnings management, and the interaction effect of *DummyBankruptcy* and *Leverage*, which serves as the proxy for financial leverage in the context of higher bankruptcy risk.

The baseline regression for the second hypothesis (**H2**) can be described as follows:

$$\begin{aligned} \text{Mscore} = & \beta_{1,t} + \beta_{1i,t} \text{DummyBankruptcy} + \beta_{2i,t} \text{Leverage} + \beta_{3i,t} \text{ROA} + \beta_{4i,t} \text{Size} + \\ & \beta_{5i,t} \text{DummyBankruptcy} * \text{Leverage} + \varepsilon_{i,t} \end{aligned}$$

3.4 Research Assumptions

When making use of a logistic and RE regression, the dataset utilized must be in line with several assumptions for it to be statistically accurate. Therefore, it is important to test for these assumptions before conducting a regression.

3.4.2 Testing for Perfect Multicollinearity

One of the assumptions that need to be tested for is collinearity. Testing for multicollinearity is crucial to ensure the reliability and validity of the results of a regression analysis. Multicollinearity occurs when there is some level of correlation between the independent variables of a regression. Given that the goal of this thesis is to isolate the relationship between the risk of bankruptcy and instances of earnings management, the Variance Inflation Factor (VIF) is used to analyze the presence and severity of multicollinearity among the independent

variables. *Appendix 1* presents the results of this analysis. Given that all the IVF values are between 1 and 2, a regression can be performed.

3.4.3 Testing for Heteroskedasticity and Autocorrelation

Another assumption that should hold when running a regression is that the error terms of the independent variables should have constant variances, this is called homoscedasticity. In order to test for if heteroskedasticity is present, the Breusch-Pagan/Cook-Weisberg test is performed. The results of this analysis, displayed in *Appendix 2*, show that the hypothesis of constant variances is rejected, given that the p-value is smaller than 0.1. Hence, heteroskedasticity is present. Seeing that heteroskedasticity is present, robust standard errors will be used when conducting the regression analysis.

In addition to this, it is also important to test for autocorrelation within the selected sample. Autocorrelation refers to a correlation between a given variable and its lagged values. Seeing that a key assumption of regression analysis is that the errors are uncorrelated it is important to analyze this. The Woolridge test for autocorrelation in panel data will be used to test this assumption. In *Appendix 3*, the results of this test are presented. Seeing that the p-value is lower than the threshold of 0.5, the hypothesis of no autocorrelation is rejected, meaning that autocorrelation is present in the sample. To account for this, a Random effects model with robust standard errors will be performed. This type of regression considers autocorrelation and eliminates it.

Table 3:

Overview of variables used.

Variable	Definition	Source
<i>Dependent variables:</i>		
Beneish M-score	Indicates whether a firm manages earnings.	Calculated with data provided by Eikon DataStream
DummyEM (Dummy)	1 for earnings manipulation	
<i>Independent variables:</i>		
DummyBankruptcy (Dummy)	1 for firms with higher risk of bankruptcy	Bloomberg Eikon DataStream
Leverage (%)	Total debt / Total assets *100	
DummyBankruptcy * Leverage	Interaction term	
<i>Control variables:</i>		
ROA (%)	Net income / Total assets	Eikon DataStream
Firm Size	Log (Total Assets)	Eikon DataStream

Chapter 4. Data Analysis and Results

4.1 Descriptive Statistics

The selected sample contains data on 82 non-financial listed Spanish firms over 5 years for a total of 410 observations. In **Table 4**, the complete descriptive statistics can be found. These statistics provide a summary of the distribution as well as the means and variability of each variable used in this thesis. Among the 410 observations, 22% have a Beneish M-score larger than -2.2 indicating that these 90 observations contain cases of earnings manipulation. DummyBankruptcy (dummy variable for bankruptcy risk) suggests that 46%, or 188, of the observations in this dataset, have a higher risk of bankruptcy. The mean level of financial leverage of 31,81 indicates an average level of financial leverage across the sample of firms, while the standard deviation of 18,17 suggests a large amount of variation in leverage levels between firms. As for the Return on Assets (ROA), a higher value is indicative of a more efficient firm. In the sample, the average ROA of 5.24% indicates that for every dollar of assets, the average company earns a return of 5,24%. This is generally considered a good ROA, thus indicating that most of the firms in the sample are profitable. The average firm size in this sample is 6.06, which is in line with what is considered larger firms. With a sample size of 410 observations, it can be concluded that the sample size is sufficiently large, and the Central Limit Theorem can be applied. This theorem states that the sample will be approximately normally distributed when a sufficiently large sample size is used. Meaning that the assumption of normal distribution that is needed to use regression analysis is satisfied.

