MASTER THESIS 2018

CAPITAL STRUCTURE AND FIRM PERFORMANCE

AN ASSESSMENT OF DETERMINING FACTORS OF CAPTIAL STRUCTURE AND ITS EFFECT ON FIRM PERFORMANCE IN THE NORWEGIAN MARKET

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ABSTRACT

This paper investigates the factors that determines the capital structure and its effect on firm performance. A sample of 78 Norwegian firms listed on Oslo Stock Exchange All Share Index (OSEAX) has been applied to analyze the relationship between leverage and company performance. The chosen sample period is 2006–2016 and annual figures were collected from DataStream in order to perform the empirical study.

In this paper, a panel data approach has been applied and the analysis has been divided into two main parts. The first part considers the variables that determines the capital structure where the chosen variables consist of size, tangibility, profitability, age, growth and non-debt tax shield. As proxies of capital structure, we included the ratios of short-term debt, long-term debt and total debt over total assets. During the second part of our analysis, we investigate the effect capital structure has on firm performance. The capital structure ratios are now used as explanatory variables while the determined factors are used as control variables. As performance ratios, we used return on asset, return on equity and Tobin's Q. All chosen variables have been proved to be significant in previous empirical studies.

The findings from the first section suggest that size, age, tangibility, profitability and non-debt tax shield all have a significant effect on firm leverage. Size is found to be negatively related to all debt ratios whereas mixed signs are found to the other factors depending on which leverage ratio is used. Our results are also partly in line with developed theories, such as the pecking order theory and the trade-off theory.

The discovery of capital structure and its effect on firm performance suggest that Norwegian listed companies with lower short-term debt and total debt tend to generate a higher return on their assets. Furthermore, short-term and total debt are found to have a positive relationship to Tobin's Q, which suggests that firms with high debt ratios tend to achieve a higher market-to-book value of their assets. Finally, our results indicate capital structure has no effect on performance measured by ROE for the listed Norwegian companies.

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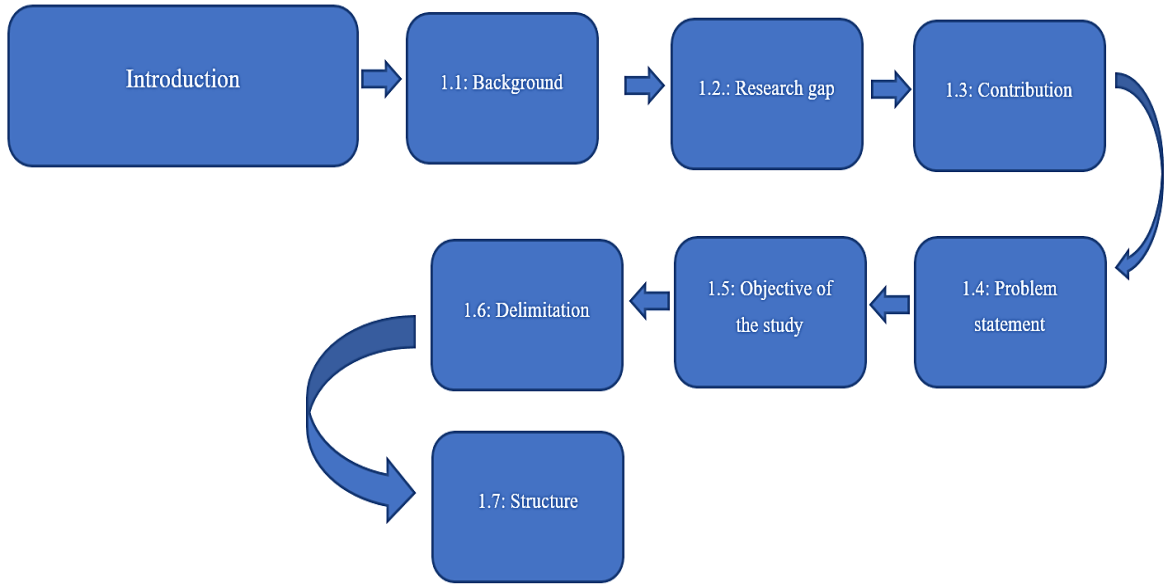
List of abbreviations:

STDTA	Short-term debt to total assets
LTDTA	Long-term debt to total assets
TDTA	Total debt to total assets
ROA	Return on assets
ROE	Return on equity
OLS	Ordinary least square model
FE	Fixed effect model
RE	Random effect model
FGLS	Feasible generalized least square model
NDTS	Non-debt tax shield
VIF	Variance inflation factor

1 INTRODUCTION

The first chapter introduces the purpose of the thesis where we begin by presenting the background related to capital structure and its link to previous literature and established theories. The subsequent sections will be more focused on the objective of the thesis. This part includes research gap, contribution, delimitations, objective of the study and the problem statement of our thesis. Finally, we will end this chapter by presenting an overview of the structure of the thesis.

FIGURE 1: STRUCTURE OF THE SECTION



1.1 BACKGROUND

The relationship between capital structure and firm performance has been a puzzling issue in corporate finance over the years. Several theoretical frameworks have been developed as an attempt to explain how capital structure is determined. Nonetheless, researchers still have a

long way to go in order to verify what actually drives capital structure. One of the most important issues that companies are facing is how to determine the optimal capital structure.

The managers of the firm must analyze different sources of funding that are available in the capital markets where the goal is to construct an optimal capital mix that reduces the costs and maximizes the value of the firm. This is a continuous process, since firms in general need to fund new projects on a regular basis in order to stay competitive in the market (Ebaid, 2009).

From a broad specter, capital structure can be seen as a mix between debt and equity that the management use to finance the investments of a company. The firm can raise equity, by issue common or preferred stocks, while debt can be raised through loans, notes and bonds. The equity holders are the owners while the debt holders are the creditors of the firm. The debt holders do not in general have a long-term commitment to the firm, since they are more interested in the payments of interests and principal. The equity holders are in addition to return on their investment interested in regular payments of dividend, while the managers are interested in investing the retained earnings in new projects. Thus, the decision of capital structure plays a huge role as it impacts the stakeholders, where an additional raised debt may increase the bankrupt risk and lead to conflicts of interest between the stakeholders (Chadha & Sharma, 2015).

There have been major discussions around the topic of capital structure ever since Modigliani and Miller published they irrelevance theory in 1958. Their suggestion was that in a perfect capital market, the value of a company would be independent of its capital structure. However, many of the underlying assumptions behind the theory does not hold in real life, which is something the authors has been criticized for. Since the publications of Modigliani and Miller, several other theories have been developed which takes many of the existing market imperfections into consideration. The three most known theories are the trade-off theory, the pecking order theory and the agency theory (Le & Phan, 2017).

An important point regarding the theories mentioned is that no single theory can fully explain the determinants of capital structure or the effect capital structure has on a company's performance. These theories are based on some critical assumptions, while in real life the issue is extremely more complex. When we consider the test results from Burrell and Morgan (1979), the prediction of any theory might change when the underlying assumptions are not

the same. As a result, the relationship between capital structure and firm performance may vary significantly in different contexts.

1.2 RESEARCH GAP

Over the years, a number of studies have been examining both the determinants of capital structure and its relationship to firm performance. However, there are quite few studies that combines these two topics. By merging these two parts, we open for a deeper analysis of their relationship. It also provides a better overview of which factors are behind the decisions regarding capital structure and how it can be linked to the performance of the firms.

As mentioned previously, this topic has been studied individually over the past years in both developed and emerging markets. Yet, we have not identified any in-depth studies covering the Norwegian market. This opens-up an opportunity for a new study and our intention is to fill the gap by conducting a study covering firms listed in the Norwegian market during the period 2006-2016.

The empirical studies in different countries have ended up with different results, which makes it difficult to generalize the results and draw a clear conclusion. Due to this, there is room for more research to achieve a wider and more complete understanding about the interplay between capital structure and firm performance.

1.3 CONTRIBUTION

Our study aims to contribute to existing literature by combining the two topics of determinants of capital structure and its effect on firm performance. Our intention by linking the topics is to provide a better insight and a deeper understanding about which factors influences capital structure and the effect it has on firm performance. There is also limited research available about these two topics in the Norwegian market. The findings of our study will thereby contribute with an updated analysis in a developed country such as Norway, by using the most recent data.

The thesis will also contribute through evaluating developed theories, such as the pecking order and the trade-off theory. Our results will provide information whether these theories are able to explain the decisions regarding capital structure and firm performance in the Norwegian market.

1.4 PROBLEM STATEMENT

A vital issue for a firm is to find and operate with an appropriate capital structure. Not only to maximize the return of the shareholders, but the decision also has an impact on firm's ability to stay competitive in the market. Following the publications of the pioneers within capital structure, Modigliani & Miller, many studies has been carried out throughout the years to determine the capital structure and its influence on firm performance.

The management's decision on capital structure is an important factor from a strategic point of view, since it has to do with the firm's ability to meet the obligations from various stakeholders. The equity holders and debt holders represent different types of investors with different level of risk, control and benefits. The debt holders have low control of the company and they normally receive a fixed return on their investments. They are also protected through legally binding debt covenants which the firm must follow. On the other hand, the equity holders are the owners of the firm and they receive only the residuals and normally bears the highest risk among the investors. Due to their risky investment, they will claim a higher expected return and a greater influence on the firm.

The focus of this thesis is to investigate the relationship between capital structure and firm performance of listed Norwegian companies between 2006 and 2016. We will start by investigate which factors determines the capital structure and then its relationship with firm performance. The research question can thereby be defined in the following way:

"What determines the capital structure of the listed Norwegian firms and does it affect their performance"

1.5 OBJECTIVE OF THE STUDY

The main purpose of the study is to answer the research question. According to the conclusion from previous research papers, we can expect three different scenarios. The first one is a positive relationship, the second one is a negative relationship and last one is no relationship between the dependent and independent variables. Considering that majority of the empirical papers were able to find either positive or negative relationship in their research, we expect to end up with similar results. Thus, our study also aims to answer in which direction the independent variables affect the dependent variables. We will analyze our findings and compare them with the results of previous published research papers and the expectations of developed theories.

1.6 DELIMITATIONS

The research question has been subject to a number of delimitations used as boundaries to control the range of the thesis. These were created before the research started with the purpose of reducing the issue of spending time on unnecessary or unrelated areas. The delimitations aim to narrow the scope of our study and to increase the overall quality.

As our research question states, we are investigating the capital structure and the effect it has on the performance of listed Norwegian companies. Also, as mentioned in the research gap section, we have not been able to find any previous study investigating this subject in-depth within the Norwegian market. Therefore, our study focuses solely on companies listed on the Oslo Stock Exchange (OSEAX).

We chose the OSEAX because the index includes all companies of all sizes listed on Oslo Børs. Since Oslo Børs in general is heavily weighted in the energy sector, we considered it important to choose an index that also includes companies from other sectors. Our aim is to get a better overview of the overall capital structure of Norwegian companies. Also, by using companies from the OSEAX index, we increase the sample size considerably compared to other available indexes. A large sample is crucial in order to increase the validity of the results when performing empirical analysis. Since all chosen companies are listed in Norway,

they are subject to the same conditions when it comes to rules and regulations in the stock market.

In general, financial data of listed companies are easier to access and more comprehensive compared to data of private companies. This provides us with a larger sample of data points over time in addition to the ability of getting access to market values. Since private and public companies are different in a number of ways, it might affect the financing decisions of the companies. Publicly traded companies tend to have more options when it comes to sources of funding and a relatively open access to the capital markets. These options may allow them to adjust their capital structure at a lower cost compared to private companies. Due to these differences, we have chosen to focus solely on listed companies during our research.

The chosen sample period used in our study is limited to 2006-2016. This period includes data from the most recent annual reports and it also covers the financial crisis. The reason why we chose a 11-year time frame, was to be able to cover and analyze different business cycles in the Norwegian market. Most importantly, the analysis would not be biased and the results would provide us with suitable presentation of what determines the capital structure and its effect on firm performance of the Norwegian companies.

The collected data is gathered from Thomson Reuters DataStream. We are aware of the existence of other sources, but since our study program provides access to this database, it was our natural choice. The accuracy of our data is thereby based on the precision of this source.

During our study, we are using data that is based on Norwegian accounting standards. Since different countries are using different accounting practices, the comparison of studies may be inaccurate. Therefore, when evaluating results from studies made in other countries then Norway, this shortage is taken into consideration.

Since the topic of capital structure has been investigated a lot over the years, a large number of studies has been published. When it comes to previous studies, we have chosen to focus solely on the ones that we find most relevant and in line with our topic. As a result, there might be researchers and scholars that are not mentioned due to lack of space in the specific

section. Our intention is to make the literature review narrow and focused by discussing only appropriate studies and thereby increasing the quality of the paper.

Similar to other studies investigating capital structure, our approach to calculate leverage is somewhat simplified. All debt is assumed to be the same and we do not take into consideration differences in priority, covenant restrictions and convertibility etc. We are aware of the issue of debt composition might be interesting and provide insights about the financing behavior in the market. During our study, we have chosen to limit the debt composition to short-term, long term and total debt. However, the purpose of our study is not to investigate debt structure in detail, but rather how Norwegian companies finance their assets through debt and equity.

We have limited the performance measures used in our study to return on equity, return on assets and Tobin's Q. These three measures have been the most commonly used proxies in previous empirical studies. Some researchers have used other measures of performance, such as return on invested capital and earnings per share, but we find the three chosen proxies to serve the full purpose during our study.

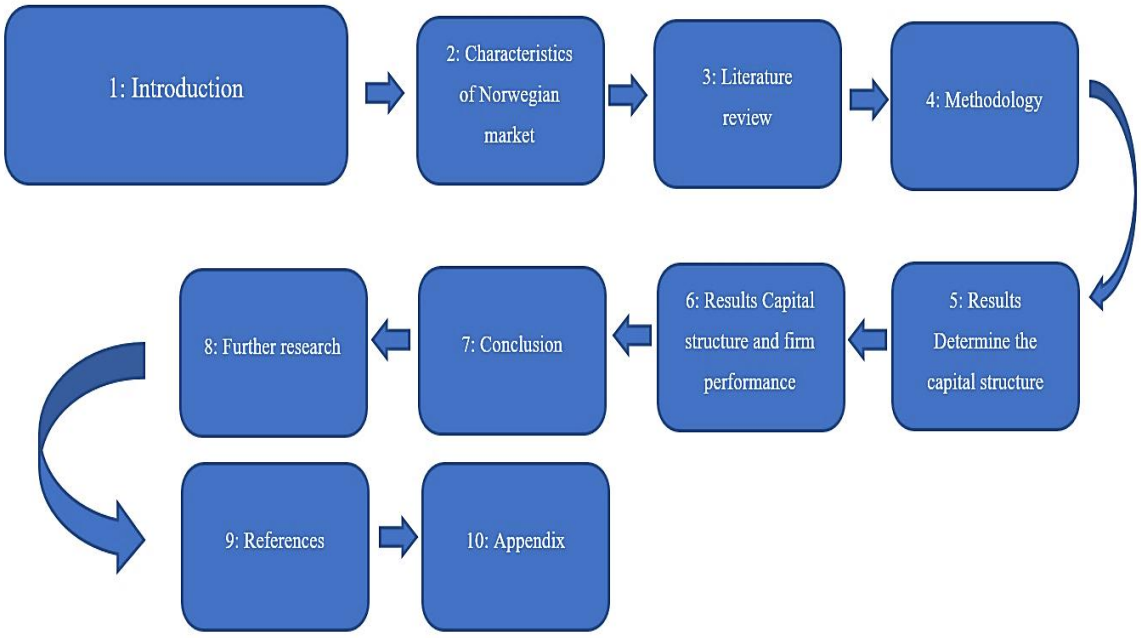
In the methodology section, we will include cross-sectional and time series regression models, which also has been a common practice in previous empirical studies. The level of methodology reflects what we have been taught in our master's program. We have used several methods and tests to ensure that the validity and reliability of our results will be as accurate as possible. We are aware of the existence of other sophisticated methods, but we consider the chosen methods to be sufficient tools used to answer our research question.

1.7 STRUCTURE

The outline of the thesis will begin with an introduction chapter regarding capital structure along with the problem statement of the study. The subsequent chapter will provide a description of the Norwegian market where the purpose is to give the reader a better understanding of the collected data. Although the information in the chapter will not be actively used in the analysis section, it is included to provide a better understanding of the

regression results and aims to make the interpretation easier. Furthermore, in chapter 3 we will present relevant theoretical frameworks regarding capital structure and its relationship to firm performance. Additionally, previous research papers related to the topic of the thesis will also be presented. Chapter 4, outlines the details of the methodology used in our paper. We will elaborate on the research design applied during our study and discuss its reliability and validity. Furthermore, we will provide a detailed description of each test that is used along with the selected regression models. In chapter 5 and 6, we will present our analysis and results to answer our research question. The first one considers what determines the capital structure, while the second one deals with how capital structure affects the firm performance. In the final chapters of our thesis, we will present the conclusion in chapter 7 and the implication and suggestions for further research in chapter 8.

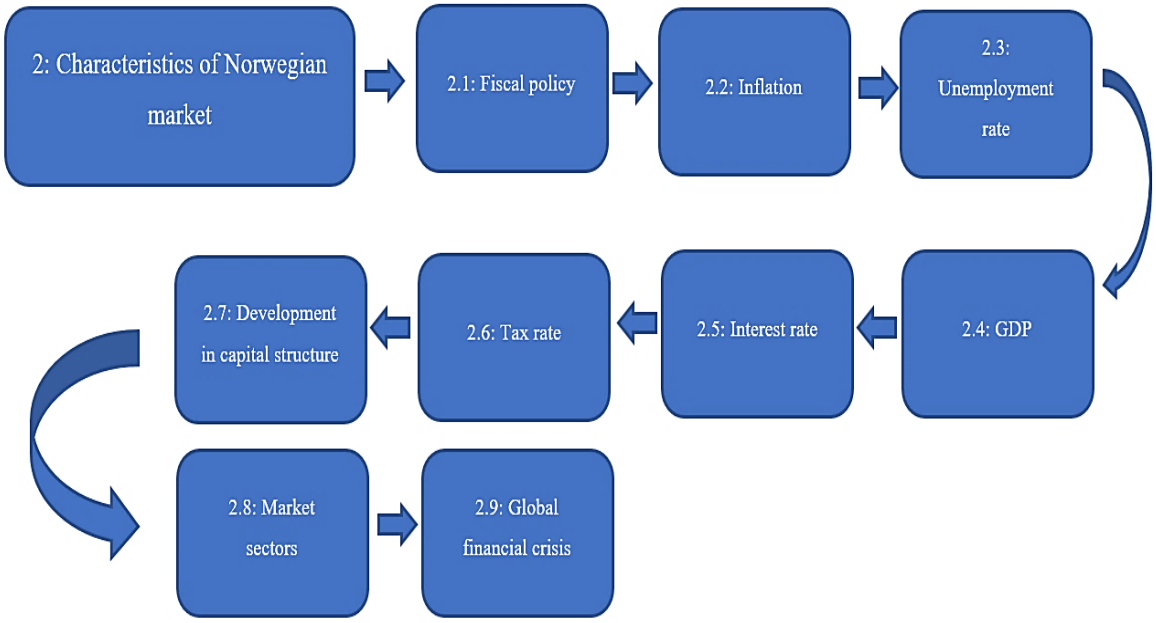
FIGURE 2: STRUCTURE OF THE THESIS



2. CHARACTERISTICS OF THE NORWEGIAN MARKET

In this chapter we will present some macroeconomic factors that in general effects the entire Norwegian economy. The factors presented can also be seen as decisive for the future development and growth of the market. The main purpose of the section is to provide a general overview of macroeconomic factors that has influenced our data. In addition, we have added a section about the three largest industries in Norway to provide a better understanding of the market and an insight in factors affecting the stock market. Lastly, since our sample period covers the financial crisis, we have included a brief explanation about the background and how the event affected the Norwegian economy. However, coming from a finance background with basic knowledge in macroeconomics, we will look into the topic from a broad perspective.

FIGURE 3: STRUCTURE OF THE SECTION



2.1 FISCAL POLICY

Before we dive into the description of the macroeconomic factors, we will begin with a brief explanation of the fiscal policy in Norway. This is helpful in order to understand how the macroeconomic factors are applied to affect the Norwegian economy. The government stabilizes the economy through spending and taxation. This is called the fiscal policy. In the short time horizon, the government aims to control the inflation and prevent excessive unemployment. For the long-term, the government focuses more on the economic growth and improved living standard for its citizens. This can be done by changing the tax rate and government expenditures. In general, there are two types of fiscal policies, expansionary and contractionary.

The Norwegian central bank manages the monetary policy in Norway. Their main goal is to keep the economy stabilized, by adjusting the money supply and the interest rate. During a period of economic expansion, the banks have tendency to increase their loans to companies, which may result in a higher debt ratio for the firms. On the other hand, during a recession, the banks are less willing to lend money due to increased uncertainty and risk. This may result in firms borrowing less money, and a decrease in debt ratios could be expected.

