

FINANCIAL DISTRESS

A MEASURE OF FINANCIAL DISTRESS BETWEEN PUBLICLY-TRADED
AND PRIVATELY-HELD FIRMS IN THE EU DURING TIMES OF
ECONOMIC CRISIS.

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Abstract

This thesis before you attempts to investigate whether there is a structural difference between privately-held firms and publicly-traded firms with respect to financial distress during the economic crisis of 2007 to 2008 in the European Union. Firstly, we clarify our research question by discussing various relevant theories such as the information-asymmetry theory which argues that there is a difference between investors outside of the firm and management inside the firm respectively. According to this theory, management exploits this difference in information to obtain advantages when attempting to acquire financing for the firm's investment projects. We can combine said information-asymmetry theory with the agency theory which argues that privately-held firms have less influential stakeholders than do publicly-held firms. Additionally, when either firm type acquires debt, the debt holders are an additional stakeholder to be considered in the investment choices and capital structure of either firm type.

Secondly, we discuss relevant reference researches done by others and compare these amongst each other and with our own research, respectively. Then we discuss our methodology on how we relate aforementioned theories with the data we have acquired for this research. We will briefly take a look at some basic statistical information – as we only have a limited amount of observations due to data limitations. Although we find that we lack sufficient observations to function as any hard evidence, we do find indications that the quality of our dataset suffices to find that there is indeed a slight discrepancy between privately-held and publicly-traded firms in times of economic turmoil.

We have employed Altman's (2000) Z-score and its underlying financial ratios to analyze our data. In order to keep a respectable overview of these ratios and the Z-score respectively, we have added an appendix to this report containing tabular and graphical overviews of our analysis – these overviews will be directed towards throughout this report. We find that the majority of said underlying financial ratios are statistically insignificant between privately-held and publicly-owned firms, therefore proving no statistically significant difference in company performance between said

two parties. On the contrary, the actual Z-score proves to be significant, therefore concluding that during times of economic crisis, privately-held firms tend to perform slightly better than do publicly-traded firms within the same industry. Throughout this report we will link to a variety of similar researches done by others who have found similar conclusions with respect to aforementioned research question.

1. Introduction

During Fall of 2008, one of the worst financial crisis struck the continent of Europe¹. Originally coming from the United States, Europe got involved less than a year later. At the time of this writing, this economic crisis is considered the worst since the Great Depression of the 20's and 30's². Although this economic phenomenon must be highly frustrating for many business owners, it is however an excellent - and dare I say, unique - opportunity for Finance students such as ourselves to take advantage of from an educational perspective. As such we have decided to take a research subject for this thesis which is directly linked to the effects of this global economic crisis. Since one of the authors has majored in Entrepreneurship³, the other in Corporate Finance⁴, we decided to take a research question which covers both specializations. As such we have come to formulate a research question which attempts to clarify a (possible) difference between publicly-traded and privately-held firms.

The scope of our research will be limited to the European Union, with its member-states as it was on January 1st, 2004. This limitation is applied because within the science of Corporate Finance it has been obvious that some findings in say, the United States are not always applicable globally - even under the same circumstances, other variables, including those not directly related to the science of Corporate Finance might be of influence on what we try to examine. Henceforth it is logical to imply that our findings within the European Union might not be applicable globally as well. With this setting it allows us to gather data for five consecutive years on both privately-held and publicly-traded firms, thus giving a reliable overview of the condition of privately-held firms within the European Union while suffering from the current economic crisis in comparison to their publicly-traded counterparts.

The social and scientific relevance of this study has been covered in various forms of theoretical and empirical research. From these reference papers we have concluded

¹ Landler (2008)

² Hilsenrath *et al.* (2008)

³ Naoual Aouaki graduated in her major Entrepreneurship at Erasmus University, Rotterdam, the Netherlands in 2009.

⁴ Johan den Heijer graduated in his major Corporate Finance at Erasmus University, Rotterdam, the Netherlands in 2009.

that there is no straightforward method to measure or predict financial distress or its likelihood of occurring. We wish to note however that there is a huge volume of research papers regarding the subject of which the vast majority employs the same underlying variables within their models. We will discuss two of the referenced research papers to illustrate said variety in methods.

Pindado *et al.* (2008) has introduced an advanced econometrical prediction model to forecast financial distress. They employ a logistic regression model which allows for a dynamic dimension within said model. The dynamic aspect comes from the fact they employ the stock price of the researched firm before and after it encounters financial distress. They construct this dynamic by assuming that a firm which is in financial distress will be negatively valued on the stock exchange and will therefore experience a fall in its stock price. The then obvious advantage of the model is that it is more accurate than any of its predecessors. However, its accuracy comes at the price of requiring one to know a sufficient degree of math to employ it – a skill which is not always prevalent within research subjects in practice, such as business managers. Besides said math requirement, the model is suited for large datasets specifically.

On the contrary, Altman (1968 and 2000) introduced the Z-score model which is based upon a variety of underlying financial ratios assembled together in a multiple discriminant analysis model. When the value of the dependent variable (thus the Z-score) is low, the firm in question is expected to experience financial distress within the coming two years – this with approximately 80% accuracy, see Altman (1968). Therefore, the higher the value of the dependent variable, the less unlikely a firm is to experience financial distress. The value criteria will be further elaborated upon in our Methodology chapter.

The advantage of the Z-score model is that it eliminates the statistical biases which normally occur when making comparisons between firms – these biases are usually caused by the wide variety in firm sizes, measured in total net sales. The aforementioned financial ratios underlying said model are commonly known by finance professionals and as such this model is widely used in practice by said financial professionals and other related professions for several decades. In Altman

(2000) the traditional Z-score model is adjusted to have become suitable for employment with privately-held firms and non-manufacturing firms – in the traditional model, one of the financial ratios required the market value of equity for example, which is non-existent for privately-held firms. A similar manner of execution can be found in Chaitanya (2005), who employs the Z-score model in a similar fashion to determine financial distress in the Indian banking sector.

The social relevance of this study is obvious from our research question, which is formulated as follows:

Q: Do privately-held firms experience a different degree of financial (not economical) distress than do their publicly-traded comparables during the economic of 2007 and 2008?

Within our research we wish to incorporate several facets of both corporate finance and entrepreneurship. Not only will we apply existing theories regarding financial distress, but also the effects of information asymmetry with respect to the capital structure and debt financing. Lastly we will discuss agency-problems which may be of influence on either privately-held or publicly-traded firms. We believe this is of critical importance to our research question as the literature states that privately-owned firms tend to finance their firm with debt significantly more often than do publicly-owned firms, see Brav (2009).

The remainder of this thesis is divided as follows: first we will define our research questions and discuss aforementioned relevant theories with respect to our research question. The third chapter of the thesis will elaborate on our research methodology, the data which we acquired, together with a sample description and some basic statistical information. The fourth chapter will display our analytical results from said data followed by our interpretation and a discussion of the empirical findings. Then lastly we will draw a conclusion based on the discussed theories in combination with our empirical findings.

2. Theoretical framework

2.1 Introduction

To the surprise of finance professionals, Modigliani and Miller (1958) theorized that the capital structure of the firm, i.e. its total debt in relation with its equity, is of no relevance with respect to its valuation - assuming perfect capital markets. However, Modigliani and Miller had such strict assumptions which cannot be held true to be empirically tested. For example, in practice capital markets have proven many times throughout modern history that they are far from perfect. Phenomena such as information asymmetry, agency problems, transaction costs, taxes and the like all add up to its imperfections.

Therefore, the contrary seemed to be dominating practice: the capital structure of the firm *did* influence a firm's performance. As such, the capital structure of the firm is influenced by the type of firm in question – be this a privately-held or publicly-traded firm. Some of the relevant research which has been done in this field bases its findings on questionnaires sent out to privately-held and publicly-traded firms⁵. Both types of firms have certain distinct features which are subject to information asymmetry, a potential cause of financial distress, and therefore agency costs as theorized by the well-known agency theory, this in respect to said capital structure.

Because publicly-traded firms suffer from control issues – the top managers of said firm type are not always the (full) owners of such firm – it is important for them to attract debt in order to become an unattractive takeover candidate⁵. Secondly, the top management of publicly-traded firms is elected by the board of commissioners of such firm. These commissioners in turn are elected by the shareholders. Then it is logical to see that for publicly-traded firms there are several more parties involved in investment decisions – including the choice whether to finance through equity or debt – than there is with privately-held firms. In contrast, privately-held firms are directly controlled and owned by its shareholders. The equity of such firm is divided amongst that same management.

⁵ Brounen *et al.* (2005)

This chapter will discuss the relevant financial theories concerning our research question. In the coming paragraph we will discuss the capital structure of the firm, followed by information-asymmetry, then we will turn to the theoretical implications of financial distress and finally a summary of our theoretical framework.

2.2 The capital structure of the firm

Graham and Harvey (2001) find evidence that firms keep a certain degree of financial flexibility regarding their capital structure. This supports the assumption that firms apply the static trade-off theory⁶. The study of Brounen *et al* (2005) confirms that the same findings apply to European firms. Brounen *et al* (2005) also finds that publicly-traded firms consider the tax benefits of debt issuance – this in the shape of a tax shield. In contrast, privately-held firms do not consider such benefits. This might imply that publicly-traded firms finance themselves through debt easier than do privately-held firms.

The above however is in contrast with the research done by Brav (2009). In that research paper Brav calls upon the fact that publicly-traded firms in the United Kingdom have easier access to public capital markets than do privately-held firms. He therefore theorizes that based on this fact, privately-held firms are more inclined to finance themselves through debt, such as bank debt and the like, as they have no such access to capital markets – or at least, at a significantly higher cost than do their publicly-traded counterparts. Although there are not many studies in which publicly-traded and privately-held firms are compared empirically with respect to their capital structure, what we want to research might just add a little to this poorly explored terrain in the economical sciences.

⁶ The static trade-off theory assumes a trade-off between the tax benefits through a tax shield and the potential costs of financial distress which may occur due to the acquisition of corporate debt. According to this theory, firms balance the benefits with the costs in their capital structure.

As such our first hypothesis is the following:

H1: privately-held firms are more inclined to employ debt financing than do their publicly-traded counterparts, this due to poor or no access to the capital markets. Therefore the equity to total liabilities ratio from publicly-traded firms will be higher than that of privately-held firms.

2.3 Information asymmetry

Privately-held firm's behavior towards attracting debt differs from publicly-traded firms. Where privately-held firms prefer to acquire debt from informal sources as alternatives to the capital market, publicly-traded firms utilize aforementioned capital market. However, such privately-held firms are subject to information-asymmetric problems (Carey *et al.* (1993), Kwan and Carleton (2004) and Denis and Mihov (2003)).

This is because the information known to employees and the firm's management – known as *inside information* – is not known to the public at the same time. As such, said inside information regarding the financial health of privately-held firms is generally not available to (potential) providers of debt. These insiders then, have a tendency to exploit this information advantage: when they have evidence that, say, in the near future the firm will perform less, they will be inclined to acquire as much debt as possible against the current interest rate, see Chandra *et al* (2008). The argument of acquiring this debt is usually covered by a need to restructure the firm's organization or some vague argument as such. The actual purpose of acquiring excess liquid assets is done to get the best possible debt contracts against the most favorable interest rates before said inside information becomes public knowledge, thus causing the current interest rate to go up.

