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# The impact of capital structure on firm performance:

## What is the role of firm specific factors?

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## Abstract

This study focuses on the impact of firm specific factors into the relationship between capital structure and firm performance. Since previous studies found mixed and contradicting results of the effect of leverage on firm performance, the goal of this research is to improve our understanding of this relationship. This research extends previous studies by focusing on the impact of the firm specific factors size, growth, volatility of earnings and tangibility on the relationship between capital structure and firm performance. The data sample consists of 1,175 listed firms from the United States for the period 2011 till 2018. Since this research makes use of panel data, the fixed effects model is used to analyze the dataset. Firm performance is measured by the return on assets, return on equity and Tobin's Q. This study finds evidence of a negative relation between leverage and firm performance. The volatility of earnings of a firm shows to have a negative effect on the relation between leverage and firm performance. Furthermore, the size of a firm shows a tendency towards a positive effect while growth shows a tendency towards a negative effect on the relationship between leverage and firm performance.


**Keywords:** Firm performance, capital structure, leverage, firm specific factors, size, tangibility, volatility of earnings, growth

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# 1. Introduction

Capital structure decisions remain a crucial aspect of firms in reaching their goal: maximizing the wealth of shareholders. When a firm cannot meet their debt obligation, the firm is forced into bankruptcy (Kraus & Litzenberger, 1973). Therefore, capital structure does not only influence the cost of capital but it even affects the extent to which a company survives recessions or economic shocks. The capital structure decision is an important decision in order to maximize returns and to deal with competitiveness (Gill et al., 2011).

Capital structure deals with the decision in which combination a firm will access sources of capital. The capital structure is a mix of debt and equity, which can be financed by internal or external financiers. The level a firm makes use of debt in comparison to equity is called the financial leverage position. The Modigliani and Miller theorem proved that in perfect markets the decision between financing with debt or equity has no significant effect on firm value, cost of capital or availability of capital (Modigliani & Miller, 1958; Myers, 2001). Modigliani and Miller's capital structure irrelevancy theory has led to plenty of new research about the 'optimal capital structure'. Later literature criticized the theory of Modigliani and Miller because in the real-world perfect markets do not exist, and thus the source of capital does have an effect on firm value.

More recent theories abandon the assumptions of the perfect markets and came up with more realistic and empirically applicable insights, like the static trade-off theory, the pecking order theory and the free cash flow hypothesis (Jensen, 1986; Kraus & Litzenberger, 1973; Myers & Majluf, 1984). These theories account for market imperfections such as cost of financial distress, agency costs and tax advantages (Kraus & Litzenberger, 1973). Due to tax shield advantages, the trade-off theory expects a positive effect of leverage on firm performance till the point that the marginal benefit of additional debt offset the marginal costs of additional debt (Myers, 2001). The pecking order theory argued that firms prefer internally generated funds before external capital since external capital is more costly due to information asymmetry and transaction costs (Myers, 1984). Therefore, the pecking order theory expects a negative link of leverage on firm performance. The free cash flow hypothesis of Jensen (1986) argued that debt has a positive effect on firm performance since debt motivates managers to be more efficient and perform better in order to

avoid bankruptcy. These positive affects hold until the point where the marginal costs offset the marginal benefits of additional debt.

During the years empirical studies have been conducted into the relationship of capital structure and firm performance. There are still unresolved conflicting results according to the relationship between leverage and firm performance. Some studies found a negative relationship between leverage and firm performance (Li et al., 2019; Salim & Yadav, 2012; Soumadi & Hayajneh, 2012; Vithessonthi & Tongurai, 2015). However, other studies found positive results for this relationship (Gill et al., 2011; Margaritis & Psillaki, 2010; Wippern, 1966). Some studies argued that these mixed and contradicting results are induced by other factors that affects the relationship between leverage and firm performance, like the credit risk of a firm or the level of international activities (Li et al., 2019; Vithessonthi & Tongurai, 2015). Also, other firm specific factors like size, tangibility and the volatility of earnings of a firm might affect the relationship between capital structure and firm performance. Larger firms face lower costs of capital due to lower information asymmetries and their market power (Baumol, 1959; Rajan & Zingales, 1995; Smith, 1977). More tangible firms have more collateral available which might lead to lower costs of debt (Akintoye, 2008). More volatile firms are less stable, face more costs of financial distress and can benefit less from the tax advantage of additional debt (Fama & French, 2002). Based on the literature, these firm specific factors might affect the relation between leverage and firm performance. Although some studies found evidence that firm specific factors affect the relationship between leverage and firm performance, the number of studies that tried to explain the mixed and contradicting results into the relation of capital structure and firm performance by taking into account other firm specific factors is limited. Since there is not much evidence yet whether the relation between leverage and firm performance is affected by different firm specific factors, studying the impact of different firm specific factors into the relation of capital structure and firm performance could be a valuable addition to the current literature. Therefore, this study aims to fill this research gap by focusing on the role of different firm specific factors into the relationship of capital structure and firm performance. Hence, this research aims to answer the question: *What is the role of firm specific factors into the relationship of capital structure and firm performance?*

The goal of this study is to get more insights in the relationship between capital structure and firm performance. Since most literature focused only on the direct effect of capital structure and firm performance, this study extends to the existing literature by focusing whether firm specific factors affect the relationship between leverage and firm performance. This study focuses on the role of the firm specific factors size, growth, tangibility and the volatility of earnings of a firm. This study uses a data sample of listed firms from the United States over the period 2011 till 2018. Since this study makes use of panel data, the fixed effects model is used to test the hypotheses. This study finds that leverage has a negative effect on firm performance. Volatility of earnings shows to have a negative effect on the relation between leverage and firm performance. Furthermore, tangibility shows a tendency towards a positive effect, while growth shows a tendency towards a negative effect on the relation between leverage and firm performance. The findings of the effect of size on the relation between leverage and firm performance are mixed.

In order to present this analysis, first this research continues by the literature review of section 2. In this section the most relevant theories and findings in empirical research will be provided, and the hypotheses of this study will be elaborated. Hereafter, section 3 will report the data sample and discusses the methodology which is used to test the hypotheses. Section 4 starts with an explanation of the descriptive statistics and the correlation matrix. Furthermore, section 4 presents the results of this study. The last section will conclude this study by discussing the results, limitations and recommendations for future research.

# 2. Literature Review

## 2.1 Theories

### *Modigliani and Miller Theorem*

One of the oldest and most famous theories with their focus on the relationship between capital structure and firm performance was written by Modigliani and Miller (1958). Based on their assumption that markets are perfectly competitive, they argued that the capital structure of companies will not affect the market value of companies. Due to the linear function of the cost of equity to the company's leverage ratio the weighted cost of capital stays constant. However, the assumption that markets are perfectly competitive implies that information is freely available for everybody, taxes and transaction costs are zero and the rate for borrowing and lending is the same (Hamada, 1969).

Due to various criticisms on the existence of perfect competitive markets, Modigliani and Miller were encouraged to critically review their original theory. In their modified research they revised their assumption of zero taxation. Due to tax-deductibility of interest companies can benefit from partially offsetting interest by paying lower taxes, which is called the tax shield benefit. Since taking on more debt gives firms higher tax shield benefits, Modigliani and Miller concluded in their revised research that taking a more leveraged position will stimulate the performances of firms (Modigliani & Miller, 1963). Therefore, the revised research of Modigliani and Miller suggested that there is a positive relation between leverage and firm performance due to tax shield benefits.

Although Modigliani and Miller came back on their zero taxation assumption, they still kept many assumptions of perfect competitive markets in their theory. Research has backed the theory of Modigliani and Miller that in complete and perfect capital markets the capital structure of firms does not affect firm performance (Hirshleifer, 1966; Robichek & Myers, 1966; Stiglitz, 1969). Since markets are in reality not perfect due to various reasons, the explanatory power of Modigliani and Miller's theory is quite low. Although the theory of Modigliani and Miller is heavily criticized because their unrealistic assumptions of the real world, still the theory is used as a starting point in many other research papers.

### *Static Trade-off Theory*

Kraus and Litzenberger (1973) came with a trade-off theory between the tax advantage of debt and bankruptcy penalties into a state preference framework. When a firm increased their leverage, it is of importance that the company earns its debt obligation with certainty (Kraus & Litzenberger, 1973). When the leverage ratio of a company increases, there is a higher possibility that the firm cannot meet its debt obligation and thus will face costs of financial distress. The costs of financial distress are the possible costs of bankruptcy or reorganizations, and it also refers to agency costs that might arise when stockholders and bondholders get a conflict when the creditworthiness of a firm is in doubt (Myers, 2001). The costs of financial distress negatively affects firm performance. The tax shield advantage and the reduction of free cash flow problems are the benefits of financing with debt (Fama & French, 2002). From the trade-off theory perspective a firm will use debt financing up to the point where the marginal benefit of additional debt is just offset by the marginal costs of additional debt (Myers, 2001). As long as the marginal benefits of additional debt are higher than the marginal costs, leverage has a positive effect on firm performance.

### *Pecking order theory*

An alternative theory that explains the financing decisions of firms is the pecking order theory. Contradicting with the static trade-off theory, the pecking order theory claims that an optimal level of capital structure does not exist. This because firms have no target debt ratio, but firms will finance their business based on a particular preference order for capital. This theory suggests that firms first will use their internally generated funds, before they will access capital markets, like debt and equity. Furthermore, debt is preferred before equity (Myers, 1984). The pecking order theory takes the transaction costs and the concept of asymmetric information into account when firms approach external funds. Managers of firms have more information about the firm than potential investors have. Investors know this as well and they take this asymmetric information problem into account. Investors expect that the securities are overpriced when managers access the equity markets. Therefore, investors will increase their discount rates which affects the price of a share and thus the value of a firm. Due to these information asymmetry and transaction costs, the costs of external capital increases. Therefore, managers prefer to finance new investments first with internally generated funds (retained earnings), then with debt and at the latest if necessary with equity (Fama & French, 2002). According to the pecking order theory, the cost of internally generated funds are lower than the cost of external capital due to information asymmetry and

transaction costs. Therefore, the pecking order theory suggests a negative link between leverage and the performance of a firm (Frank & Goyal, 2009; Rajan & Zingales, 1995; Titman & Wessels, 1988).