Companies are vulnerable to economy-wide shocks. The business cycle fluctuation is not under the managements control and can have large impact on the capital structure and firm performance. Several previous academic papers have found firms that are highly leveraged, tend to be very sensitive to the changes in the economic activity (Baker and Martin, 2011, p.64). As a result, highly leveraged firms may lose more of their value during a recession compared to unlevered companies.

2.2 INFLATION

Inflation describes an overall index of the cost of living in a country. Changes in inflation also affects the financial market where both the stock market and the bond market are affected. A rise in the inflation causes the input prices to increase, which in turn reduces the purchasing power of consumers. A rise may also result in a decline of revenues and profits, which in

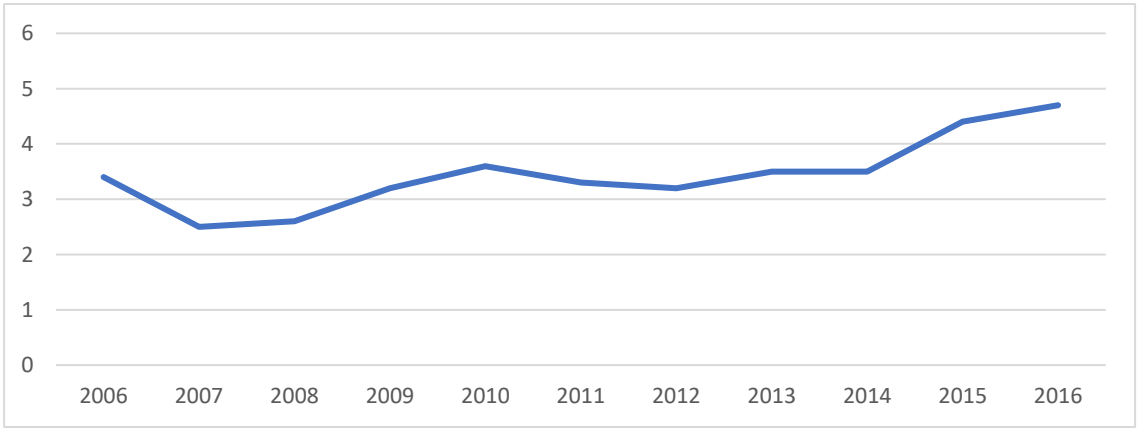
general slows the economy down for some time until a stable rate is reached. The inflation also affects the cost of capital, which may lead to projects becoming unprofitable, and thereby affecting the overall growth of the economy negatively.

The Norwegian Government defines the inflation target for the monetary policy in Norway. The target is a low and stable annual inflation of around 2 percent over time. The inflation target is forward looking and flexible and the goal is to achieve a high economic output and stable employment rate over time (Norges Bank, 2018).

2.3 UNEMPLOYMENT RATE

Unemployment rate is an important factor that directly impacts the overall economy of a country. If the unemployment rate rises in a country, it may result in difficulties for the people to serve their regular payments. It also leads to expectations of lower wage growth and increased uncertainty about the future. The unemployment rate tends to be lower during economic expansion periods and higher during recession periods. Hence, the development may provide indications of the general economic growth in a country. The graph below illustrates the development in the unemployment rate in Norway from 2006 to 2016.

FIGURE 4: UNEMPLOYMENT RATE (%)



The figure illustrates unemployment rate (%) based on age between 17-74. *Source:* Authors' own illustration based on numbers from OECD, 2017

On a general basis, Norway had one of the lowest unemployment rates in Europe during the period 2006-2016 (OECD, 2017). According to Figure 4, we observe a small increase from around 2.5 percent to 3.6 percent from 2008 to 2010, as a result of the financial crisis. After this, the rate stabilized, until it increased again from 3.5 percent to 4.7 percent in 2016 (OECD, 2017). A reasonable explanation of the general increase of the unemployment rate over the period is the oil-driven recession resulting in a lower oil price. The reasons behind the reduction in the oil price is discussed in section 2.8.

2.4 GROSS DOMESTIC PRODUCT (GDP)

GDP is the final monetary value of all products and services produced in a country over a specific period of time. It is a primary indicator used to measure the general economic wealth of a country. The measure includes all goods and services produced by economic agents in the country regardless of their ownership structure.

In economic terms, the final users of products and services can be divided into three main groups, which are households, businesses and government. One of the most common ways of calculating GDP is by using the expenditure approach, which is based on the money spent by different groups that participate in the economy. The measurement can be formulated as:

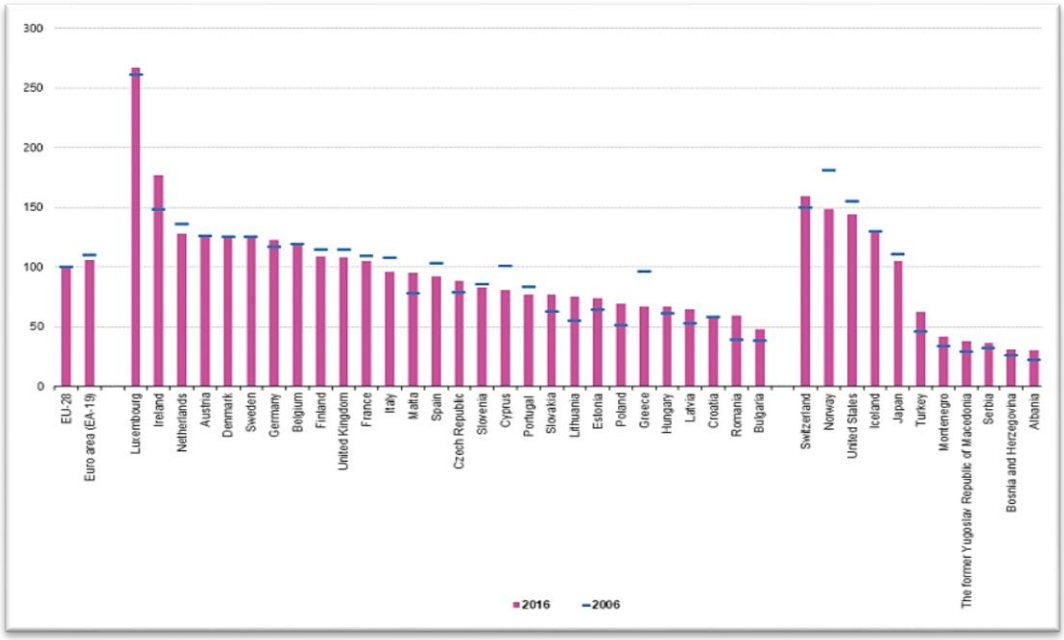
EQUATION 1: GDP

$$GDP = Consumption + Investments + Government\ spending + Net\ Exports$$

Consumption represents the expenditures by all private consumers and non-profit organizations, investments represents the sum of all investments in a country spent on capital equipment, inventories and housing. Furthermore, government spending refers to total government expenditures, which may for example be salaries to government employees, public schools, road construction and military expenditures. Finally, net exports represent a country's total exports minus total imports over the period.

GDP per capita is a commonly used measurement for the living standard in a country. In general, a country with a high level of GDP per capita is considered to have high living standard compared to a low-level country. As can be seen from the figure below, Norway had the second highest GDP per capita in Europe in 2006, and forth highest in 2016 (Eurostat statistics, 2017).

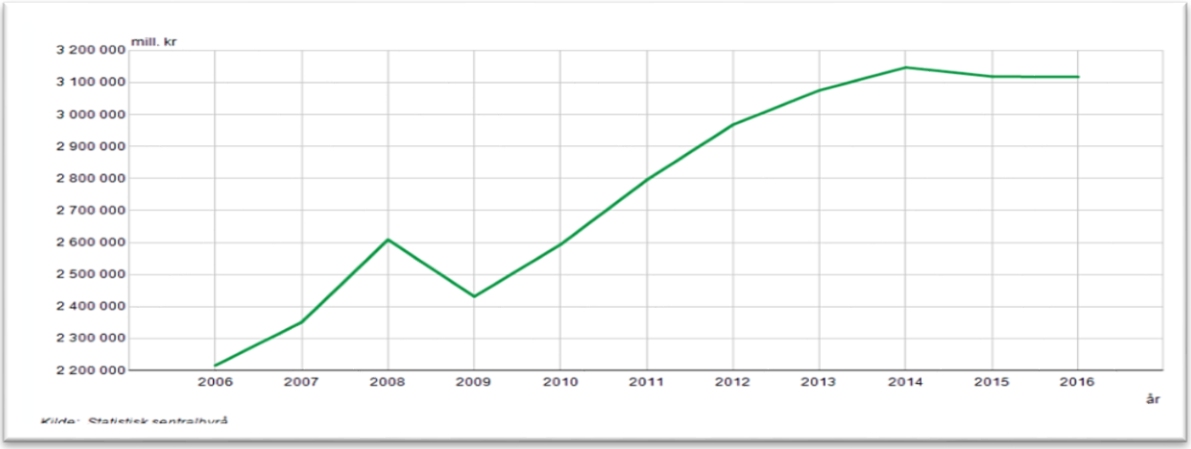
FIGURE 5: GDP PER CAPITA IN EUROPE



The figure illustrates the GDP per capita for European countries in the years 2006 (blue lines) and 2016 (purple lines*). Source:(*World Bank)

A way to determine the overall condition of the economy in a country is the GDP growth rate. It provides an overview of the increase or decrease in the economic output over a specific period. The rate is an important factor for investors in their decision of adjustments in asset allocation due to economic changes. The development of GDP in Norway over the period 2006 to 2016 is presented in the graph below:

FIGURE 6: GDP IN NORWAY



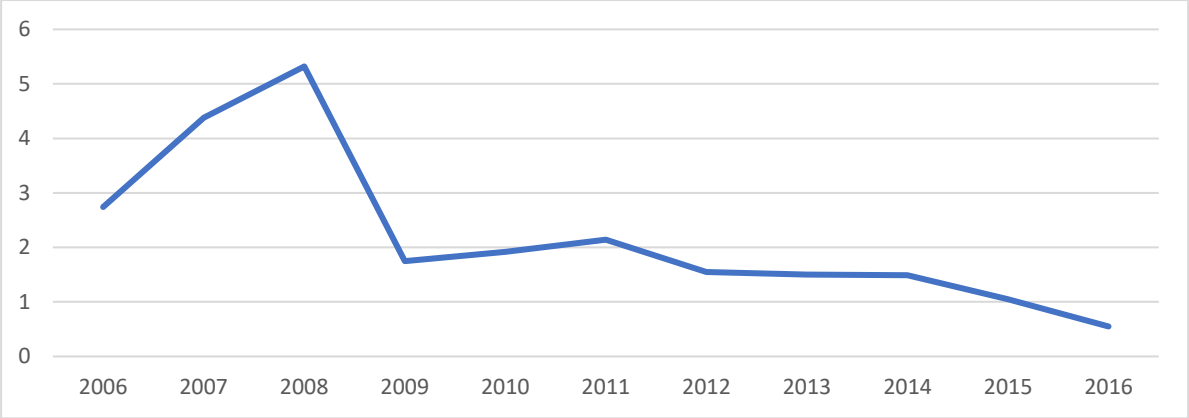
The figure illustrates the development of GDP in Norway over the years 2006-2016. *Source:(*SSB, 2018)

As illustrated in Figure 6, the GDP has grown in a relatively stable rate over the period, with exception in 2008 where we find a decrease due to the global financial crisis. Furthermore, the growth flattens out and we observe a slightly decrease in GDP from 2014 to 2016, most likely due to a decrease in the oil price. Overall, since the growth in GDP provides an overview of the economic conditions of a country, Norway has performed well over the period despite the financial crisis and a lower oil price.

2.5 INTEREST RATE

The key policy rate is the most important monetary policy instrument used by the Norwegian Central Bank. The rate affects the short-term money market rates and it is also crucial in the expectations about future lending rates and bond yields. The main goal with the key policy rate is to ensure economic stability in a country (Norges Bank, 2018). The Central Bank of Norway adjusts the interest rate with a view of stabilizing the inflation close to the target of around 2 percent over time (Norges Bank, 2018). Many countries have struggled with low inflation rates over the last years. As a result, a general reduction of interest rates has been seen in many countries. The development in the key policy rate in Norway over the period 2006 to 2016 can be seen in the graph below:

FIGURE 7: KEY POLICY RATE (%) IN NORWAY



The figure illustrates the development of the key policy rate (%) in Norway over the years 2006-2016.
Source: Authors' own illustration based on numbers from (Norges Bank, 2018)

Observing Figure 7, the interest rate was increasing from 2006 to 2008 where it was set at the highest level during the period of around 5.3 percent. Due to the financial crisis in 2008, the Central Bank of Norway lowered the rate as an attempt to stabilize the overall economy in the country. After the crisis, the interest rate has constantly been reduced to historical low levels. Since the key policy rate affects the overall lending rates in the country, companies have been able to borrow money at record low rates over the past years. As a result, the capital structure is expected to have been affected.

2.6 TAX RATE

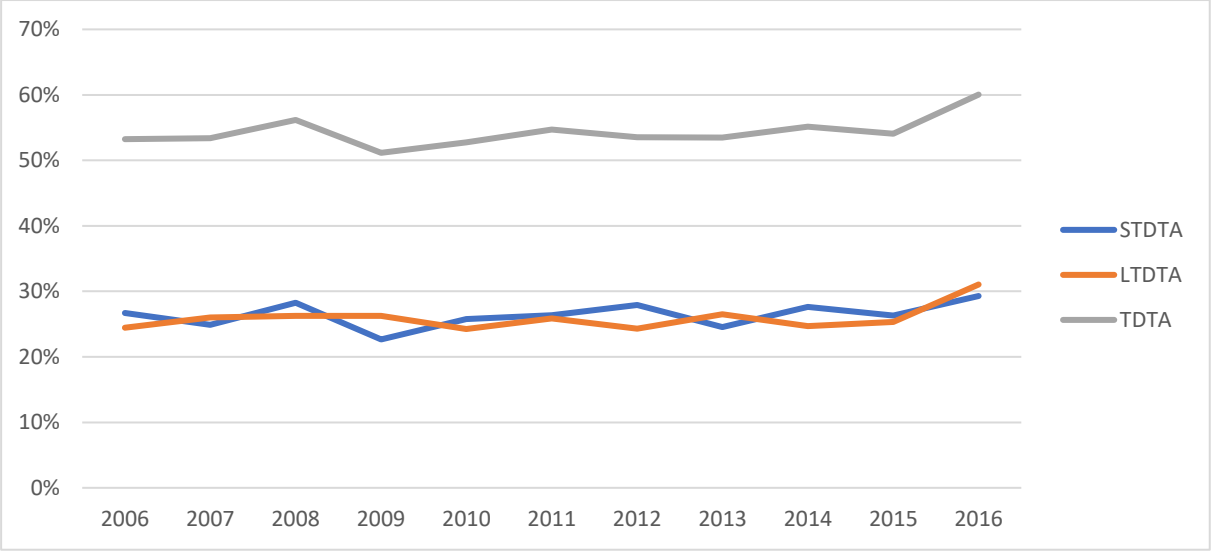
Norwegian resident companies are subject to corporate income tax (CIT) on their worldwide income. If a company is not resident in Norway, it is subject to CIT only when it is engaged in operations that is conducted in Norway or managed from Norway (PWC, 2018). Since the interest expenses are tax deductible under a corporate tax system, the benefits of debt financing increases. During our chosen sample period, the CIT rate was 28 percent until 2014 before it decreased to 27 percent. In 2016, the corporate tax rate was again reduced to 25 percent (KPMG, 2018). Despite the reductions, Norway had the highest corporate tax rates in Scandinavia over the period.

From a trade-off theory perspective, taxes motivate a company to issue debt instead of equity to reduce the tax payments to the government (Frank and Goyal, 2008). Hence, leverage is expected to be positively correlated with the corporate tax rate. A problem with this assumption is that taxes are only about a century old, and debt financing was used long before corporate income taxes was introduced (Braudel, 1982). From this we know that taxes do not fully explain or justifies the use of debt financing, but we need to be aware of the factor when analyzing the capital structure in modern corporate finance.

2.7 DEVELOPMENT IN CAPITAL STRUCTURE

Figure 8 illustrates the capital structure of Norwegian listed companies over the period of 2006-2016. Three different proxies representing the capital structure are being used. These are short-term debt to total assets (STDTA), long-term debt to total assets (LTDTA) and total debt to total assets (TDTA). As can be seen, the total debt ratio has been between 50 to 60 percent over the period, indicating that the companies have been financing their assets with slightly more debt than equity. We observe a decrease in total debt of around 5 percent as a possible result of the global financial crisis between 2008 and 2009. The years after the crisis, the leverage ratio has increased and we find a total debt ratio of around 60 percent in 2016. A possible reason for the increase in debt might be the actions made by the Norwegian Central Bank, by lowering the key policy rate over the period. This reduction has made it possible for companies to borrow money at record low interest rates. As a result, debt financing might have become more attractive compared to issuing equity during the period.

FIGURE 8: THE DEVELOPMENT OF CAPITAL STRUCTURE OF THE NORWEGIAN FIRMS



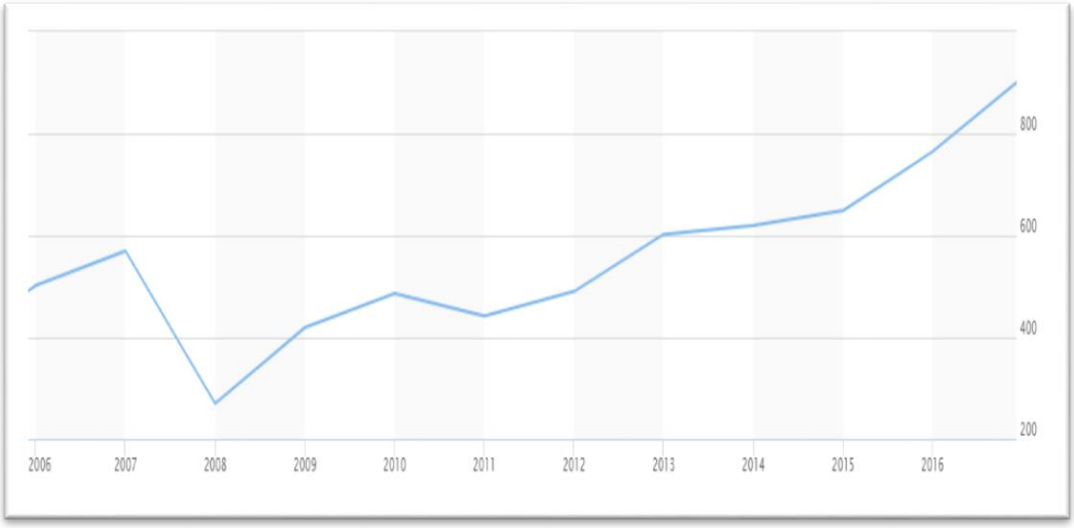
The figure illustrates the development of the capital structure (STDTA, LTDTA and TDTA) for the listed Norwegian companies between the years 2006-2016.
Source: Authors` own illustration based on numbers from DataStream

Next, we look at the debt structure which indicates how the companies are financing their assets using long and short-term debt. As can be seen from Figure 8, the ratios were between 20 and 30 percent and relatively similar over time. This indicates that over the period, the Norwegian companies have financed their assets using almost the same amount of long and short-term debt. Moreover, the short-term debt ratio decreased by almost 10 percent between 2008 and 2009, whereas the long-term debt ratio remained almost constant. The decrease seems reasonable since the financial crisis caused many borrowers to default on their loans. As a result, banks became more cautious before approving new loans. Since short-term loans are often issued on a regular basis, the actions made by banks during the financial crisis might have contributed to the decrease. A possible explanation of the constancy of the long-term debt ratio might be that long-term loans have much longer maturities compared to short-term loans. Many of the long-term loans were probably issued before the financial crisis with maturities far in the future. Hence, the level of these loans is not as affected by year specific events as short-term loans.

2.8 MARKET SECTORS

The Oslo Stock Exchange was opened in 1819 and the first listing contained of 16 bonds and 23 stocks. Over the years, the stock exchange has developed an important national function when it comes to information, legalization and regulation of trading in stocks and other financial products. The stock exchange was privatized in 2001, and it is the only regulated market for securities trading in Norway. The stock exchange is offering a full range of financial products, including equities, derivatives and fixed income instruments (Oslo Børs). Oslo Stock Exchange contains of several indices but we have during our study chosen to focus on OSEAX which contains all listed companies. The development of the index during our sample period can be seen in Figure 9. Below the table we will present the main sectors listed on Oslo Stock Exchange.