The reverse is true for when the firm has positive news as inside information: it will delay acquiring debt until such inside information has become common knowledge to the public. Logically, a firm's management will be more inclined to quickly publish positive inside information and to delay negative inside information as to maximize its own advantage. Figure 1 below broadly summarizes this theory.

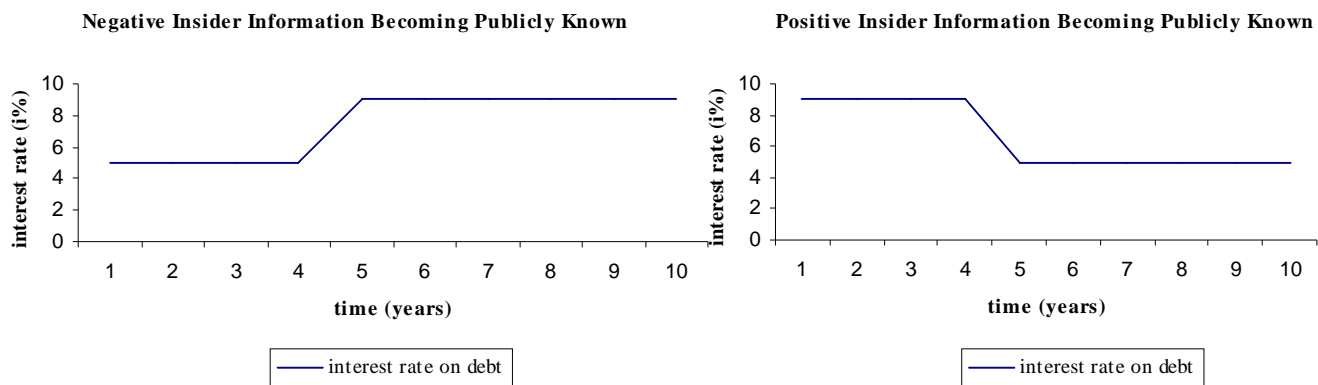


Figure 1: in the left graph we can see that in the fourth year negative insider information becomes publicly known, causing the interest rate on debt for the firm to go up significantly due to increased risk. In the right graph we can see the opposite happening: here, in the fourth year positive insider information is immediately made publicly known, allowing the firm from then on to acquire debt against a more favorable interest rate.

The motivation to delay negative news and to acquire debt can be found in the study by Chandra and Nayer (2008). They find that the interest rates on debt are contracted for duration of 7 to 15 years on average. As such, the interest advantage the privately-held firm gains through delaying said negative inside information becoming public is of significant size, *ceteris paribus*. From the point of view of the debt holders, they will experience a higher degree of systematic risk on the issued debt prior to the publication of negative insider information.

In contrast, publicly-traded firms are legally required to submit annual financial statements, making them more transparent as a business in respect to their investors. Privately-held firms however are generally not legally required to submit said financial statements, therefore making them seem more opaque towards outsiders. As such, Wittenberg-Moerman (2006) finds that information-asymmetry is larger with privately-held firms than it is with publicly-traded firms.

2.4 Implications of financial distress

When a firm is no longer able to meet its financial obligations (towards its debt holders, to be specific) it will experience financial distress. Because a firm has a relative amount of liabilities compared to its total equity, the capital structure of such firm would become rather complex to manage – especially when a firm has an array

of debt holders. A consequence of debt financing is that it could trigger a conflict of interests between the shareholders on the one hand and the debt holders on the other hand, this causing the gap between the management and shareholders to widen.

For example, debt holders would be inclined to prefer that the firm finances projects containing as little financial risk as possible to ensure that they will be able to receive their interest payments in the future. This is in contrast with the shareholders as they would prefer that the firm engages in riskier projects in order to acquire a higher yield on their respective investments.

Naturally there are costs linked to financial distress. These costs can be divided into direct and indirect costs. The direct costs of financial distress are related to the costs made when the firm files for Chapter 11. Such costs can contain administrative costs, legal costs and the like. We would like to note however that the direct costs of financial distress are rather limited while the indirect costs of financial distress however are not. They tend to linger long after the firm has steered itself away from financial distress.

The indirect costs of financial distress influence the behavior of various sections within and around a firm; this because the rules of the game have changed as can be found in the agency theory. Clients to a financially distressed firm will be more cautious with placing orders with said firm as they are not certain whether the firm will be operational for a sufficiently continued time to complete the requested order. A similar line of thought applies to suppliers of the respective firm. Suppliers prefer to supply firms of which they are certain they are able to pay for the delivered goods or services.

Employees within a financially distressed firm still have to receive their wages regardless of the situation said firm is in. Employees who can be fired to cut costs generally will be fired by the management in an attempt to save the firm. An indirect cost of this is that it causes a loss of human capital for such firm.

Lastly, because a financially distressed firm cannot meet its obligations to its debt holders, it is forced to sell its assets at distressed prices in order to generate sufficient

cash flow to meet short-term financial requirements. Another immaterial, indirect problem caused by financial distress is that the firm in question will take a reputation hit and a loss in credibility to its suppliers, when its distress becomes public knowledge.

2.5 Theoretical implications

The consequence of aforementioned theoretical findings is that privately-held firms henceforth pay a higher interest percentage on their loans to compensate its investors for the increased risks – caused by this information asymmetry between the firm and its debt holders – than do publicly-traded firms, *ceteris paribus* – see Brav (2009). Due to higher interest payments, the overall cost of capital for privately-held firms is considered to be higher than that of publicly-traded firms. A consequence of this statement is that privately-held firms are less flexible in restructuring the capital structure of their firm than are publicly-traded firms, see Brav (2009). The latter generally utilizes the capital market in order to acquire better loans – it is common knowledge that in times of economical crisis, interest percentages drop. Therefore it has become attractive to review outstanding debts in order to exchange these debts for loans with a lower interest percentage, if it is legally permissible.

Secondly, there is equity to consider besides debt financing for both privately-held and publicly-traded firms. Brav (2009) classifies this as the *level effect*. He finds that the relative costs of debt financing are lower than the relative costs of equity financing for privately-held firms due to differences in transaction costs between debt and equity issuance. Therefore said firms will prefer debt financing over equity financing, something which is in agreement with the static trade-off theory⁷. In contrast, because publicly-traded firms have better access to capital markets than do privately-held firms, the contrary applies to publicly-traded firms: the relative cost of equity for them is lower than the relative cost of debt.

Because privately-held firms do not suffer from agency problems caused by top management as do publicly-traded firms with respect to the capital structure, we can now add our second hypothesis:

⁷ The static trade-off theory basically states that firms will prefer debt over equity until the cost of marginal debt has become equal to the cost of equity.

H2: publicly-traded firms have a lower Z-score as they are affected by agency problems while privately-held do not.

Our motivation for above hypothesis is because publicly-traded firms suffer from agency problems, they will perform less on an overall scale than do privately-held firms within the same industry. Recall that a low Z-score indicates that the firm will experience financial distress within the coming two years. Managers of publicly-traded firms will be easier inclined to execute their own agenda for their own personal gain – this because they are not the (full) owners of the firm in question. Such threat is negligible in privately-held firms as the managers of such firm are its owners as well.

Lastly, we would like to add a few assumptions with respect to our empirical analysis, either based on arguments of aforementioned theories or they will be argued upon after they have been displayed below.

A1: the financial crisis occurred in 2007 in the United States⁸ and manifested itself into a global economical crisis during the course of 2008.

We add this assumption to allow ourselves to draw a line after we have analyzed the data from whereon the financial crisis may have affected the firms in our dataset. As such, any statistical differences found outside the observed years of 2007 and 2008 are accounted to individual firm achievements or industry-specific influences. Therefore our second assumption:

A2: Any statistical deviations in our dataset, after analysis, which are not in the years 2007 or 2008 are accounted to individual firm achievements or industry-specific influences.

⁸ A few newspaper articles showing that over time the financial crisis in the United States manifested itself into a global economical crisis over time:
Rutenberg, Jim, Peter Baker, Vill Vlasic. 2009. “Early Resolve: Obama Stands in Auto Crisis.” *The New York Times*, April 29, A1
Goldman, David. 2009. “Bank bailout: What’s in the plan.” *CNNMoney.com*, February 10, http://money.cnn.com/2009/02/10/news/economy/bank_bailout_overhaul/index.htm (downloaded April 30, 2009)
Pugh, Tony. 2009. “Businesses struggle as bank loans remain elusive.” *The News & Observer*, May 14, politics section
Leow, Jason. 2009. “China Loans Hard to Get – Smaller Enterprises Left Dry as Bulk of Lending Goes to Big Projects.” *The Wall Street Journal*, May 14, Asia section

It is generally considered difficult to link financial distress with a firm's performance. It is either the chicken or the egg that came first: did poor performance cause the firm to experience financial distress or did the effects of financial distress cause the firm to perform poorly?⁹ For our analysis of the years 2007 and 2008 we assume:

A3: When a privately-held firm performs poorly in comparison to its publicly-traded comparables, we assume the firm experiences financial distress¹⁰. Vice versa applies for publicly-traded firms' performance with respect to privately-held firms.

The positive approach for A3 holds true as well: if we do not find any financial distress, we accredit this to proper management as seen in Whitaker (1999).

⁹ Andrade *et al.* (1998)

¹⁰ Asquith (1994)

2.6 Summary

In this chapter we have discussed information asymmetry, agency problems and the capital structure of the firm. We have put aforementioned three theoretical frameworks in perspective with respect to privately-held and publicly-traded companies. With this, we were able to derive our main research question and to define both the direct and indirect effects of financial distress. For the sake of simplicity, we have added three assumptions to allow ourselves to ignore any discrepancies we may find in our dataset which are not related to the determination of financial distress during the economic crisis of 2007 and 2008, respectively.

Figure 2 below displays an overview of the capital structure and its effects on both privately-held and publicly-traded firms.

Capital structure of privately-held and publicly-traded firms	
Type of firm	
Privately-held	Publicly-traded
- not legally mandatory to publish annual reports and financial statements	- legally obligated to publish annual reports and financial statements
- seems opaque to outsiders	- seems transparent to outsiders
- information-asymmetry between insiders and outsiders of the firm	- information-asymmetry between insiders and outsiders, although to a lesser degree than is the case with privately-held firms
- pays higher interest rates on debt due to risk caused by information-asymmetry	- pays market-based interest rates on debt
- inflexible capital structure	- flexible capital structure
- no or poor access to capital markets	- access to capital markets, renegotiates debt contracts in times of crisis to acquire lower interest rates on its debt

Figure 2: an overview of the theoretical effects of capital structure on both privately-held and publicly-traded firms.

3. Data - Sample and Sample Description

3.1 Introduction

Our research question requires us to acquire a dataset which contains privately-owned firms which are operational on the market of the European Union. Besides these privately-owned firms, we require publicly-traded, comparable firms to determine whether aforementioned privately-owned firms indeed experience no, less or a lesser degree of financial distress than do their publicly-traded counterparts - thus effectively answering our research question.