***Agency theory***

Other capital structure theories are more based on the agency theory of Jensen and Meckling (1976). The agency theory suggest that the conflict between shareholders and managers arises from the separation of ownership and control (Jensen & Meckling, 1976). Grossman and Hart (1982) came with a theory how shareholders could incentivize managers to solve part of the agency problem. In their theory Grossman and Hart (1982) suggest that debt increases the market value of firms because debt gives managers the incentive to maximize profit. They argued that firms that exist for 100% of equity do not go into bankruptcy and thus managers have no reason to maximize profit. The market will know this and therefore the value of a firm will decrease. Issuing debt gives an incentive to managers to maximize profit because managers will lose their benefits when their firm is going into bankruptcy (Grossman & Hart, 1982). Since issuing debt gives an incentive to managers, this theory suggest that debt has a positive effect on firm performance. Grossman and Hart (1982) suggest to trade-off the capital structure, where issuing debt results in a higher market value while issuing equity results in lower risks due to risk sharing.

The free cash flow hypothesis of Jensen (1986) discussed how to deal with the agency theory of Jensen and Meckling (1976) by motivating managers not to waste free cash flows. The theory stated that issuing debt will solve part of the agency problem since it motivates managers to be more efficient and perform better because otherwise the firm may not meet its debt obligations (Jensen, 1986). There is a limitation to this effect since increasing leverage increases another part of the agency costs, like higher costs of financial distress. Therefore, Jensen (1986) argued that debt has a positive effect on firm performance till the point where the marginal costs of debt just offset the benefits.

## 2.2 Empirical evidence

Many studies did empirical research to the relation between capital structure and firm performance. Some of these studies explicitly investigated the relation between capital structure and firm performance for a specific country. Soumadi and Hayajneh (2012) studied this relation specifically

for Jordanian listed firms for the period 2001 till 2006. They used return on equity and Tobin's Q as their indicators for firm performance, and they measured the leverage ratio as the book value of total liabilities divided by total assets. They found that leverage has a negative effect on firm performance for their sample of Jordanian firms (Soumadi & Hayajneh, 2012). De Mesquita and Lara (2011) investigated the effect of capital structure on firm performance for the Brazilian market. They distinguished a short term debt and a long term debt leverage ratio and found different results for these leverage indicators. Return on equity showed a positive correlation with the short term debt ratio, while it showed a negative correlation with the long term debt ratio (Mesquita & Lara, 2011). Also Abor (2005) found that the effect of short term debt and long term debt on firm performance differ. He studied the relation between capital structure and firm performance for a small sample of Ghanaian firms over 1998 till 2002. By measuring profitability as EBIT, Abor (2005) stated that short term debt has a positive effect on profitability due to the relative low cost of short term debt, while long term debt is relatively more expensive which causes the negative effect between long term debt and profitability. Gill et all. (2011) extended the research of Abor (2005) by investigating the effect of leverage on profitability for two industry types in the United States; the manufacturing industry and the service industry. Gill et al. (2011) argued that almost all previous studies where focused on industrial firms. They argued that, in comparison with manufacturing firms, firms in the service industry might contain other aspects that influence profitability. The distribution of capital might be one of these aspects since the level of investment in tangible assets, like machinery and equipment, differs between both industries (Gill et al., 2011). In order to test whether the effect of capital structure on profitability differs between industries, Gill et al. (2011) studied this relation for a sample of firms from the manufacturing and service industry. In their research they used return on equity as their measurement for profitability. They found a positive effect of short term, long term and total debt on profitability for both industries (Gill et al., 2011). According to Gill et al. (2011), these positive effects are caused by low interest rates for the time period of 2005 till 2007 and by the tax deductibility of interest in the United States. Although the effect is positive Gill et al. (2011) noted that the capital structure should not exist of debt only, since debt increases the possibility that a firm goes into bankruptcy.

For Malaysian listed companies, Salim and Yadav (2012) studied the relation between capital structure and firm performance for a sample of different industries during the years from 1995 till

2011. They used return on equity, return on assets, Tobin's Q and earnings per share as a measurement for profitability. Salim and Yadav (2012) measured leverage for short term, long term and total debt. In their regression they controlled for size and growth, which turned out to have a significant effect on firm performance for most industries. Specifically, they showed that for most industries a negative relation between the three leverage ratios and firm performance measured by return on assets, return on equity and earnings per share. Although some industries showed an insignificant relation, none of them showed a significant positive relation for the effect of leverage on firm performance. Firm performance measured by Tobin's Q showed some mixed and insignificant results according to the relation between leverage and firm performance. However, long term debt on Tobin's Q still showed a significant negative relation. Overall, the results of Salim and Yadav (2012) mainly showed that leverage has a negative effect on firm performance. This negative relation might be due to the default risk firms face when they increase their debt (Salim & Yadav, 2012). Wippern (1966) studied the relationship between leverage ratio and shareholders wealth. Wippern (1966) used another measurement approach of leverage and firm performance. He measured leverage as the fixed charges to minimum expected income, where the level of fixed charges contains interest and preferred dividends. An increase in debt will lead to higher interests and thus an increase in fixed charges. When the level of earnings remains constant, an increase in debt will lead to a higher leverage ratio according to the measurement of Wippern (1966). According to this mechanism between fixed charges and the level of earnings, the measurement method of Wippern (1966) is another proxy for leverage. Wippern (1966) used the earnings yield of a share to measure firm value. The study did not find evidence for an optimal capital structure. However, for the range of capital structures used in his study Wippern (1966) proved that higher leverage leads to an increase in shareholders wealth. Based on this, he concluded that leverage positively affects firm performance. Although many studies found evidence for a significant effect of leverage on firm performance, Krishnan and Moyer (1997) did not find this evidence. They argued that leverage itself does not seem to affect corporate performances for 81 corporations from Hong Kong, Malaysia, Singapore and Korea (Krishnan & Moyer, 1997).

Li et al. (2019) discussed that previous studies found mixed and contradicting results of the relationship between capital structure and firm performance. They argued that there might be other factors that moderates the relationship between capital structure and firm performance which could

induce these mixed and contradicting results. In their research they test whether credit risk is such a factor that might affect the relationship between capital structure and firm performance. They hypothesized that firms with a low credit risk will face a negative effect of leverage on firm performance, while high credit risk firms will face a positive effect (Li et al., 2019). In their study capital structure is measured as the book values of long term debt divided by the total assets while firm performance is measured as the pre-tax profit divided by total assets. For their data sample of small- and medium sized enterprises of ten European countries in 2012, they did not find a significant effect for firms with a high credit risk. However, they did find evidence in favour of their hypothesis that the relation between leverage and firm performance is negative for firms with a low credit risk (Li et al., 2019). Also, other studies found that there are factors that moderates the effect of leverage on firm performance. Vithessonthi and Tongurai (2015) studied the moderating role of the level of international activities of a firm into the relationship. Based on their expectations that firms that are involved with export and import activities have more and better opportunities to effectively use debt than firms that are just domestically oriented, they hypothesized that leverage has a stronger effect on firm performance for internationally oriented firms than the effect is for domestically oriented firms (Vithessonthi & Tongurai, 2015). Their study used a panel data sample of more than 150.000 non-financial firms in Thailand. The leverage ratio is measured as total liabilities divided by total assets and profitability is indicated as the return on assets. For the whole sample, the study of Vithessonthi and Tongurai (2015) showed a negative effect of leverage on firm performance. Furthermore, they found evidence in favour of their hypothesis since internationally oriented firms showed a positive relation between leverage and firm performance while domestic oriented firms showed a negative relation. This is in line with their expectation that firms with a lot of import and export have better investment opportunities than domestic firms without import and export (Vithessonthi & Tongurai, 2015). Furthermore, Vithessonthi and Tongurai (2015) found that the effect of leverage on firm performance is stronger for larger firms, which implies that the size of a firm effects the relation between leverage and firm performance.

Margaritis and Psillaki (2010) studied the relation of leverage on firm performance from the agency costs perspective. From the perspective of the free cash flow theory of Jensen (1986) and the managers fear of liquidation (Grossman & Hart, 1982), increasing leverage will lower the cost of agency and increase the efficiency of the manager. However, the possible costs of financial distress

from Myers (1977) theory may affect the firm's value negatively. Overall, Margaritis and Psillaki (2010) hypothesized that the positive effect will exceed the negative effects, thus higher leverage will improve firm performance. For their data sample of French manufacturing firms from high and low growth industries, they used a non-parametric technique of data envelopment analysis to estimate firm efficiency. The debt to total assets ratio was used as their measurement of leverage (Margaritis & Psillaki, 2010). They controlled for the possibility that the relation between leverage and firm efficiency may switch at higher leverage ratios. Furthermore they expected that size, structure of assets, structure of ownership and opportunities to growth are variables which might affect the efficiency of a firm and therefore they controlled for these variables. Margaritis and Psillaki (2010) found a positive effect of leverage on firm efficiency for every industry in their sample, and therefore they concluded that leverage has a positive effect on firm performance. Although the effect was positive for every industry, some traditional industries (chemicals and textiles industry) showed a stronger positive effect which indicates that the impact of debt is higher for industries with a low growth rate. This finding indicates that the growth of a firm affects the relation between leverage and firm performance. McConnell and Servaes (1995) already found evidence that the growth rate of firms affect the relation between leverage and firm performance. In their study they McConnell and Servaes (1995) hypothesised that leverage could affect firm value both positive as negative depending on the growth opportunities of a firm. Although projects with a positive net present value would increase firm value, Myers (1977) showed with the underinvestment problem that debt could induce managers to refuse these positive projects in order satisfy shareholders. Therefore, McConnell and Servaes (1995) expect a negative effect of debt on firm performance for firms with many growth opportunities. On the other side, the free cash flow hypothesis of Jensen (1986) indicates that having debt will reduce the free cash flow and therefore prevents firms with nearly no growth opportunities from engaging in projects with a negative net present value. Therefore, McConnell and Servaes (1995) expect for firms with low growth opportunities that debt positively affects firm performance. McConnell and Servaes (1995) found evidence in favour of their hypothesis. They proved that the relation between firm value and leverage is negative for firms with a high growth rate, while it is positive for firms with a low growth rate (McConnell & Servaes, 1995). McConnell and Servaes (1995) measured leverage by calculating the ratio of market value of long-term debt by the replacement value of assets and used the Tobin's Q ratio as their measurement of firm performance. They distinguished high growth

firms and low growth firms based on the value of the price to operating earnings (P/E) ratio (McConnell & Servaes, 1995).