FIGURE 9: THE DEVELOPMENT OF OSEAX DURING 2006-2016



Sources: (Market watch, 2018)

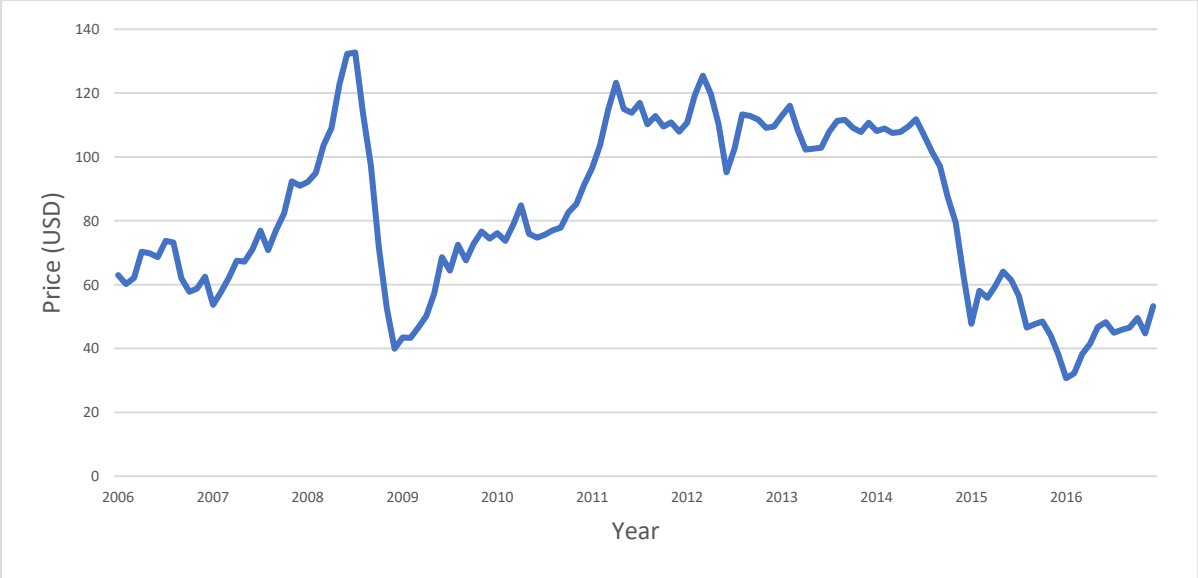
***Energy**:*

Norway is a large exporter of both oil and gas, and the country plays an important role in supplying the energy markets around the globe. The Norwegian oil adventure started for real in 1969 after the findings of the oil field Ekofisk in the North Sea. The field turned out to be one of the largest findings ever to be discovered at sea. In the upcoming years, the search for more oil was intensified and many more fields has been found, produced and sold since then.

Even though large findings have been made over the years, there are still large remaining resources. Thus, the activity on the Norwegian shelf is expected to remain high over the next 50 years, keeping the industry an important driver for the Norwegian economy. As today, Norway is the sixth largest supplier of crude oil and the second largest supplier of natural gas in the world (Norwegian Petroleum, 2018).

Oslo Stock Exchange is the second largest market in Europe for energy companies when it comes to the number of listed companies. It is also the second largest market in the world for companies within the oil service sector (Oslo Børs, 2018). The profitability of the companies in the energy sector is highly dependent on the oil price. The development in the price of crude oil over the period 2006-2016 is presented in the graph below:

FIGURE 10: CHANGES IN OIL PRICE



The figure illustrates the monthly average Brent oil price between the years 2006-2016 (USD per barrel).
Source: Authors' own illustration using numbers from (Bloomberg, 2018)

As can be seen from the graph, the oil price increased substantially from 2007 to 2008 when it peaked with a price of around $135 per barrel. When the financial crisis hit the markets in 2008, we observe a sharp decrease to a price of around $40 in 2009. During the upcoming years after the crisis, the price recovered until 2014-2015 when a sharp reduction again occurred.

The decline in oil price in 2014-2016 can be seen as a result caused by numerous factors. First, large economies such as China, Russia and Brazil experienced a slowdown in their economies resulting in a lower demand of oil. Second, US and Canada increased their own production of crude oil and were able to cut their imports of oil from other countries significantly. These actions lowered the demand of oil from countries such as Norway even more and increased the pressure on the world price. Finally, the largest holder of oil reserves, Saudi Arabia, decided to keep their production constant in hope of increased long-term benefits of not losing market shares. The country can produce oil at a very low cost and is able to withstand a low oil price over a longer period without any critical threat to the economy. Over the period, a combination of these factors resulted in a decrease of the oil price from around $125 in 2012 to a lowest price of around $25 in early 2016 (Bank of Canada, 2017).

Shipping:

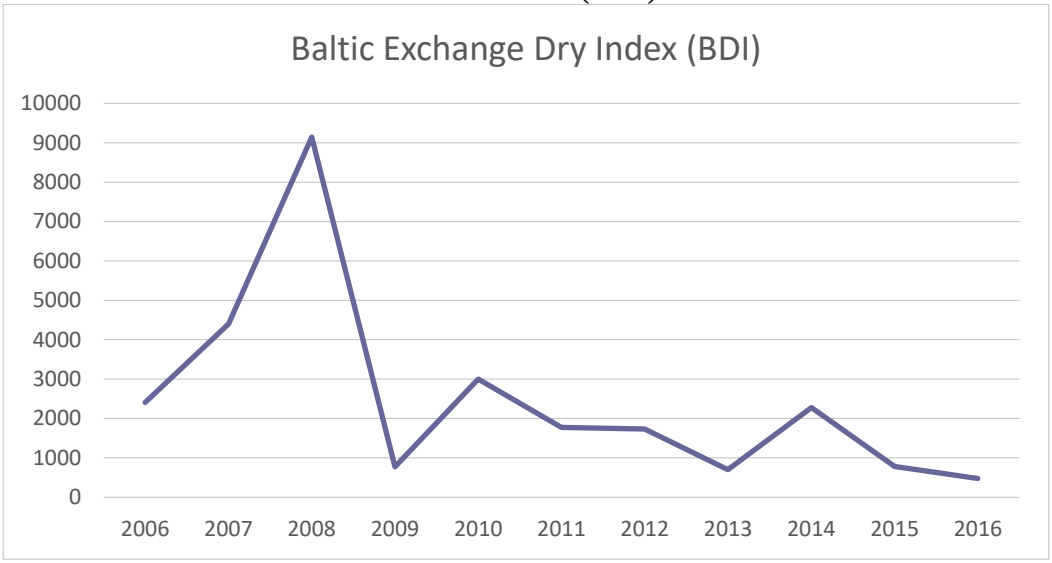
Shipping has always been a prerequisite for a well-functioning international trade. As today, about 90 percent of the trading volume in the world is transported by ships (Stopford, 2009). During the past decades, the demand for maritime operations has increased and become highly important in the petroleum and other offshore sectors (Menon Economics).

The coastline of Norway stretches over about 21 000 kilometers and has made Norwegians a people of the sea. For thousands of years they have been building boats for fishing and coastal transportation in addition to voyages of exploration. Their experiences have provided them with knowledge to become a leading nation within the shipping industry. As today, Norway has one of the largest and most comprehensive maritime sectors in the world. Measured by the number of listed companies, the offshore fleet is the second largest in the world and the sector is characterized by high competence, strong innovation and developed technologies (Oslo Børs, 2018).

The International Maritime Organization (IMO) and International Labour Organization (ILO) are two main organizations responsible for the regulation of the global shipping industry. The industry can be broadly classified into three main sectors. First, the Liquid bulk sector, which

covers the transportation of crude oil and other petroleum products. Second, the Dry bulk sector, which mainly transports iron ore and coal. Finally, the Liner shipping sector, which mainly involves transportation of containerized goods and vehicles. The profitability of the companies in the shipping industry is highly dependent on the different shipping rates. The shipping industry is in general a very capital intense industry and the rates are very cyclical and determined by the global supply and demand within the industry. There are many different rates available in the shipping sector, but we have chosen to include an overview of the development of the Baltic Exchange Dry Index (BDI) over the period:

FIGURE 11: BALTIC EXCHANGE DRY INDEX (BDI)



The graph illustrates the Baltic Exchange Dry Index between 2006 and 2016 (End of year values). *Source*: Authors' own illustration using numbers from DataStream

As can be seen from the graph above, the index has developed quite dramatically during the period. We find a sharp increase before the financial crisis hit the markets in 2007-2008 when the index decreased from above 9000 in 2008 to below 1000 in 2009. As observed, the index has been volatile over the period and overall, we find a decrease in the bulk shipping market. Some reasons behind the decrease are an oversupplied market combined with a slow growth in demand, mainly as a result of slow exports from China (UNCTAD, 2017).

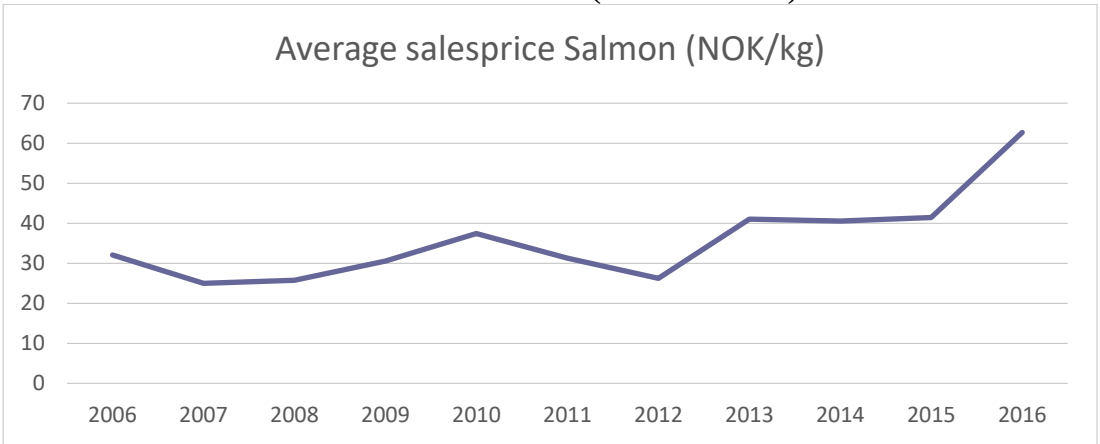
***Seafood**:*

Norway has a long coastline and control expanses of ocean area that is over six times the size of its mainland area (Government of Norway, 2015). These geographical characteristics combined with the climatic conditions have made the country extremely well suited for the seafood industry.

Norway is today the second largest exporter of fish and other seafood products in the world. Also, Oslo Stock Exchange is the world's largest and most important financial marketplace for the seafood sector. The country has over the years developed to be a leading nation when it comes to efficiency and modernization of a sustainable seafood production. Today, the industry is delivering seafood products to consumers in more than 130 countries around the world.

Even though Norway has many advantages within the seafood industry, a high cost level and strict regulations places limitation on the companies within the sector. Also, macroeconomic factors such as exchange rates play an important role in an industry that exports close to 95 percent of its productions (Norwegian Government). In general, the profitability of the companies within the sector is sensitive to changes in interest rates, exchange rates and commodity prices. Since salmon is the main commodity within the seafood industry in Norway, a graph over the development in sales price over the period is presented in Figure 12:

FIGURE 12: AVERAGE SALES PRICE SALMON (NOK/PER KILO)



The graph illustrates the average sales price of salmon between 2006-2016. *Source*: Authors' own illustration using numbers from DataStream

As the graph above illustrates, the average sales price of salmon has increased substantially over the period. Since the price is affected by numerous factors, it is difficult to conclude the exact reasons behind the price jump during the period. But in general, an increase in global demand combined with uncertainty and stagnation in production, are factors claimed to have contributed to the increase (Seafoodsource, 2016).

2.9 GLOBAL FINANCIAL CRISIS

Our chosen sample period includes the extreme event of the global financial crisis in 2007-2008. Since the event affected the financial markets around the world, a brief explanation of the crisis and the implications it had on the Norwegian market is included in this section.

Financial crises may be defined as a disorder in the financial markets resulting in the declining of prices of assets, real estate or debtor insolvency. The phenomenon causes considerably disturbance in the economy and make the distribution of capital more inefficient. These crises may spread over national borders, making it hard to allocate funds even on an international level (Eichengreen & Portes, 1987).

The first indications of the financial crisis came in the United States in 2007, when losses started to increase on real estate mortgages. The losses spread to financial products, such as sub-prime mortgages, increasing the problems and spread fear within the financial sector (Taylor, 2009). Losses in highly levered financial products financed with risky debt resulted in the default of the investment bank Lehman Brothers in September 2008. This event caused the interbank money market to freeze, and a lack of confidence in the credit sector was spread. As a result, the world economy went into a global recession, followed by crashes in both the real estate and stock markets, and a global financial crisis was a fact.

As the case all over the world, the financial crisis also hit the Norwegian financial market, even though the country was less affected compared to many other countries. The reason why the crisis did not hit Norway as hard as other countries, was due to Norwegian banks were not as exposed to risky mortgage backed securities as other countries. Also, the country had low interest rates, a solid banking sector, a strong welfare system and a large part of the population were public employees not in high risk of losing their jobs (Midthjell, 2010). Even

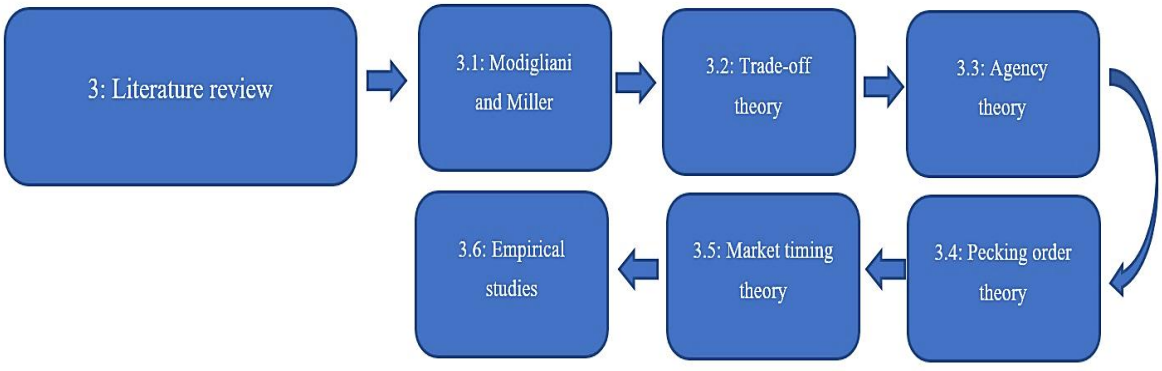
though the country was less affected, actions were also taken by the Norwegian government in order to control the damage caused by the financial crisis.

On company level, the implications of the crisis were a reduction of credit supply by the banks. This reduction resulted in a higher cost of capital and lower investment grades, which in general contributed to a decrease in the firm performance over the period. Due to the implications, the crisis likely had an impact on the capital structure of the Norwegian companies.

3. LITERATURE REVIEW

In this chapter we will present the theories related to capital structure and its effect on the firm performance. However, not all the theories in this chapter will be significantly relevant for our thesis. We have decided to include the theories of Modigliani and Miller proposition I and II, trade-off, agency problem, pecking order and market-timing theory. According to the objective of the study, the chosen variables and the time frame, the thesis will mainly rely on the pecking order, trade-off and agency theory. We will end this chapter by including previous papers that investigates similar topic and present their result and relationship with the theories.

FIGURE 13: STRUCTURE OF THE SECTION



3.1 MODIGLIANI & MILLER

Modigliani & Miller (M&M) published their first theory about capital structure and firm value in 1958. The first proposition was called the irrelevance theory and it is based on a set of conditions, which can be referred to as a perfect capital market. The fundamental assumptions behind the theory were built on the following conditions:

1: "Investors and firms can trade the same set of securities at competitive market prices equal to the present value of their future cash flows.

2: There are no taxes, transaction costs or issuance costs associated with security trading.

3: A firm's financing decision do not change the cash flows generated by its investments, nor do they reveal new information about them." (Berk & DeMarzo, 2013 p.483)

EQUATION 2: M&M PROPOSITION I

$$V_L = V_u = V_a$$

M&M proposition I implies that in a perfect capital market, capital structure has no relevance to the value of a firm. They argued that the total value should be equal the market value of the cash flows generated by the firm's assets, and is thereby not influenced by the choice of capital structure. Over the years, the theory has been heavily criticized for its unrealistic assumptions. In the real world, the firms have to pay tax, the financial markets are not perfect, and bad performing firms can go bankrupt. According to Modigliani and Miller, if proposition I does not hold, an arbitrage mechanism will take in place. This means that the investors will buy an undervalued asset and sell an overvalued, such that the price of the undervalued asset will rise and the price of the overvalued asset will fall until both prices are equal (Ebaid, 2009). Even though M&M proposition I has been heavily criticized due to its limitations and assumptions, it still provided the foundation for other theories to be developed and is considered a corner-stone in modern corporate finance.

Modigliani and Miller published proposition II in 1963, which is an extended version of their earlier model. According to this model, shareholders expected return in a levered firm increases with the proportion of leverage. Since the return of a portfolio equals the weighted average of the returns of the securities in it, the equality presented in Equation 2 results in the following relationship:

EQUATION 3: COST OF UNLEVERED EQUITY (PRE-TAX WACC)

$$r_a = r_u = r_e \times \frac{E}{D+E} + r_d \times \frac{D}{D+E}$$

Where;

$r_e = Expected\ rate\ of\ return\ on\ levered\ equity$
$r_d = Expected\ rate\ of\ return\ on\ debt$
$r_u = Expected\ rate\ of\ return\ on\ unlevered\ equity$
$r_a = Expected\ rate\ of\ return\ on\ total\ assets$
$D = Market\ value\ of\ debt$
$E = Market\ value\ of\ equity$

Solving for r_e using Equation 3, we get the following formula for the levered equity:

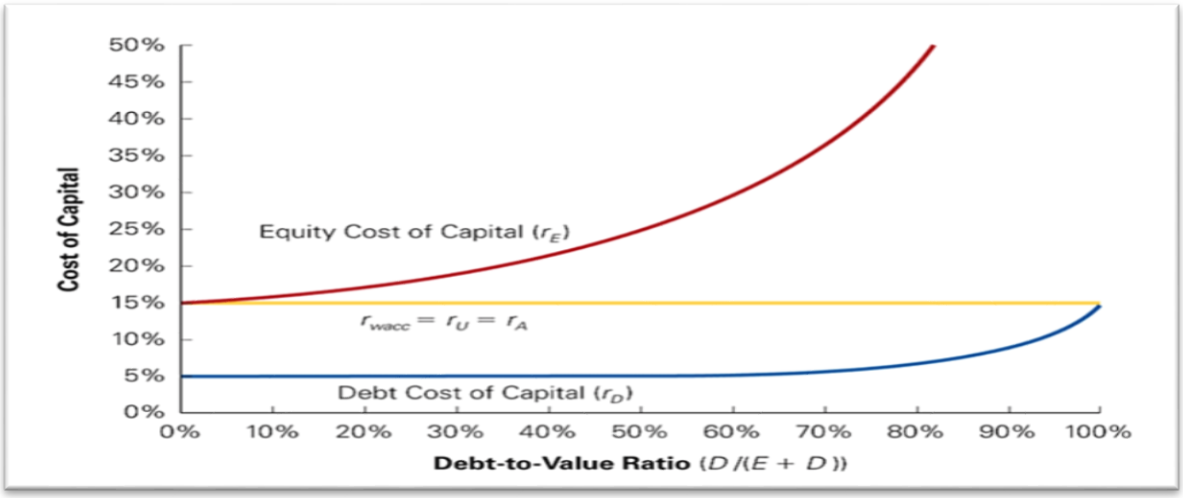
EQUATION 4: M&M PROPOSITION II

$$r_e = r_u + \left(\frac{D}{E}\right) \times (r_u - r_d)$$

Equation 4 tells us about the effect of leverage on the expected return of the levered firm. The expected return equals the unlevered equity return r_u with an additional return caused by

leverage $\left(\frac{D}{E}\right) \times (r_u - r_d)$. When the company performs well, we get $(r_u > r_d)$ resulting in a higher return on the levered equity. On the other hand, if the company performs poorly, we get $(r_u < r_d)$, which lowers the expected rate of return on levered equity. (Berk and DeMarzo, 2013. p 489)

FIGURE 14:WACC AND LEVERAGE WITH PERFECT CAPITAL MARKET



Equity, debt and weighted average cost of capital for different amount of leverage. The rate of increase in r_D and r_E, and thus the shape of the curves, depends on the characteristics of the firm's cash flows. Source: (Berk and DeMarzo, 2013. P 490)

3.2 TRADE-OFF THEORY

The trade-off theory was originally proposed by Kraus and Litzenberger in 1973. They proposed that bankruptcy costs and tax shield effects on debt should be considered in addition to the statements of M&M proposition II. We can modify the Equation 3 with the presence of a tax shield on the payable interest expense in the following way:

EQUATION 5: THE WEIGHTED AVERAGE COST OF CAPITAL (WITH TAX SHIELD)

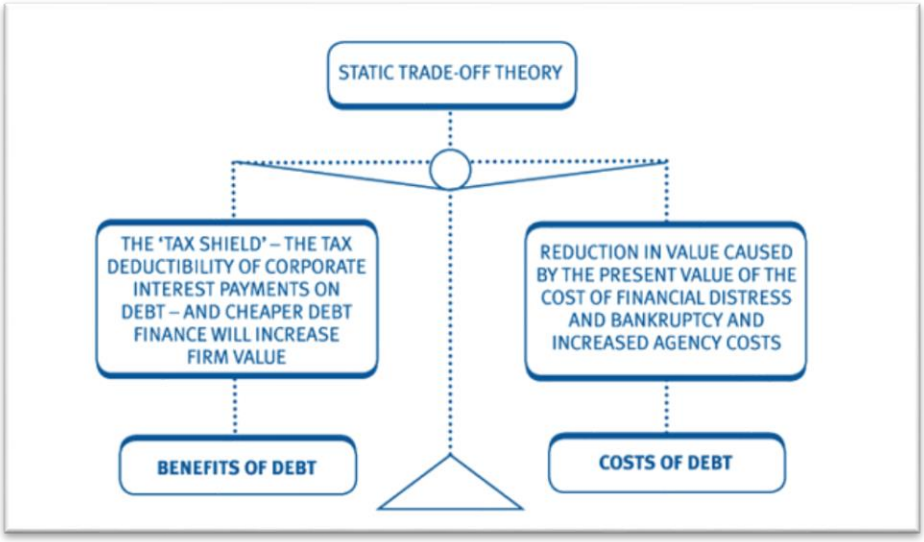
$$r_{wacc} = \frac{E}{E+D} \times r_e + \frac{D}{E+D} \times r_d \times (1 - T_c)$$

Where;

$r_{wacc} = The\ weighted\ average\ cost\ of\ capital$
$r_d = Expected\ rate\ of\ return\ on\ debt$
$r_e = Expected\ rate\ of\ return\ on\ equity$
$E = Market\ value\ of\ equity$
$D = Market\ value\ of\ Debt$
$T_c = Corporate\ tax\ rate$

To identify the optimal capital structure, the weights between benefits and costs associated with debt should be considered. The present value of the tax shield increases the value of the firm. If we assume no further cost related to taking on more debt in the capital structure, this tax advantage would imply full debt financing. An offsetting cost of debt is bankruptcy cost, where the risk of firm not being able to fulfill its obligations increases. This implies that a higher debt level is associated with higher probability of default.