3.2 Data

We have decided to acquire said data from an established databank. Our choice therefore has been Thomson ONE Banker¹¹, more specifically the Worldscope databank. We managed to secure our dataset by filtering the aforementioned databank by issuing the following criteria¹²:

- The firm had or has to be operational within one of the fifteen member states of the European Union as per January 1st, 2004 during the time period January 1st, 2004 until December 31st, 2008 as displayed in table 1 below.
- The firm has to be privately-owned
- Working capital, total assets, retained earnings, earnings before interest and taxes (EBIT), total common equity, total liabilities and total net sales has to be known for said time period.
- The firm must not be part of any of the following categories based on SIC coding¹³, those being 60 till 65 and 67, thus effectively leaving the firms in the financial sector out of the database as they have their own valuation criteria.

¹¹ <http://banker.thomsonib.com/>

¹² Please view Appendix 5 in the back of this report for the variables and codes inserted in WorldScope to acquire our dataset.

¹³ <http://www.sec.gov/info/edgar/siccodes.htm>

EU member states as per January 1st, 2004		
Country	No. of privately-held firms	Percentage
Austria	0	0.00%
Belgium	1	3.57%
Denmark	1	3.57%
Finland	0	0.00%
France	4	14.29%
Germany	11	39.29%
Greece	0	0.00%
Ireland	1	3.57%
Italy	1	3.57%
Luxembourg	0	0.00%
Netherlands	2	7.14%
Portugal	1	3.57%
Spain	0	0.00%
Sweden	0	0.00%
United Kingdom	6	21.43%
Total privately-held firms:	28	100.00%

Table 1: breakdown of the number of privately-held firms in each of the member states of the European Union as per January 1st, 2004.

Upon inserting above criteria in Worldscope, we obtain a total of 29 firms matching aforementioned criteria. Now, from these 29 firms we need to find comparable firms who match above financial criteria, as well as the following additional three requirements:

- The comparable firm must be publicly traded
- The comparable firm's net sales must be ranked five places above or below the privately-owned firm with which it is compared. This allows us to scale the comparable sets based on the net sales criteria, thus allowing for fair comparables and possibly eliminating any irregularities.
- The comparable firm is operational in the same industry as that of the privately-owned firm

After matching these 29 privately-owned firms with their comparables, we remain with a total of 28 privately-owned firms - one privately-owned firm did not have any publicly-traded comparables and is therefore no longer suitable to be in our dataset and thus removed¹⁴. The remaining 28 firms, with their publicly-traded comparables, are then considered our workable dataset. Although we must make note that some

¹⁴ Ober, located in France has been removed.

publicly-traded comparables did not fully meet all of aforementioned criteria: for certain years not all financial data was available. We deem this to be a slight issue however as it will decrease the value of any comparison made between privately-owned and publicly-traded firms.

As becomes clear from table 1 above, not all European member states are equally represented in our analysis. Unfortunately due to aforementioned data limitations from privately-held firms, there are several European countries which are not represented at all. While on the other hand the three largest economies – those being Germany (almost 40%), France (about 14%) and the United Kingdom (21%) – are overrepresented. However, upon having SPSS perform a PP-plot to determine the normality of the data, it appears – after applying a natural log transformation – that the data is distributed normally within reason¹⁵. Although we must make note that with a mere 28 observations divided over 15 EU countries, our dataset is rather on the slim side. Therefore we will limit ourselves by applying our statistical findings to the European Union as a whole rather than making any specific remarks per country per se.

3.3 Summary

Within this chapter we have made the decision to acquire our dataset from WorldScope. Next, we have defined the limitations and argued said limitations in order to acquire the relevant data from said databank. From this dataset we have presented the distribution of privately-held of firms over the member states of the European Union as of January 1st, 2004. Lastly, we have made some final remarks regarding the overall quality of the data based on statistical explorative study.

¹⁵ We employ a PP-plot in our statistical software package to determine the normality of our data. We believe this is of importance as normally distributed data is assumed to be representative towards the population as a whole and therefore allowing us to make stronger statements with respect to our findings further onward in this thesis.

4. Methodology

4.1 Introduction

After we have successfully acquired our dataset from WorldScope, we believe it is appropriate to further elaborate upon the method of our choice in which we analyze said dataset. We have studied various research papers to which we have referred in the Introduction section, and have concluded that using financial ratios would be most appropriate to analyze our data and henceforth to answer our research question. In this chapter we will discuss our research setup and our exploratory findings acquired from our dataset.

4.2 Research setup¹⁶

We are aware that there are superior econometric methods¹⁷ available at this time of writing to analyze financial distress. However, as we are limited by the availability of data from relevant privately-owned firms, such advanced models would yield inaccurate results. As for Altman's Z-score (see Altman (1968) and the reviewed Z-score in Altman (2000)), we analyze the underlying financial ratios separately rather than using the Z-score exclusively. Reason for this is that we are comparing privately-owned with publicly-traded firms in order to determine financial distress. The Z-score merely measures bankruptcy – which is an extreme form of financial distress however. Therefore we will be having a closer look at the underlying ratios to determine whether privately-owned firms are leveraged more than their publicly-traded comparables.

Furthermore we wish to define the financial ratios used in our analysis to measure the degree of financial distress amongst privately-owned and publicly-traded firms. Various studies consider the use of financial ratios as good predictors of bankruptcy¹⁸ - which can be an eventual result of financial distress, however extreme. Following said studies; we will analyze our data based on financial ratios measuring profitability, solvency and liquidity. We measure said criteria by using the following

¹⁶ We would like to note that Appendix 5 supplies an overview of the codings employed in the WorldScope database which we inserted in order to acquire our respective dataset.

¹⁷ Recall Pindado *et al.* (2008).

¹⁸ Deakin (1972), Altman (2000).

ratios:

- **Working capital ratio**

The formula for the working capital ratio is defined as:

$$(1) \quad \text{Working capital ratio} = \text{WC} / \text{TA}$$

Where:

WC = working capital

TA = total assets

According to previously mentioned studies in this paragraph, this is widely considered the most significant financial ratio to measure financial distress. This solvency ratio is more reliable than similar ratios such as the quick ratio and the current ratio, as these are subject to manipulation through balance accounts, see Altman (2000). Working capital is defined as the balance difference between current assets and current liabilities. This allows us to measure the liquidity of a firm. Recall from the theory chapter that a lack of liquid assets can be a quick cause of financial distress for any firm.

- **Retained earnings ratio**

The formula for the retained earnings ratio is defined as:

$$(2) \quad \text{Retained earnings ratio} = \text{RE} / \text{TA}$$

Where:

RE = retained earnings

TA = total assets

This financial ratio partially measures the leverage of the firm. Firms with a low leverage have financed themselves through retention of profits rather than using debt-financing. Therefore we expect this profitability ratio of privately-owned firms to be higher than that of publicly-traded firms as the latter

generally finances themselves with assets acquired from its owners while the former has easier access to the capital market and therefore will have easier access to equity. Retained earnings are defined as the total reinvested earnings of a firm over its lifetime. Unfortunately this account is subject to manipulation through stock dividend declarations and reorganizations. Altman (2000) states that Retained Earnings is logically biased against younger firms as they had less time than established firms to build up their earnings. As such this rating would suggest that a younger firm would be in financial distress quicker than it would for the established firms. This is exactly what occurs in practice: 50% of the younger firms fail in the first five years (Dun & Bradstreet, 1994).

- **Earnings ratio**

The formula for the earnings ratio is defined as:

$$(3) \quad \text{Earnings ratio} = \text{EBIT} / \text{TA}$$

Where:

EBIT = earnings before interest and taxes

TA = total assets

The level of solvency is measured by this financial ratio: if the liabilities exceed the firm's assets (valued by its earning power), the firm will be likely to suffer financial distress in the near future. Earnings before interest and taxes are defined as what it says on the tin: it measures the total earnings of the firm prior to taxation and interest payments. Therefore it measures the earning power of the firm's assets, i.e. its true productivity. Henceforth we expect this ratio to be higher for privately-owned firms than for publicly-traded firms, this based on the same argument as mentioned previously.

- **Equity ratio**

The formula for the equity ratio is defined as:

$$(4) \quad \text{Equity ratio} = E / TL$$

Where:

E = market value or book value of equity¹⁹

TL = total liabilities

This financial ratio is another ratio to measure solvency. Essentially, it measures to what degree the market value of equity may drop until the total sum of liabilities exceed said equity, hence resulting in insolvency. Equity is measured as the total sum held by investors in the firm in the shape of stock - whether this is preferred or common. Fisher (1959) used this ratio in a study of yield-spread differentials on corporate bonds, proving it a good predictor of bankruptcy and thus financial distress.

- **Sales ratio**

The formula for the sales ratio is defined as:

$$(5) \quad \text{Sales ratio} = TNS / TA$$

Where:

TNS = total net sales

TA = total assets

In practice, this ratio is considered of little purpose. Regardless, this liquidity ratio measures how much turnover a firm generates, thus indicating how well the firm is able to handle a competitive market. As we are comparing privately-held firms with publicly-traded firms within the same industry, we deem this financial ratio relevant to consider in our analysis.

¹⁹ We employ the book value of equity for privately-held firms following Altman (2000) as their equity is not publicly traded and therefore has no visible or measurable market value.

The dataset contains comparables which are in the same industry as the privately-owned firm. We do not need to express any concern towards differences in size of firms in said database. Reason for this is that we use financial ratios which tend to deflate any size-effects significantly and preserve the homogeneity of the data. Secondly, as mentioned among the three requirements for comparables, the net sales volume for said comparables lies closely to the net sales volumes of the privately-held firms.

After we have processed the missing data in SPSS we have inserted the previously mentioned five financial ratios. Lastly, we have added the following two formulae to determine the Z-score for privately-owned firms and of publicly-traded firms. The Z-score for privately-owned firms is an adjusted multiple discriminatory regression formula of the traditional Z-score formula. Reason for this is that the original formula was exclusively suited to determine financial distress (as in predicting bankruptcy within the next two years) of publicly-traded firms only. The adjusted formula, notated as Z' is however used for privately held firms. Altman (2000) finds that privately held firms have different weights attached to aforementioned five financial ratios than do their publicly-traded comparables. The following two formulae are taken from Altman (2000).

Altman's Z-score for publicly-traded firms:

$$(6) \quad Z = 1,2 X_1 + 1,4 X_2 + 3,3 X_3 + 0,6 X_4 + 0,999 X_5$$

Altman's Z-score for privately-owned firms:

$$(7) \quad Z' = 0,717 X_1 + 0,847 X_2 + 3,107 X_3 + 0,42 X_4 + 0,998 X_5$$

Where:

Z = the Z-score for publicly-traded firms

Z' = the Z-score for privately-held firms

X₁ = (current assets – current liabilities) / total assets

X₂ = retained earnings / total assets

X₃ = earnings before interest and taxes (EBIT) / total assets

$$X_4 = \text{equity} / \text{total liabilities}$$

$$X_5 = \text{sales} / \text{total assets}$$

To recall for convenience, our research setup is displayed summarized in figure 3 below.