Table 4.

Descriptive statistics.

Variable	N	Minimum	Maximum	Mean	Standard deviation
Mscore	410	-11.09	14.04	-3.04	2.36
DummyEM	410	0	1	0.22	0.41
Zscore	410	-1.42	26,54	2.49	2.69
DummyBankruptcy	410	0	1	0.46	0.5
Leverage	410	0	103.63	31.81	18.17
ROA	410	-28.03	59.61	5.24	8.68
Size	410	4.13	8.06	6.06	0.96
Observations	410				

Note: This table displays the descriptive statistics for 82 Spanish firms over 5 years, totaling 410 observations. The M-score has the characteristics of probability. A higher M-score implies a higher likelihood of earnings manipulation. The Z-score also has similar characteristics, with a lower Z-score indicating a higher likelihood of financial distress. The variables "DummyEM" and "Dummybankruptcy" are binary variables. These binary variables are given in 0 and 1, with 0 as "not at risk for bankruptcy" and 1 as "higher risk of bankruptcy". Furthermore, these binary variables are given as proportions. Leverage is given as a ratio of total debt to total assets, in percentage. ROA is given as a percentage and is calculated by dividing a firm's net income by its total assets. Size is calculated by taking the log of a firm's assets.

4.2 Regression Results

The first model, displayed in column 1 of **Table 5**, is a logistic regression with a dummy variable for earnings management as the dependent variable and a dummy for bankruptcy risk, level of financial leverage, profitability (ROA), and firm size as independent variables. The results of **Table 5** show that at a 10% significance level, a higher bankruptcy risk has a negative

association with instances of earnings management. Namely, the odds ratio of 0.51 implies that the odds of a firm managing its earnings are 0.51 times lower when a firm is at risk for bankruptcy. When the odds ratio of a variable is lower than 1, it indicates that the treatment group, in this case, firms that have a higher risk of bankruptcy, have lower odds of managing their earnings than firms in the control group, i.e., firms with a lower risk of bankruptcy. Seeing that **H1** stated that a higher risk of bankruptcy has a positive impact on instances of earnings management, this hypothesis is rejected at a 10% significance level. It is worth noting that this model has a relatively low R-squared, with a value of 0.05, meaning that 5% of the variation in the instances of earnings management is caused by the independent variables in this model. In column 2 the regression results for the second model are given. This model is a Random Effects Model, which is used when analyzing panel data. An interaction effect was added to analyze the impact of financial leverage and a higher bankruptcy risk on earnings management. When controlling for profitability and firm size, this interaction effect is not statistically significant. Meaning that there is no evidence that suggests that financial leverage in the context of higher bankruptcy risk has an impact on instances of earnings management. However, it is worth mentioning that the coefficient of this interaction term is negative. Meaning that, a negative relationship between financial leverage in the context of higher bankruptcy risk and instances of earnings management could be expected, however, given that the coefficient is not statistically significant, no conclusions can be drawn.

Table 5*Regression results.*

	DummyEM	Mscore
Variables	Logistic (1)	REM (2)
(Constant)	1.12 (0.80)	-1.35 (6.98)
Dummybankruptcy	0.51* (0.29)	0.62 (0.83)
Leverage	-0.01 (0.01)	-0.16 (0.13)
ROA	0.38*** (0.14)	0.025** (0.01)
Size	-0.47*** (0.13)	-0.16 (0.13)
Dummybankruptcy *		0.01
Leverage		(0.19)
R²	0.05	0.02
F-statistics		
N	410	410
N groups		82