FIGURE 15: STATIC TRADE-OFF THEORY



The figure illustrates the benefit and the cost of debt in accordance to static trade-off theory. Source: (Kaplan Financial Knowledge Bank)

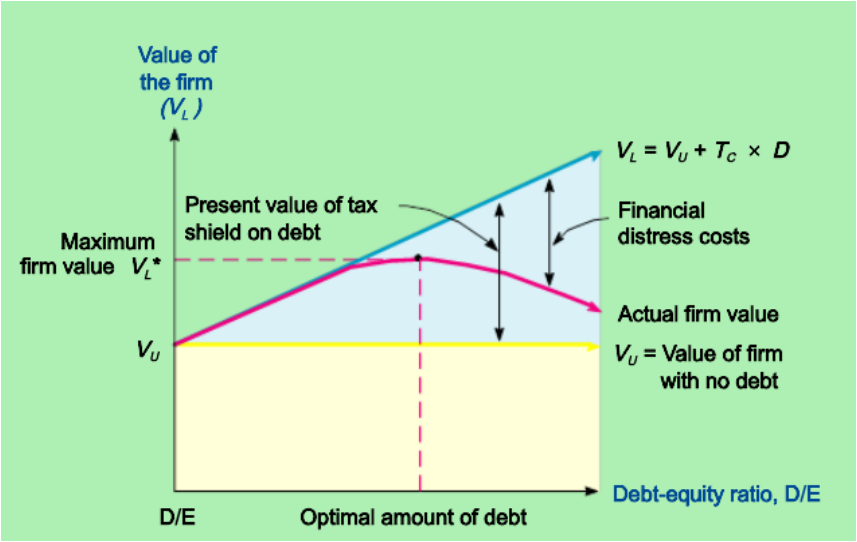
According to Jensen and Meckling (1976), we can divide bankruptcy costs into direct and indirect costs. The direct costs consist of consulting, legal and restructuring expenses a company faces through financial distress periods. The indirect costs include broken contracts, lost profits, poor credit terms and increased cost regarding firm's borrowing.

Myers (2001) proposed that financial distress includes bankruptcy costs and agency costs when the firm's creditworthiness is uncertain. A higher leverage leads to higher interest expense, which lowers the taxable profit. As a result, equity financing will become more favorable than debt financing. An additional debt also increases the firm's obligations, which in return causes the probability of default to increase. Overall, higher leverage increases the financial distress costs, which affects the firm's market value negative (Myers, 2001).

Jensen and Meckling (1976) argued that managers had the incentive to engage in risky projects that benefits the equity holders in the case of success but losses for the bondholders in the case of failure. Since the debt holders are aware of this issue, they require a risk premium and consequently a higher interest payment. The increased cost of debt decreases the attractiveness of using leverage as a funding source.

In this section we will demonstrate in further details how the trade-off theory works. As we can observe from Figure 16, there are three different lines in the graph. The yellow line represents an all-equity financed firm, which is based on the M&M proposition I. As the firm begins to take on more debt, it is able to benefit from the tax shield. The blue and red line represents a company that has a mix of debt and equity in its capital structure with the present value of the tax shield included. Notice that the present value of the tax shield increases as the firm borrows more money until additional debt results in higher probability of default, which increases the distress cost. Hence the blue line is aligned with M&M proposition II and the red line with trade-off theory. To identify the maximum firm value, cost and benefit associated with debt should be considered. In Figure 16, the optimal capital structure is presented on the highest point in the red curve.

FIGURE 16: THE OPTIMAL CAPITAL STRUCTURE AND THE VALUE OF THE FIRM



The figure illustrates: M&M I (yellow line), M&M II (blue line) and trade-off theory (red line). *Source*: (Slideplayer)

Dynamic trade-off theory:

According to Baker and Martin (2011, p 19), the static model is based on a single period trade-off between benefits from tax shield and bankruptcy cost. We can extend the model and consider multiple periods, which forms the dynamic trade-off theory. Even though we can find the optimal debt ratio in a single period, in the long run it would not be beneficial for the

firm. However, maintaining a fixed leverage ratio requires a frequent rebalancing of equity and debt, hence transaction cost will inquire. Furthermore, Baker and Martin (2011, p 19) argues that large readjustment of the target capital structure only appears periodically to capture the tax benefit of leverage. The companies have a debt corridor that allows the firms leverage ratio to float between a range of upper- and lower-bounds of the corridor. With market frictions, most firms' capital structure tends to deviate from the optimal ratio.

The trade-off theory in relation to leverage and firm performance:

The trade-off theory suggests that a profitable firm should have a higher target debt ratio, since they have low bankruptcy costs. The benefits with high leverage opens up the door for further investments to grow and to reduce tax payments through the interest rate tax shield. Furthermore, several studies have come to a conclusion that bankruptcy cost do exist, but they are reasonably small compared to the benefits of tax shield (Baker and Martin, 2011. P162). As a result, a more profitable firm should borrow more money to take advantage of the tax shield effects and operate with a higher leverage. This implies that we could expect a positive relationship between the debt level and the profitability of the firm. There are several empirical studies that provides evidence supporting a positive relationship between the debt level and firm performance. This will be discussed more in details under the empirical studies section.

3.3 AGENCY THEORY

Until now, we have assumed that stakeholders interest is align with the managers and the financial decisions are in interest of the stakeholders. This assumption may be possible in theory, but not in practice. The focus on separation ownership and control was initiated by Jensen and Meckling (1976). The agency theory can be divided into two categories; the conflict between the manager and shareholders and the conflict between shareholders and debtholders.

The conflict between the managers and shareholders

Jensen and Meckling (1976) argued that managers, the agents, does not always act in the interest of the shareholders, the principal. Instead they might try to seek more benefits for themselves. The managers can increase their personal benefits at the expense of the shareholders by for example upgrading to larger offices, buying corporate jets and other perks. Furthermore, the managers can spend the retained earnings on new investments, although paying dividend might have been a better alternative for the equity-holders (Stulz, 1990). These destroying activities can be prevented by increasing the managers stake ownership in the firm. As a result, potential loss for the shareholders will also affect the managers negatively. In addition, increasing the debt level of the firm will also decrease the managers ability to destroy firm value. A part of the generated income will be used to pay the debt holders, which decreases the excess cash that is disposal for the management (Jensen, 1986).

The conflict between the shareholders and debt-holders

The conflict between equity-holders and debt-holders arise when there is a risk of default. If the debt has no default risk, debtholders have no interest in the income, value or risk of the assets. On the other hand, if a default probability exist, equity holders can benefit at the expense of the debt investors. The equity holders have a residual claim and they gain when the value of debt falls. Suppose that the risk of default is significant, the equity holders will carry the loss in the beginning, but as the size of the default increases, the debtholders will also have to carry the loss. During distress periods, the managers will be tempted to choose risky investments with negative NPV that benefits the shareholders since they have little to lose. Higher risk increases the upside potential for the equity holders, but the downside is anticipated by the creditors who will require a premium for the risk they are taking (Jensen and Meckling, 1976). In addition, debt covenants restrict paying out dividend, taking on more debt and make sure that the firm is able to fulfill their obligation.

3.4 PECKING ORDER THEORY

The Pecking order theory was originally proposed by Donaldson in 1961, who explored that managers strongly favored internal funding using retained earnings instead of external funds, regardless the size of the firm. It was further developed by Myers and Majluf in 1984, where they stated that if outside investors are less informed than people inside the firm, then equity could be mispriced (Baker and Martin, 2011 P 79). Furthermore, if the company had to finance their new projects by issuing equity, underpricing might be so significant that the new investors would capture more than their required rate of return from the new project following in a net loss for the existing shareholders. In such cases, the managers will not go through with the project, although it can generate a positive NPV. However, the underinvestment can be avoided if the company can finance themselves with a security that is not heavily undervalued by the market. Following the work of Myers in 1984, he states that managers should finance the project first with retained earnings, which involves no asymmetric information (Baker and Martin, 2011 P79). If the internal funding source is not sufficient enough then debt can be the optimal source of funding following equity as the last resort.

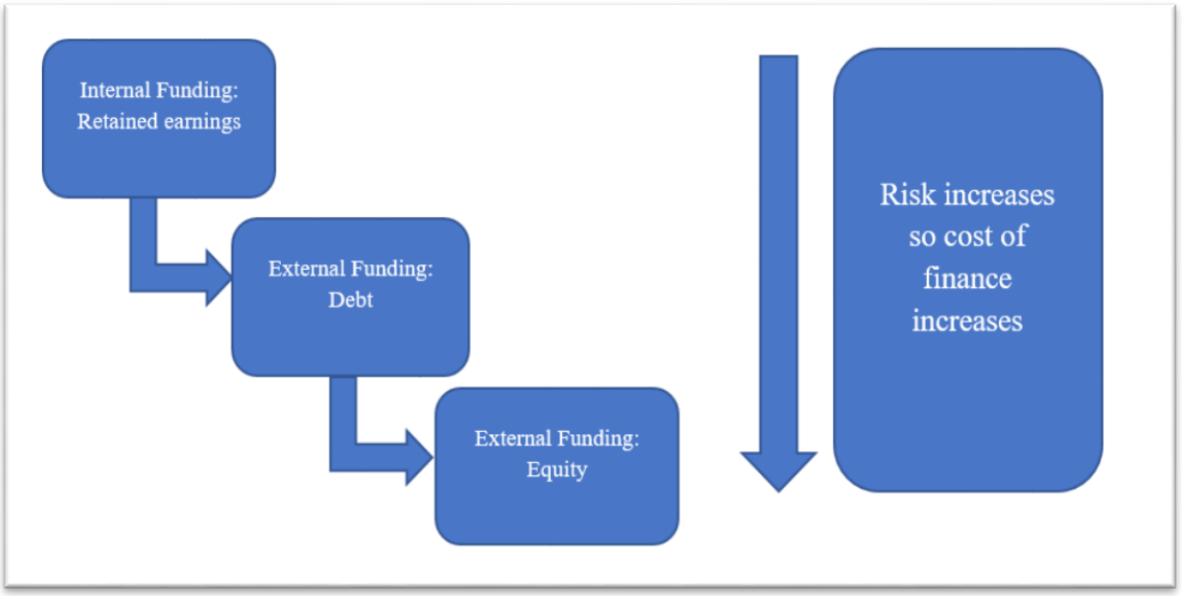
The Pecking order theory does not assume a target debt-to-equity ratio. Firms will always utilize the internal source of funding, before they choose an external source of finance, since they want to avoid mispricing and net loss for existing shareholders. Yet, there are a lot of companies in reality that issues equity despite the fact that they have not fully utilized the other sources first (Baker and Wurgler, 2002).

A critical point of the theory is the relationship between investments capabilities to generate internal fund (i.e. retained earnings) and the choice of financing. If the project is expected to generate future growth opportunities, external sources can be used for financing if the internal funds are not sufficient enough. This is confirmed by Hutchinson in 2015, who found that firms with low retained earnings tend to use external financing sources (Nawi, 2015, p.14). These companies are more likely to be small firms with high growth opportunities.

According to the theory, a profitable firm generates high earnings and it is expected to have less debt in their capital structure compared to less profitable firms. As a result, the theory

predicts a negative relationship between the debt level and firm's profitability. There are several empirical studies that supports the negative relationship between debt and profitability and these will be discussed further down in this chapter.

FIGURE 17: PECKING ORDER THEORY



The figure illustrates the pecking order theory. Firms prefer internal funding in the first place and then moves on to debt and equity as their last funding option.
Source: Authors own illustration

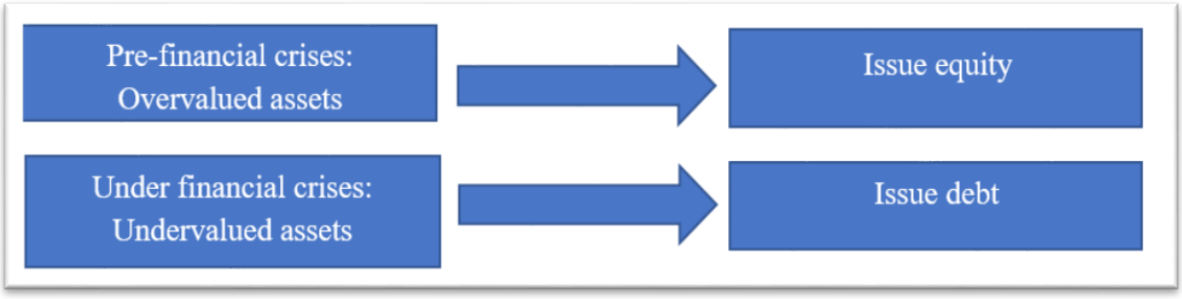
3.5 MARKET TIMING THEORY

The market timing theory was developed by Baker and Wurgler (2002) when they published their paper Market Timing and Capital Structure. Since then, the theory has challenged traditional theories such as the trade-off and pecking order theory. The market timing theory is based on the specific market conditions when the management decides to finance their investments. They will look for the sources of funding that is cost efficient and most beneficial in accordance with the current market conditions in the capital markets (Huang and Ritter, 2009).

The theory suggests that during a recession, the stock prices are undervalued, consequently the firms would prefer to fund themselves with debt. On the other hand, a firm may issue shares if they consider the stock price to be currently overvalued (Frank and Goyal, 2007).

According to DeAngelo, DeAngelo and Stulz (2010), the majority of firms tend to fail to issue stocks during the most attractive market timing opportunities. One of the plausible reasons behind this is that rational investors would influence the managers attempt to sell overvalued shares. As a result, the stock price would drop to its fair value. As Baker and Wurgler (2002) stated, the managers are not capable of timing the market correctly. A real-life example is the financial crisis in 2008, where the financial institutions repurchased their shares after the crisis for a higher price (DeAngelo, DeAngelo & Stulz, 2010). Based on the market conditions, the market timing theory predicts a relationship between leverage and firm performance to be negative before the recession and positive during the recession.

FIGURE 18: MARKET TIMING THEORY



The figure illustrates the market timing theory, where firm issues equity when their assets are overvalued or debt if their assets are undervalued.
Source: Author's own illustration

3.6 PAST EMPIRICAL STUDIES

International studies on determinants of capital structure:

After Modigliani and Miller published their theory about the irrelevance of capital structure in 1958, the topic has been generating great interest among financial researchers. Over the years, several empirical studies have tried to identify the most significant factors that determents capital structure. The following section provides a selection of international empirical studies, which has been published over the past decades.

Capital structure has also been compared across countries in a number of studies over the years. In general, many of these studies have concluded that companies in Japan and Continental Europe are more leveraged compared to Anglo-American countries. For instance, a study by Borio (1990), classifies Japanese companies as “high leverage” and Anglo-American companies as “low leverage”. Furthermore, Rutherford (1988) suggests that companies in France, Germany and Japan are more levered compared to companies in United States and the United Kingdom. The author is aware that differences in accounting adjustments and that the use of market values may narrow the result, but concludes that it would probably not change the main findings.

Rajan and Zingales (1995), studied the determinants of capital structure across the G-7 countries between 1987 and 1990. They found that the factors tangibility and size were significant and positively related to leverage. On the other hand, they found profitability to be negatively related to leverage. The findings were thereby in line with the predictions of the pecking order theory.

Michaelas et al. (1999) investigated the capital structure of small and medium size companies in UK between 1986 and 1995. Their goal was to test the pecking order theory and the predictions that smaller growth firms rely more on external funding compared to large firms. Their results concluded that the growth factor actually was positively related to leverage and that profitability was negatively related to leverage. Their findings were thereby in line with the predictions of the pecking order theory.

Song (2005), studied the Swedish market using panel data over the period of 1992-2000. STDTA, LTDTA and TDTA was used as dependent variables while tangibility, non-debt tax shield, size, growth uniqueness and income variability was used as independent variables. The study found that tangibility and size were positively related to total debt, while mixed results were found for the other factors. The results were thereby mixed in supporting the pecking order and the trade-off theory.

In a study made by Huang and Song (2006), they investigated the determinants of capital structure by analyzing data of 1200 listed Chinese companies over the period of 1994 to 2003. Their results indicated that leverage increases with firm size and fixed assets, and decreases with profitability, non-debt tax shield, growth and managerial shareholdings. Their findings

were thereby supporting the pecking order theory. They also found that Chinese companies in general tend to have lower ratios of long term debt over total assets compared to other countries.

Delcoure (2007) studied determinants of capital structure in emerging Central and East European (CEE) countries between 1996 and 2002. They wanted to investigate whether their findings were in line with those found in western countries and if traditional theories were applicable in also in CEE countries. The variables used were size, tangibility, growth, profitability, non-debt tax shield and risk. Their results indicated that size, tangibility and non-debt tax shield were all positive and significant determinants of all leverage ratios. The study also concluded that some traditional theories of capital structure are also portable in CEE countries. However, they found that the pecking order, trade-off and agency theories only partially explain the choices of capital structure in the CEE countries.

Nasimi (2016), investigated companies listed on the S&P 500 index over the period of 2010 to 2014. The study employed multiple regression analysis to test the impact of six explanatory variables on three dependent variables. The conclusion was that profitability, size, growth, tangibility, cost of financial distress and non-debt tax shield were all determinants of capital structure. They also found that tangibility best described the capital structure of the listed firms. Their conclusion indicated mixed result in support of both the pecking order and the trade-off theory.

Butt (2016), studied capital structure from a trade-off perspective in the US over the period of 1990 to 2012. He tested three main predictions of the model and the goal was to investigate the relationship between leverage and profitability, growth and firm size. The study found no significant relationship between asset size of a company and the level of leverage. Considering growth, he found the variable to have significant negative relation to leverage. On the other hand, he found a positive relationship between profitability and leverage. The results of the study were mainly in line with the predictions of the trade-off theory.

In summary, the determinants of capital structure have been examined in both developed and emerging countries over the years. The results have been mixed and this study aims to extend the existing literature by empirically investigate the factors influencing the capital structure of Norwegian companies.

Determinants of capital structure including Norway:

As we presented in the previous subchapter there has been a large amount of research conducted across the world to determine the factors affecting capital structure. However, there has been very few papers focusing on the Norwegian market. This leaves a very big gap in knowledge regarding the capital structure of the Norwegian companies. At the same time, there has been some international research papers that has included Norwegian companies when they have analyzed the capital structure in several countries. Through these papers we will get an idea of which factors may play a key role in determining the capital structure in the Norwegian market.