Privately-owned firm	COMPARISON GROUP		
	Publicly-traded firm	Publicly-traded firm	... Publicly-traded firm
working capital ratio	working capital ratio	working capital ratio	... working capital ratio
equity to total liabilities	equity to total liabilities	equity to total liabilities	... equity to total liabilities
EBIT to total assets	EBIT to total assets	EBIT to total assets	... EBIT to total assets
retained earnings to total assets	retained earnings to total assets	retained earnings to total assets	... retained earnings to total assets
<u>Z-score</u>	<u>Z-score</u>	<u>Z-score</u>	... <u>Z-score</u>

Figure 3: the research setup of our thesis summarized. We select a privately-owned firm and match it with a set of publicly-traded firms based on the criteria mentioned above. We then calculate the working capital ratio, equity to total liabilities, earnings before interest and taxes (EBIT) to total assets, retained earnings to total assets and finally the Z-score of both the privately-owned and the publicly-traded firms. We then take the average of the publicly-traded comparables to compensate for outliers and incidental profits or losses for individual companies – example: the sale of a division of a firm. Then finally we compare the comparison group with the individual privately-held firm.

4.3 Preliminary statistics

Furthermore, we wish to supply a breakdown of the sample distribution. As mentioned amongst the requirements, we have left out the financial and insurance sector as they have a different method of asset valuation therefore making an objective comparison between said sector and others difficult.

Sample information		Number of observations
2004	private firm	28
	comparables	116
2005	private firm	28
	comparables	116
2006	private firm	28
	comparables	117
2007	private firm	28
	comparables	117
2008	private firm	28
	comparables	117
Total		723

Table 2: sample overview of the number of observations per type of firm, per year. Only in 2004 and 2005 we have two instances with a missing value.

In table 2 we find a breakdown of our dataset sorted by the number of observations per firm type, per year. We have a total of 723 observations; therefore we experience missing values in our dataset in 2004 and 2005, this for publicly-traded firms exclusively. On average we have a scale of one privately-held firm versus four publicly-traded comparable firms, this with a minimum of a one-on-one comparison set and a maximum of a one-on-eight comparison set.

Sample distribution by SIC-code			
SIC-code range	Industry segment	Number of observations	%
0000 - 0999	Agriculture, forestry and fishing	0	0,0%
1000 - 1999	Mining and construction	1	3,6%
2000 - 3999	Manufacturing	16	57,1%
4000 - 4999	Transportation and public utilities	3	10,7%
5000 - 5999	Wholesale and retail trade	2	7,1%
6000 - 6999	Finance, insurance and real estate	0 ^a	0,0%
7000 - 8999	Services	6	21,4%
Total		28	100,0%

^a Recall that SIC category 6 has been removed from the dataset.

Table 3: this table displays the sample distribution by type of industry based on SIC-codes²⁰. From this table can be seen that especially the manufacturing and services industry are dominant in our dataset.

Table 3 above displays a breakdown of our dataset based on the SIC-coding criteria mentioned earlier. As can be observed from this breakdown, our dataset is dominantly represented by manufacturing firms and the services industry mainly. As these two industry types are the most dominant within the European Union²¹, we have a representative dataset with respect to reality. Lastly we would like to note that the Z-score was mainly developed to estimate bankruptcy (read: financial distress) in especially aforementioned two industry types.

Data summary on Z-score				
		Minimum	Maximum	Median
2004	private firm	-3,556	5,483	1,882
	comparables	-19,613	4,556	2,140
2005	private firm	-2,996	5,330	1,580
	comparables	-6,291	5,169	2,262
2006	private firm	-0,647	6,679	1,747
	comparables	-9,524	6,725	2,245
2007	private firm	-1,574	6,322	1,674
	comparables	-2,945	7,497	2,432
2008	private firm	-10,422	7,307	1,949
	comparables	-6,077	7,666	2,346

Table 4: here we see an exploratory analysis on the calculated Z-scores for privately-held and publicly-traded firms. As can be seen from the median, our data is not biased towards financially distressed or financially sound firms.

An exploratory analysis on the Z-score shows that our dataset is not biased towards financially distressed or financially sounds firms. If we apply the criteria from table 5

²⁰ <http://www.sec.gov/info/edgar/siccodes.htm>

²¹ <http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/>

below to take a closer look on table 4 above, we find that the median generally lies in the neutral or “gray” area²². Observing the maximum and minimum values of Z-scores for all five years displayed, we find that both financially distressed and financially healthy firms are represented in the dataset. Therefore we can conclude that we have a fair sample in respect to the division over the three financial statuses mentioned in table 5. In order to draw a fair comparison between the privately-held and publicly-traded firms, we have adjusted the original criteria of the two Z-score models. We have titled the new criteria “merged” as can be seen in table 5. This is the criteria upon which we determine in which of the three financial statuses a privately-held or publicly-traded firm respectively, is located in. We have acquired this merged set of criteria by simply taking the lower bound criteria of both publicly-traded and privately-held firms, adding those two up together and divide by two. The same is done for the upper bound criteria of two said firm types. Logically, the middle bound criterion is simply the difference between the upper and lower bound criteria.

As a final note on the exploratory statistics, we would like to clarify why the minimum ratios on the Z-score are all negative. This is because firms may use the account of retained earnings to record their retained profits over past years *or* their retained losses. Since we have a dominant amount of observations in which the latter is the case, these retained *losses* causes the eventual Z-score as defined in (6) for privately-held firms and (7) for publicly-traded firms respectively, to be negative.

Z-score criteria			
Type of firm	status		
	financially distressed	"gray" area	financially sound
Public	$Z < 1.80$	$1.80 < Z < 2.99$	$Z > 2.99$
Private	$Z < 1.23$	$1.23 < Z < 2.90$	$Z > 2.90$
Merged	$Z < 1,52$	$1,52 < Z < 2,95$	$Z > 2,95$

Table 5: criteria used with the Z-score to determine whether a firm is financially distressed, neutral or financially sound. We display the original criteria for the Z-score model for publicly-traded and privately-held firms respectively, and our model labeled “merged” in order to classify aforementioned firm types with respect to any of the three financial statuses.

²² Altman (2000) defines the “gray” area as the interval in which the Z-score cannot determine with a high level of certainty whether the firm in question will or will not experience financial distress within the coming two years.

4.4 Summary

Our methodology chapter argues to relate our dataset to our theoretical framework in its research setup. It does so by combining our research question with the available data, and Altman's Z-score. The Z-score is based on five financial ratios, which are then separately discussed and defined.

Secondly, we take a look at the preliminary statistics from our dataset. From here we learn that our dataset is not specifically biased towards financially sound, neutral or financially distressed firms – be this privately-held or publicly-traded firms. Instead, we find that all three groups are represented in our dataset. To illustrate the purpose of our utilization of Altman's Z-score, we have inserted a table with the original criteria for privately-held and publicly-traded firms, and a “merged” group which is used throughout the remainder of this report to measure financial distress within comparison sets.

5. Results

5.1 Introduction

Due to the large amount of tables and other graphical overviews available upon data analysis, we limit ourselves here to the most prominent of said tables. The remaining graphs not displayed here can be found in the Appendix and will be directed to throughout the next chapter.

Since we have made 28 sets of comparables, this being one privately-held firm versus a set of publicly-traded comparable firms – recall that this is based on net sales to compensate for industry size - we therefore have a preselected dataset. As such we have employed a paired samples t-test using SPSS. A requirement for executing such test is that the used data is normally distributed – or at least within reason of a normal distribution. Upon executing a PP-plot to determine whether our dataset is normally distributed, we have found that our dataset matches normal distribution within reason. Although we appear to lack in the quantity of observations, the quality of the observations we have managed to secure within our dataset appear to compensate for it. Nonetheless, as we only have a limited amount of observations, we will apply a 10% critical value rather than the traditional 5% to compensate for said data limitation. As SPSS created an enormous amount of output, we have decided to limit our statistical output to the most relevant tables and graphs with respect to the research question.

Recall that we use the Z-score to analyze the firm's performance during times of economic crisis. We have made the assumption in a previous chapter that the economic crisis started in 2007 and manifested itself globally during the course of 2008. We therefore expect to see statistical variations between privately-held and publicly-traded firms during these two years specifically. Another assumption we added is that any other anomalies in the statistical output can be clarified by market- and industry influences. In order to thoroughly assess the statistical output, we will discuss the statistical analysis of all five statistical ratios separately first. Finally, we will assess the statistical output of the Z-score.

For each of the tables in this chapter, a pair refers to the comparison made between privately-held and publicly-traded firms, in which the former is inserted first. Therefore a positive t-value implies that privately-held firms have a higher value for that respective observation than do publicly-traded firms. The opposite holds true if a t-value is negative.

5.2 Working capital ratio

Working capital to total assets			
alpha = 10%	Year	t-value	Significance
Pair 1	2004	1,843	0,038
Pair 2	2005	0,421	0,338
Pair 3	2006	-0,753	0,229
Pair 4	2007	-0,408	0,343
Pair 5	2008	0,043	0,483

Table 6: this table displays the working capital ratio between privately-held and publicly-traded firms. Only the observations from 2004 prove to be statistically significant; therefore we assume no significant difference in working capital between publicly-traded and privately-held firms.

Recall that the working capital ratio is one of the prominent determinants of financial distress. From table 6 we find that there is no statistically significant difference in working capital ratios between privately-held and publicly-traded firms. In Brav (2009) we find that the capital structure of privately-held firms is less flexible than those of publicly-traded firms. This is caused due to poor or no access to the capital markets of the former mentioned firm type.

Regardless of their access to capital markets, it appears that privately-held firms are then just as able to keep a sufficient level of liquid assets to prevent an occurrence of financial distress. On the one hand, for all observations except 2004 prove to be statistically insignificant, therefore we have to conclude that there is no significant difference in working capital between privately-held and publicly-traded firms. On the other hand we wish to recall that we are working with a very limited dataset. It could be that we lack a sufficient number of observations to make any solid conclusions on this financial ratio.

5.3 Retained earnings ratio

Retained earnings to total assets			
alpha = 10%	Year	t-value	Significance
Pair 1	2004	1,538	0,068
Pair 2	2005	0,120	0,523
Pair 3	2006	-0,182	0,428
Pair 4	2007	-1,563	0,065
Pair 5	2008	-0,946	0,176

Table 7: this table displays the retained earnings ratio between privately-held and publicly-traded firms. We find that only our observations for 2004 and 2007 are statistically significant at the 10% threshold.

The retained earnings ratio measures the leverage within a firm. A firm with a low retained earnings rating is suspected to finance itself through debt rather than retained profits over past years, thus effectively leading to unsustainable growth. From table 7 we find a mixed result: only 2004 and 2007 appear to be statistically significant against the 10% critical value. For 2004 we can state that the observed publicly-traded comparables have better retained earnings ratios than do their privately-held counterparts. The opposite is true for 2007.

What we found in studies mentioned in the theoretical chapters of this thesis with respect to the retained earnings ratio is that privately-held firms lack access to the capital markets; they are more inclined to retain their profits from past years in order to finance their projects to ensure sustainable business growth in the future. This would confirm our observation for the year 2007, in which we effectively observe that during years of economic crisis, privately-held firms retain a larger share of the profits from former years to survive the economic crisis than do publicly-traded firms. The latter group will be more inclined to restructure its debt through the capital markets during an economic crisis to take advantage of the favorable interest rates, see Brav (2009). What goes for the working capital ratio applies to the retained earnings ratio as well: we believe a more sizeable analysis is needed to confirm our findings and those of the references mentioned.