*Note: This table displays the regression analysis of being at risk for bankruptcy on instances of earnings management. Column 1 displays the results of a logistic regression while column 2 displays a random effects model. The variable *Dummybankruptcy* is a binary variable with a value of 1 for being at risk for bankruptcy and 0 if not at risk for bankruptcy. The dependent variable of column 1, *DummyEM*, is described as the odds ratio while that of column 2, *Mscore*, is used as a proxy for earnings management with a score higher than 2.22 signalling earnings manipulation. Robust standard errors are given in parentheses. * $p < 0.10$, ** $p < 0.05$ and *** $p < 0.01$.*

4.3 Robustness Check

A robustness check is conducted in order to enhance the reliability and generalizability of the results presented in this thesis. The empirical results of this thesis will be tested by means of sub-group analysis. This analysis will gather insight into whether the conclusions drawn from this study still hold across the different regions in Spain. The sample that was gathered of 82 firms will be split into groups based on what stock exchange they are listed on. In Spain, the main stock exchanges that firms are listed on are either the Madrid Stock Exchange, the Bilbao stock exchange, or the Barcelona stock exchange. The same regression analysis will be adopted for the four sub-group samples. The distribution is as follows: 46 firms are listed on the Madrid stock exchange, 18 firms are listed on the Barcelona stock exchange, and 17 firms are listed on the Bilbao stock exchange. *Appendix 5* displays the results that are obtained by re-running both the logistic and RE regressions on the sample of each region. The robustness check indicates that the initial finding of a negative relationship between the odds of a firm managing its earnings and being at risk for bankruptcy is supported when running the same regression on all sub-groups. However, this negative relationship is not statistically significant across all groups, in particular, for the cities of Barcelona and Bilbao. It is important to note, however, that the smaller sample size for the regions of Bilbao and Barcelona may be the cause of the relationship not being significant. When studying whether financial leverage may have a significant influence on the choice to manage earnings for firms under financial distress, the results prove to be insignificant across all groups, confirming the results that were obtained previously.

Chapter 5. Conclusion and Discussion

5.1 Overview

In summary, this thesis aimed to investigate the impact a higher bankruptcy risk has on instances of earnings management. This was done by conducting a Logistic and a Random Effects Model regression using data on 82 non-financial listed Spanish firms over a period of five years, resulting in 410 observations. The main finding from the logistic model is that a negative association exists between the odds of a firm managing its earnings and a higher risk for bankruptcy. This suggests that a firm with a higher risk of bankruptcy has a lower chance of managing its earnings than firms with a lower risk of bankruptcy. This is in contrast with the first hypothesis (**H1**) that stated that a positive relationship exists between a higher bankruptcy risk and instances of earnings management. Some previous studies (Agrawal & Chatterjee, 2015) have also found similar results in a sample of 150 Indian firms. However, this result also contrasts with other studies such as Li, Abeysekera & Ma (2011) and Hassanpour & Ardakani (2017) which found a positive relationship. The differences in findings could be due to country-specific factors.

Despite a lot of previous literature supporting the second hypothesis (**H2**) that higher financial leverage negatively influences instances of earnings management, this thesis found no statistically significant evidence of this relationship when firms under financial distress. Although the findings did not indicate a statistically significant effect, it is worth noting that the absence of statistical significance does not necessarily imply that a true relationship does not exist. Other factors may have influenced the results in a counteractive way, such as sample size, measurement errors or other factors and should be studied further.

The robustness check of the empirical results obtained in this paper was found to support the main findings when studying different regions of Spain. However, this was not the case for all cities, as there was a lack of statistical significance in the cities of Barcelona and Bilbao. This result could be partly due to a smaller sample size for these cities, or it could point to regional-specific factors that may be present. Future research could focus on these factors and include a larger sample size in order to gather more reliable results.

Thus, to answer the research question of "*What is the effect of a higher risk of bankruptcy on instances of earnings management in Spanish firms?*", the main findings point to a significant negative effect in the overall sample of non-financial listed firms in Spain. Meaning that, firms with a higher bankruptcy risk were found to have fewer instances of earnings management compared to firms that were not at risk of bankruptcy. This result is significant at a 10% significance level.