Frydenberg (2004) studied which factors determined the capital structure for non-listed manufacturing firms in Norway during the period 1990-2000. The independent variables consisted of size, growth, Non-debt tax shield, uniqueness, industry category, fixed assets, dividends and return on assets. The dependent variables included STDTA, LTDTA and TDTA. Their findings revealed that fixed assets were the most important factor when describing the maturity of debt. Firms with a large volume of fixed assets in their balance sheet also tend to have a large portion of long-term debt. On the other hand, firms with less fixed assets appeared to have larger portions of short-term debt. Moreover, the study indicated that profitable firms had low leverage ratios. The negative relationship between capital structure and firm performance was in line with the pecking order theory.

Fan et al. (2012) studied the influence of institutional environment and company specific variables on a firm's capital structure and debt maturity. The sample period was between 1991-2006 and the research was performed on 39 developed countries, including Norway. The institutional environment consisted of tax policy, financial institution, legal system and regulation. The company specific variables were tangibility, profitability, firm size and market-to-book-ratio. The results indicated that country level determinants where more decisive then the industry specific. Additionally, firms in Norway had the second largest long-term debt ratio indicating that they were significantly more leveraged compared to firms in many other developed countries. Overall, their research showed that profitable firms had low leverage, which is in line with the pecking order theory. The factor size and tangibility were found to be positively related to leverage, which supports the trade-off theory.

TABLE 1: EMPIRICAL STUDIES - DETERMINING THE CAPITAL STRUCTURE

Authors and date	Geography	Year range of date	Dependent variables	Independent variables	Results
Rajan and Zingales (1995)	G-7 countries	1987-1990	TDTA, Debt-to-net assets, Debt-to-capital	Tangibility, M/B, Size, Profitability	Supports the Pecking order theory
Huang and Song (2006)	China	1994-2003	Six different measures of leverage	Profitability, Size, Tangibility, Tax, NDTS, Growth, Vol, Managerial ownership, Ownership structure	Supports the Pecking order theory
Michaelas et al. (1999)	UK	1986-1995	STDTA, LTDTA	Size, Age, profitability, Growth, Future growth opportunities, Operating risk, Asset structure, TO, Net debtors	Supports the Pecking order theory
Delcoure (2007)	CEE countries	1996-2002	STDTA, LTDTA, TDTA	Size, Tangibility, Growth, Profitability, NDTS, Risk	Mixed results for the Pecking and Trade-off theories
Nasimi (2016)	US	2010-2014	STDTA, LTDTA, TDTA	Profitability, Size, Growth, Tangibility, Cost of financial distress, NDTS	Mixed results for the Pecking and Trade-off theories
Butt (2016)	US	1990-2012	BV and MV of leverage	Profitability, Growth, Size	Supports the Trade-off theory
Chakraborty (2010)	India	1995-2008	TDTA	Profitability, Tangibility, Size, Growth, NDTS, Uniqueness	Mixed results for the Pecking and Trade-off theory
Frydenberg (2004)	Norway	1999-2000	STDTA, LTDTA, TDTA	Size, Growth, Industry Category, FA, Div, ROA, Uniqueness	Supports the pecking order theory
Song (2005)	Sweden	1992-2000	STDTA, LTDTA, TDTA	Tangibility, NDTS, Size, Growth, Uniqueness, Income variability	Mixed results for the pecking order and trade-off theory
Fan et al. (2012)	39 Countries	1991-2006	Leverage	Tangibility, ROA, M/B, Size	Mixed results for the pecking order and trade-off theory

Capital structure and firm performance:

A large number of scholars have conducted studies to examine the effect capital structure has on the performance of firms. Studies has been made mainly in developed countries but during recent years also in emerging markets. The following section provides an overview of some international studies investigating the topic.

Research made by Chakraborty (2010) covered 1169 non-financial firms listed either on the Bombay Stock Exchange or on the National Stock Exchange in India between 1995 and 2008. The study used both book value of total debt and market value of total debt as proxies of capital structure. As explanatory variables, profitability, tangibility, size, growth, non-debt tax

shield and uniqueness were used. The study concluded that profitability was negatively related to leverage and that low profit firms in general used more debt.

Another study made by Vatavu (2015) aiming to establish the relationship between capital structure and financial performance of 196 listed Romanian companies between 2003 and 2010. Their results indicated that firms avoiding debt and operating mainly with equity tended to achieve higher returns over time. Overall, their results found that equity had a positive impact on performance and that total debt and short-term debt showed signs of negative relationships with ROE and ROA.

Salim and Yadav (2012) investigated the Malaysian market using panel data of 237 listed companies on the Bursa Malaysia Stock Exchange during 1995-2011. They divided the data into the six main sectors and the result indicated that firm performance measured by ROE and ROA had a negative relationship to both short- and long-term debt. On the other hand, their results showed that all leverage ratios were significant and positively related to the performance measure Tobin's Q.

Gleason et al. (2000) investigated the relationship between ROA and capital structure. The study was made using data from 198 European Community retail companies. Again, the results indicated that leverage had a significant negative influence on the performance of the companies. They also found that the size of the companies had a positive influence on the performance, where larger companies earned higher returns on assets compared to smaller companies.

Majumdar and Chibber (1999) used contemporary data and regression analysis to investigate the relationship between the level of debt in the capital structure, and the performance of over 1000 Indian firms between 1988 and 1994. Their results supported the pecking order theory by indicating a negative and significant relationship between leverage and firm performance. During the period of the study, suppliers of debt in India were all government-owned, which they claim may influenced their results.

Zeitun and Tian (2007) mainly found a negative and significant relationship between capital structure and performance when studying companies in Jordan between 1989 and 2003. These findings were negative both when considering book and market values. On the other hand,

they found a positive and significant relationship between STDTA and Tobin's Q. They claim that this finding may support the theory of Myers (1977), where firms with large ratios of STDTA tend to have a higher growth rate and higher performance.

Ahmad et al. (2012), investigating the capital structure and performance of 58 firms in the Malaysian market over the years 2005-2010. They performed two regression models and used ROE and ROA as dependent variables, and short-term, long-term and total debt over total assets as independent variables. Their findings indicated that ROE, STDTA and TDTA were significant and negative while LTDTA was positive and significantly related to leverage. For the variable ROA, only STDTA and TDTA were found to be negatively related to leverage.

Abor (2005), studied the relationship between capital structure and performance of listed firms in Ghana between 1998 and 2002. Capital structure was defined as STDTA, LTDTA and TDTA while performance was defined as ROE. The study found significant and positive relationship between STDTA and TDTA and performance and ROE. On the other hand, the study found a negative relationship between LTDTA and ROE.

Arabahmadi and Arabahmadi (2013) studied the profitability of 252 non-financial firms listed on the Teheran Stock Exchange between 1999-2008. The study found a positive relationship between STD and TD and ROE. These results suggested that an increase in short-term debt of the firms would result in an increase in profitability. However, when considering LTD, they found a negative relationship, signaling that an increase in long-term debt would result in a lower profitability. Again, mixed results supporting theories of capital structure were found.

Tifow and Sayilir (2015) investigated manufacturing firms listed on Borsa Istanbul in Turkey between 2008-2013. As independent variables, STDTA, LTDTA and TDTA were used while as dependent variables ROA, ROE, EPS and Tobin's Q were used. The study concluded that STDTA was negatively related to ROA, EPS and Tobin's Q. Moreover, they found the ratio LTDTA to be negatively related to ROE, EPS and Tobin's Q and positively related to ROA.

In general, empirical studies investigating the relationship between capital structure and firm performance have been found to end up with mixed results. The studies have been made in both developed and emerging markets and our study aims to extend the existing literature.

This will be done by empirically investigate the relationship between capital structure and firm performance in the Norwegian market.

Capital structure and firm performance including Norway:

Weill (2008) investigated the relationship between capital structure and firm performance in seven European countries between 1998-2000. The sample included 11836 manufacturing companies, where 409 of them were from Norway. The findings suggested that leverage and corporate performance varied across the countries. The results showed that in five of the countries, including Norway, a positive and significant relationship between leverage and firm performance was found. Italy was the only country with a negative relationship between corporate performance and leverage, while no significant relationship was found in Portugal. The differences were claimed to be a result of the access to bank credit and the efficiency of the legal system.

TABLE 2: EMPIRICAL STUDIES - CAPITAL STRUCTURE AND FIRM PERFORMANCE

Authors and date	Geography	Year range of date	Dependent variables	Independent variables	Results
Vatavu (2015)	Romania	2003-2010	ROA, ROE	STDTA, LTDTA, TDTA	Supports the Pecking order theory
Salim and Yadav (2012)	Malaysia	1995-2011	ROA, ROE, EPS, Tobin`s Q	STDTA, LTDTA, TDTA	Mixed support for pecking order and trade-off theory
Gleason et al. (2000)	14 European countries	1994-1995	ROA, PM	TDTA	Supports the Pecking order theory
Majumdar and Chhibber (1999)	India	1988-1994	Return on net worth	Debt/Equity	Supports the Pecking order theory
Zeitun and Tian (2007)	Jordan	1989-2003	ROE, ROA, EBITDA/Tot assets, Tobin`s Q, P/E, MV equity/BV equity	STDTA, LTDTA, TDTA, TDTE, TDTC	Supports the Pecking order theory
Ahmad et al. (2012)	Malaysia	2005-2010	ROE, ROA	STDTA, LTDTA, TDTA	Mixed support for pecking order and trade-off theory
Abor (2005)	Ghana	1998-2002	ROE	STDTA, LTDTA, TDTA	Mixed support for pecking order and trade-off theory
Arabahmadi and Arabahmadi. (2013)	Teheran	1999-2008	ROE	STD/Tot capital, LTD/Tot capital, TD/Tot capital	Mixed support for pecking order and trade-off theory
Weill (2008)	Belgium, France, Germany, Italy, Norway, Portugal, Spain	1998-2000	Cost efficiency mean	Leverage, Size, Tangibility, Inventory, STDTD	Supports the trade-off theory
Tifow and Sayilir (2015)	Turkey	2008-2013	ROA, ROE, EPS, Tobin`s Q	STDTA, LTDTA, TDTA	Mixed support for pecking order and trade-off theory

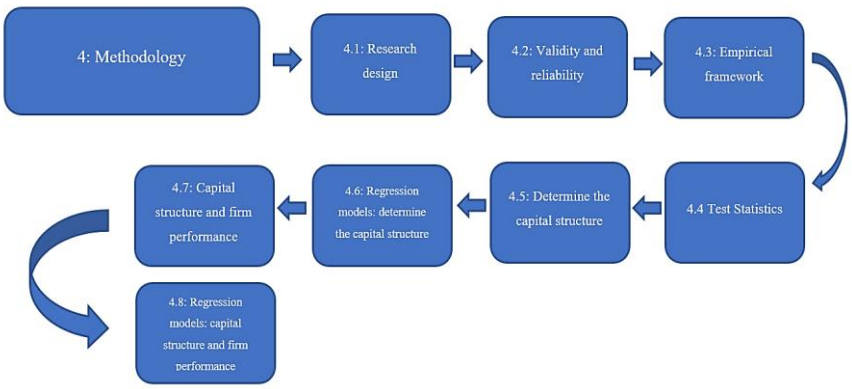
4. METHODOLGY

In this section we will begin with a short description of the data collection process and research design. More specifically, we explain and discuss the regression models and the statistical tests that will be used to answer our research question. We will follow up by presenting the dependent and independent variables used in our regression models. In this part, it is essential for you, as a reader, to have a clear frame of the methodology chapter, before continuing the journey. Our study is divided into two separate sections with their own individual main objectives.

The first part is about determining the factors of capital structure for listed Norwegian companies over the period 2006-2016. We will define and describe the independent and dependent variables in this section. Furthermore, we will link the factors with the theoretical and empirical research and discuss the effect it has on the firm's capital structure. The section will end with a presentation of the regression models with the chosen factors.

The second part is about how capital structure effects the performance of the Norwegian listed firms. The independent variables will be based on all the factors used in part one, so we will not go much deeper into those variables. However, in this section we will define and describe the dependent variables more in detail. Additionally, review the previous empirical research and discuss its findings on the performance measures. We will end the chapter with an overview of the regression models with the chosen factors.

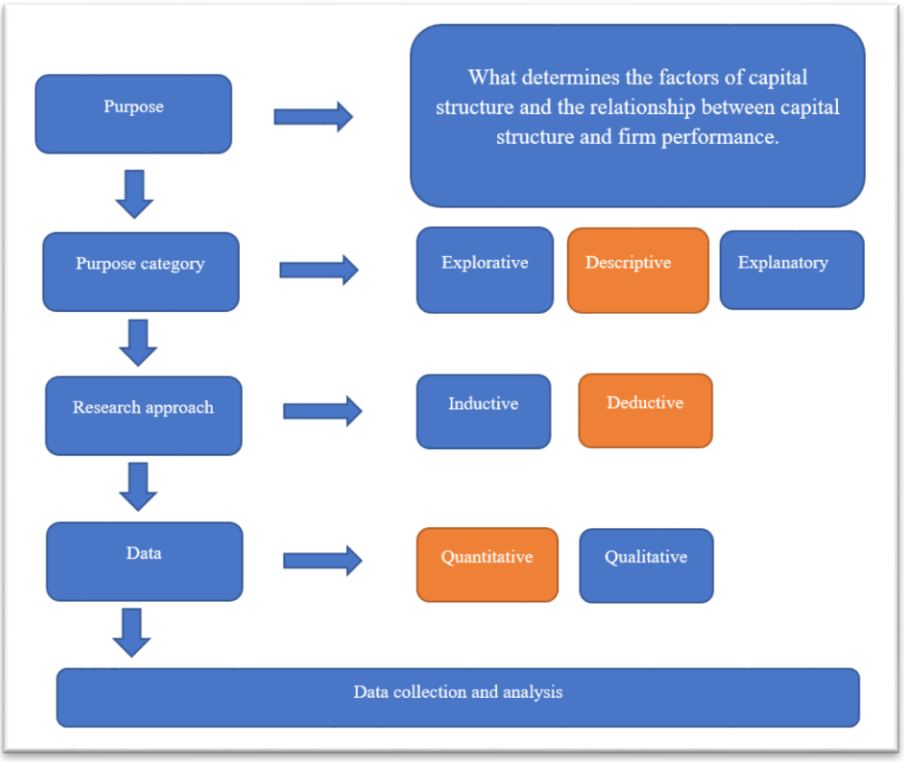
FIGURE 19: STRUCTURE OF THE SECTION



4.1 RESEARCH DESIGN

In this section we have provided a research design for data collection and analysis in accordance to Saunders et al. (2009). The framework is designed and based on the problem statement of the study. In the rest of the sub-sections we will discuss the suitability of our choices in accordance to our research.

FIGURE 20: RESEARCH DESIGN



The figure illustrates the research design used in this paper. Source: Authors own illustration

Nature of the research – Explorative, Descriptive and Explanatory

The nature of the research is defined by Saunders et al. (2009) into three categories, explorative, descriptive and explanatory. First, explorative research papers expose new information, by for example taking an established theory and apply it in newly emerged phenomena. The purpose of such study is to see whether these developed theories fits into these phenomena. On the other hand, a researcher can also develop a theory by explaining and

describing the new phenomena. The problem statement in these types of research papers would begin with the question *what.* Second, a descriptive study has as intention to explain and provide an additional information regarding the topic. The descriptive nature is based on previous explorative research, meaning a researcher will use a previous study as a guidance to perform its study properly. The problem statement in this type of paper will begin with *how.* Finally, Explanatory study tries to explain the relationship between the variables. This kind of research will try to explain *why* things happen. However, Saunders et al. (2009) states that differentiating between these three natures of research is very difficult.

The focus of this paper is *what* determines the capital structure and *how* does it affect the performance of the Norwegian companies. We will not go deep into *why* these relationships might exist. As a result, this study can be seen to have a combination of exploratory and descriptive nature of research.

Research approach – Inductive and Deductive

We will now consider the research approach in this thesis. Saunders et al. (2009) stated that the research can be either inductive or deductive. Considering inductive approach, the researcher will first examine the collected data and then refer to the established theories in order to explain the findings. In a deductive approach, the researcher will formulate hypothesis based on the existing literature and then investigates it based on data. In this paper, we have adopted the inductive approach. Our study is based on previous empirical papers used to determine the factors of capital structure and its effect on firm performance. After analyzing the data, we compare it to the established theories, such as pecking order and trade-off theory.

Data collection – quantitative and Qualitative

The study is based on quantitative secondary data (Saunders et al., 2009, p.681), which has been gathered from Thomson Reuters DataStream, and the quality of our sample is based on

the correctness of this database. Furthermore, to analyze the raw data, we have used Microsoft Office Excel and STATA to make a set of panel data and run the chosen regression models.

Our sample period is set between 2006-2016, which includes recent data, but also covers a longer period to mitigate the possible bias from year specific effects. Also, due to the cyclicality in some sectors, we consider it important that our sample period covers at least one cycle, and it also gives us the opportunity to observe how the capital structure is behaving over a longer period.

We first included all the listed firms that are traded in OSEAX from 2006-2016, which resulted in 96 companies. Second, we excluded the firms with missing values through the sample period. Third, we deleted banks and insurance companies, due to the differences in their financial statement compared to other companies (Ebaid, 2009). Finally, we ended up with a sample data of 78 firms, resulting in a total of 858 observation in a set of panel data. For safety reasons, we also made sure that the extreme values were in line with the annual figures reported by the companies. In Table 3 we can observe the industry distribution of the 78 companies. Notable is that the information technology, consumer staples, industrials and energy sectors are significantly over-represented compared to other sectors. This is in line with what we discussed previously where the Norwegian economy is heavily weighted in the oil and gas, sea food and shipping industry. The seafood sector is represented under consumer staples whereas shipping companies are found under the industrial sector.

TABLE 3: INDUSTRY DISTRIBUTION OF THE SAMPLE

Industry	Number of companies
Information Technology	13
Consumer Staples	9
Consumer Discretionary	2
Materials	3
Financials	2
Industrials	26
Real Estate	3
Health Care	3
Telecommunication Services	1
Energy	16
Total companies	**78**

The table presents the number of companies in each industry in the Norwegian market during 2006-2016. *Source*: Authors' own illustration using numbers from DataStream.

4.2 VALIDITY AND RELIABILITY

Reliability and validity controls the quality of the research. Reliability measures the consistency of the collected data and analysis. High reliability means that the data and the analysis would give the same result as if it was performed by others or in another time period (Saunders et al., 2009). A typical issue regarding reliability is if the collected data is biased. In this paper, we have included quantitative secondary data, so the threat can be considered as low. Furthermore, the regression models applied in this paper are easily replicable and commonly used. We also seek for high transparency throughout the research paper, including the process of gathering the data and during the analysis section. Overall, we consider the thesis to be highly reliable.

The validity concerns the arguments made in this paper. It is characterized as the degree of whether the chosen variables in the study actually measures what it is supposed to and whether it represents the casual relationship as stated (Saunders et al., 2009). We can separate the discussion regarding validity into internal, external and construct validity.

Internal validity concerns the robustness of the causal relationship in the findings (Saunders et al., 2009). A key factor is whether the researcher is able to argue for why there should be relationship between independent and dependent variables. In this paper, we have chosen our dependent and independent variables based on the previous studies. The majority of the studies have presented a significant relationship between their dependent and independent variables. As a result, this study provides a high internal validity.

External validity concerns how generalized the findings are. It is debatable whether the results can be generalized across countries. In order to assure to some length generalization in this research, we collected a sample period based on 11 years. This will cover different business cycles but whether its generalized in the future is debatable. However, the results we have obtained in the paper will not be transferable to other countries.

Construct validity is concerned with whether the thesis measures what it is supposed to measure. In this paper, we have chosen the variables based on previews studies that has proved to be significant. The measures ROE, ROA and Tobin Q has been common measures for profitability, while short-term, long-term and total debt has been common definitions of

capital structure. However, the factors for determining capital structure varies substantially depending on the problem statement of the specific study. We have chosen six factors that have turned out to be highly significant for determining the capital structure according to previous research.

4.3 EMPIRICAL FRAMEWORK

The research is based on panel data, which can be defined as a combination of time-series and cross-sectional data. Hence with observations on the same cross-sectional units over a specific period. Also, since each cross-sectional unit in our study has the same number of observations, it can be considered as a balanced set of panel data. (Gujarati, 2004 p.562). Furthermore, we will use multiple regression analysis to investigate the relationship between the dependent and independent variables. By working with multiple regression models, we can investigate this relationship between a response variable and more than one explanatory variable.

There are several advantages of using panel data over cross-section or time-series data. First of all, since panel data relate to firms, states or countries etc., over time, there may be bound to exist heterogeneity in these units (Gujarati, 2004 p.637). Panel data estimation can take this heterogeneity explicitly into account by allowing for firm-specific variables. Second of all, by using a combination of cross-section and time series data, panel data allows for more informative data with higher variability and it also increases the sample size considerably. Finally, by studying repeated cross-sectional observations, panel data are well suited to study changes over time and enables the ability to study more complicated behavioral models (Gujarati, 2004 p.637).