Reviewing the literature, there is mixed and contradicting evidence according to the relation between capital structure and firm performance. Where Wippern (1966), Margaritis and Psillaki (2010) and Gill et al. (2011) found evidence for a positive relation between leverage and firm performance, Soumadi and Hayajneh (2012), Salim and Yadav (2012), Li et al. (2019) and Vithessonthi and Tongurai (2015) concluded that the effect of leverage on firm performance is negative. Mesquita and Lara (2011) and Abor (2005) found mixed results, while Krishnan and Moyer (1997) concluded that there is no significant effect at all. Furthermore, other studies found that the effect of leverage on firm performance depends on additional factors like the level of growth, credit risk, size and international activities (Li et al., 2019; McConnell & Servaes, 1995; Vithessonthi & Tongurai, 2015). Overall, the literature did not came with an unanimous result how leverage affects profitability. Since the literature that proved a negative effect is slightly in favour, this research expects a negative effect of leverage on firm performance. This gave rise to the first hypothesis of this research:

**Hypothesis 1:** The effect of leverage on firm performance is negative.

Gill et al. (2011) argued that investment patterns might affect the relation between capital structure and firm performance. In cases of bankruptcy, the level of collateral firms have is of importance for banks (Gill et al., 2009). Tangible assets are often used as collateral for loan contracts. Lenders want to insure themselves against the possibility of default of a company, therefore lenders often require collateral to ease financing constraints. Collateral could mitigate the agency concerns (Liberti & Sturgess, 2018). Hart and Moore (1994) stated that when collateralized assets are valuable, banks are more likely to lend. According to Akintoye (2008) a firm that relies on tangible assets will face lower costs of financial distress and this leads to lower costs of debt. According to the static trade-off theory of Kraus and Litzenberger (1973) and the free cash flow hypothesis of Jensen (1986), taking on additional debt has a positive effect on firm performance when the benefits of additional debt offset the costs of additional debt. According to this, the effect of debt on firm performance should be more positive when the costs of debt decreases due to a higher level of

tangibility. Therefore, this research expects that tangibility has a positive effect on the relation between leverage and firm performance.

**Hypothesis 2:** Tangibility has a positive effect on the relationship between leverage and firm performance.

In previous research, size has been considered as a determinant of firm performance (Fosu, 2013; Papadogonas, 2007; Seetanah et al., 2014). It sounds logical that firms aim to increase their size in order to reach better performances. This is in line with the economies of scale theory. Larger firms can decrease their production costs by increasing the level of production, resulting in better performances (Scherer, 1973; Shepherd, 1972). Other research came with suggestions that might indicate a moderating role of size on the relation between leverage and firm performance. Baumol (1959) argued that larger firms benefit from their market power and their easier access to new capital. Rajan and Zingales (1995) and Smith (1977) argued that issuing new equity is more costly for small firms, which indicates that the information asymmetry is smaller in larger firms. Therefore, large firms might have greater access to capital and lower costs of capital due to lower information asymmetries between a firm's manager and capital markets. From the pecking order theory perspective, when large firms face lower costs of capital due to lower information asymmetries it implies that size has a more positive effect on the relation between leverage and firm performances. Furthermore, Ang et al. (1982) found that there is a scale effect in the cost of bankruptcy where small firms face higher costs of bankruptcy than large firms. In general large firms face lower bankruptcy costs due to diversification of their business (Titman & Wessels, 1988). According to the static trade-off theory of Kraus and Litzenberger (1973) and the free cash flow hypothesis of Jensen (1986), the effect of leverage on firm performance should be more positive for larger firms due to their lower costs of financial distress. Vithessonthi and Tongurai (2015) found support for this expectation for firms from Thailand. In their study they found that the effect of leverage on firm performance is more positive for large firms than for small firms (Vithessonthi & Tongurai, 2015). This gave rise to hypothesis 3:

**Hypothesis 3:** Size has a positive effect on the relationship between capital structure and firm performance.

Volatility of earnings could be seen as a proxy for firm risk. Firms with more volatile earnings might face higher costs of financial distress due to a greater probability of default (Fama & French, 2002). Furthermore, Fama and French (2002) argued that firms with less volatile earnings benefit more from the tax shield. Myers (2001) and Jensen (1986) argued from respectively the static trade-off theory perspective and the free cash flow hypothesis that firms will face a positive effect of debt on firm performance up to the point where the marginal costs of additional debt offset the marginal benefits of additional debt. According to the literature, more volatile firms face higher costs of financial distress and benefit less from the advantages of additional debt. Therefore, this research expects that volatility of earnings has a negative effect on the relation between leverage and firm performance. This leads to hypothesis 4:

**Hypothesis 4:** Volatility of earnings has a negative effect on the relationship between capital structure and firm performance.

Based on the literature, growth affects the relation between capital structure and firm performance (Margaritis & Psillaki, 2010; McConnell & Servaes, 1995). McConnell and Servaes (1995) hypothesized that the direction of the effect of leverage on firm performance depends on the growth opportunities of a firm. Their research proved that growth has a negative effect on the relation between leverage and firm performance for a sample of American firms from 1976 and 1986. They argued that debt induces firms with many positive net present value growth opportunities to refuse projects, while it prevents firms with nearly no growth opportunities to invest in projects with a negative net present value (McConnell & Servaes, 1995). Margaritis and Psillaki (2010) found in their study that firms with a lower growth rate showed a more positive effect between leverage and firm performance. These findings gave rise to hypothesis 5:

**Hypothesis 5:** Growth has a negative effect on the relationship between capital structure and firm performance.

# 3. Research Method

## 3.1 Data

In order to test the effect of firm specific factors into the relationship of capital structure and firm performance, this research uses a quantitative research method. This research focuses on listed firms from the United States. Only listed firms are included in this study since most listed companies provide a lot of data about their capital structure and performances. This study wants to focus on a data sample for one country to prevent that firms are affected differently by possible country specific aspects. Since there is a lot of financial data available for firms from the United States, this research focuses only on companies from the United States. In order to avoid possible pre and during crisis effects, this research focuses on data after 2010. Since this study wants to use a recent dataset, the time period of this research reaches from 2011 till 2018. The sample of listed firms of the United States over the period 2010 till 2018 is retrieved from the database Orbis. Thereafter, the financial data for the sample of firms is obtained through the Eikon database. Since the Eikon database did not have direct values available for Tobin's Q, these values are obtained through Orbis.

Chen (2004) argued that firms in the finance industry have a strikingly different balance sheet structure compared to firms in other industries. In line with his research we dropped the finance, insurance and real estate sector from our sample. Based on the industry SIC code Orbis provided, the finance, insurance and real estate sector could be distinguished. Firms without a SIC code were dropped from the sample as well. Furthermore, in order to minimize the level of missing values this research includes only those firms having data available over the whole time period from 2011 till 2018. This results in a final data sample of 1,175 firms.

## 3.2 Measurement of variables

### *Dependent variable*

Firm performance is the dependent variable in this study. Literature have discussed several measurements to define firm performance. These measurements could be market-based or accounting-based measurements. Gill et all (2011) used only book values, since their dataset did not provide any market values. Therefore, they used the accounting-based measurement return on

equity (ROE) as a firm performance indicator. Also de Mesquite and Lara (2011) used return on equity as their performance indicator. Salim & Yadav (2012), Gill et al. (2009) and Vithessonthi and Tongurai (2015) used return on assets as another accounting-based measurement in their research. This research will use both return on equity and return on assets as an indicator for firm performance. However, in order to gain more validity this study will measure firm performance both accounting-based and market-based. Tobin's Q is a widely used market-based measurement. This measurement is the ratio between a firm's market value and the replacement cost of their physical assets (Morck et al., 1988). Different studies have used Tobin's Q as a market based measurement (McConnell & Servaes, 1995; Morck et al., 1988; Salim & Yadav, 2012; Soumadi & Hayajneh, 2012; Zeitun & Tian, 2007). This research follows these studies by using Tobin's Q as a market based measurement. Overall, firm performance will be measured by ROE, ROA and Tobin's Q.

***Independent variable***

Capital structure could be measured by the level of leverage of a firm, therefore leverage is the independent variable of this research. Also for this variable there are differences between book value measurements and market value measurements. Furthermore, debt consist of different parts like short term debt and long term debt which could be used as different measurement indicators. Frank and Goyal (2009) used both book value and market value measurements in their study and distinguished the measurements into total debt and long term debt measurements. However, most studies only used book values to determine the leverage ratios. The ratio between total debt and total assets is the most common measurement (Gill et al., 2009; Li et al., 2019; Margaritis & Psillaki, 2010; Soumadi & Hayajneh, 2012; Vithessonthi & Tongurai, 2015). However, other studies used different accounting measurements to distinguish debt into short term and long term ratios (Abor, 2005; Gill et al., 2011; Mesquita & Lara, 2011; Salim & Yadav, 2012). This study uses the ratio between total debt and total assets (TDR) as the main leverage measurement. Nevertheless, the level of short term debt and long term debt is not a fixed ratio based on the level of total debt, so the effect between leverage and firm performance may vary due to the chosen measurement indicator for leverage. Therefore, this study will use multiple accounting measurements in order to gain more validity in studying the relation between leverage and firm performance. In addition to the total debt ratio this study uses, in line with previous literature, the short term debt ratio (STD) and the long term debt ratio (LTD).