5.2 Research Implications

This thesis has not only contributed to the current literature, but its findings also have social implications. As for the current literature, this thesis studied the country of Spain, where little research has been done on earnings management. Next to this, European countries have not been studied as extensively as countries from other continents, therefore this paper adds a new sample in a different setting. This also helps fill the gap in the literature and helps enhance the knowledge on this topic. Additionally, this thesis has also implemented a different methodology

than previous literature by utilizing different proxies that have been proven to be accurate in predicting bankruptcy and instances of earnings management.

In a more social setting, the results of the first hypothesis (**H1**) can provide insights for policymakers and internal- and external auditors when assessing a firm's financial statements. Namely, a higher bankruptcy risk does not imply that a firm will manage its earnings. With this knowledge in mind, regulators can focus their resources on other aspects of a firm's financial statement and work more efficiently. As for the second hypothesis, despite the lack of statistical significance, it is important to continue monitoring and assessing financial leverage's impact in the context of higher bankruptcy risk to better understand the potential implications.

5.3 Limitations and Suggestions for Future Research

No study is without its limitations. As for this thesis, a sample size of 82 non-financial firms was used. This may limit the generalizability of its findings, as only non-financial firms were studied. Future research could expand to more firms, as well as financial ones, for a more diverse sample, to provide a deeper understanding of the relationship between a higher bankruptcy risk and earnings management. In addition, this study only focused on the country of Spain, thus limiting the conclusions that can be made. Different countries in Europe may have different cultural or regulatory differences that may influence the results in that country. Given the limited amount of research done on the continent of Europe and instances of earnings management, future research could expand on more European countries to get more country specific results, as well as use different methodologies to try to obtain the most accurate results possible. Future research could also expand on other potential factors that may influence the relationship between a higher bankruptcy risk and instances of earnings management. This could aid auditors in identifying red flags when doing the end-of-year audit. By addressing these limitations and conducting studies with different samples, future research can enhance the current understanding of this relationship.

Bibliography

- Abbaspour, A. M. & N. (2017). The Effect of Leverage and Liquidity Ratios on Earnings Management and Capital of Banks Listed on the Tehran Stock Exchange. *ideas.repec.org*. <https://ideas.repec.org/a/eco/journ3/2017-04-14.html>
- Agrawal, K., & Chatterjee, C. (2015). Earnings Management and Financial Distress: Evidence from India. *Global Business Review*, 16(5_suppl), 140S-154S. <https://doi.org/10.1177/0972150915601928>
- Agustia, D., Muhammad, N. S., & Permatasari, Y. (2020). Earnings management, business strategy, and bankruptcy risk: evidence from Indonesia. *Heliyon*, 6(2), e03317. <https://doi.org/10.1016/j.heliyon.2020.e03317>
- Altman, E. I. (1968). Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy. *Journal of Finance*, 23(4), 589. <https://doi.org/10.2307/2978933>
- Altman, E. I., Iwanicz-Drozdowska, M., Laitinen, E. K., & Suvas, A. (2017). Financial Distress Prediction in an International Context: A Review and Empirical Analysis of Altman's Z- Score Model. *Journal of International Financial Management and Accounting*, 28(2), 131–171. <https://doi.org/10.1111/jifm.12053>
- Ardison, K. M. M., Martinez, A. L., & Galdi, F. C. (2012). The effect of leverage on earnings management in Brazil. *Advances in Scientific and Applied Accounting*, 305–324. <https://doi.org/10.14392/asaa/2012050301>
- Beatty, A., Ke, B., & Petroni, K. R. (2002). Earnings Management to Avoid Earnings Declines across Publicly and Privately Held Banks. *The Accounting Review*, 77(3), 547–570. <https://doi.org/10.2308/accr.2002.77.3.547>
- Beneish, M. D. (2001). Earnings management: a perspective. *Managerial Finance*, 27(12), 3–17. <https://doi.org/10.1108/03074350110767411>