Even though there are substantial advantages using panel data, some shortcomings do exist. Since it consists of both cross-section and time-series data, it suffers from the problems that exists within these individual models. For cross-sectional dimensions, this problem is mainly heteroscedasticity, and for time-series dimensions it is mainly autocorrelation. To address these problems, there are several estimation techniques available. In general, when working with panel data, the general pooled OLS, fixed effects model and random effects model are

common estimation methods being used. In addition, we will also present the FGLS model, to make sure that we end up with highest persistence and robust findings.

TABLE 4: ESTIMATION METHODS IMPLIED IN DIFFERENT STUDIES

Authors	Estimation methods
Ebaid (2009) Salim and Yadav (2012)	Pooled OLS
Tifow and Sayilir (2015)	FGLS
Chadha and Sharma (2015)	FE
Mugosa (2015)	Pooled OLS, FE, FGLS and Tobit regression
Le and Phan (2017) Oino and Ukaegbu, (2015)	Pooled OLS, FE, RE and GMM

Source: Authors own illustration based on the estimation methods used in previous research papers

4.3.1 POOLED ORDINARY LEAST SQUARE (OLS)

Regression is a popular and commonly used statistical technique in social sciences. The basic linear model can be presented as:

EQUATION 6: BASIC LINEAR MODEL

$$Y_{it} = \alpha + \beta_1 X_{it} + \mu_{it}$$

where:

Y_{it} = Dependent variable for company *i* at time *t*

X_{it} = K x 1 vector of explanatory variables

β_1 = K x 1 vector of constants

μ_{it} = Error term for company *i* at time *t*

The coefficient α is common for all firms while μ_{it} is the unobserved factor. The model estimates a constant that is equal across all the firms and the main idea behind OLS regression is that it provides an intercept and slope that is identical to all firms. The model falls short, when it ignores any form of heterogeneity across the firms. If unobserved heterogeneity does not exist and μ_{it} is independent to the all chosen X_{it}, the OLS model would be consistent and appropriate to use (Le & Phan, 2017).

4.3.2 FIXED EFFECTS MODEL

When using a fixed effect model (FE), the individuality α_i of each firm or cross-sectional unit is taken into consideration by allowing the intercept in the regression model to differ, but the slope of the coefficients is constant across firms (Gujarati, 2004 p.640). This allows for the fact that each firm may have some special characteristics of its own, but does not vary over time, which means that it is time-invariant. Nonetheless, the intercept varies for all firms, giving each of the companies a unique intercept. The difference in the intercepts are the unobserved variation between cross-sectional units, which could be due to differences in the managerial style or philosophy etc. (Gujarati, 2004, p.642). Moreover, the fixed effects model considers the time-invariant characteristics to be unique for all companies, and does not allow the company's error term and the constant to correlate with other companies (Torres-Reyna, 2007).

According to Huang and Ritter (2009), the speed adjustment is perhaps the most important issue in the study of capital structure. For instance, when we looked at the pooled OLS, the regression model did not take the unobserved heteroscedasticity into consideration. This underestimates the speed of adjustments, which can be improved by adding a firm specific effect to OLS (Oino & Ukaegbu, 2015). The model for fixed effect can be formulated in the following way:

EQUATION 7: THE FIXED EFFECT MODEL

$$Y_{it} = \beta_1 X_{it} + \alpha_i + \mu_{it}$$

Where Y_{it} is the dependent variable, β_1 is the coefficient of independent variable, X_{it} is the independent variable. Furthermore, α_i is the individual error component at the firm level (Torres-Reyna, 2007).

4.3.3 RANDOM EFFECT MODEL

An alternative to the FE model is the random effects model (RE), where it is assumed that the intercept of each individual unit is a random drawing from a large population with a constant average. The model estimates the coefficients under the assumption that individual or group effect are uncorrelated across the firms. It allows for the intercept to vary across the units, but the variation will be treated randomly. The intercept is then calculated as the deviation from the constant mean (Gujarati, 2004, p.647).

An advantage of the RE model compared to the FE model is that we do not have to estimate N number of cross-sectional intercepts. There is only need of estimating the mean value of the intercept and its variance. A RE model is appropriate to use when the intercept of each cross-sectional unit is uncorrelated with the independent variables (Gujarati, 2004, p.650). The model can be formulated in the following way:

EQUATION 8: RANDOM EFFECT MODEL

$$Y_{it} = \alpha + \beta_1 X_{it} + \mu_{it} + \varepsilon_{it}$$

Where Y_{it} is the independent variable for company i at time t, β_1 is the coefficient of the independent variable, X_{it} is the independent variable for firm i and time t and α is the constant in the regression model. Furthermore, μ_{it} is the error term between entity and ε_{it} is the error term within entity.

4.3.4 FEASIBLE GENERALIZED LEAST SQUARES (FGLS)

To control for autocorrelation and heteroscedasticity we finally apply the Feasible Generalized Least Square (FGLS) method. We are interested to compare the results with the other models that were mentioned above. The FGLS model is able to absorb specific effects and solve within-cluster correlation and heteroscedasticity (Mugosa, 2015). Furthermore, the model provides consistency and efficiency of the estimators with coefficients that are significant. FGLS is preferred above Generalized Least Squares (GLS), since we do not know the true value of the variance and covariance for the disturbance terms that are used by GLS, which is unknown in reality. As a result, the model is not feasible estimator (Wooldridge, 2002).

The Feasible Generalized Least Squares model (FGLS) allows for estimation with presence of AR (1) autocorrelation and heteroscedasticity across the panel data (Mugosa, 2015). According to Mugosa (2015) the model can be formulated in the following way:

EQUATION 9: FEASIBLE GENERALIZED LEAST SQUARES MODEL

$$\beta_{FGLS} = (X' \Omega X)^{-1} X' \Omega Y$$

Where X represents the independent variable, Y corresponds to the dependent variable and finally Ω represents the covariance matrix of unique errors.

4.4 TEST STATISTICS

4.4.1 F-TEST AND BREUSCH-PAGAN LAGRANGE MULTIPLIER (LM)

To decide whether RE and FE models are more appropriate than OLS, we have performed two different tests in STATA. The F-test is employed to determine whether OLS or FE is a better model for our data. The Breusch-Pagan Lagrange Multiplier (LM) is conducted to

decide between RE and pooled OLS. According to both models, the null hypothesis finds pooled OLS as the most appropriate model, while the alternative hypothesis would choose FE and RE models (Oino & Ukaegbu, 2015).

4.4.2 HAUSMAN TEST

The Hausman principle is applicable to all hypothesis tests where we have two different estimates. The comparison between the RE and FE models are one possible way of using it (Hausman, 1987). Before we compare two estimates with each other, we need to remember that the first variable should be consistent under the null and alternative hypothesis. The second variable should be consistent under the null hypothesis, but inconsistent under the alternative hypothesis. To explain further in details how the Hausman test works, we will use the general linear model. The formula is presented in the following way:

EQUATION 10: GENERAL LINEAR MODEL

$$Y_{it} = \alpha + \beta X_{it} + \alpha_i + e_{it}$$

$$\mu_{it} = \alpha_i + e_{it}$$

Y_{it} stands for the dependent variable of a specific firm i at time t. X_{it} is the independent variable for the specific company i at time t and β is coefficient factor for independent variable. Here we assume that the error term μ_{it} includes a time-invariant individual component α_i and idiosyncratic error that is normally distributed with mean of zero and a constant variance. It is worth noticing that the α_i does not have the subscript t, since it only captures the firm specific time-invariant factors that otherwise would have been avoided (Kunst, 2009).

As mentioned previously, the random effects model essentially assumes that the covariance between α_i and $X_{it}$is zero. If the covariance is equal to zero, both RE and FE are consistent estimators. If this condition is satisfied, a RE model would be more efficient than a FE model. This is the case due to the standard errors of the RE model being lower than FE model. If the covariance between α_i and X_{it} does not equal to zero, the FE is solely consistent, while RE is

not. The test has an asymptotic distribution and if the null hypothesis is rejected, it concludes that RE model is not appropriate and a fixed effects model should be used (Kunst, 2009).

The Hausman test is constructed by using the numerator equal to the difference between FE and RE estimated value of the parameter beta. The denominator is the difference between the variance of FE and RE estimates. The Statistic H, is distributed as x^2 under the null hypothesis, with degrees of freedom corresponding to the dimension of β (Pedace, 2013, p.302).

EQUATION 11: HAUSMAN TEST

$$H = \frac{\left(\hat{\beta}_{FE} - \hat{\beta}_{RE}\right)^2}{Var\left(\hat{\beta}_{FE}\right) - Var\left(\hat{\beta}_{RE}\right)} \sim x^2$$

$$H0: Cov(\alpha_i, X_{it}) = 0$$
$$HA: Cov(\alpha_i, X_{it}) \neq 0$$

4.4.3 AUTOCORRELATION

Autocorrelation can be seen as correlation between variables used in series ordered in time (time-series data) or space (cross-sectional data). Classical linear regression model assume that autocorrelation does not exist in the disturbances μ_{it}. A consequence of having autocorrelation in linear panel data is that it results in biased standard errors, which in return provides a result that is less efficient (Gujarati, 2004, p.489). Several tests have been proposed for panel data throughout the years, we will in this paper be using the Wooldridge (2002) test. This is very attractive, since it requires few assumptions to be implemented. The Wooldridge test identifies whether serial correlation exist in the idiosyncratic error terms of the panel data.

4.4.4 HETEROSCEDASTICITY

When using linear regression model, a critical assumption is that the error terms μ_i all have the same variance, σ_i^2. The error terms are then considered to be homoscedastic. If this condition is not fulfilled, heteroscedasticity is present in the data. If this is the case, the estimators are no longer minimum variance or efficient (Gujarati, 2004, p.427). Heteroscedasticity is typically encountered when using cross-sectional data. Since we are using panel data which consists of both cross-sectional and time-series observations, the critical assumption of homoscedasticity might be violated. Although the error process might be homoscedastic within cross-sectional units, it can still differ across units. This is known as groupwise heteroscedasticity. In order to determine whether this is the case in our data, we will be using a modified Wald test for the FE model. The test is chi-squared distributed with a null hypothesis of homoscedasticity (Antonie et al., 2010).

4.4.5 MULTICOLLINEARITY

Correlation can be seen as the relationship between two variables and it explains mainly two things. First, we get the direction between the two variables and secondly, we get the strength of the relationship between the same variables (Gujarati, 2004, p.23). In statistics, coefficients lower than 0.3 is considered to have little or no correlation, whereas a correlation between 0.3 and 0.5 is considered low. Furthermore, values between 0.5 and 0.7 is considered moderate, while coefficients between 0.7 and 0.9 is considered as highly correlated. The pairwise correlations also provides an indication of problems regarding multicollinearity. These problems might occur when the independent variables are correlated, which results in large standard errors. The consequence of multicollinearity is that the coefficients cannot be estimated with great accuracy (Gujarati, 2004, p.350).

Multicollinearity is a potential problem that have to be examined for when performing regression analysis. This problem might be serious, since it decreases the variability of the results. One of the main issues is that it makes some of the independent variables insignificant, while they in fact are significant (Hair et al., 2010).

Pearson's correlation was employed to diagnose the potential collinearity between the independent variables. The coefficient of 1, both positive and negative, is associated with a perfect linear relationship. On the other hand, a correlation of zero concludes that there is no relationship between two variables. If the correlation between two variables is greater than 0.7, multicollinearity might be present in the data (Wooldridge, 2015).

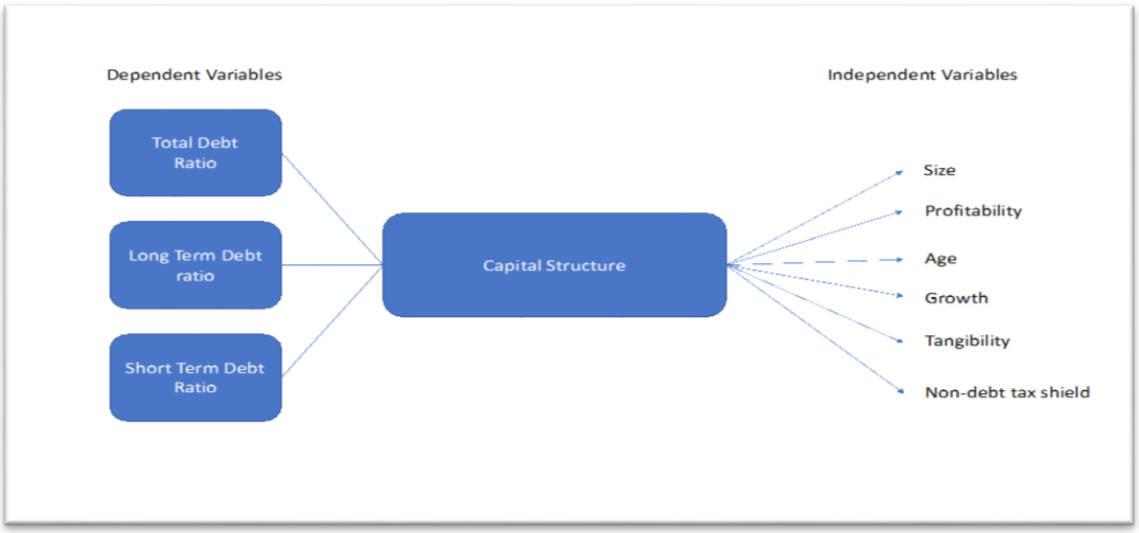
To verify that multicollinearity will not be an issue for our sample, we have also conducted a Variance Inflation Factor (VIF) test. The test is a well-known within statistics and used to analyze in which degree the variables are correlated with each other. According to Pedace (2013, p.184), low VIF values are favored, and values above 10 indicates multicollinearity.

4.5 DETERMINING FACTORS OF CAPITAL STRUCTURE

To estimate and identify determining factors of capital structure in Norwegian companies, we are using previous studies in addition to developed theories which have been discussed in chapter 2. It is important to notice that these theories are not exclusive when it comes to explaining the choice of capital structure of a company. Each theory is used to analyze the dynamics of capital structure, but in reality, it is a function affected by several other factors which may be rooted in all underlying theories (Parson and Titman, 2008).

During the past years, empirical studies have ended up with conclusions both in line with the expectations of existing theories, but also contradicting results. For example, the pecking order theory and the trade-off theory are often correlated in opposite directions between the determining factors and leverage. This makes it difficult to evaluate and interpret the results and conclude which theory is the most prominent. During our study, multiple regression analysis has been employed for testing the impact of the chosen independent variables on the dependent variables. Based on previous empirical literature, we have chosen six explanatory factors that are expected to explain the leverage ratios of the Norwegian companies. Similarly, we have used three ratios of leverage, representing capital structure. All the chosen factors are discussed and defined in this chapter.

FIGURE 21: DETERMINING CAPITAL STRUCTURE – DEPENDENT AND INDEPENDENT VARIABLES



The figure illustrates the chosen dependent and independent variables for investigating the capital structure for Norwegian companies. *Source*: Authors own illustration

4.5.1 DEPENDENT VARIABLES

As dependent variables, we have chosen three different leverage ratios, used as a measurement of capital structure for each company. The factors employed are short-term debt, long-term debt and total debt as a ratio of total assets. The chosen factors are in line with the ones used in several previous studies (Rajan and Zingales, 1995; Nasimi, 2016; Chakraborty, 2010). All variables are measured in terms of book values and they are defined in the following way:

SHORT-TERM DEBT TO TOTAL ASSET (STDTA):

Short-term debt is also known as the current liabilities on the balance sheet of a company. It is mainly used to fund short-term obligations, such as funding payroll or serving recurring expenses such as utilities and rent. The debt is considered short-term since the money borrowed are generally supposed to be repaid within one year (RBC Royal Bank, 2009). Therefore, the debt ratio provides an overview of the company's ability to fulfill the short

term financial obligations. Using same approach as several previous studies, for example Chadha and Sharma (2015) and Nasimi (2016), the leverage ratio is calculated as short-term debt over total assets.

EQUATION 12:SHORT-TERM DEBT TO TOTAL ASSETS

$$STDTA = \frac{Short\ Term\ Debt}{Total\ Assets}$$

LONG-TERM DEBT TO TOTAL ASSET (LTDTA):

LTDTA provides information about the portion of a company's total assets that are financed with long-term debt. It mainly covers investments or purchases that usually has a repayment time longer than one year. These investments may be real estate, equipment and leasehold improvements. The usage of long-term debt financing to fund long-term asset investments enables the company to preserve cash and liquid business assets to fund daily expenses. Compared to short-term debt, long-term debt often allows well defined repayment terms with fixed payments over the agreed period (RBC Royal Bank, 2009). The ratio varies from different market sectors and can be considered as highly firm specific. Similar to Nasimi (2016), the ratio is calculated as long-term debt over total assets.

EQUATION 13: LONG-TERM DEBT TO TOTAL ASSETS

$$LTDTA = \frac{Long\ Term\ Debt}{Total\ Assets}$$

TOTAL DEBT TO TOTAL ASSET (TDTA):

As a final proxy of capital structure, the total debt ratio was used. Since the ratio includes both long- and short-term obligations, it provides creditors and investors with information about the total amount of leverage being used by a company. A lower ratio indicates that the company is financing its operations with less leverage and holds a larger fraction of equity. A higher ratio indicates that the company has taken on more risk, which increases the default probability of the company (Berk and DeMarzo, 2013, p.531). Similar to Nasimi (2016), the ratio was calculated as total debt over total assets.

EQUATION 14: TOTAL DEBT TO TOTAL ASSETS

$$TDTA = \frac{Total\ Debt}{Total\ Assets}$$

4.5.2 INDEPENDENT VARIABLES

In this section, we will present factors that according to developed theories may influence the financing decision of a company. It is important to notice that there are uncountable ways of finding, defining and measuring the correct determinants of capital structure (Harris & Raviv, 1991). During our study, we will limit the factors to the most commonly used explanatory variables. We will provide a brief description of each of the chosen determinants used during our study, and their relationship to chosen capital structure theories.

SIZE:

Firm size has in several academic papers been empirically significant in relation to determine the capital structure. In the US, large firms tend to have higher leverage ratios compared to smaller ones (Fama and French, 2002). Similarly, international cross-sectional studies made by Rajan and Zingales (1995) finds mixed results, but they argue that in most countries

leverage is positively correlated with firm size.

There are several reasons why factor size has an impact on firm leverage. Leary and Roberts (2004) argues that large firms tend to have access to better terms and cheaper funding compared to smaller firms. Additionally, large firms are claimed to be more diversified when it comes to their financing sources, which tends to reduce the risk of bankruptcy. Furthermore, Shumway (2001) argues that the size of the outstanding equity is a crucial predictor of the probability of a firm to default. Moreover, other empirical studies also indicate that the direct costs of bankruptcy are relatively low for large firms, which according to trade-off theory would result in a positive relationship to leverage.

Most empirical studies find a robust and positive relationship between firm size and leverage. For example, Serghiescu and Vaidean (2014) finds size as an explanatory variable positively correlated with the level of debt when investigating listed companies in the Bucharest Stock Exchange over the period 2009-2011. These findings are in thereby line with the predictions of the trade-off theory.

Barclay, Marx and Smith (1998) finds a negative relationship between size and leverage, where they argue that larger companies in general are financed with lower leverage due to their lower costs of issuing equity. Also, Rajan and Zingales (1995) claims that larger firms tend to disclose more information to outsiders compared to small firms. Hence, large firms with less asymmetric information problem should have more equity than debt, resulting in a lower leverage ratio. Due to this, following the pecking order theory, firm size is expected to be negatively related to debt.

Overall, the factor size is considered to be among the most significant variables in determining capital structure. In addition, it is also commonly used as a control variable in several empirical corporate finance studies. The factor has been defined in a number of ways in previous literature. Rajan and Zingales (1995) defined size as the logarithm of annual sale while Fama and French (2002) defined the factor as the logarithm of book value of total assets. In this research paper, we have defined size as the natural logarithm of total assets. The use of natural logarithm also reduces the dispersion and minimizes the effects of extreme observations (Anthony, 2008).

EQUATION 15: SIZE

$$Size = Log(Total\ Assets)$$

PROFITABILITY (PROF):

Using different theoretical approaches will result in different expectations about the relationship between the profitability and leverage of a company. The pecking order theory presented in section 2, suggests that a profitable company would prefer internal funding to external funding. Hence, companies with larger cash inflows would be financing their operations with less debt, and more with retained earnings, resulting in a lower leverage ratio. According to the pecking order theory, we expect a negative relationship between profitability and leverage.

The trade-off theory, predicts a positive relationship between profitability and leverage. This is because an increase in profitability, ceteris paribus, would result in a reduction in the expected bankruptcy costs. According to the trade-off theory, an increase in agency costs, bankruptcy costs or taxes, push firms with high profitability towards higher leverage. Also, the existence of deductibility of corporate interest payments encourages profitable firms to increase the leverage to benefit from the interest tax shield. Moreover, if past profitability can be considered as a reasonable proxy for the future, companies with high degree of profitability may be able to increase their level of debt. This may be the case since the ability of paying back the debt can be considered as greater, resulting in better terms reducing their cost of debt.