***Control and interaction variables***

The size of a firm can affect profitability in different ways. Due to the economies of scale theory larger firms may decrease the costs of production per product by increasing the production level (Scherer, 1973; Shepherd, 1972). Due to market power larger firms might access new capital easier (Baumol, 1959). Previous studies have considered size as a determinant of firm performance (Fosu, 2013; Papadogonas, 2007; Seetanah et al., 2014). Therefore, this study follows Abor (2005) and Gill et al. (2011) by controlling for the size of a firm. According to previous studies, the size of a firm will be measured as the logarithm of net sales (Abor, 2005; Gill et al., 2011; Rajan & Zingales, 1995; Titman & Wessels, 1988). Since the growth of sales might affect firm performance directly, Abor (2005) and Gill et al. (2011) also included sales growth as a control variable. They measured this variable as the percentage growth between current year's sales and previous year's sales. This research includes growth as a control variable as well measured by the yearly growth in sales (Abor, 2005; Gill et al., 2011). Campello (2007) found that asset tangibility is related to firm performance. Different aspects of tangibility might affect firm performance, like the probability of going bankrupt since a tangible firm has many assets to convert into cash. On the other side, having many tangible assets may lead to higher costs of depreciation or maintenance costs which affect firm performance negatively. Therefore, this study will include tangibility as control variable. According to Rajan & Zingales (1995), the variable asset tangibility will be measured as fixed assets divided by total assets. In this research we define fixed assets as the book value of property, plant and equipment.

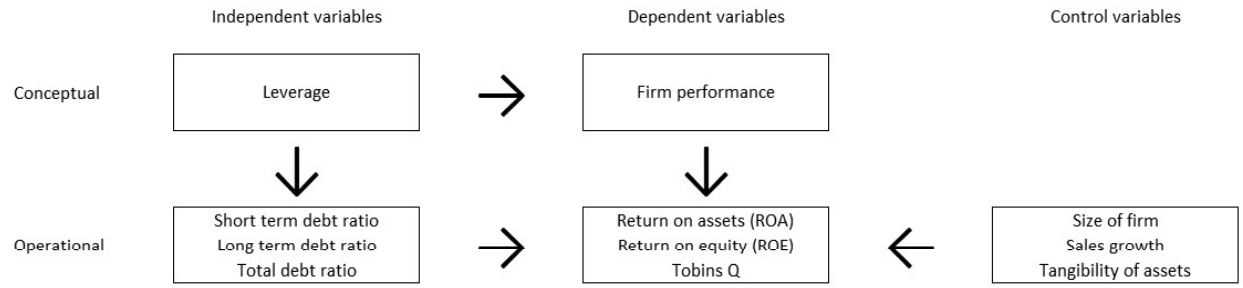
This study expects that the variables size, growth, tangibility and volatility of earnings will affect the relation between leverage and firm performance. The variables size, growth and tangibility are already defined. In line with the measurement of Titman and Wessels (1988) the volatility of earnings will be measured as the standard deviation of the annual percentage change in earnings before interest. A summary with the measurements of all the variables is included in table 3 of appendix A.

### 3.3 Method

The dataset in this research contains multiple economic entities over time. Since our sample exist of multiple firms over a longer time frame we make use of panel data methodology. Figure 1 shows

the predictive validity framework developed by Libby et al. (2002) for hypothesis 1 of this research. It shows in a simply view the variables used in this research and their connection.

Figure 1 – Predictive validity framework




According to the predictive validity framework, the following regression is developed:

**(1) Firm performance$_{i,t}$ = $\beta_0$ + $\beta_1$Leverage$_{i,t}$ + $\beta_2$Size$_{i,t}$ + $\beta_3$Growth$_{i,t}$ + $\beta_4$Tangibility$_{i,t}$ + $\varepsilon_{i,t}$**

In order to test hypothesis 2, 3, 4 and 5 we will add the interaction terms into regression formula 1. These interaction terms are respectively tangibility (TAN), size, growth and volatility of earnings (VOE) interacted with the leverage ratio. Therefore, the following regression is developed in order to test the hypotheses:

**(2) Firm performance$_{i,t}$ = $\beta_0$ + $\beta_1$Leverage$_{i,t}$ + $\beta_2$Size$_{i,t}$ + $\beta_3$Growth$_{i,t}$ + $\beta_4$Tangibility$_{i,t}$ + $\beta_5$Leverage*TAN$_{i,t}$ + $\beta_6$Leverage*Size$_{i,t}$ + $\beta_7$Leverage*VOE$_{i,t}$ + $\beta_8$Leverage*Growth$_{i,t}$ + $\varepsilon_{i,t}$**

In order to gain more validity in this research the variables firm performance and leverage are measured by multiple indicators. The dependent variable firm performance is represented by ROE, ROA and Tobin's Q. The independent variable β1Leverage is measured by the three indicators TDR, LTD and STD. Furthermore, the Y-intercept is indicated by β0. The control variables are included in β2, β3 and β4. Lastly, the interaction terms of tangibility, size, growth and volatility of earnings interacted with leverage are included in β5, β6, β7 and β8. Since this research uses both three different variables to measure firm performance as three different variables to measure leverage, the formula in regression 2 leads to nine separate regressions. These nine regressions are separately formulated in appendix B. Since previous studies showed that TDR is the mostly used measurement of leverage, we will focus on TDR as our main leverage measurement. The regressions with leverage measurements LTD and STD will be used as a robustness check.

Since this study makes use of a dataset over a longer time period with multiple observations, a panel data method will be used. A panel data method is preferred over an OLS regression because an OLS regression will ignore the time-variant factor of panel data. Many studies chose between their panel data method based on the results of the Hausman test (Baltagi et al., 2003). In this study the Hausman test indicated for most regressions that the fixed effects model is more appropriate than the random effects model. However, some regressions failed to meet the asymptotic assumptions of the Hausman test. Therefore, in addition to the Hausman test we used the Sargan-Hansen statistic to test which panel data model is the most appropriate one for this study. Table 6 of appendix C shows the test with ROA as measurement for profitability and TDR as leverage measurement. The Sargan-Hansen statistic indicates that the fixed effects model is the most appropriate model for this research. This test is performed for all the regressions both with and without robust standard error terms, but only the result for the first regression without robust standard error terms is included in table 6 of appendix C since all test showed the same results.

In order to test for heteroscedasticity in our panel data, the modified Wald test for groupwise heteroscedasticity is performed. Table 7 of appendix C shows that the modified Wald test for groupwise heteroscedasticity indicates that heteroscedasticity is a problem in our dataset. In order to take heteroscedasticity into account, this study will use robust standard error terms in the regressions. The modified Wald test for groupwise heteroscedasticity is performed for each regression. However, only the result for the first regression is included in table 7 of appendix C since all the tests showed the same results. Overall, this study will use a fixed effects model with robust standard error terms to test the hypotheses.

# 4. Results

## 4.1 Descriptive statistics

The descriptive statistics of this research starts by checking whether the dataset is normally distributed. This test is done for the values of all variables based on their measurements defined in section 3.2. By doing this, most variables showed fat tails which indicates outliers. It is important to correct for outliers in order to avoid biased results. In order to control for these outliers this research have chosen for winsorizing these variables at a 4% level. This means that the value of outliers below the 2 percentile and above the 98 percentile are replaced by respectively the value of the 2 and 98 percentile. Winsorizing is a common procedure to modify the value of outliers and it is assumed that it is an improving of the dataset if the outliers are replaced by more plausible values so that these are more in line with the rest of the data (Ghosh & Vogt, 2012).

The data sample of this research consist of 1,175 firms. Since we make use of a longer time period in this research each firm has multiple observations over the period 2011 till 2018. In total this research contains 9,400 observations. In table 1 the variables used in this dataset are explained by their mean, standard deviation, minimum and maximum. As showed in table 1 all the variables have 9,400 observations. The mean of ROA is almost 4%, which implies that on average firms have a net income of almost 4% of the total assets. The level of ROE is on average a bit higher with about 7.7%. Tobin's Q represents the market value related to the replacement value of a firm. If a firm is worth more than their book value implies, Tobin's Q will show a value above 1. The Tobin's Q ratio in our sample varies from 0.17 to 5.54 with an average of 1.33. So the market valued the firms in this data sample on average higher than the book values imply.

Since some leverage ratios show a value of zero, there are firms that exist fully of equity. However, firms finance themselves on average for about 23% with debt. With about 20% most of the debt is long term related, while about 3% consists of short term debt. During 2011 and 2018 listed firms from the United States showed a yearly growth in sales of about 8%. Although some firms showed a high tangibility rate of about 87%, the average level of property, plant and equipment was with 28% of the total assets much lower. The size of a firm was measured by the logarithm of net sales and showed an average value of 13.9. Lastly, the volatility of earnings measured as the standard

deviation of the annual percentage change in earnings before interest showed on average a value of 1.07.

Table 1 – Descriptive Statistics

| Variables | Observations | Mean | SD | Min | Max |
|---|---|---|---|---|---|
| ROA | 9,400 | 0.03996 | 0.10278 | -0.35495 | 0.23755 |
| ROE | 9,400 | 0.07694 | 0.22887 | -0.723 | 0.6154 |
| Tobin's Q | 9,400 | 1.33036 | 1.13705 | 0.168 | 5.535 |
| STD | 9,400 | 0.02904 | 0.04879 | 0,0 | 0.23068 |
| LTD | 9,400 | 0.1994 | 0.16226 | 0,0 | 0.60389 |
| TDR | 9,400 | 0.23066 | 0.17375 | 0,0 | 0.646 |
| Growth | 9,400 | 0.07922 | 0.19358 | -0.37047 | 0.77383 |
| VOE | 9,400 | 1.07244 | 1.95732 | 0.02111 | 11.22 |
| Tangibility | 9,400 | 0.28202 | 0.24479 | 0.01104 | 0.86599 |
| Size | 9,400 | 13.8582 | 2.05286 | 8.96565 | 18.0461 |

*Table 1 represents the descriptive statistics for the variables used in this research. This table presents the mean, the standard deviation (SD), the minimum value (Min) and maximum value (Max) of all the variables. The following variables are represented: return on assets (ROA), return on equity (ROE), Tobin's Q, short term debt ratio (STD), long term debt ratio (LTD), total debt ratio (TDR), growth of sales (Growth), tangibility of assets (Tangibility), size and the volatility of earnings (VOE)*

### 4.2 Correlation matrix

Table 4 of appendix C presents the correlation matrix. The correlation matrix indicates whether there exist multicollinearity between the variables. The correlation matrix in table 4 of appendix C shows some high values between ROA and ROE (0.8946) and LTD and STD (0.9420). However, since these variables will not be used in the same regressions, this is not an issue. Overall, the other variables show a low correlation between each other with the highest value between ROE and Size (0.4366). The low correlation coefficients indicates that there are little problems of multicollinearity. Although the level of coefficients are low, many coefficients show a significant effect which indicates that multicollinearity exists. Therefore, the VIF test is applied in order to test for multicollinearity. Table 5 of appendix C showed the VIF test with ROA as measurement for profitability and TDR as measurement for leverage. A critical VIF value of above ten indicates that multicollinearity may give problems to the dataset (Wooldridge, 2012). As showed in table 5 of appendix C, the highest VIF value is 1.18. The VIF test has been performed for all the nine regression combinations. The highest value of all these VIF tests showed a value of 1.21. Since all

the VIF tests showed low values, this research assumes that multicollinearity is not an issue in this study.