5.4 Earnings ratio

Earnings before interest and taxes (EBIT) to total assets			
alpha = 10%	Year	t-value	Significance
Pair 1	2004	1,029	0,156
Pair 2	2005	0,408	0,343
Pair 3	2006	0,800	0,215
Pair 4	2007	-0,720	0,239
Pair 5	2008	-0,523	0,303

Table 8: here we find an overview of the earnings before interest and taxes (EBIT) divided by the total assets of the firm. Here we find that none of our observations are considered statistically significant, therefore concluding that there is no significant difference in earnings ratio between privately-held and publicly-traded firms.

The ratio of earnings before interest and taxes (EBIT) to total assets measures the solvency of the firm. It does so by showing the amount of revenue a firm generates in relation to its total assets. Or to use the American expression: it shows how much “bang for your buck” an investor may gain through investing in the firm in question. From table 8 we may conclude that none of the observed years is statistically significant. Henceforth we may logically state that there is no statistically significant difference in earnings ratio between publicly-traded and privately-held firms, whether this be in times of economic crisis or otherwise.

The implication of this finding is that the assets of privately-held firms have similar yields compared to the assets of publicly-traded firms. This while our theoretical framework back in this report stated that privately-held firms have a higher degree of risk as they are more opaque to outsiders. A suggestive research question which comes to mind here then is whether investors get compensated for this additional risk by investing in such privately-held firms – if this would be practically viable, that is.

5.5 Equity ratio

Equity to total liabilities			
alpha = 10%	Year	t-value	Significance
Pair 1	2004	-1,119	0,137
Pair 2	2005	-1,179	0,125
Pair 3	2006	-0,330	0,372
Pair 4	2007	-1,311	0,100
Pair 5	2008	-0,511	0,307

Table 9: in this table we find the equity displayed against the total liabilities of the firm. Again the t-values are negative implying that privately-held firms have better equity to total liability ratios than do publicly-traded firms. Note however that this statement is barely relevant as only our observations from 2007 are statistically significant– assuming a 10% threshold.

In contrast with our hypothesis, we find evidence for 2007 that the privately-held firms have better equity to total liabilities ratios than do their publicly-traded comparables as seen in table 9 above²³. For all other years however we find no statistical evidence that there is any significant difference in equity ratio between publicly-traded and privately-held firms. We believe that the explanation of this finding can be found in Chandra and Nayar (2008). They find that privately-held firms have liabilities which indeed might be larger expressed as a percentage of total equity, but are smaller in absolute numbers than those of publicly-traded firms. This same finding however violates most of our theoretical framework stating that privately-held firms are more inclined to employ debt financing. We suggest an analysis on a larger scale ought to be executed to verify our findings.

²³ This because the t-value for 2007 is negative, thus implying that the group which we inserted first in SPSS has a higher value on the equity ratio than does the second group. Typically, for each table we inserted the privately-held firms as the first group.

5.6 Sales ratio

Net sales to total assets			
alpha = 10%	Year	t-value	Significance
Pair 1	2004	0,883	0,193
Pair 2	2005	-0,448	0,329
Pair 3	2006	0,428	0,336
Pair 4	2007	0,464	0,323
Pair 5	2008	0,482	0,317

Table 10: this table displays the net sales of the firm in relation to the total assets. As all five observations are statistically insignificant, we may conclude that there is no significant difference in net sales to total assets between privately-held and publicly-traded firms.

Recall that the net sales to total assets ratio was inserted to ensure that the publicly-traded comparables were suitable for comparison with the privately-held firms. The second function of this ratio is to show to what degree a firm can handle itself in the face of competition. As said ratio is not statistically significant as seen in table 10, privately-held firms have similar net sales to total assets ratios as those of publicly-traded firms.

In our theory chapter we however state that privately-held firms are generally more leveraged than are publicly-traded firms. We can clarify these by referring back to the agency-theory mentioned previously in the theory chapter of this thesis – as such we may assume we lack statistically sufficient observations to confirm said theories. Although the management of privately-held firms is usually in control of the firm, having leverage within their firm discourages them to shirk or to take on negative NPV projects, see Whitaker (1999) and Brav (2009). They have to save their short-term assets in order to pay off their debt holders or make interest payments to such debt holders. Examples of failing to be an effective manager can be found in the 90's: in the United States corporate raiders bought up firms which were run by a sub-optimal management in order to restructure its capital structure, thereby forcing management to be more effective with the firm's cash flows.

5.7 Z-score

Z-score alpha = 10%	Year	t-value	Significance
Pair 1	2004	0,867	0,197
Pair 2	2005	-0,621	0,270
Pair 3	2006	-0,184	0,428
Pair 4	2007	-2,837	0,004
Pair 5	2008	-1,701	0,050

Table 11: The overall results of the five financial ratios statistically analyzed are displayed in the above table. In years of economic crisis (those being 2007 and 2008), privately-held firms have a significantly better overall Z-score than do publicly-traded firms. This is statistically significant at the 10% threshold as well as the traditional 5% threshold.

Finally, we have table 11 with the Z-score of privately-held and publicly-traded firms. Recall that the Z-score is a multiple discriminatory formula based upon the five financial ratios we just discussed. From table 11 above, we can conclude that privately-held firms have significantly better Z-scores than do publicly-traded firms – this being statistically significant for the years 2007 and 2008 at both the 5% and the 10% threshold.

This confirms our hypothesis that publicly-traded firms, which are generally controlled by a management which does not (fully) own the firm, are more inclined to shirk on their responsibilities and perform sub-optimally. This is however in contrast with privately-held firms which are directly owned by its management. The implication of this result with respect to our theoretical framework is that publicly-traded firms indeed experience agency costs caused by information-asymmetry in the shape of sub-optimal performance caused by management shirking or employing negative NPV projects.

5.8 Summary

Our results in this chapter have proven to be statistically insignificant for all five of the financial ratios discussed. Therefore we may conclude that, based on these five financial ratios individually, that there is no statistically significant difference between privately-held firms and publicly-traded firms during times of economic crisis. However, the Z-score is significant during the years of economic crisis, thus allowing us to conclude that if we consider aforementioned five financial ratios as a

whole – which is what the Z-score is – we find that there is indeed a statistically significant difference between privately-held and publicly-traded firms. We find it worth to note that a duplicate research with a larger amount of observations is recommended in order to confirm our findings till thus far.

6. Discussion

6.1 Introduction

Aside from the statistical analysis which has been discussed in the previous chapter, we have also added graphical displays of each of the 28 comparison sets. These can be found in the Appendix chapter and will be discussed further in this chapter. Secondly, we will discuss tabular overviews which will allow us to get a closer look to the actual dataset employed for this analysis as a statistical analysis does not always classify actual differences in data as statistically significant.

6.2 Findings

In appendix 2 we have added an overview of the Z-scores as found in our dataset. As can be observed from this appendix, the number of comparables in each set varies from one-on-one comparisons up to one-on-eight comparisons. Logically, the more comparable firms in a set, the more accurate – i.e. the least biased towards a specific firm in such comparables set - the average of such set is. We also observe that in comparison set 6 there are two missing values present for 2004 and 2005 respectively.

Furthermore, appendix 3 is derived from the results found in appendix 2. If we consider the overview of firm performance displayed in appendix 3 in combination with the Z-score criteria displayed in table 5, then we are able to produce table 12 below. We have defined the criteria as follows:

- Far better performance / far worse performance
A privately-held firm performs far better or far worse when in appendix 3 the “X” marking lies two columns away from the “X” marking of the publicly-traded firm.
- Better performance / worse performance
A privately-held firm performs better or worse when in appendix 3 the “X” marking lies one column away from the “X” marking of the publicly-traded firm.

- Same performance

A privately-held firm is considered to have the same level of performance when the “X” marking lies in the same column as that of the publicly-traded average.

Percentage overview of privately-held firms performance in comparison with publicly-traded firms in 2008

Level of performance	no. of private firms	percentage
Far better performance	1	3.57%
Better performance	2	7.14%
Same performance	18	64.29%
Worse performance	5	17.86%
Far worse performance	2	7.14%
Total	28	100.00%

Table 12: an overview of the performance of privately-held firms set out on a five point scale in comparison with publicly-traded firms. From the table we can clearly see that based on our observations, privately-held firms on overall perform slightly worse than do publicly-traded firms in the same sector.

If we consider the information displayed in table 12, we can conclude on the overall that 25% of the privately-held firms in our dataset perform worse than do publicly-traded firms. This does not come as a surprise however as our theoretical framework argues that since privately-held firms have a less flexible capital structure and tend to prefer debt financing over equity financing²⁴, that we suggested that such privately-held firms would achieve lesser performances than their less-leveraged publicly-traded comparables. Regardless, as could be seen from table 11, this has no statistically significant effect on the overall Z-score of the 28 comparison sets.

As the results displayed in table 12 appear not to be statistically significant, we may account the actual difference between the privately-held and publicly-traded firms to coincidence within the dataset rather than a structural difference between two said parties. It would be likely that if a larger examination was performed, that either the analytical results would be statistically significant, or we would not find such differences as displayed in table 12.

²⁴ Recall Brav’s level effect.

Lastly we would like to make a note regarding Appendix 4. Here we see the 28 graphs with comparison sets of which our respective dataset consists - these 28 graphs give a visual confirmation of aforementioned table 12 and Appendix 2. As can be observed from the majority of graphs in Appendix 4, is that the differences in Z-score between privately-held firms and their publicly-traded comparables is rather small – usually the first digit behind the comma. Another interesting observation is that over the course of the observed five years, both the privately-held firm and its respective publicly-traded comparable firms tend to move in the same direction with respect to the Z-score – see graphs 3 to 5, 7, 8, 10, 15, 19, 20 to 25 and 28. Recall that the difference between privately-held and publicly-traded firms in the economic crisis years of 2007 and 2008 is statistically significant, for the three previous years however it is not. This can be observed in graphs 9, 10, 14 and 18 respectively. Lastly, we find a few graphs in which firms tend to move in all directions. Apparently these comparison sets contain an insufficient amount of comparables – as could be seen in Appendix 2 – to display a reliable overview.

6.3 Summary

This chapter compares the argumentation from our theoretical framework with our findings in the results chapter. Based on our statistical analysis, we find arguments in favor of our theoretical framework. But since our dataset is rather limited in the amount of observations, we have taken the opportunity of taking a closer look to the data. Therefore this chapter presents various tables and appendices with graphical displays showing the difference in Z-score ratios between privately-held and publicly-traded firms.

Reviewing these overviews strengthens our conclusion from the results chapter that there is indeed a difference in performance between privately-held and publicly-traded firms in times of economic crisis. Although it must be stated that there is no clear trend in any of the displayed tables or graphs. Once again we recommend a duplicate research with a larger amount of observations to be executed to confirm our findings.

7. Conclusion

7.1 Introduction

Using a dataset containing a total of 28 privately-held firms we have analyzed to determine whether there is a statistically significant difference between privately-held firms and publicly-traded firms with respect to financial distress during the economic crisis of 2007 and 2008, respectively. Our hypothesis in this thesis is that privately-held firms are more inclined to employ debt financing than do their publicly-traded counterparts, this due to poor or no access to the capital markets. Therefore the equity to total liabilities ratio from publicly-traded firms will be higher than that of privately-held firms.