- BeneishMessod, D. (1999). The Detection of Earnings Manipulation. *Financial Analysts Journal*, 55(5), 24–36. <https://doi.org/10.2469/faj.v55.n5.2296>
- Burgstahler, D., & Dichev, I. D. (1997). Earnings management to avoid earnings decreases and losses. *Journal of Accounting and Economics*, 24(1), 99–126. [https://doi.org/10.1016/s0165-4101\(97\)00017-7](https://doi.org/10.1016/s0165-4101(97)00017-7)
- Chen, Y., Chen, C., & Huang, S. (2010). An appraisal of financially distressed companies' earnings management. *Pacific Accounting Review*, 22(1), 22–41. <https://doi.org/10.1108/01140581011034209>
- Darrat, A. F., Gray, S., Park, J. T., & Wu, Y. (2016). Corporate Governance and Bankruptcy Risk. *Journal of Accounting, Auditing & Finance*, 31(2), 163–202. <https://doi.org/10.1177/0148558x14560898>
- Davidson, S., Stickney, C., & Weil, R. (1987). Accounting: The language of business. *Thomas Horton and Daughter. Sun Lakes Arizona.*
- Denis, D. J., & Denis, D. K. (1995). Causes of financial distress following leveraged recapitalizations. *Journal of Financial Economics*, 37(2), 129–157. [https://doi.org/10.1016/0304-405x\(94\)00792-y](https://doi.org/10.1016/0304-405x(94)00792-y)
- Egbunike, P. A., & Igbinoia, I. M. (2018). Threat of Bankruptcy and Earnings Management in Nigerian Listed Banks. *DOAJ (DOAJ: Directory of Open Access Journals).*
- Elisei, C. (2023, February 15). Analysis: Spain's new restructuring law is being put to the test, fast. *Reuters*. <https://www.reuters.com/markets/europe/spains-new-restructuring-law-is-being-put-test-fast-2023-02-15/>
- Hassanpour, S., & Ardakani, M. H. (2017). The Effect of Pre-bankruptcy Financial Distress on Earnings Management Tools. *International Review of Management and Marketing*, 7(3), 213–219. <https://dergipark.org.tr/tr/download/article-file/367732>

- Healy, P. M., & Palepu, K. G. (2003). The Fall of Enron. *Journal of Economic Perspectives*, 17(2), 3–26. <https://doi.org/10.1257/089533003765888403>
- Healy, P. M., & Wahlen, J. M. (1999). A Review of the Earnings Management Literature and Its Implications for Standard Setting. *Accounting Horizons*, 13(4), 365–383. <https://doi.org/10.2308/acch.1999.13.4.365>
- Hsiao, C. (1986). *Analysis of Panel Data*. <https://dx.doi.org/10.1017/cbo9780511754203>
- Jamadar, Y., Ong, T. S., Abdullah, A. A., & Kamarudin, F. (2021). Earnings and discretionary accruals. *Managerial and Decision Economics*, 43(2), 431–439. <https://doi.org/10.1002/mde.3391>
- Jelinek, K. (2007). The effect of leverage increases on earnings management. *The Journal of Business and Economic Studies*, 13(2), 24–46. <https://www.proquest.com/docview/235798383?pq-origsite=gscholar&fromopenview=true>
- Jensen, M. C. (1996). Agency costs of free cash flow, corporate finance, and takeovers. In *Cambridge University Press eBooks* (pp. 11–16). <https://doi.org/10.1017/cbo9780511609435.005>
- Jopson, B., & Arnold, M. (2023, February 17). EU bankruptcy filings jump to 8-year high as pandemic aid ends. *Financial Times*. <https://www.ft.com/content/c90c3556-3218-47ff-aeda-3f23af217c11>
- Kamal, M. E., Salleh, M. F., & Ahmad, A. (2016). Detecting financial statement fraud by Malaysian public listed companies: The reliability of the BEneish M-score model. *Jurnal Pengurusan*, 46, 23–32.
- Kamal, M. H. A., Salleh, M. a. a. M., & Ahmad, A. (2016). Detecting Financial Statement Fraud by Malaysian Public Listed Companies: The Reliability of the Beneish M-Score