### 4.3 Regression results

This section will provide the results of this study. As mentioned before, since this research makes use of panel data the regressions are tested with the fixed effects model. Table 2 shows the results of the fixed effects model with TDR as the leverage indicator. As presented in table 2, 1,175 firms are included in this research with 9,400 observations over 8 years. Model 1, 2 and 3 show the regression results for respectively ROA, ROE and Tobin's Q as measurement for profitability.

Table 2 – Fixed Effects model main results

| | | (1) | (2) | (3) |
|---|---|---|---|---|
| VARIABLES | Expected relationship | ROA | ROE | Tobin's Q |
| TDR | - | -0.175*** | -0.341*** | -1.286*** |
| | | (0.014) | (0.037) | (0.146) |
| Size | + | 0.043*** | 0.068*** | 0.036 |
| | | (0.005) | (0.010) | (0.042) |
| Growth | + | 0.089*** | 0.141*** | 0.637*** |
| | | (0.011) | (0.020) | (0.101) |
| Tangibility | | -0.125*** | -0.224*** | -0.568** |
| | | (0.035) | (0.076) | (0.263) |
| TDR * Size (centered) | + | -0.017** | 0.029* | -0.009 |
| | | (0.007) | (0.017) | (0.100) |
| TDR * Growth (centered) | - | -0.056 | 0.077 | -1.310*** |
| | | (0.035) | (0.078) | (0.284) |
| TDR * VOE (centered) | - | -0.013*** | -0.034*** | -0.021* |
| | | (0.002) | (0.006) | (0.011) |
| TDR * Tangibility (centered) | + | 0.013 | -0.120 | 0.347 |
| | | (0.056) | (0.145) | (0.496) |
| Constant | | -0.488*** | -0.740*** | 1.235** |
| | | (0.065) | (0.136) | (0.575) |
| Observations | | 9,400 | 9,400 | 9,400 |
| R-squared | | 0.150 | 0.121 | 0.061 |
| Number of Id | | 1,175 | 1,175 | 1,175 |

Table 2 shows the results of the fixed effects model with total debt ratio (TDR) as the measurement for leverage. Model 1, 2 and 3 presents respectively the regression results with return on assets (ROA), return on equity (ROE) and Tobin's Q as dependent variables. The variables Size, Growth, VOE and Tangibility are centered in the interaction terms in order to get a more interpretable effect of TDR on profitability. *** p<0.01, ** p<0.05, * p<0.1

The first hypothesis of this study expects a negative effect of leverage on firm performance. Table 2 shows that TDR has a significant negative effect on ROA ($\beta$ = -0.175, p < 0.01), ROE ($\beta$ = -0.341, p < 0.01) and Tobin's Q ($\beta$ = -1.286, p < 0.01). TDR is also included in the interaction terms, therefore the coefficient TDR shows the effect on profitability when all the other variables in the interaction terms are zero. Since we centered the variables Size, Growth, VOE and Tangibility in the interaction term, the average value of these variables represents the value zero. Therefore, we can interpret the coefficient of TDR as the effect on profitability for firms with an average value for Size, Growth, VOE and Tangibility. Therefore, the results imply that firms with an average value for Size, Growth, VOE and Tangibility show a negative effect of the level of TDR on profitability. These results are in line with the first hypothesis. Therefore, the first hypothesis can be accepted for TDR as leverage indicator.

Furthermore, table 2 shows the coefficient of the control variables Size, Growth and Tangibility on firm performance. Size shows a positive effect on all profitability indicators with a significant effect for ROA ($\beta$ = 0.043, p < 0.01) and ROE ($\beta$ = 0.068, p < 0.01). Growth has a significant positive effect on ROA ($\beta$ = 0.089, p < 0.01), ROE ($\beta$ = 0.141, p < 0.01) and Tobin's Q ($\beta$ = 0.637, p < 0.01). Lastly, the control variable Tangibility presents to have a significant negative effect on ROA ($\beta$ = -0.125, p < 0.01), ROE ($\beta$ = -0.224, p < 0.01) and Tobin's Q ($\beta$ = -0.568, p < 0.01). Since we use interaction variables in the regressions, the interpretation of the effects of the control variables change. This study did not center the leverage variables, but it centered only the interaction variables Size, Growth, Tangibility and VOE to keep the interaction effect constant. Since we did not center leverage, the control variables show the effect on profitability for the situation that the leverage ratio is zero. Therefore, we can interpret the coefficients of the control variables as the effect on profitability for firms that fully exists of equity. Since the descriptive statistics showed that a zero leverage ratio is a realistic possible value, these coefficients still make sense. Overall, the control variables showed to have the same effect on profitability in all three models for the different profitability indicators.

Additionally, table 2 provides information about the interaction effects between TDR and Size, Growth, VOE and Tangibility on profitability. The interaction term between TDR and Tangibility shows a positive effect on ROA and Tobin's Q, while it shows a negative effect on ROE. However,

all the three models show an insignificant coefficient. This indicates that the effect of TDR on firm performance is not significantly affected by the level of tangible assets firms contain. Hypothesis 2 expected that tangibility would have a significant positive effect on the relation between leverage and firm performance. Since the interaction term between TDR and Tangibility is insignificant for ROA, ROE and Tobin's Q, the second hypothesis can be rejected with TDR as leverage indicator.

The third hypothesis leads to the expectation of a positive effect of size on the relation between capital structure and firm performance. In model 1, the interaction effect between TDR and Size shows a significant negative effect on ROA ($\beta$ = -0.017, $p < 0.05$). This implies that the effect of TDR on ROA is negatively affected by the size of a firm, and thus that the relation between TDR and ROA is more negative for larger firms. However, this interaction variable shows a significant positive coefficient on ROE in model 2 ($\beta$ = 0.029, $p < 0.10$). So model 2 implies that the effect of TDR on ROE is positively affected by the size of a firm. In model 3, the interaction effect shows an insignificant negative effect on Tobin's Q. Since hypothesis 3 expects that the size of a firm will have a significant positive effect on the relation between leverage and firm performance, only the results of model 2 are line with this hypothesis. Therefore, we only can accept hypothesis 3 for the relation between TDR and ROE. For ROA and Tobin's Q, we have to reject hypothesis 3 since the interaction term Size did not show a significant positive coefficient.

The fourth hypothesis expects that a firm's volatility of earnings negatively affects the relation between leverage and firm performance. Table 2 shows a significant negative effect of the interaction term between TDR and VOE on ROA ($\beta$ = -0.013, $p < 0.01$), ROE ($\beta$ = -0.034, $p < 0.01$) and Tobin's Q ($\beta$ = -0.021, $p < 0.10$). This indicates that the effect of TDR on profitability is more negative for firms with more volatile earnings. This negative effect is in line with hypothesis 4, therefore we can accept hypothesis 4 for all three models with TDR as leverage indicator.

The last hypothesis expects a negative effect of growth on the relationship between capital structure and firm performance. The interaction term between TDR and growth shows a significant negative effect on Tobin's Q ($\beta$ = -1.310, $p < 0.01$). This implies that leverage measured by TDR has a more negative effect on Tobin's Q when firms face higher growth rates, and thus that firms with lower growth rates face a less negative effect. This is in line with the hypothesis that growth has a negative

effect on the relation between leverage and firm performance. However, the interaction effect between TDR and Growth shows an insignificant effect in model 1 and 2 for ROA and ROE. Although we can accept hypothesis 5 with Tobin's Q as profitability indicators, we cannot accept hypothesis 5 for model 2 with ROA and ROE as our profitability measurement.

### 4.4 Robustness checks

In order to gain more validity, next to TDR this study includes two other measurement indicators of leverage. These other measurement indicators are STD and LTD. The same regressions will be tested as before, however instead of using TDR as the measurement indicator we will test the regressions with STD and LTD as leverage indicator to gain more validity. Table 8 in appendix D shows the results with LTD as measurement indicator, while table 9 of appendix D shows the results with STD as measurement indicator. The results of the robustness check will be compared to the main regression results of section 4.3.

Table 8 of appendix D shows a significant negative effect of LTD on ROA ($\beta$ = -0.154, $p < 0.01$), ROE ($\beta$ = -0.285, $p < 0.01$) and Tobin's Q ($\beta$ = -1.249, $p < 0.01$). Also, STD shows a significant negative effect for all profitability indicators ROA ($\beta$ = -0.160, $p < 0.01$), ROE ($\beta$ = -0.367, $p < 0.01$) and Tobin's Q ($\beta$ = -0.863, $p < 0.01$) in table 9 of appendix D. Since we centered the variables Size, Growth, VOE and Tangibility, these results imply that both higher ratios of long term debt and short term debt have a negative effect on profitability for firms with an average value for Size, Growth, VOE and Tangibility. These results confirm the negative effect of leverage on firm performance as found in our main regression results and as expected in hypothesis 1. Therefore, we can accept hypothesis 1.