Empirical studies indicate mixed results between profitability and leverage. For example, Rajan and Zingales (1995) and Booth et al. (2001) finds a negative relationship between profitability and the level of leverage, which supports the pecking order theory. On the other hand, Jensen, Solberg and Zorn (1992) concluded contradicting results by finding a positive relation between profitability and leverage, which supports the trade-off theory.

Overall, profitability is considered as an important factor in determining the capital structure of a firm. The factor is defined and calculated as net income divided by total assets (Frank and Goyal, 2008). The equation can be formulated in the following way:

EQUATION 16: PROFITABILITY

$$Profitability = \frac{Net\ income}{Total\ Assets}$$

AGE:

Diamond (1989) investigated the incentive problem between borrowers and lenders by considering reputation, which he defined as the credit rating of the company. The study concluded that the problems were most severe in early periods when new firms had short track records. It also highlighted that successful companies over time were able to continually repay their outstanding debt and thereby strengthening their reputation. The study also found that mature companies, as they achieved a good reputation, were able to reduce their cost of debt, due to better terms from the lenders. A decrease in the interest rate caused by a stronger reputation will have different effects on the leverage depending on which theory we apply.

According to the trade-off theory, a reduction in borrowing costs may have different effects on the leverage ratio. The theory in general indicates that lower interest rates would result in higher leverage ratios. On the other hand, if a mature company experiences financial difficulty, it might affect the reputation of the company in a negative way and result in an increase in the cost of debt in the future. From this point of view, a higher interest rate would result in a decrease in the leverage ratio.

In general, mature companies may have a higher ability to finance their operations and investments using internally generated funds. This would, from a pecking order perspective, predict a negative relationship between age and leverage. This is confirmed by Frank and Goyal (2009), who were examining the factors influencing capital structure in publicly traded American firms between 1950 and 2003. They concluded that mature and more established firms were able to finance most of their capital expenditures from internally generated funds,

such as retained earnings. The findings also indicate that young firms will rely more on debt financing when developing their companies.

In conclusion, it is important to have in mind that the relationship between age and good reputation may not always be true. For example, a young firm could have an experienced management team resulting in a strong reputation within the industry. Furthermore, we believe firm age to be a significant factor based on previous studies. During our study, the factor is defined as the number of years the company has been in business.

GROWTH:

The issue whether growth opportunities affect the decision about firm`s capital structure can be viewed from a trade-off perspective. According to Frank and Goyal (2008), growth firms tend to lose more of their value when they go into financial distress, increasing the expected bankruptcy costs. The theory thereby predicts a negative relationship between leverage and firm growth.

Agency theory also predicts a negative relationship between growth and leverage, since underinvestment problems is considered to be more severe for growth companies. The issue of underinvestment may occur due to firms with risky debt have an incentive not to invest in positive NPV project because the shareholders bear the entire cost but only receives a part of the profits (Myers, 1977).

According to the pecking order theory, firms with higher growth opportunities, should issue more debt over time. This expectation is built on the assumption that growth firms have a high demand for funding and may not always have sufficient retained earnings to fund their investments. Hence, external funds must be used, such as debt and equity. The theory thereby predicts a positive relationship between leverage and growth (Frank and Goyal, 2008).

There have been several academic research papers investigating the relationship between leverage and growth over the past decades, including Rajan and Zingales (1995) and Frank and Goyal (2008). Rajan and Zingales (1995) concluded that there is a negative relation between leverage and growth of companies in all G7 countries. Most of the empirical studies

have confirmed the negative relationship, which also is in line with the predictions of the trade-off theory. However, some studies do find the opposite results where growth is positively related to leverage (Booth et al., 2001).

Overall, the outcome of previous studies seems to vary substantially. One of the reasons could be due to different definitions and calculations of the factor. It is challenging to choose the most appropriate definition, but during our study, we have chosen to follow Nasimi (2016), by measuring growth as the annual percentage change in revenues.

TANGIBILITY (TANG):

The trade-off and agency theory indicates a positive relationship between tangibility and leverage. From a trade-off perspective, having a high level of tangible assets will reduce the bankruptcy costs and a positive relation to leverage is expected. Furthermore, the agency theory states that shareholders have incentives to invest in a sub-optimal way due to the conflicts between lenders and shareholders. Due to this issue, lenders take actions to protect themselves by requiring tangible assets as collateral. Firms with high level of tangible assets will then be in a position to use these as a collateral and issue more debt. Hence, a positive relation between tangibility and leverage is expected. Moreover, tangible assets are easier to collateralize, since they suffer a smaller loss when companies go into financial distress.

Most empirical studies do observe a positive and significant relationship between tangibility and leverage, such as Jensen & Meckling (1976) and Rajan and Zingales (1995). During our study, we follow Huang and Song (2006) and Chakraborty (2010) by defining tangibility as the ratio between fixed assets and total assets.

EQUATION 17: TANGIBILITY

$$Tangibility = \frac{Fixed\ Assets}{Total\ assets}$$

NON-DEBT TAX SHIELD (NDTS):

In general, interest payments contribute to a reduction in payable taxes. However, there are also other methods a company can choose to reduce its tax payments. Depreciation and amortization of tangible and intangible assets may also be seen as tax reducing factor. In a study by DeAngelo and Masulis (1980), they claim that depreciation on assets are a substitute of the tax advantages from debt financing. As a result, companies with high non-debt tax shields (NDTS) would finance their investments with less debt simply because the companies already capture large tax savings from depreciation.

Bradley et al. (1984) found a positive relationship between leverage and NDTS when investigating 851 firms in the US over a 20-year period. They argue that the positive relation may be due to NDTS and its link to "securable" assets. From this statement, they argue that firms with large portions of fixed assets also have large amounts of depreciation. Since fixed assets may be used as collateral when issuing debt, a positive relationship to leverage could be expected.

Also, since different empirical studies are using different proxies for NDTS, it is challenging to find the most appropriate calculation. During our study, the variable is defined as depreciation and amortization over total assets, which is in line with previous studies by Huang and Song (2006) and Chakraborty (2010).

EQUATION 18: NON-DEBT TAX SHIELD (NDTS)

$$Non\ debt\ tax\ shield\ (NDTS) = \frac{Depreciation\ +\ Amortization}{Total\ assets}$$

TABLE 5: EMPIRICAL STUDIES AND THEORIES PREDICTION REGARDING DETERMINE THE FACTORS OF CAPITAL STRUCTURE

Variables	Author (Year)	Supporting theory	Pecking order	Trade-off
Size	Rajan and Zingales (1995) Serghiescu and Vaidean (2014) Barclay, Marx and Smith (1998)	Trade-off theory Trade-off theory Pecking order theory	-	+
Profitability	Jensen, Solberg and Zorn (1992) Rajan and Zingales (1995) Booth et al. (2001)	Trade-off theory Pecking order theory Pecking order theory	-	+
Age	Diamond (1989) Frank and Goyal (2009)	Trade-off theory Pecking order theory	-	+ / -
Growth	Rajan and Zingales (1995) Butt (2016) Booth et al. (2001)	Trade-off theory Trade-off theory Pecking order theory	+	-
Tangibility	Jensen and Meckling (1976) Harris and Raviv (1991)	Trade-off theory Pecking order theory	-	-
Non-Debt Tax shield	Bradley et al. (1984) Titman and Wessels (1988)	Trade-off theory Pecking order theory	-	-

The table illustrates empirical studies regarding the factors of determining the capital structure and the theories prediction between leverage and the factors.
Source: Authors own illustration.

4.6 REGRESSION MODELS: DETERMINE THE FACTORS OF CAPITAL STRUCTURE

The following regression models will examine the relationship between capital structure ($TDTA_{it}$, $STDTA_{it}$ and $LTDTA_{it}$) and the chosen factors ($SIZE_{it}$, $GROWTH_{it}$, $TANG_{it}$, $NDTS_{it}$, $PROF_{it}$ and AGE_{it}). The dependent variables consist of short-debt to total assets, long-term debt to total assets and total debt to total assets for firm i at time t. The independent variables consist of, size, growth, tangibility, non-debt tax shield, profitability and age for firm i at time t.

OLS REGRESSION MODEL

Under the hypothesis that there is no individual or group effect among the firms that are included in our paper, we estimate the pooled OLS model. The relationship between the dependent variables and independent variables can be displayed in the following form:

EQUATION 19: OLS REGRESSION FOR DETERMINING CAPITAL STRUCTURE

(1) $TDTA_{it} = \alpha + \beta_1 SIZE_{it} + \beta_2 GROWTH_{it} + \beta_3 TANG_{it} + \beta_4 NDTS_{it} + \beta_5 PROF_{it} + \beta_6 AGE_{it} + \mu_{it}$

(2) $STDTA_{it} = \alpha + \beta_1 SIZE_{it} + \beta_2 GROWTH_{it} + \beta_3 TANG_{it} + \beta_4 NDTS_{it} + \beta_5 PROF_{it} + \beta_6 AGE_{it} + \mu_{it}$

(3) $LTDTA_{it} = \alpha + \beta_1 SIZE_{it} + \beta_2 GROWTH_{it} + \beta_3 TANG_{it} + \beta_4 NDTS_{it} + \beta_5 PROF_{it} + \beta_6 AGE_{it} + \mu_{it}$

FIXED EFFECTS MODEL

When taking into consideration the specific characteristics of a firm α_i, we allow the intercept to vary, providing each of the companies with a unique intercept. The relationship between the dependent variables and independent variables when using a fixed effect model can be formulated as:

EQUATION 20: FIXED EFFECT FOR DETERMINING THE CAPITAL STRUCTURE

(4) $TDTA_{it} = \beta_1 SIZE_{it} + \beta_2 GROWTH_{it} + \beta_3 TANG_{it} + \beta_4 NDTS_{it} + \beta_5 PROF_{it} + \beta_6 AGE_{it} + \alpha_i + \mu_{it}$

(5) $STDTA_{it} = \beta_1 SIZE_{it} + \beta_2 GROWTH_{it} + \beta_3 TANG_{it} + \beta_4 NDTS_{it} + \beta_5 PROF_{it} + \beta_6 AGE_{it} + \alpha_i + \mu_{it}$

(6) $LTDTA_{it} = \beta_1 SIZE_{it} + \beta_2 GROWTH_{it} + \beta_3 TANG_{it} + \beta_4 NDTS_{it} + \beta_5 PROF_{it} + \beta_6 AGE_{it} + \alpha_i + \mu_{it}$

RANDOM EFFECTS MODEL

When the intercept of each cross-sectional unit is uncorrelated with the independent variables, a random effect model is appropriate to use. In our study, the models can be formulated in the following way:

EQUATION 21: RANDOM EFFECT FOR DETERMINING THE CAPITAL STRUCTURE

(7) $TDTA_{it} = \alpha + \beta_1 SIZE_{it} + \beta_2 GROWTH_{it} + \beta_3 TANG_{it} + \beta_4 NDTS_{it} + \beta_5 PROF_{it} + \beta_6 AGE_{it} + \mu_{it} + \varepsilon_{it}$

(8) $STDTA_{it} = \alpha + \beta_1 SIZE_{it} + \beta_2 GROWTH_{it} + \beta_3 TANG_{it} + \beta_4 NDTS_{it} + \beta_5 PROF_{it} + \beta_6 AGE_{it} + \mu_{it} + \varepsilon_{it}$

(9) $LTDTA_{it} = \alpha + \beta_1 SIZE_{it} + \beta_2 GROWTH_{it} + \beta_3 TANG_{it} + \beta_4 NDTS_{it} + \beta_5 PROF_{it} + \beta_6 AGE_{it} + \alpha_i + \varepsilon_{it}$

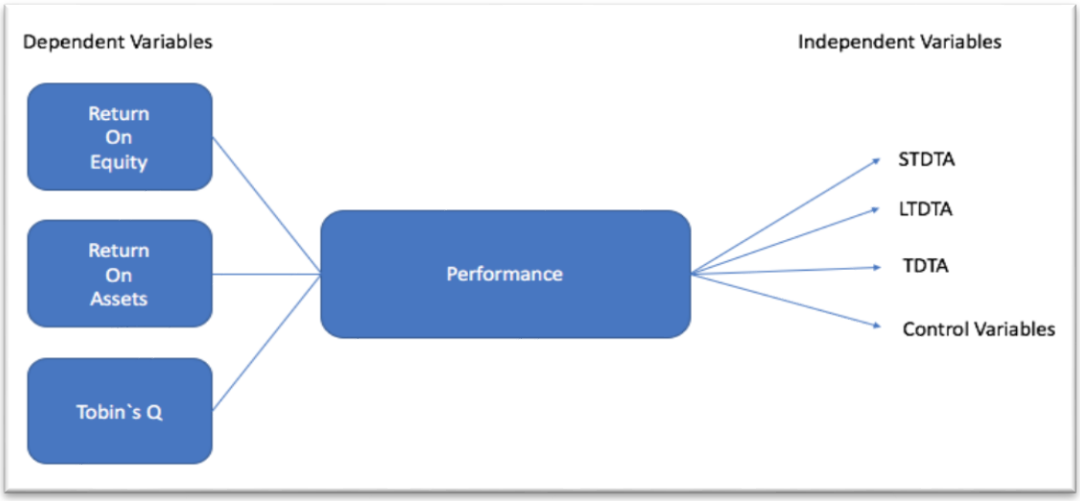
4.7 CAPITAL STRUCTURE AND FIRM PERFORMANCE

To evaluate the effect capital structure has on firm performance, a precise measure is crucial. In this study we have applied two accounting based measurements for performance. These are return on equity (ROE) and return on assets (ROA) and they are the most commonly used accounting based performance measures in previous studies, such as Abor (2005) and Salim & Yadav (2012). To calculate them, the values are generally found in the balance sheet and income statement of the company's annual report.

Our third and final chosen dependent variable is Tobin's Q, which is a market-based performance measure of a firm's assets. This ratio has also been commonly used in empirical studies, such as in Ebaid (2009) and Salim and Yadav (2012).

We have chosen to use these three measures as proxies of firm performance to investigate whether they can be explained by the independent variables or not. Our dependent and independent variables are presented and defined in the following sections.

FIGURE 22: DEPENDENT, INDEPENDENT AND CONTROL VARIABLES FOR THE EFFECT OF CAPITAL STRUCTURE ON FIRM PERFORMANCE



The figure illustrates the relationship of capital structure (STDTA, LTDTA and TDTA) and control variables (Age, Growth, Tangibility, NDTS and Size) to performance ratios (ROE, ROA, Tobin`s Q). *Source*: Authors own contribution

4.7.1 DEPENDENT VARIABLES

RETURN ON EQUITY (ROE):

One of the most commonly used performance measures in previous literature has been return on equity (ROE), which also is a crucial proxy since it measures the value contribution to the shareholders (Zeitun & Tian, 2007). The measure explains the efficiency of the management in sense of creating profits using the funds provided by the shareholders. Additionally, it is also popular due to the use of information from both balance sheet and income statement.

Empirical studies have found mixed results concerning the relationship between ROE and leverage. Abor (2005), studied listed firms in Ghana between 1988 and 2002 and found a positive and significant relationship between both STDTA and TDTA and ROE. On the other hand, Zeitun and Tian (2007) found a significant negative relationship when investigating firms in Jordan between 1989 and 2003. Similarly, Ebaid (2009), found a negative relationship when studying the Egyptian market. In our study, we have as most other studies, chosen to calculate ROE using the following formula:

EQUATION 22: RETURN ON EQUITY

$$ROE = \frac{Net\ Income}{Total\ Equity}$$

RETURN ON ASSETS (ROA):

Next proxy for performance is return on assets (ROA), which is calculated as net income divided by total assets. The ratio has also been used in several studies and it evaluates a company's efficiency and how well it is able to generate profits using all of its assets. A high ROA indicates that the company has been successful in translating assets into profits. Furthermore, Vatavu (2015) found a negative and significant relationship between ROA and leverage, when studying companies in the Romanian market between 2003 and 2010.

In general, there are two ways a company can increase their ROA. First, by increasing the net income, second, by becoming more effective in the use of the existing assets. Hence, the ratio is also often referred to as the profitability ratio or productivity ratio. During our study, we are using the same definition of ROA as Vatavu (2015), where the performance measure can be presented as:

EQUATION 23: RETURN ON ASSET

$$ROA = \frac{Net\ Income}{Total\ Assets}$$

TOBIN'S Q:

Tobin's Q is during our study representing the market performance of a firm. The ratio measures the market value of a firm compared to the replacement cost of the firm's assets.

James Tobin came up with the ratio based on his theory that the combined market value of all companies on a stock market should roughly equal their replacement cost. According to his theory, the market value of a firm should thereby be the same as the cost of starting up the same firm today.

A classical way of calculating the Q-value is by dividing the market value of a firm by its book value of total assets. However, due to data unavailability, the calculation of Tobin's Q is often challenging. Therefore, we have as similar to other studies, considered the market value of debt to be equal to book value of debt (Salim and Yadav, 2012). The market value of equity was calculated as the number of shares outstanding multiplied with price per share at the end of each year. The interpretation of the ratio is that a low Q-value (between 0 and 1), indicates that the cost of replacing the firm's assets is higher than the value of the stock. This would then imply that the stock is undervalued. In opposite, a high Q-value would imply that the stock is overvalued.

Empirical studies have ended up with different results regarding the relationship between Tobin's Q and leverage. Zeitun and Tian (2007) found a negative and significant relationship between TDTA and the ratio when investigating listed companies in Jordan between 1989-2003. On the other hand, Salim and Yadav (2012) found significant and positive relationships between all debt ratios and Tobin's Q when studying the Malaysian market between 1995 and 2011. Following the study of Zeitun and Tian (2007), the formula of the market performance measure can be presented as:

EQUATION 24: TOBIN'S Q

$$Tobin's\ Q = \frac{MV\ of\ Equity + BV\ of\ Debt}{BV\ of\ total\ Assets}$$

4.7.2 INDEPENDENT VARIABLES

As independent variables, we have chosen three different leverage ratios, representing the capital structure of a company. These are the ratios of short-term debt to total assets (STDTA), long-term debt to total assets (LTDTA) and total debt to total assets (TDTA). All ratios are in line with several empirical studies (Ebaid, 2009; Salim and Yadav, 2012). These variables were previously used in the section about determining the factors influencing the capital structure, where they are explained and defined. The difference in this section is that the capital structure ratios now will be used as explanatory variables. The intention with the regression models is to examine the effect these explanatory variables has on the performance of Norwegian firms.

4.7.3 CONTROL VARIABLES

Control variables are factors that will influence the outcome of the regression models, but are not of particular interest during a specific study. Their impact can be minimal or significant, but since they are known they must be included in order to be neutralized. The main idea is to remove their effect from the equation.

The first control variable is size, measured as the natural logarithm of total assets of each company. Previous literatures (Ebaid, 2009), suggests that the size of a company may influence its performance. These researchers argue that larger companies may have more capacity and more opportunities compared to smaller companies. Therefore, this study controls for the differences in the operating environment of the companies by including the size variable in the model. Also, the variable is included to control for company size effects on the dependent variables.

The second control variable is growth, measured as annual growth in sales. The variable was found to be positively related to ROA in a study by Zeitun and Tian (2007) who studied Jordanian companies between 1989-2003. Also, the variable has been commonly used as a control variable in empirical studies, such as in Salim & Yadav (2012).

The third control variable is age, measure as the number of years the company has been in business. The relationship between age and profitability has been investigated in a large number of studies during the years. Empirical studies by Majumdar (1997) found a significantly negative relationship between age and profitability when studying Indian firms between 1988 and 1994. Since other empirical studies have found a significant relationship, we decided to include the variable as a control variable in our study.

The forth control variable is tangibility, measured as fixed assets over total assets. Tangible assets are considered real things that a company has such as property, plant and equipment. As mentioned previously, the factor is claimed to have a vital role as a determining factor of capital structure. Also, Chadha and Sharma (2015) found a significant relationship between tangibility and financial performance. The results indicate that if a firm increases it`s tangible assets, it will affect the financial performance in a positive way. Hence, they claim that in order to maximize the shareholders wealth, managers should increase the investments in tangible assets.

The final control variable is the non-debt tax shield, defined as depreciation and amortization divided by total assets. A study by Abbas et al. (2013), found a significant and positive relationship between the non-debt tax shield and performance when investigating non-financial firms in Pakistan between 2005-2010. The study concludes that the factor plays an important role for increasing the financial performance of the firms.

4.8 REGRESSION MODELS: CAPITAL STRUCTURE AND FIRM PERFORMANCE

In this section we will not present the full specification of our models. It will be a recap of the previously mentioned regression models with the intention of how capital structure effects the performance of Norwegian companies.