As described in our methodology section, we have acquired a dataset from WorldScope containing the relevant data of both privately-held and publicly traded firms. This combined with the Z-score from Altman (2000), and the underlying five financial ratios, those being the working capital ratio, the retained earnings ratio, the net sales ratio, the earnings ratio and the equity ratio we are able to find a statistically significant difference in Z-scoring between the privately-held and publicly-traded firms, this in favor of the former mentioned.

Below you will find the implication of our research, our recommendations for further research and finally our conclusion.

7.2 Implications

Unfortunately we were restricted by data limitations, therefore limiting ourselves to merely making comments regarding our findings applicable to the European Union as a whole rather than to each specific member state as of January 1st, 2004. We believe this research topic can be of significant value to the European Union as it has relatively more privately-held firms than does the United States for example – as a consequence any American research findings do not have to be applicable in the European Union and vice versa, per se.

Our report finds that privately-held firms perform significantly better in times of economic crisis than do publicly-traded²⁵. Even though theory suggests that the former tends to employ debt financing more frequently than does the latter, similar theories suggest that privately-held firms tend to retain more of their profits to see through economic turmoil than do publicly-traded firms. We also noted that this is true in relative numbers with respect to total equity, but does not necessarily hold when compared in absolute numbers.

7.3 Recommendations

Admittedly, we have only had the chance to take a slight peek at this research topic. Regardless, we believe that the European government(s)²⁶ would consider this report a subject of further interest. If it is really true that privately-held firms indeed perform better than do publicly-traded firms in economic crises, the government(s) would do good by reviewing their tax policies to determine whether a similar result could be encouraged amongst publicly-traded firms, therefore benefitting the European economy as a whole.

As has been noted throughout this report, we recommend a similar research is to be executed with respect to our research question, but with a larger amount of observations in order to review our findings. Another point of interest would be to verify – also with a larger dataset – whether privately-held firms indeed differ significantly from publicly-traded firms with respect to their capital structure and financing decisions.

7.4 Conclusion

Based on our analysis we have found that none of the five financial ratios, those being the working capital ratio, earnings ratio, equity ratio, net sales ratio and the retained earnings ratio appear to be statistically significant. However, after processing these aforementioned five financial ratios into Altman's Z-score model for privately-held firms and publicly-traded firms, respectively, we do find a statistically significant

²⁵ This exclusively for the Z-scores measured between privately-held and publicly-traded firms however. We have found no statistically significant evidence that there is any difference in the five underlying financial ratios.

²⁶ Let this be the government from each member state separately or the European government in Brussels.

difference between the two aforementioned stakeholders – this in favor of the privately-held firms.

As such our conclusion is that privately-held firms indeed do perform better than do their publicly-traded comparables. The former experiences a lesser degree of agency problems as fewer parties are involved in the decision making with respect to the capital structure of the firm or its investment decisions. Although these same privately-held firms seem more opaque to outsiders as they are not legally obligated to publish their financial records, they are suspected of having a more committed management – committed as in to the firm rather than the managers' perks and luxuries – than do publicly-traded firms.

Secondly, reference studies find that privately-held firms tend to employ debt financing more frequently, which is in line with the pecking-order theory and to some degree with the trade-off theory with respect to capital structure. We have however found no such evidence in our dataset due to lack of sufficient observations. On the other hand, we have found statistical evidence that privately-held firms indeed have significantly higher retained earnings than do publicly-traded firms. On the overall, utilizing the aforementioned Z-score, privately-held firms only significantly outperform publicly-traded firms in times of economic turmoil. Outside of such harsh times, we have found no evidence that the aforementioned two firm types outperform one another.

7.5 Summary

In this report we have issued the research question asking ourselves whether there is a difference in performance between privately-held and publicly-traded firms during the economic crisis of 2007 and 2008 in the European Union. To shape our research question, we have argued the possible effects based on the agency theory, the capital structure of the firm and information asymmetry.

Then we discuss the utilization of five financial ratios and the use of Altman's Z-score model. We argue its validity based on various similar researches done by other

authors with respect to financial distress. Next we have explored our dataset to determine the nature of the data we have acquired through WorldScope.

Our results chapter then finds that there is no statistically significant difference in performance between privately-held and publicly-traded firms during times of economic crisis. Our side note is that our data is rather limited by the number of observations. This note is reinforced by the fact that we find a statistical significant difference in performance between privately-held firms and publicly-traded during times of economic crisis based on Altman's Z-score. This difference in performance is in favor of the privately-held firms.

Lastly, we take a closer look at our data by the means of tabular and graphical displays. Although we are unable to find a clear trend in either of the tabular or graphical displays, we can safely conclude that during times of economic crisis, privately-held firms perform slightly better than do publicly-traded firms.

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Appendix

Appendix 1

List of definitions used in this report accompanied by a brief description.

List of definitions used throughout this report	
Term	Definition
(a) comparable	A firm which is in the same industry and approximately of the same size (usually measured in net sales volume) as the firm to which it is compared.
comparables set	A group of comparable firms
EBIT	Abbreviation for <i>earnings before interest and taxes</i> .
economical distress	The definition of this term is when a firm or economy is structurally shrinking rather than growing. If this remains for a sufficient time with a firm, it may eventually lead to bankruptcy.
financial distress	A term for the situation in which a firm can no longer comply with its agreements to debt holders.
financial ratio	Ratios used in the science of corporate finance to determine certain aspects deemed significant to any firm. Such aspects include solvency, liquidity and profitability.
privately-held firm	A firm of which the equity is not publicly traded or listed on any stock exchange.
publicly-traded firm	A firm of which the equity is publicly traded and listed on any stock exchange.
Z-score	Altman's Z-score is based on five statistically significant financial ratios, those being working capital ratio, retained earnings ratio, EBIT to total assets ratio, equity to total liabilities ratio and net sales to total assets ratio. The Z-score is to determine whether the firm in question will experience financial distress within the coming two years (with approximately 80% reliability in its predictions).

Appendix 2

In the table below there is an overview of the Z-scores from both privately-held firms and their respective comparable sets.

Z-scoring of private firms and their publicly-traded comparables							
		No. of comparables	Z-score				
			2004	2005	2006	2007	2008
Comparables Set 1	Private firm	3	-1.55	0.75	0.70	1.12	1.73
	Comparables		-3.98	-4.46	-3.39	2.53	2.33
Comparables Set 2	Private firm	5	-0.51	-2.76	-0.65	0.15	3.02
	Comparables		-19.61	-6.29	6.73	4.71	3.66
Comparables Set 3	Private firm	4	2.05	2.15	2.20	1.47	2.47
	Comparables		2.06	2.26	2.12	1.84	1.77
Comparables Set 4	Private firm	6	2.13	2.03	2.30	2.40	2.61
	Comparables		2.14	2.36	2.31	2.37	2.51
Comparables Set 5	Private firm	5	1.51	1.41	1.67	1.49	1.52
	Comparables		2.37	2.68	2.40	2.53	2.29
Comparables Set 6	Private firm	1	-7.58	6.14	2.39	-1.57	-4.00
	Comparables				-9.52	-2.95	-6.08
Comparables Set 7	Private firm	5	1.33	1.32	1.22	1.31	1.30
	Comparables		2.98	2.86	2.63	2.49	2.17
Comparables Set 8	Private firm	5	3.61	2.66	3.55	3.70	3.38
	Comparables		3.54	3.90	4.19	4.13	4.23
Comparables Set 9	Private firm	7	2.61	2.59	2.70	2.27	2.37
	Comparables		4.20	4.03	4.12	4.27	4.49
Comparables Set 10	Private firm	3	2.23	2.26	2.37	2.10	2.13
	Comparables		3.31	3.65	3.02	3.19	3.45
Comparables Set 11	Private firm	3	1.88	1.57	1.85	1.86	2.24
	Comparables		0.22	0.73	3.99	1.41	1.17
Comparables Set 12	Private firm	1	-3.57	-3.00	-0.29	3.19	3.55
	Comparables		-4.25	-3.66	-3.24	7.50	0.69
Comparables Set 13	Private firm	6	0.28	0.14	0.22	0.05	0.17
	Comparables		0.38	0.25	0.73	1.23	1.05
Comparables Set 14	Private firm	1	1.25	1.06	1.26	1.10	0.40
	Comparables		4.56	4.96	3.63	3.84	7.67
Comparables Set 15	Private firm	6	1.32	0.97	1.24	1.23	1.31
	Comparables		4.43	2.20	2.13	2.22	2.52
Comparables Set 16	Private firm	5	2.27	1.92	2.02	2.15	1.95
	Comparables		2.14	1.96	1.63	1.58	1.98
Comparables Set 17	Private firm	3	2.11	1.58	1.78	1.97	1.99
	Comparables		1.65	1.93	1.67	1.98	1.60
Comparables Set 18	Private firm	2	1.78	1.80	1.83	1.72	1.63
	Comparables		3.57	2.47	2.18	2.30	2.77
Comparables Set 19	Private firm	5	3.14	1.68	1.71	1.66	2.02
	Comparables		2.77	3.12	2.99	2.94	3.41
Comparables Set 20	Private firm	5	2.00	0.87	1.09	1.16	1.06
	Comparables		0.15	2.87	3.18	3.28	3.27
Comparables Set 21	Private firm	5	3.23	3.36	3.27	3.89	3.38
	Comparables		3.06	3.15	3.10	3.10	2.71
Comparables Set 22	Private firm	4	1.65	1.85	1.71	2.16	1.95
	Comparables		3.28	2.87	2.98	2.83	2.36
Comparables Set 23	Private firm	5	1.06	-0.03	0.18	0.42	0.75
	Comparables		0.02	0.52	1.24	1.27	1.50
Comparables Set 24	Private firm	7	0.88	1.22	1.54	1.69	1.67
	Comparables		1.92	1.96	2.13	2.24	2.57
Comparables Set 25	Private firm	1	1.23	0.54	-0.30	0.27	-1.28
	Comparables		1.57	2.01	1.44	1.69	0.96
Comparables Set 26	Private firm	1	2.51	2.47	2.28	-0.55	-10.42
	Comparables		-2.50	-1.23	0.33	-2.12	-4.65
Comparables Set 27	Private firm	4	5.48	5.33	6.68	6.32	7.31
	Comparables		3.99	5.17	5.86	5.56	4.04
Comparables Set 28	Private firm	8	2.24	2.25	2.46	2.63	2.53
	Comparables		1.94	1.78	1.55	1.55	1.69

Appendix 3

Classification of Z-score results as displayed in Appendix 2, with the criteria used from table 5.