Furthermore, table 8 and 9 of appendix D show the coefficients of the control variables Size, Growth and Tangibility. The effect of Size on all the profitability indicators is positive with a significant effect for ROA and ROE. Growth shows to have a significant positive effect in all the models and Tangibility shows to have a significant negative effect in all the models. These results can be interpreted as the effect of the control variables on firm performance if the leverage ratio is zero. The findings of the regressions with STD and LTD as leverage measurements are in line with the findings of the main results from table 2 with TDR as leverage measurement.

The interaction effect of tangibility on the relation between LTD and firm performance shows to be positive for ROA and Tobin's Q. However none of the models shows a significant effect for the interaction variable between LTD and Tangibility. The regression with STD as leverage indicator did not find a significant effect either. Overall, none of the interaction variables between Tangibility and leverage show significant evidence in favor of hypothesis 2. Therefore, we can reject hypothesis 2 in line with the main regression results.

According to the third hypothesis a positive effect of size on the relation between leverage and firm performance is expected. Table 8 of appendix D shows a positive effect of the interaction between LTD and Size on ROE and Tobin's Q. However, these positive effects turned out to be insignificant. The model with ROA as profitability measurement showed a significant negative effect ($\beta$ = - 0.023, p < 0.01). In table 9 of appendix D we can see that the interaction effect between STD and Size is significant positive for ROE ($\beta$ = 0.075, p < 0.10) while the effect on ROA and Tobin's Q is not significant. Overall, in the main regression results we found results in favor of hypothesis 3 for the interaction effect of TDR and Size on ROE. We found the same results for the interaction variable of STD and Size on ROE. Therefore, we can accept hypothesis 3 for the interaction effect of TDR/STD and Size on ROE. However, for the other models we did not find any prove for a significant positive interaction effect of Size, so we have to reject hypothesis 3 for the other models.

Hypothesis 4 expects a negative effect of a firm's volatility of earnings on the relation between leverage and firm performance. Table 8 of appendix D shows that the interaction between LTD and VOE is significant negative for ROA ($\beta$ = - 0.014, p < 0.01), ROE ($\beta$ = - 0.037, p < 0.01) and Tobin's Q ($\beta$ = - 0.027, p < 0.05). Also, table 9 of appendix D shows that the interaction between STD and VOE is significant negative for ROA ($\beta$ = - 0.043, p < 0.01) and ROE ($\beta$ = - 0.082, p < 0.01). These findings of a significant negative effect between leverage and VOE are in line with the main regression results. These findings support hypothesis 4. Although the interaction effect between STD and VOE on Tobin's Q is not significant, we can accept hypothesis 4 since all the other results show a significant negative effect of a firm's volatility of earnings on the relation between leverage and firm performance.

Lastly, hypothesis 5 expects that growth will negatively affect the relation between leverage and firm performance. The interaction term between LTD and Growth of table 8 in appendix D shows a significant negative effect for ROA ($\beta$ = - 0.064, p < 0.10) and Tobin's Q ($\beta$ = - 1.282, p < 0.01). The interaction effect of LTD and Growth on ROE is insignificant. Table 9 of appendix D shows that the interaction effect between STD and Growth is negative for ROA and Tobin's Q. However, none of them show a significant effect. Overall, the effect of Growth on the relation between LTD and firm performance is significant negative for ROA and Tobin's Q, and on the relation between TDR and firm performance it is just significant negative for Tobin's Q. These results are in line with the expectations of hypothesis 5. Therefore, we can accept hypothesis 5 for the models with LTD/TDR on ROA and TDR on Tobin's Q. However, the other models did not find a significant negative effect of the interaction variable Growth, and thus hypothesis 5 can be rejected for the other models.

# 5. Discussion & Conclusion

## 5.1 Discussion and interpretation of results in comparison with prior research

The goal of this research is to obtain a better understanding regarding the relation between capital structure and firm performance. Previous studies showed to be mixed and contradicting in their findings. Where Wippern (1966), Margaritis and Psillaki (2010) and Gill et al. (2011) found evidence for a positive relation between leverage and firm performance, Soumadi and Hayajneh (2012), Salim and Yadav (2012), Li et al. (2019) and Vithessonthi and Tongurai (2015) concluded that the effect of leverage on firm performance is negative. Other studies found that the effect of leverage on firm performance depends on other firm specific factors like the level of growth, credit risk or international activities (Li et al., 2019; McConnell & Servaes, 1995; Vithessonthi & Tongurai, 2015). This study investigated whether other firm specific factors affect the relationship of capital structure and firm performance. The firm specific factors that are included in this study are size, tangibility, growth and the volatility of earnings.

Based on the literature review, this study developed five hypotheses which have been tested. The results of this research show that the effect of leverage on firm performance is negative. The findings are in line with the pecking order theory, since the pecking order theory expects a negative link between leverage and firm performance because the costs of internally generated funds are lower than the costs of external capital due to information asymmetry and transaction cost (Myers & Majluf, 1984). Although previous empirical studies found evidence for both a positive as a negative effect of leverage on firm performance, most empirical studies proved the negative effect of leverage on firm performance which is in line with the findings of this research (Li et al., 2019; Salim & Yadav, 2012; Soumadi & Hayajneh, 2012; Vithessonthi & Tongurai, 2015).

Tangibility did not show to have a significant positive effect on the relation between leverage and firm performance as expected in this study. Since tangible assets are often used as collateral for loan contracts, literature suggested that a firm with tangible assets would face lower cost of financial distress and thus lower costs of debt (Akintoye, 2008). Based on the lower cost of debt for more tangible firms, a positive effect of tangibility on the relation between leverage and firm performance was expected. Based on the insignificant results this effect is not that strong. However,

the insignificant results still show slightly a tendency towards a positive effect of tangibility on the relation between leverage and firm performance.

The findings of the interaction effect of Size on the relation between capital structure and firm performance are mixed. Where this effect showed to have a significant positive effect on ROE in the models with TDR and STD as leverage indicators, it showed even a significant negative effect on ROA with TDR as leverage indicator. Literature suggested that larger firms face lower costs of debt due to their market power and lower information asymmetry (Baumol, 1959; Rajan & Zingales, 1995; Smith, 1977). Furthermore, large firms face lower costs of financial distress due to diversification of their business which can lead to lower costs of debt (Ang et al., 1982; Titman & Wessels, 1988). Based on the lower costs of debt and lower costs of financial distress for larger firms, this study expected a positive effect of Size on the relationship between leverage and firm performance. Vithessonthi and Tongurai (2015) found support for this expectation for firms in Thailand. Since firms from the United States just have an average debt ratio of about 23%, it might be the case that many firms from our data sample do not face large costs of financial distress due to a critical debt value. This might be a reason why the effect of tangibility and size on the relation between leverage and firm performance is not significant. If firms do not face costs of financial distress, firms with more tangible assets and larger firms cannot face lower costs of financial distress because there are no costs of financial distress at all. It might be interesting for future research to study to what extent costs of financial distress play a role for listed firms from the United States, and whether costs of financial distress differ between countries.

This study has shown that the level of earnings volatility has a negative effect on the relation between leverage and firm performance. Except for the regression with STD as leverage indicator on Tobin's Q, all the regressions showed a significant negative effect of the interaction term VOE. These findings are fully in line with the expectations based on the literature that firms with less volatile earnings benefit more from the tax shield advantage and thus that the effect of volatility of earnings on the relation between leverage and firm performance is negative (Fama & French, 2002).

Lastly, growth showed a negative effect on the relationship between leverage and firm performance in all the regressions on ROA and Tobin's Q. However, it only showed a significant negative effect in the regressions with TDR on Tobin's Q and LTD on ROA and Tobin's Q. Although not all the results are significant, these findings show a tendency of a negative effect of growth on the relationship between leverage and firm performance. This tendency is in line with the expectations and findings of prior studies that proved a negative effect of growth on the relation between leverage and firm performance (Margaritis & Psillaki, 2010; McConnell & Servaes, 1995). The regressions with ROE as dependent variable did not show the same results. These findings show a positive effect of the interaction variable Growth. Although the findings for ROE are not significant, it might be interesting for future research to investigate why ROE shows different results.

### 5.2 Conclusion, contribution, limitations & recommendations for further research

This study contributes to the existing literature by providing a better understanding of the relationship between leverage and firm performance. Furthermore, where most previous studies just focused on the direct effect of leverage on firm performance, this research extends to those studies by investigating whether other firm specific factors have an effect on the relationship between leverage and firm performance. Based on the findings of the effect of the firm specific factors tangibility, size, growth and volatility of earnings into this relationship, this study gave some new insights in the relationship between capital structure and firm performance

A limitation of this study is that the sample of firms only consist of listed firms from the United States. Since the financial system of the United States is characterized as market-based, different results might appear in countries with bank-based financial systems. Therefore, future research could extend the data sample of this study, to see whether the results of this study are generalizable to other countries or to not listed firms. Another limitation of this study is the level of data that has been dropped out of the sample. Since this study only included firms that have all data available over the whole time period from 2011 till 2018, quite a lot of data has been dropped. Furthermore, this study uses, except for Tobin's Q, mostly book values to measure the variables since this sort of data is better accessible than data with market values. Although this is in line with most prior research, it might be interesting for future studies to investigate whether the results of this study are generalizable to studies that focus more on variables measured by market values.

# 6. References

Abor, J. (2005). The effect of capital structure on profitability: an empirical analysis of listed firms in Ghana. *Journal of Risk Finance*, *6*(5), 438–444.

Akintoye, I. R. (2008). Effect of capital structure on firms' performance: The Nigeria performance. *European Journal of Economics, Finance and Administrative Sciences*, *10*, 233–243.

Ang, J. S., Chua, J. H., & Mcconnel, J. J. (1982). The Administrative Costs of Corporate Bankruptcy: A Note. *The Journal of Finance*, *37*(1), 219–226.

Baltagi, B. H., Bresson, G., & Pirotte, A. (2003). Fixed effects, random effects or Hausman-Taylor? A pretest estimator. *Economics Letters*, *79*(3), 361–369.