- Model. *Jurnal Pengurusan*, 46, 23–32. <https://doi.org/10.17576/pengurusan-2016-46-03>
- Khanh, M. Q., & Phung, T. (2019). The effect of financial leverage on real and accrual-based earnings management in Vietnamese firms. *Economics & Sociology*, 12(4), 299–312. <https://doi.org/10.14254/2071-789x.2019/12-4/18>
- Lara, J. M. G., Osma, B. G., & Neophytou, E. (2009). Earnings quality in ex-post failed firms. *Accounting and Business Research*, 39(2), 119–138. <https://doi.org/10.1080/00014788.2009.9663353>
- Leach, R. E., & Newsom, P. (2007). Do Firms Manage Their Earnings Prior to Filing for Bankruptcy. *Academy of Accounting and Financial Studies Journal*, 11(3), 125. <https://www.questia.com/library/journal/1G1-166823528/do-firms-manage-their-earnings-prior-to-filing-for>
- Li, F., Abeysekera, I., & Ma, S. (2011). Earnings management and the effect of earnings quality in relation to stress level and bankruptcy level of Chinese listed firms. *Corporate Ownership and Control*, 9(1), 366–391. <https://doi.org/10.22495/cocv9i1c3art2>
- Lubben, S. J. (2011). Financial institutions in bankruptcy. *Seattle UL Rev*, 34, 1259. https://heinonline.org/HOL/Page?handle=hein.journals/sealr34&div=54&g_sent=1&asa_token=UDfCCUjvzr8AAAAA:bvVf_BLbi6BcZ5eHLeM2lj8NOnpUiQbG27tnbw2zKKiUjLfhNvePRe1vTi3V0PGIbNaUctAP&collection=journals
- Mayer, C. (2008). Trust in Financial Markets. *European Financial Management*, 14(4), 617–632. <https://doi.org/10.1111/j.1468-036x.2008.00454.x>
- McNichols, M. F. (2000). Research design issues in earnings management studies. *Journal of Accounting and Public Policy*, 19(4–5), 313–345. [https://doi.org/10.1016/s0278-4254\(00\)00018-1](https://doi.org/10.1016/s0278-4254(00)00018-1)

- Nareswara, F. A., & Dewiyanti, S. (2022). Bankruptcy risk and its effect on earnings management of Indonesian firms. *Icobar*.
- Salimi, A. Y. (2015). Validity of Altmans Z-Score Model in Predicting Bankruptcy in Recent Years. *Academy of Accounting and Financial Studies Journal*, 19(2), 233.
<https://www.questia.com/library/journal/1G1-458680893/validity-of-altmans-z-score-model-in-predicting-bankruptcy>
- Schipper, K. (1989). Earnings management. *Accounting Horizons*, 3(4), 91.
- Tarjo, & Herawati, N. (2015). Application of Beneish M-Score Models and Data Mining to Detect Financial Fraud. *Procedia - Social and Behavioral Sciences*, 211, 924–930.
<https://doi.org/10.1016/j.sbspro.2015.11.122>
- Usheva, M., & Vagner, L. (2021). Earnings Management as a Tool of Bankruptcy Prevention during Global Pandemic of COVID-19. *SHS Web of Conferences*, 92, 02063.
<https://doi.org/10.1051/shsconf/20219202063>
- Venkataramana, N., Azash, M., & Ramakrishnaiah., K. (2012). Financial Performance and Predicting the Risk of Bankruptcy: A Case of Selected Cement Companies in India. *International Journal of Public Administration and Management Research*, 1, 40–56.
- Zamri, N., Rahman, R. A., & Isa, N. M. (2013). The Impact of Leverage on Real Earnings Management. *Procedia. Economics and Finance*, 7, 86–95.
[https://doi.org/10.1016/s2212-5671\(13\)00222-0](https://doi.org/10.1016/s2212-5671(13)00222-0)

Appendix

Appendix 1: Variance Inflation Factor table for testing for multicollinearity.

Variable	VIF	1/VIF
Zscore	1.32	0.759252
Leverage	1.17	0.8564
ROA	1.16	0.909124
Size	1.10	0.860730
Mean VIF	1.19	

Appendix 2: Breush-Pagan/Cook-Weisberg test for heteroskedasticity.

H₀: Constant variance Chi2(1)

= 737.58

Prob > chi2 = 0.000

Appendix 3: Woolridge test for autocorrelation in panel data.

H₀: no first-order autocorrelation

F(1, 81) = 124.367

Prob > F = 0.000

Appendix 4: Hausman test.