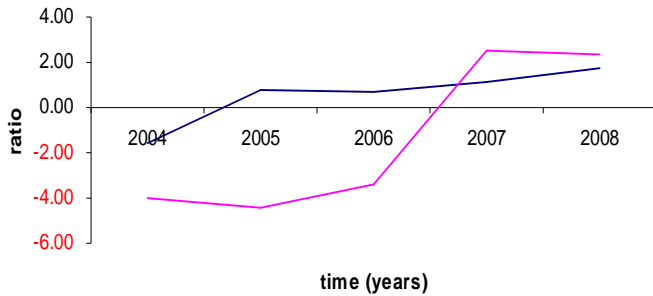
Z-score result		Status		
		Distress	"gray" area	Healthy
Comparables Set 1	Private firm		X	
	Comparables		X	
Comparables Set 2	Private firm			X
	Comparables			X
Comparables Set 3	Private firm		X	
	Comparables		X	
Comparables Set 4	Private firm		X	
	Comparables		X	
Comparables Set 5	Private firm		X	
	Comparables		X	
Comparables Set 6	Private firm	X		
	Comparables	X		
Comparables Set 7	Private firm	X		
	Comparables		X	
Comparables Set 8	Private firm			X
	Comparables			X
Comparables Set 9	Private firm		X	
	Comparables			X
Comparables Set 10	Private firm		X	
	Comparables			X
Comparables Set 11	Private firm		X	
	Comparables	X		
Comparables Set 12	Private firm			X
	Comparables	X		
Comparables Set 13	Private firm	X		
	Comparables	X		
Comparables Set 14	Private firm	X		
	Comparables			X
Comparables Set 15	Private firm	X		
	Comparables		X	
Comparables Set 16	Private firm		X	
	Comparables		X	
Comparables Set 17	Private firm		X	
	Comparables		X	
Comparables Set 18	Private firm		X	
	Comparables		X	
Comparables Set 19	Private firm		X	
	Comparables			X
Comparables Set 20	Private firm	X		
	Comparables			X
Comparables Set 21	Private firm			X
	Comparables		X	
Comparables Set 22	Private firm		X	
	Comparables		X	
Comparables Set 23	Private firm	X		
	Comparables	X		
Comparables Set 24	Private firm		X	
	Comparables		X	
Comparables Set 25	Private firm	X		
	Comparables	X		
Comparables Set 26	Private firm	X		
	Comparables	X		
Comparables Set 27	Private firm			X
	Comparables			X
Comparables Set 28	Private firm		X	
	Comparables		X	

Appendix 4

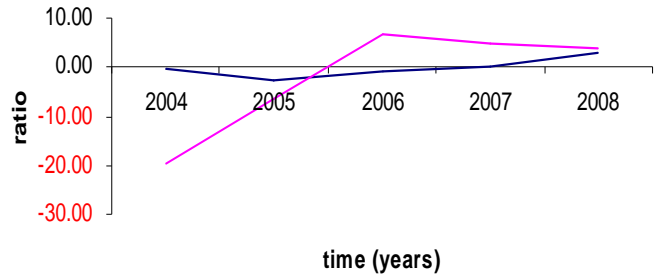
The 28 graphical displays of the Z-score over the time period 2004 – 2008.