Baumol, W. J. (1959). *Business Behavior, Value and Growth*. New York: Macmillan.

Chen, J. J. (2004). Determinants of capital structure of Chinese-listed companies. *Journal of Business Research*, *57*(12), 1341–1351.

Fama, E. F., & French, K. R. (2002). Testing Trade-Off and Pecking Order Predictions About Dividends and Debt. *Review of Financial Studies*, *15*(1), 1–33.

Fosu, S. (2013). Capital structure, product market competition and firm performance: Evidence from South Africa. *Quarterly Review of Economics and Finance*, *53*(2), 140–151.

Frank, M. Z., & Goyal, V. K. (2009). Capital structure decisions: Which factors are reliably important? *Financial Management*, *38*(1), 1–37.

Ghosh, D., & Vogt, A. (2012). Outliers: An Evaluation of Methodologies. *Joint Statistical Metings*, 3455–3460.

Gill, A., Biger, N., & Mathur, N. (2011). The Effect of Capital Structure on Profitability: Evidence from the United States. *International Journal of Management*, *28*(4), 3–15.

Gill, A., Biger, N., Pai, C., & Bhutani, S. (2009). The Determinants of Capital Structure in the Service Industry: Evidence from United States. *The Open Business Journal*, *2*(1), 48–53.

Grossman, S. J., & Hart, O. D. (1982). Corporate Financial Structure and Managerial Incentives. *The Economics of Information and Uncertainty*, *3*, 107–140.

Hamada, R. S. (1969). Portfolio Analysis, Market Equilibrium and Corporation Finance. *The Journal of Finance*, *24*(1), 13–31.

Hart, O., & Moore, J. (1994). A Theory of Debt Based on the Inalienability of Human Capital. *The*

*Quarterly Journal of Economics*, *109*(4), 841–879.

Hirshleifer, J. (1966). Investment Decision under Uncertainty: Applications of the State-Preference Approach. *The Quarterly Journal of Economics*, *80*(2), 252–277.

Jensen, M. C. (1986). Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers. *American Economic Review*, *76*(2), 323–329.

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, *3*(4), 305–360.

Kraus, A., & Litzenberger, R. H. (1973). A state-preference model of optimal financial leverage. *The Journal of Finance*, *28*(4), 911–922.

Krishnan, V. S., & Moyer, R. C. (1997). Performance, capital structure and home country: An analysis of Asian corporations. *Global Finance Journal*, *8*(1), 129–143.

Li, K., Niskanen, J., & Niskanen, M. (2019). Capital structure and firm performance in European SMEs: Does credit risk make a difference? *Managerial Finance*, *45*(5), 582–601.

Libby, R., Bloomfield, R., & Nelson, M. W. (2002). Experimental research in financial accounting. *Accounting, Organizations and Society*, *27*, 775–810.

Liberti, J. M., & Sturgess, J. (2018). The Anatomy of a Credit Supply Shock: Evidence from an Internal Credit Market. *Journal of Financial and Quantitative Analysis*, *53*(2), 547–579.

Margaritis, D., & Psillaki, M. (2010). Capital structure, equity ownership and firm performance. *Journal of Banking and Finance*, *34*(3), 621–632.

McConnell, J. J., & Servaes, H. (1995). Equity ownership and the two faces of debt. *Journal of Financial Economics*, *39*(1), 131–157.

Mesquita, J. M. C. de, & Lara, J. E. (2011). Capital structure and profitability: The Brazilian case. *International Journal of Management*, *28*(4), 3–15.

Modigliani, F., & Miller, M. H. (1958). The Cost of Capital, Corporation Finance and the Theory of Investment. *The American Economic Review*, *48*(3), 261–297.

Modigliani, F., & Miller, M. H. (1963). Corporate Income Taxes and the Cost of Capital : A Correction Author ( s ): Franco Modigliani and Merton H . Miller Source : The American Economic Review , Vol . 53 , No . 3 ( Jun ., 1963 ), pp . 433-443 Published by : American Economic Association Stable. *The American Economic Review*, *53*(3), 433–443.

Morck, R., Shleifer, A., & Vishny, R. W. (1988). Management ownership and market valuation. An empirical analysis. *Journal of Financial Economics*, *20*, 293–315.

Myers, S. C. (1977). Determinants of corporate borrowing. *Journal of Financial Economics*, *5*(2), 147–175.

Myers, S. C. (1984). The Capital Structure Puzzle. *The Journal of Finance*, *39*(3), 574–592.

Myers, S. C. (2001). Capital structure. *Journal of Economic Perspectives*, *15*(2), 81–102.

Myers, S. C., & Majluf, N. S. (1984). Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics*, *13*(2), 187–221.

Papadogonas, T. A. (2007). The financial performance of large and small firms: evidence from Greece. *International Journal of Financial Services Management*, *2*(1/2), 14–20.

Rajan, R. G., & Zingales, L. (1995). What Do We Know about Capital Structure? Some Evidence from International Data. *The Journal of Finance*, *50*(5), 1421–1460.

Robichek, A. A., & Myers, S. C. (1966). Problems in the Theory of Optimal Capital Structure. *The Journal of Financial and Quantitative Analysis*, *1*(2), 1–35.

Salim, M., & Yadav, R. (2012). Capital Structure and Firm Performance: Evidence from Malaysian Listed Companies. *Procedia - Social and Behavioral Sciences*, *65*(156–166).

Scherer, F. M. (1973). The Determinants of Industrial Plant Sizes in Six Nations. *The Review of Economics and Statistics*, *55*(2), 135–145.

Seetanah, B., Seetah, K., Appadu, K., & Padachi, K. (2014). Capital Structure And Firm Performance: Evidence From An Emerging Economy. *The Business & Management Review*, *4*(4), 185–196.

Shepherd, W. G. (1972). The Elements of Market Structure. *The Review of Economics and Statistics*, *54*(1), 25–37.

Smith, C. W. (1977). Alternative methods for raising capital. Rights versus underwritten offerings. *Journal of Financial Economics*, *5*(3), 273–307.

Soumadi, M. M., & Hayajneh, O. S. (2012). Capital Structure and Corporate Performance Empirical Study on the Public Jordanian Shareholdings Firms Listed in the Amman Stock. *European Scientific Journal*, *8*(22), 173–189.

Stiglitz, J. E. (1969). A Re-Examination of the Modigliani-Miller Theorem. *The American Economic Review*, *59*(5), 784–793.

Titman, S., & Wessels, R. (1988). The Determinants of Capital Structure Choice. *The Journal of Finance*, *43*(1), 1–19.

Vithessonthi, C., & Tongurai, J. (2015). The effect of leverage on performance: Domestically-

oriented versus internationally-oriented firms. *Research in International Business and Finance*, *34*, 265–280.

Wippern, R. F. (1966). Financial Structure and the Value of the Firm. *The Journal of Finance*, *21*(4), 615–633.

Wooldridge, J. M. (2012). *Introductory Econometrics: A Modern Approach*. Mason, Ohio: South-Western Cengage Learning.

Zeitun, R., & Tian, G. (2007). Capital structure and corporate performance: evidence from Jordan. *Australasian Accounting, Business and Finance Journal*, *1*(4), 40–61.

# 7. Appendices

## Appendix A – Summary of variables

Table 3 – Summary of variables

| Category | Variable | Definitions | Measurement | Source |
|---|---|---|---|---|
| Dependent variable - Firm performance | ROA | Return on Assets | Values direct retrieved from Eikon | Eikon |
| Dependent variable - Firm performance | ROE | Return on Equity | Values direct retrieved from Eikon | Eikon |
| Dependent variable - Firm performance | Tobin's Q | Tobin's Q ratio | Values direct retrieved from Orbis | Orbis |
| Independent variable - Leverage | TDR | Total debt ratio | Total debt / Total assets | Eikon |
| Independent variable - Leverage | LTD | Long term debt ratio | Long term debt / Total assets | Eikon |
| Independent variable - Leverage | STD | Short term debt ratio | (Short term debt + current portion long term debt) / Total assets | Eikon |
| Control / interaction variable | Size | Firm's size | Logarithm of net sales | Eikon |
| Control / interaction variable | Growth | Sales growth | Annual percentage change in net sales | Eikon |
| Interaction variable | TAN | Assets tangibility | Fixed assets (property, plant and equipment) / Total assets | Eikon |
| Interaction variable | VOE | Volatility of earnings | Standard deviation of the annual percentage change in EBIT | Eikon |

*Table 3 represents the full list of variables used in this research with their method of measurement.*

## Appendix B – Regression formulas

$$ROA_{i,t} = \beta_0 + \beta_1 TDR_{i,t} + \beta_2 Size_{i,t} + \beta_3 Growth_{i,t} + \beta_3 Tangibility_{i,t} + \beta_5 TDR*TAN_{i,t} + \beta_6 TDR*Size_{i,t} + \beta_7 TDR*VOE_{i,t} + \beta_8 TDR*Growth_{i,t} + \varepsilon_{i,t}$$

$$ROA_{i,t} = \beta_0 + \beta_1 LTD_{i,t} + \beta_2 Size_{i,t} + \beta_3 Growth_{i,t} + \beta_3 Tangibility_{i,t} + \beta_5 LTD*TAN_{i,t} + \beta_6 LTD*Size_{i,t} + \beta_7 LTD*VOE_{i,t} + \beta_8 LTD*Growth_{i,t} + \varepsilon_{i,t}$$

$$ROA_{i,t} = \beta_0 + \beta_1 STD_{i,t} + \beta_2 Size_{i,t} + \beta_3 Growth_{i,t} + \beta_3 Tangibility_{i,t} + \beta_5 STD*TAN_{i,t} + \beta_6 STD*Size_{i,t} + \beta_7 STD*VOE_{i,t} + \beta_8 STD*Growth_{i,t} + \varepsilon_{i,t}$$