	__Coefficients__			Standard error
	(b) fe	(B) re	(b-B) Difference	
Bankruptcy	3.3	3.21	0.09	3.69
Leverage	0.01	0.09	-0.08	0.13
ROA	0.03	0.13	-0.1	0.14
Size	-7.39	-1.41	-5.98	9.45

Test of H₀: Difference in coefficients not systematic.

Chi(4) = 1.42

Prob > chi2 = 0.8411

Appendix 5: Robustness check.*Regression results for firms listed on the Madrid stock exchange.*

Variables	DummyEM	Mscore
	Logistic (1)	REM (2)
(Constant)	3.2** (1.1)	-0.89 (0.)
Dummybankruptcy	0.99** (0.43)	2.29 (1.57)
Leverage	-0.01 (0.01)	0.01 (0.00)
ROA	0.38*** (0.14)	0.03** (0.01)
Size	-0.82*** (0.19)	-0.32 (0.19)
Dummybankruptcy *		-0.03
Leverage		(0.03)
R²	0.12	0.06
F-statistics		
N	230	230
N groups	46	46

*Note: This table displays the regression analysis of being at risk for bankruptcy on instances of earnings management. Column 1 displays the results of a logistic regression while column 2 displays a random effects model. The variable Dummybankruptcy is a binary variable with a value of 1 for being at risk for bankruptcy and 0 if not at risk for bankruptcy. The dependent variable of column 1, DummyEM, is described as the odds ratio while that of column 2, Mscore, is used as a proxy for earnings management with a score higher than 2.22 signalling earnings manipulation. Robust standard errors are given in parentheses. * $p < 0.10$, ** $p < 0.05$ and *** $p < 0.01$.*

Regression results for firms listed on the Barcelona Stock Exchange.

Variables	DummyEM	Mscore
	Logistic (1)	REM (2)
(Constant)	-2.36 (2.3)	-2.51* (1.42)
Dummybankruptcy	0.07 (0.61)	-0.41 (0.95)
Leverage	-0.01 (0.01)	0.01 (0.00)
ROA	0.06* (0.04)	0.02 (0.25)
Size	0.13 (0.3)	-0.02 (0.25)

Dummybankruptcy *		0.02
Leverage		(0.04)
R²	0.05	0.03
F-statistics		
N	90	90
N groups		18

Note: This table displays the regression analysis of being at risk for bankruptcy on instances of earnings management. Column 1 displays the results of a logistic regression while column 2 displays a random effects model. The variable *Dummybankruptcy* is a binary variable with a value of 1 for being at risk for bankruptcy and 0 if not at risk for bankruptcy. The dependent variable of column 1, *DummyEM*, is described as the odds ratio while that of column 2, *Mscore*, is used as a proxy for earnings management with a score higher than 2.22 signalling earnings manipulation. Robust standard errors are given in parentheses. * $p < 0.10$, ** $p < 0.05$ and *** $p < 0.01$.

Regression results for firms listed on the Bilbao Stock Exchange.

	DummyEM	Mscore
Variables	Logistic (1)	REM (2)
(Constant)	-2.18 (2.38)	-1.35 (6.98)
Dummybankruptcy	0.41 (0.61)	0.07 (0.34)
Leverage	-0.01 (0.02)	0.01 (0.01)
ROA	0.03 (0.05)	0.03*** (0.01)
Size	-0.02 (0.35)	0.07 (0.08)
Dummybankruptcy *		-0.01
Leverage		(0.00)
R²	0.02	0.15
F-statistics		
N	85	85
N groups		17

Note: This table displays the regression analysis of being at risk for bankruptcy on instances of earnings management. Column 1 displays the results of a logistic regression while column 2 displays a random effects model. The variable *Dummybankruptcy* is a binary variable with a value of 1 for being at risk for bankruptcy and 0 if not at risk for bankruptcy. The dependent variable of column 1, *DummyEM*, is described as the odds ratio while that of column 2, *Mscore*, is used as a proxy for earnings management with a score higher than 2.22 signalling earnings manipulation. Robust standard errors are given in parentheses. * $p < 0.10$, ** $p < 0.05$ and *** $p < 0.01$.