Legend - firm type	
privately-held	
publicly-traded	

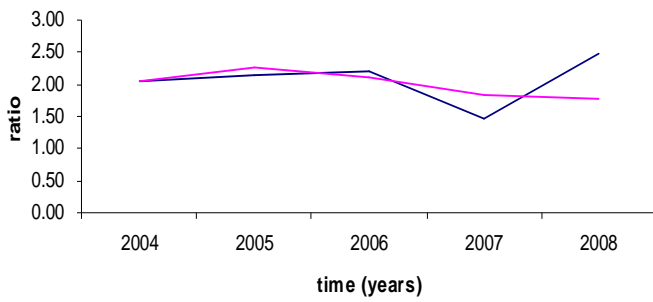
Z-score - Comparison Set 1



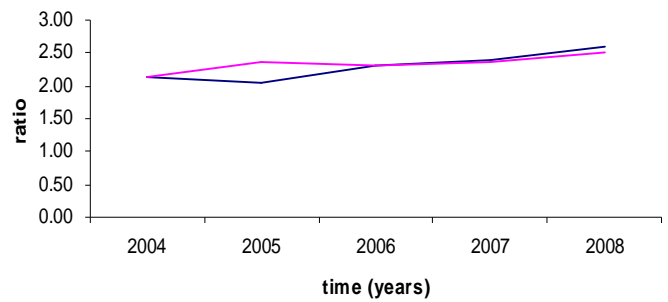
Z-score - Comparison Set 2



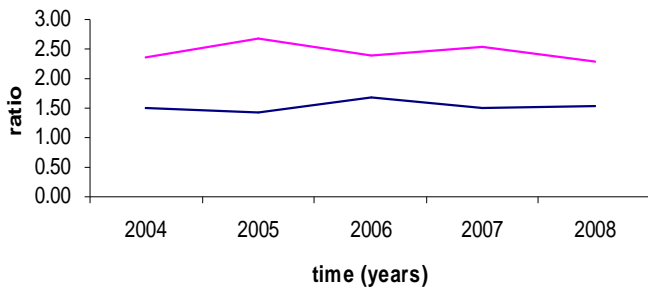
Z-score - Comparison Set 3



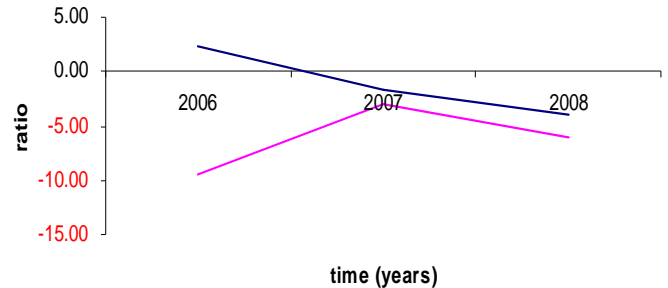
Z-score - Comparison Set 4



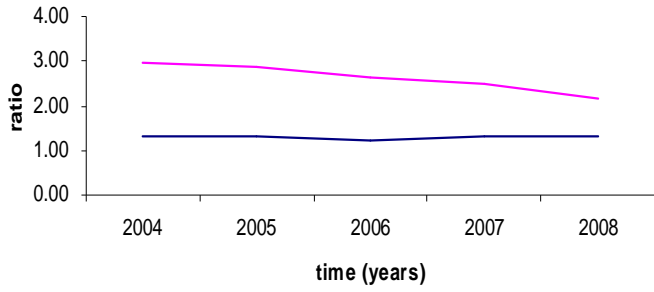
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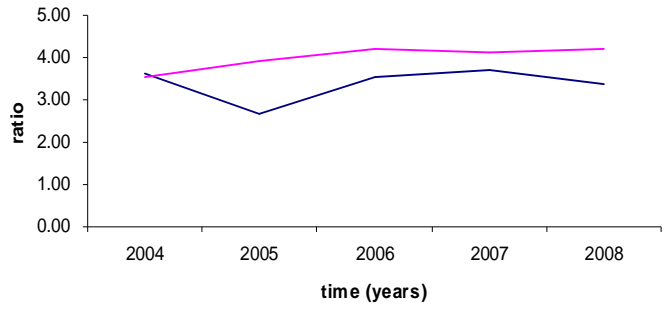
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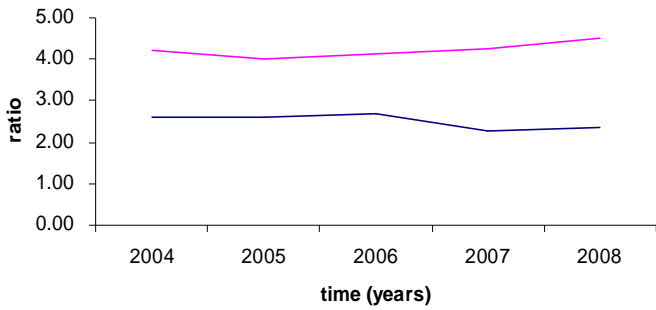
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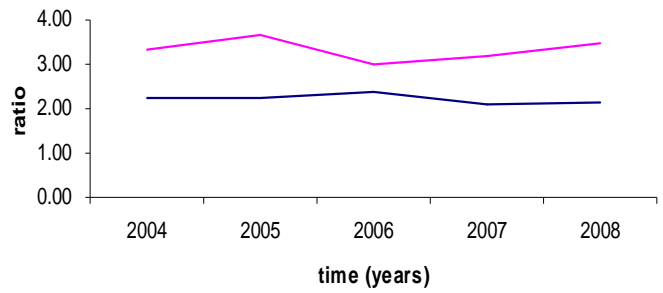
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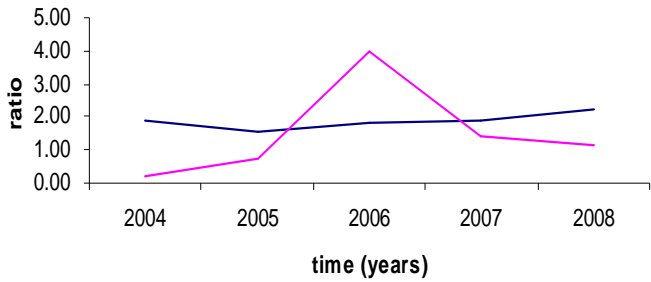
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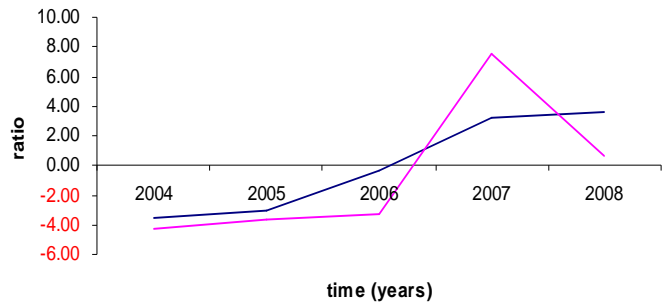
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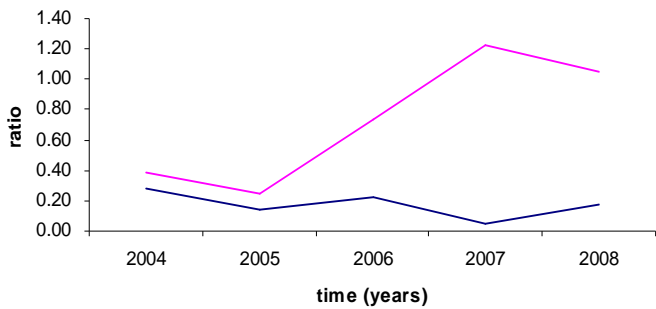
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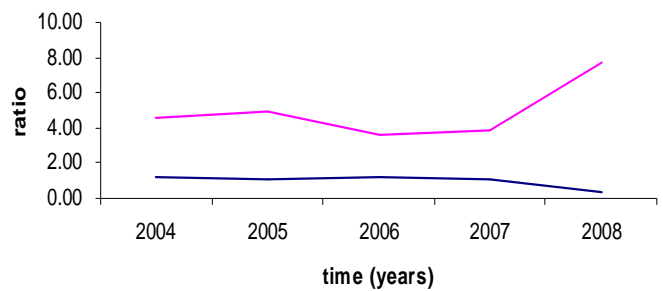
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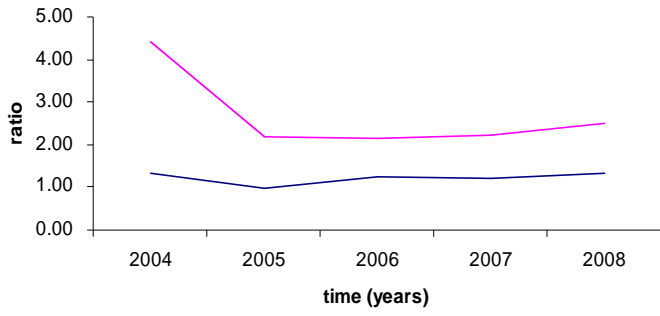
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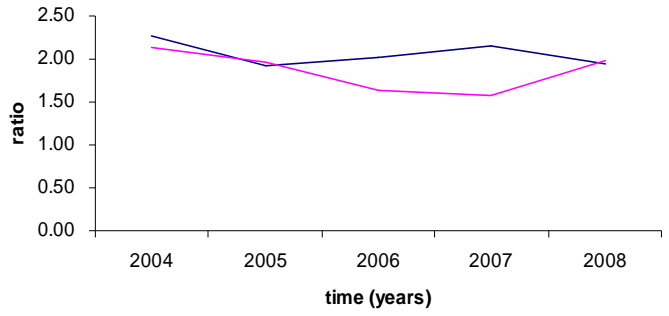
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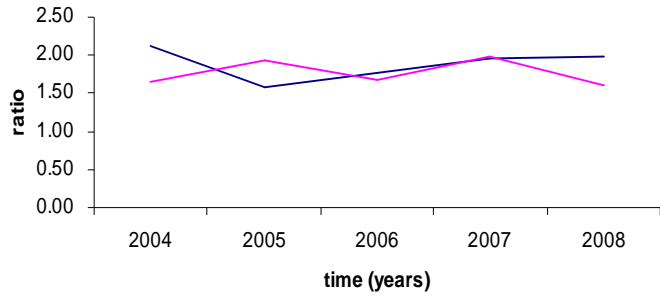
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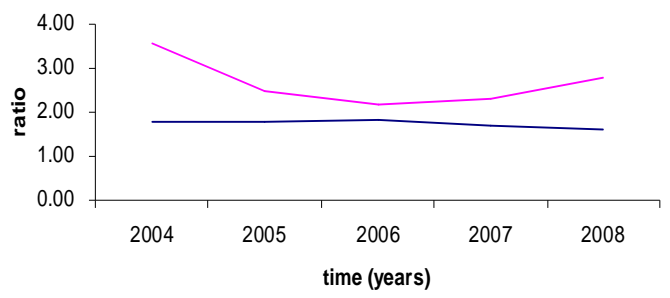
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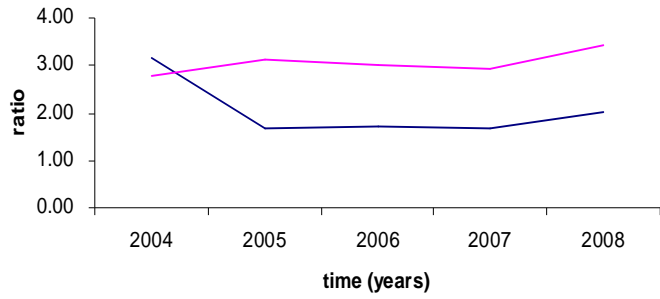
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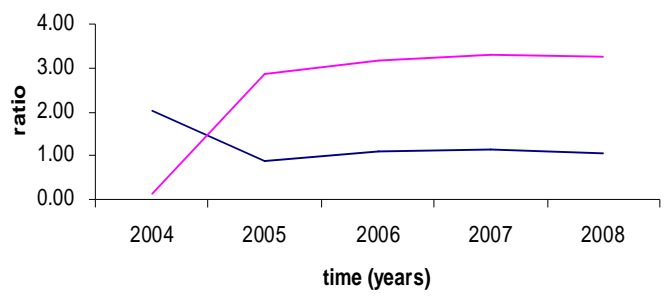
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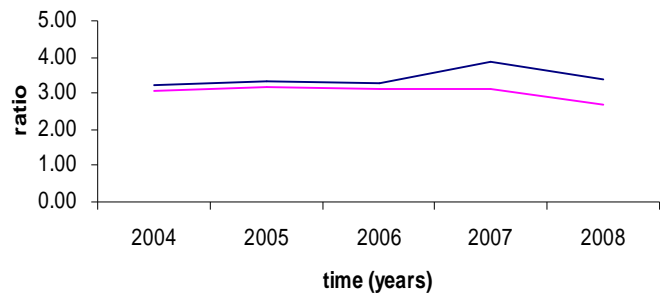
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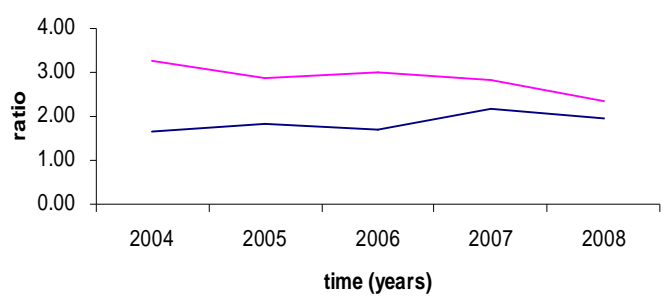
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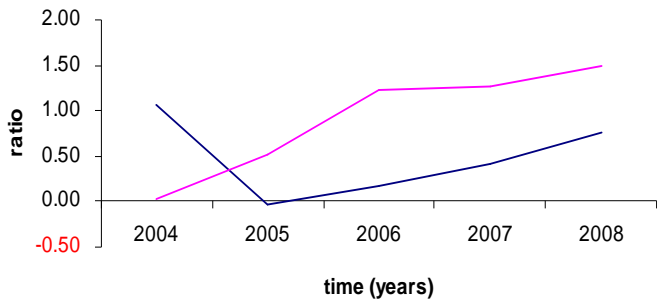
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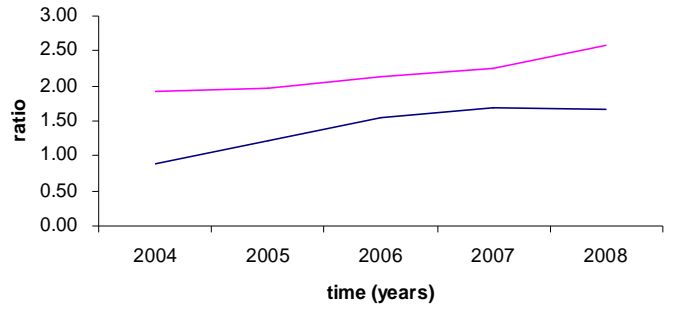
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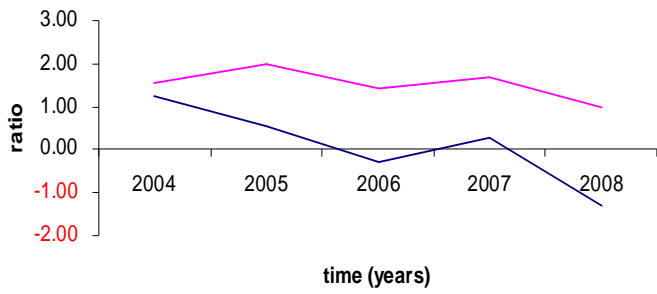
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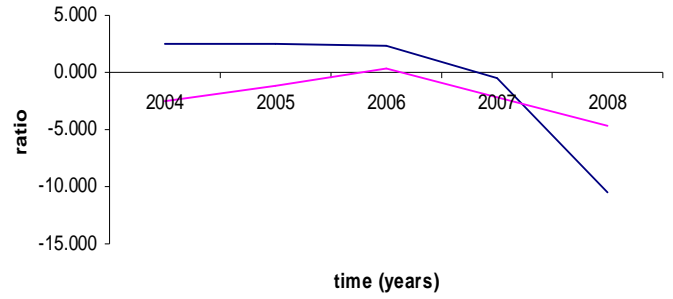
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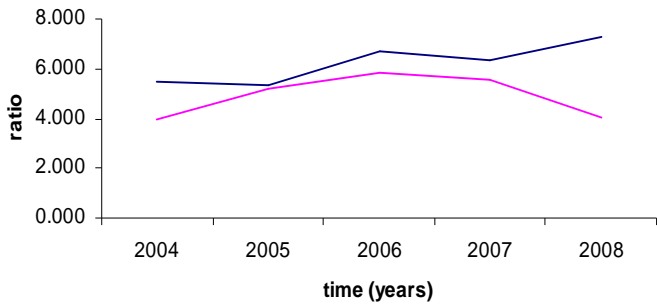
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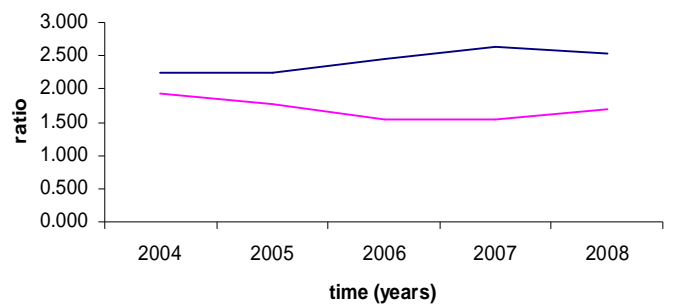
Z-score - Comparison Set 26



Z-score - Comparison Set 27



Z-score - Comparison Set 28



Appendix 5²⁷

This appendix supplies an overview of the coding used by the WorldScope database of the variables used throughout this thesis.

Overview of WorldScope variables			
Variable name	WorldScope item name	WorldScope source code	WorldScope definition
Total Assets	TOTAL ASSETS	02999	TOTAL ASSETS represent the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment and other assets.
Retained Earnings	RETAINED EARNINGS	03495	RETAINED EARNINGS represent the accumulated after tax earnings of the company which have not been distributed as dividends to shareholders or allocated to a reserve account. Excess involuntary liquidation value over stated value of preferred stock is deducted if there is an insufficient amount in the capital surplus account.
Earnings Before Interest and Taxes	EARNINGS BEFORE INTEREST AND TAXES (EBIT)	18191	EARNINGS BEFORE INTEREST AND TAXES (EBIT) represent the earnings of a company before interest expense and income taxes. It is calculated by taking the pretax income and adding back interest expense on debt and subtracting interest capitalized.
Equity	COMMON EQUITY	03501	COMMON EQUITY represents common shareholders' investment in a company. It includes:
Total Liabilities	TOTAL LIABILITIES	03351	TOTAL LIABILITIES represent all short and long term obligations expected to be satisfied by the company. It includes:
(Net) Sales	NET SALES OR REVENUES	01001, 19101, 19102, 19103, 19104	NET SALES OR REVENUES represent gross sales and other operating revenue less discounts, returns and allowances.
SIC Code	SIC CODES	07021, 07022, 07023, 07024, 07025, 07026, 07027, 07028	SIC CODES were developed by the U.S. government to provide a standard industry classification which covers all the economic activities of the United States. They are derived from the 1987 edition of the Standard Industrial Classification Manual compiled by the Executive Office of the President of the United States, Office of Management and Budget. These SIC codes are assigned to both U.S. and
Total Current Assets	CURRENT ASSETS - TOTAL	02201	TOTAL CURRENT ASSETS represents cash and other assets that are reasonably expected to be realized in cash, sold or consumed within one year or one operating cycle. Generally, it is the sum of cash and equivalents, receivables, inventories, prepaid expenses and other current assets. For non-U.S. corporations, long term receivables are excluded from current assets even though included in net receivables.
Total Current Liabilities	CURRENT LIABILITIES - TOTAL	03101	TOTAL CURRENT LIABILITIES represent debt or other obligations that the company expects to satisfy within one year.

²⁷ We would like to note that all financial data acquired from WorldScope is measured in millions of fixed Euro's.