$$ROE_{i,t} = \beta_0 + \beta_1 TDR_{i,t} + \beta_2 Size_{i,t} + \beta_3 Growth_{i,t} + \beta_3 Tangibility_{i,t} + \beta_5 TDR*TAN_{i,t} + \beta_6 TDR*Size_{i,t} + \beta_7 TDR*VOE_{i,t} + \beta_8 TDR*Growth_{i,t} + \varepsilon_{i,t}$$

$$ROE_{i,t} = \beta_0 + \beta_1 LTD_{i,t} + \beta_2 Size_{i,t} + \beta_3 Growth_{i,t} + \beta_3 Tangibility_{i,t} + \beta_5 LTD*TAN_{i,t} + \beta_6 LTD*Size_{i,t} + \beta_7 LTD*VOE_{i,t} + \beta_8 LTD*Growth_{i,t} + \varepsilon_{i,t}$$

$$ROE_{i,t} = \beta_0 + \beta_1 STD_{i,t} + \beta_2 Size_{i,t} + \beta_3 Growth_{i,t} + \beta_3 Tangibility_{i,t} + \beta_5 STD*TAN_{i,t} + \beta_6 STD*Size_{i,t} + \beta_7 STD*VOE_{i,t} + \beta_8 STD*Growth_{i,t} + \varepsilon_{i,t}$$

$$\text{Tobin's } Q_{i,t} = \beta_0 + \beta_1 TDR_{i,t} + \beta_2 Size_{i,t} + \beta_3 Growth_{i,t} + \beta_3 Tangibility_{i,t} + \beta_5 TDR*TAN_{i,t} + \beta_6 TDR*Size_{i,t} + \beta_7 TDR*VOE_{i,t} + \beta_8 TDR*Growth_{i,t} + \varepsilon_{i,t}$$

$$\text{Tobin's } Q_{i,t} = \beta_0 + \beta_1 LTD_{i,t} + \beta_2 Size_{i,t} + \beta_3 Growth_{i,t} + \beta_3 Tangibility_{i,t} + \beta_5 LTD*TAN_{i,t} + \beta_6 LTD*Size_{i,t} + \beta_7 LTD*VOE_{i,t} + \beta_8 LTD*Growth_{i,t} + \varepsilon_{i,t}$$

$$\text{Tobin's } Q_{,t} = \beta_0 + \beta_1 STD_{i,t} + \beta_2 Size_{i,t} + \beta_3 Growth_{i,t} + \beta_3 Tangibility_{i,t} + \beta_5 STD*TAN_{i,t} + \beta_6 STD*Size_{i,t} + \beta_7 STD*VOE_{i,t} + \beta_8 STD*Growth_{i,t} + \varepsilon_{i,t}$$

## Appendix C – Data tests

Table 4 – Correlation matrix

| | ROA | ROE | TobinsQ | TDR | LTD | STD | Growth | TAN | Size | VOE |
|---|---|---|---|---|---|---|---|---|---|---|
| ROA | 1 | | | | | | | | | |
| ROE | 0.8946* | 1 | | | | | | | | |
| TobinsQ | 0.1262* | 0.1052* | 1 | | | | | | | |
| TDR | 0.0166 | 0.0678* | -0.3187* | 1 | | | | | | |
| LTD | 0.0429* | 0.0929* | -0.2876* | 0.9420* | 1 | | | | | |
| STD | -0.0644* | -0.0440* | -0.1584* | 0.3498* | 0.0304* | 1 | | | | |
| Growth | 0.1374* | 0.1056* | 0.2003* | 0.0138 | 0.0212* | -0.0231* | 1 | | | |
| TAN | 0.0218* | 0.0232* | -0.2375* | 0.2815* | 0.2938* | 0.0273* | -0.0674* | 1 | | |
| Size | 0.3975* | 0.4366* | -0.1335* | 0.2968* | 0.3204* | 0.0017 | -0.0239* | 0.1054* | 1 | |
| VOE | -0.1886* | -0.1935* | -0.0551* | -0.0223* | -0.0290* | 0.0085 | 0.0542* | -0.0027 | -0.1388* | 1 |

*Table 4 showed the correlation matrix. All the variables used in this research are included in the correlation matrix. * Indicates a significant correlation coefficient at a 10% level.*

Table 5 – VIF Test

| Variable | VIF | 1/VIF |
|---|---|---|
| TDR | 1.18 | 0.846964 |
| Size | 1.12 | 0.893485 |
| Tangibility | 1.09 | 0.915129 |
| VOE | 1.02 | 0.977672 |
| Growth | 1.01 | 0.990883 |
| Mean VIF | 1.09 | |

*Table 5 showed the VIF test performed with return on assets (ROA) as measurement for profitability and total debt ratio (TDR) as measurement for leverage. Although the VIF test is performed for all the combinations profitability and leverage measurements, due to space restrictions in this research we only include the results of this VIF test.*

## Table 6 – Sargan-Hansen statistic

| Test of overidentifying restrictions: fixed vs random effects | |
|---|---|
| Cross-section time-series model: xtreg re | |
| Sargan-Hansen statistic | 255.858 |
| P-value | 0.0000 |
| Reject H0 | Yes |

*Table 6 shows the Sargan-Hansen statistic between the robust fixed effects and the robust random effects regressions with ROA as measurement for profitability and TDR as measurement for leverage. The rejection of the null hypothesis in the Sargan-Hansen statistic ($P < 0.05$) suggest that the Random Effect model is not an appropriate model. Therefore, the Fixed Effects model is used in this study. Although the Sargan-Hansen statistic is performed with and without robust standard error terms for all the combinations of profitability and leverage measurements, only this results is included in this research since the other tests showed the same results.*

## Table 7 – Modified Wald test

| Modified Wald test for groupwise heteroscedasticity | |
|---|---|
| H0: The variance of the residual is constant | |
| Chi2 | 9.2e+06 |
| Prob>chi2 | 0.0000 |
| Reject H0 | Yes |

*Table 7 shows the modified Wald test for groupwise heteroscedasticity with ROA as measurement for profitability and TDR as measurement for leverage. The rejection of the null hypothesis in the modified Wald test suggest that the variance of the residual is not constant, so heteroscedasticity is a problem. Although the modified Wald test is performed for all the combinations of profitability and leverage measurements, only this result is included in this research since the other tests showed the same results.*

## Appendix D – Results Robustness checks

Table 8 – Fixed Effects model results for long term debt ratio

| VARIABLES | Expected relationship | (1) ROA | (2) ROE | (3) Tobin's Q |
|---|---|---|---|---|
| LTD | - | -0.154*** | -0.285*** | -1.249*** |
| | | (0.015) | (0.038) | (0.142) |
| Size | + | 0.042*** | 0.068*** | 0.030 |
| | | (0.005) | (0.010) | (0.041) |
| Growth | + | 0.089*** | 0.150*** | 0.602*** |
| | | (0.011) | (0.020) | (0.093) |
| Tangibility | | -0.133*** | -0.265*** | -0.664*** |
| | | (0.035) | (0.077) | (0.246) |
| LTD * Size (centered) | + | -0.021*** | 0.019 | 0.039 |
| | | (0.008) | (0.020) | (0.084) |
| LTD * Growth (centered) | - | -0.064* | 0.055 | -1.282*** |
| | | (0.037) | (0.082) | (0.310) |
| LTD * VOE (centered) | - | -0.014*** | -0.037*** | -0.027** |
| | | (0.002) | (0.007) | (0.012) |
| LTD * Tangibility (centered) | + | 0.011 | -0.066 | 0.709 |
| | | (0.059) | (0.151) | (0.454) |
| Constant | | -0.485*** | -0.753*** | 1.286** |
| | | (0.065) | (0.137) | (0.556) |
| Observations | | 9,4 | 9,4 | 9,4 |
| R-squared | | 0.137 | 0.106 | 0.058 |
| Number of Id | | 1,175 | 1,175 | 1,175 |

Table 8 shows the fixed effects model with the long term debt ratio (LTD) as the measurement for leverage. Model 1, 2 and 3 presents respectively the regression results with return on assets (ROA), return on equity (ROE) and Tobin's Q as dependent variables. The variables Size, Growth, VOE and Tangibility are centered in the interaction terms in order to get a more interpretable effect of LTD on profitability. *** p<0.01, ** p<0.05, * p<0.1

Table 9 – Fixed Effects model results for short term debt ratio

| VARIABLES | Expected relationship | (1) ROA | (2) ROE | (3) Tobin's Q |
|---|---|---|---|---|
| STD | - | -0.160*** | -0.367*** | -0.863*** |
| | | (0.029) | (0.076) | (0.268) |
| Size | + | 0.031*** | 0.056*** | -0.040 |
| | | (0.005) | (0.010) | (0.039) |
| Growth | + | 0.079*** | 0.156*** | 0.402*** |
| | | (0.008) | (0.016) | (0.068) |
| Tangibility | | -0.137*** | -0.308*** | -0.571*** |
| | | (0.028) | (0.063) | (0.219) |
| STD * Size (centered) | + | 0.015 | 0.075* | -0.024 |
| | | (0.017) | (0.040) | (0.153) |
| STD * Growth (centered) | - | -0.046 | 0.085 | -1.230 |
| | | (0.116) | (0.291) | (0.865) |
| STD * VOE (centered) | - | -0.043*** | -0.082*** | 0.016 |
| | | (0.013) | (0.026) | (0.066) |
| STD * Tangibility (centered) | + | 0.051 | -0.157 | -1.324 |
| | | (0.123) | (0.309) | (1.042) |
| Constant | | -0.347*** | -0.613*** | 2.044*** |
| | | (0.065) | (0.142) | (0.538) |
| Observations | | 9,400 | 9,400 | 9,400 |
| R-squared | | 0.106 | 0.083 | 0.020 |
| Number of Id | | 1,175 | 1,175 | 1,175 |

Table 9 shows the fixed effects model with the short term debt ratio (STD) as the measurement for leverage. Model 1, 2 and 3 presents respectively the regression results with return on assets (ROA), return on equity (ROE) and Tobin's Q as dependent variables. The variables Size, Growth, VOE and Tangibility are centered in the interaction terms in order to get a more interpretable effect of STD on profitability. *** p<0.01, ** p<0.05, * p<0.1