Pooled OLS Model:

When using a pooled OLS regression, the models in our study can be presented in the following way:

EQUATION 25: OLS MODEL FOR THE EFFECT OF CAPITAL STRUCTURE ON FIRM PERFORMANCE

$$(10)\ ROA_{it} = \alpha + \beta_1 STDTA_{it} + \beta_2 LTDTA_{it} + \beta_3 TDTA_{it} + \beta_4 SIZE_{it} + \beta_5 GROWTH_{it} + \beta_6 TANG_{it} + \beta_7 NDTS_{it} + \beta_8 AGE_{it} + \mu_{it}$$

$$(11)\ ROE_{it} = \alpha + \beta_1 STDTA_{it} + \beta_2 LTDTA_{it} + \beta_3 TDTA_{it} + \beta_4 SIZE_{it} + \beta_5 GROWTH_{it} + \beta_6 TANG_{it} + \beta_7 NDTS_{it} + \beta_8 AGE_{it} + \mu_{it}$$

$$(12)\ Tobin\ Q_{it} = \alpha + \beta_1 STDTA_{it} + \beta_2 LTDTA_{it} + \beta_3 TDTA_{it} + \beta_4 SIZE_{it} + \beta_5 GROWTH_{it} + \beta_6 TANG_{it} + \beta_7 NDTS_{it} + \beta_8 AGE_{it} + \mu_{it}$$

Fixed effect model:

When using fixed effect models, the regressions can be presented as follows:

EQUATION 26: FIXED EFFECT MODEL FOR THE EFFECT OF CAPITAL STRUCTURE ON FIRM PERFORMANCE

$$(13)\ ROA_{it} = \beta_1 STDTA_{it} + \beta_2 LTDTA_{it} + \beta_3 TDTA_{it} + \beta_4 SIZE_{it} + \beta_5 GROWTH_{it} + \beta_6 TANG_{it} + \beta_7 NDTS_{it} + \beta_8 AGE_{it} + \alpha_i + \mu_{it}$$

$$(14)\ ROE_{it} = \beta_1 STDTA_{it} + \beta_2 LTDTA_{it} + \beta_3 TDTA_{it} + \beta_4 SIZE_{it} + \beta_5 GROWTH_{it} + \beta_6 TANG_{it} + \beta_7 NDTS_{it} + \beta_8 AGE_{it} + \alpha_i + \mu_{it}$$

$$(15)\ Tobin\ Q_{it} = \beta_1 STDTA_{it} + \beta_2 LTDTA_{it} + \beta_3 TDTA_{it} + \beta_4 SIZE_{it} + \beta_5 GROWTH_{it} + \beta_6 TANG_{it} + \beta_7 NDTS_{it} + \beta_8 AGE_{it} + \alpha_i + \mu_{it}$$

Random effect model:

When using random effect models, the regressions can be presented as follows:

EQUATION 27: RANDOM EFFECT MODEL FOR THE EFFECT OF CAPITAL STRUCTURE ON FIRM PERFORMANCE

$$(16)\ ROA_{it} = \alpha + \beta_1 STDTA_{it} + \beta_2 LTDTA_{it} + \beta_3 TDTA_{it} + \beta_4 SIZE_{it} + \beta_5 GROWTH_{it} + \beta_6 TANG_{it} + \beta_7 NDTS_{it} + \beta_8 AGE_{it} + \mu_{it} + \varepsilon_{it}$$

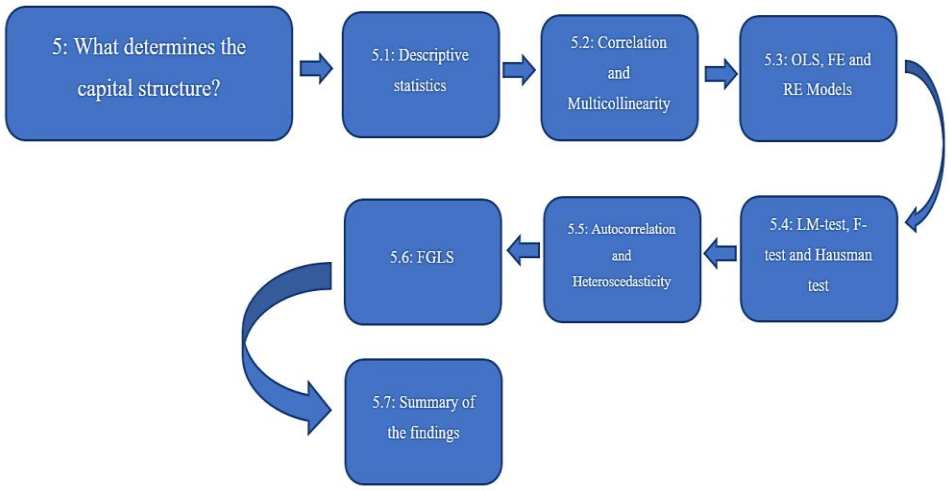
$$(17)\ ROE_{it} = \alpha + \beta_1 STDTA_{it} + \beta_2 LTDTA_{it} + \beta_3 TDTA_{it} + \beta_4 SIZE_{it} + \beta_5 GROWTH_{it} + \beta_6 TANG_{it} + \beta_7 NDTS_{it} + \beta_8 AGE_{it} + \mu_{it} + \varepsilon_{it}$$

$$(18)\ Tobin\ Q_{it} = \alpha + \beta_1 STDTA_{it} + \beta_2 LTDTA_{it} + \beta_3 TDTA_{it} + \beta_4 SIZE_{it} + \beta_5 GROWTH_{it} + \beta_6 TANG_{it} + \beta_7 NDTS_{it} + \beta_8 AGE_{it} + \mu_{it} + \varepsilon_{it}$$

5. RESULTS – DETERMINANTS OF CAPITAL STRUCTURE

This chapter presents the results from our study in determining the factors of capital structure. We begin the chapter by presenting an analysis of the descriptive statistics. In the subsequent section, we will investigate the relationship between the variables through correlation matrix and variance inflation factor (VIF). Furthermore, we will apply the mentioned regression models and test statistics and examine the results from these. In the final section, we will summarize our findings and analysis to provide an overview of the determining factors of capital structure in the Norwegian market.

FIGURE 23: THE STRUCTURE OF THE CHAPTER



As discussed earlier, there are three dependent variables used in our regression models regarding the determinants of capital structure in the Norwegian market. These are STDTA, LTDTA and TDTA. As independent variables, size, growth, age, tangibility, profitability and non-debt tax shield are being used. These explanatory variables have proved to be significant in previous studies to predict the capital structure according to developed theories.

5.1 DESCRIPTIVE STATISTICS

A summary of the descriptive statistics of all dependent and independent variables are presented in Table 6. It shows the number of observations, mean, median, standard deviation, minimum and maximum values of all variables. As illustrated in Table 6, the leverage ratios measured by STDTA and LTDTA are both around 0.26. This indicates that on average, firms listed on the OSEAX are financing their assets with about 26 percent of short-term debt and 26 percent of long-term debt.

The ratio of STDTA is lower compared to the findings of Song (2005) investigating small, medium and large companies in Sweden between 1992 and 2000. The study concluded that Swedish firms on average had a short-term debt ratio of 49 percent. Similarly, Ebaid (2009), also found a STDTA ratio of 49 percent when investigating listed Egyptian firms over the period 1997-2005. On the other hand, the ratio is higher compared to the findings of Salim and Yadav (2012), studying the capital structure of listed firms in Malaysia over the period of 1995 to 2011. Their findings showed that Malaysian firms on average had a STDTA ratio of 14 percent.

The ratio of LTDTA of 0.26 is very similar to the findings of Song (2005), who found that Swedish firms funded their assets with 25 percent long-term debt over the period 1992 to 2000. However, the ratio is higher than the findings of Salim and Yadav (2012) who found LTDTA ratios of 14 percent for firms listed in Malaysia.

The mean for the variable TDTA is 0.54, indicating that in general, 54 percent of the total assets are financed with debt. This ratio suggests that Norwegian companies in general may be overleveraged in relation to companies in other developed countries. The result can be compared to research made by De La Bruslerie and Latrous (2012), investigating the capital structure in French firms during the period 1998-2009. They concluded that on average, French firms had a leverage ratio of 22 percent. Similarly, Lin et al. (2011), found a leverage ratio of 33.4 percent when observing 22 Western European and East Asian countries over the period 1996-2008. However, even though we are studying a developed country, our results are relatively similar to the ones reported by Zou and Xiao (2006), studying Chinese listed companies over the period 1993 to 2000. In their study, they concluded that Chinese

companies on average had a leverage ratio of 47 percent. A possible explanation of the high leverage ratio in Norway could be the existence of capital intensive sectors, such as energy and shipping.

It is worth noticing that the total debt ratios of the Norwegian companies are varying substantially with a maximum value of 3.55 and a minimum value of 0. The maximum value implies that the company has an outstanding debt that is 3.55 times the book value of the assets. The number indicates an extremely high amount of leverage and that the company can be seen as very risky. The minimum value of 0 indicates that the company has financed all its assets with only equity and can be seen as an unlevered company.

The values for the factor growth are varying significantly with a minimum value of -99 percent up to an extreme maximum growth of about 118,400 percent. The large spread of the values results in an unreasonably high mean value over the sample period. Instead, if we observe the median value, we find a growth rate of 6.8 percent, which seems more reasonable and also in line with the market growth over the period (Oslo Børs, OSEAX).

The average age of the Norwegian companies is about 58 years, where we again observe a high standard deviation of almost 63. The high number is mainly a result from the wide range with a minimum age of 0 and a maximum age of 362 years. When looking at the median value of 31 years, it seems more appropriate, since the large expansion of oil and gas companies started in the 70 and 80s. Also, during the 80s the stock exchange became a platform for large financial operations due to M&As, reconstructions and fusions (Oslo Børs).

When observing the tangibility, we find a mean value of 0.373 indicating that on average, 37.3 percent of the total assets are fixed assets. This ratio is slightly higher compared to the findings of Song (2005), who found a ratio 29 percent when studying companies in Sweden. On the other hand, the tangibility ratio of Norwegian companies is higher compared to the findings of Nasimi (2016), who found a tangibility ratio of 51 percent when investigating companies in the US market. Since tangibility concerns the asset structure of the companies, the ratio is highly dependent on which industries is included in the research.

The profitability ratio shows that on average the Norwegian companies generated a net income of 1.6 percent of their total assets per year over the period. These results are lower

compared to similar studies, for example Le and Phan (2017) studying Vietnamese companies between 2007 and 2012 and found an average profitability of 6 percent. However, the result is relatively similar to the findings of Tifow and Sayilir (2015) investigating capital structure of Turkish companies between 2008 and 2013, who found a profitability of 3 percent. Since we have not been able to find any study investigating profitability over the exact same sample period, it is difficult to draw any clear conclusion about how Norwegian companies have performed compared to companies in other countries. Also, notable from the descriptive data is that the standard deviation of profitability is 21 percent, which can be considered as high. The values have a wide range with a minimum profitability of -423 percent and a maximum return of about 209 percent.

Finally, the non-debt tax shield has a mean value of 0.049 indicating that the annual depreciation has on average been around 5 percent of total assets. The result is in line with Song (2005), who found a value of 5.5 percent when investigating the Swedish market. Similarly, Nasimi (2016) found a non-debt tax shield ratio of 6.1 percent when investigating capital structure of companies in the US.

TABLE 6 - DESCRIPTIVE STATISTICS

Variables	Obs	Mean	Median	S.D.	Min	Max
STDTA	858	0.264	0.200	0.230	0.000	3.422
LTDTA	858	0.258	0.220	0.225	0.000	2.378
TDTA	858	0.543	0.570	0.265	0.000	3.551
Size	858	15.210	15.360	1.987	9.203	20.696
Growth	858	2.776	0.068	50.030	-0.990	1184.220
Age	858	57.872	31	62.704	0	362
Tangibility	858	0.373	0.300	0.304	0.000	0.960
Profitability	858	0.016	0.030	0.211	-4.230	2.090
Non-debt tax shield	858	0.049	0.040	0.0473	0.000	0.600

The table shows the descriptive statistics of listed Norwegian companies between 2006-2016.

5.2 CORRELATION AND MULTICOLINEARITY

Correlation:

Similar to the findings Vatavu (2015) and Zeitun and Tian (2007), we observe a negative correlation between LTDA and STDA. This seems reasonable since if a company chooses to increase its level of long-term debt to total assets, all else equal, the portion of short-term debt to total assets will most likely become lower.

All independent variables except profitability are positively correlated with the total debt ratio (TDTA), even though this correlation is relatively low. The negative correlation with profitability is in line with the pecking order theory, stating that profitable companies tend to prefer internal funding before debt. On the other hand, the result is opposed the expectations of the trade-off theory, stating that high profitable firms should operate with high leverage, due to larger benefits from tax shield than bankruptcy cost.

The factor size is positively correlated with TDTA, which is in line with the trade-off theory stating that bankruptcy costs are relatively lower for large firms, resulting in higher leverage ratios. Also, the result is supported by the findings of Serghiescu and Vaidean (2014) investigating the Romanian market and Fama and French (2002) investigating the US market.

The positive correlation between factor growth and TDTA is supported by the pecking order theory. The theory predicts that growth firms have a higher demand for funding and may not always have the opportunity to raise these funds internally. Our result is also in line with research made by Booth et al. (2001), investigating capital structure in 10 developing countries. However, most empirical studies have found a negative correlation between growth and leverage (Rajan and Zingales (1995), Barclay et al. (2006) and Frank and Goyal (2007).

Age and TDTA is positively correlated and the findings are supported by Diamond (1989), where he investigated the incentive problem between borrowers and lenders. Since mature companies were able to strengthen their reputation over the years, a reduction in the cost of debt was found. Additionally, according to the trade-off theory, lower interest rates increases the attractiveness of debt funding. On the other hand, the pecking order theory predict a

negative correlation between age and leverage, since mature companies have a higher ability to finance their investments with internally generated funds.

Tangibility is also found to be positively correlated with TDTA, which supports the agency cost theory. The theory claims that firms with high level of tangible assets are in a position of using these as collateral. Hence, increasing the level of debt and a positive correlation is expected. Also, the trade-off theory supports the findings, since a high level of tangible assets reduces the costs of bankruptcy. Most empirical studies also find a positive correlation between tangibility and leverage. Examples of these are Jensen and Meckling (1976) and Rajan and Zingales (1995). Furthermore, the highest positive correlation between a dependent and an independent variable is found between LTDTA and tangibility. This may be due to fixed assets are usually financed with long-term debt.

The factor non-debt tax shield is positively correlated with TDTA, which is in line with the conclusion of a study made by Bradley et al. (1984) studying firms in the US. However, our result contradicts the findings of DeAngelo and Masulis (1980) who found that depreciation on assets are substitute of the tax advantages from debt financing. They argued that the negative relationship was a result of firms with large amounts of depreciation already captured tax savings by lowering their taxable income.

TABLE 7: CORRELATION

Variables	STDTA	LTDTA	TDTA	Size	Growth	Age	Tangibility	Profitability	Non-debt tax shield
STDTA	1								
LTDTA	-0.288	1							
TDTA	0.5455	0.4975	1						
Size	-0.2789	0.1741	0.0468	1					
Growth	-0.0139	0.025	0.096	0.0087	1				
Age	-0.0657	-0.0381	0.0399	0.4597	0.0098	1			
Tangibility	-0.3012	0.643	0.2875	0.3333	0.0012	-0.1562	1		
Profitability	-0.3816	0.0569	-0.292	0.1478	0.0035	0.0445	-0.0115	1	
Non-debt tax shield	0.1334	-0.022	0.0654	-0.1379	-0.0481	-0.1957	0.0635	-0.0617	1

The table shows the correlation between the chosen variables.

Multicollinearity:

Multicollinearity arises when there is a linear relationship between the independent variables in a regression model (Pedace, 2013, p.175). In this paper we are using panel data consisting of 78 companies with nine variables over a 11-year period. According to Pedace (2013, p.175), the issue is rarely encountered in practice, but high multicollinearity is quite common which may cause problems when using regression models. To investigate whether multicollinearity exist in our data, we first examined the correlation between the independent variables presented in Table 7. If it is greater than 0.7, possible collinearity problems may exist (Wooldridge, 2015).

When observing the correlation coefficients between the independent variables, they are in general quite low with most values below 0.5, indicating low risk of multicollinearity. To confirm this, we also conducted a Variance Inflation Factor (VIF) test using STATA to examine the existence of multicollinearity. As a rule of thumb, VIF values above 10 signals high probability of multicollinearity, whereas VIF values between 5 and 10 indicates that multicollinearity might be an issue (Pedace, 2013, p.184). Table 8 shows that the highest VIF value is 1.67, indicating that there is a low level of multicollinearity in the data and confirms that this is not a serious issue in this study.

TABLE 8 – VARIANCE INFLATION FACTOR

Variable	VIF	1/VIF
Size	1.67	0.60059
Age	1.49	0.66943
Tangibility	1.32	0.75942
Non-debt tax shield	1.05	0.9507
Profitability	1.03	0.96943
Growth	1	0.99766
Mean VIF	**1.26**	

The table shows the results from the VIF test examining for multicollinearity.

5.3 POOLED OLS REGRESSION

Table 9 presents the results from the pooled OLS regression for determining the factors of capital structure. We are using STDTA, LTDTA and TDTA as dependent variables, while size, growth, age, tangibility, profitability and non-debt tax shield are used as explanatory variables. As shown in Table 9, the factor size is negatively related to all leverage ratios at a minimum of 5 percent significance level. The result indicates that a 1 percent increase in the size of a company, would on average result in a 0.01 percent decrease in the total debt ratio. The negative relationship is in line with the pecking order theory, predicting that large firms face a lower degree of problems regarding asymmetric information, which results in a lower cost of equity (Chakraborty, 2010).

When looking at the factor growth, the coefficients are close to zero in all models and no significant relationship is found. This indicates that growth cannot be considered as a determining factor of capital structure in the Norwegian market.

For the variable age, we find a positive relationship between the factor and both LTDTA and TDTA at a 0.1 percent significance level. This indicates that mature companies tend to finance their investments with a larger portion of debt. The results are in line with studies made by Diamond (1989), who concluded that companies existing over longer periods were able to repay their debt, hence creating a stronger reputation in the market. The study argued that a strong reputation enables better terms of lending and an increase in leverage was expected. However, the results are not in line with the findings of studies made by Frank and Goyal (2009), who found a negative relationship between age and leverage when investigating non-financial firms in the US.

The tangibility factor is positive and significant at a 0.1 percent level for both LTDTA and TDTA, and negative and significant for STDTA. The positive relation is supported by research made by Rajan and Zingales (1995) studying capital structure in the G-7 countries from 1987 to 1991. An explanation for the negative relation to short-term debt might be that fixed assets in general are financed with a larger portion of long-term debt. Hence, more tangible assets would result in less short-term debt. The results indicate that an increase in

tangibility of 1 percent would result in a reduction of STDTA of 0.21 percent and an increase in LTDTA and TDTA of 0.5 and 0.292 percent respectively.

When observing the profitability, we find a significant relationship at a 0.1 percent level to all dependent variables. The result shows a positive relationship to LTDTA and a negative relationship to both STDTA and TDTA. The negative results are in line with the pecking order theory, predicting that profitable companies prefer to use internal funds before debt in order to finance their investments. On the other hand, the positive relationship is in line with the trade-off theory, stating that high profitability reduces the bankruptcy costs, allowing a company to increase the leverage ratio.

For the NDTS factor we find a significantly positive relationship to STDTA and a significantly negative relationship to LTDTA. An increase of 1 percent in the NDTS would according to the result of the model lead to a 0.5 percent increase in STDTA and a 0.3 percent decrease in LTDTA. The positive result regarding STDTA is in line several empirical studies, for example Bradley et al. (1984) studying US companies. The negative relationship between NDTS and LTDTA is in line with the predictions of the trade-off theory and empirical studies made by results of Zabri (2012) investigating capital structure in Malaysian companies.

When evaluating the fitness of the regression models, we find that all F-tests have p-values that are lower than 1 percent, indicating that the models are appropriate and well fitted. Also, the R-squared values are moderate, ranging from 0.18 to 0.44. For the LTDTA regression model, this means that the model is able to explain about 44 percent of the change in LTDTA, while for the TDTA, the model is only able to explain 18 percent of the changes.

As discussed in the methodology section, by using OLS regression we cannot control for unobserved individual effects, which is common when using panel data. To deal with this issue, FE, RE and FGLS models were included alongside the pooled OLS model to control for unobserved individual effects.

TABLE 9 - POOLED OLS

	(1) STDTA	(2) LTDTA	(3) TDTA
Size	-0.0123** (0.00437)	-0.0157*** (0.00376)	-0.0117* (0.00533)
Growth	-0.0000268 (0.000135)	0.0000948 (0.000116)	0.0000615 (0.000164)
Age	-0.0000846 (0.000131)	0.000439*** (0.000113)	0.000650*** (0.000160)
Tangibility	-0.212*** (0.0254)	0.527*** (0.0219)	0.292*** (0.0310)
Profitability	-0.392*** (0.0323)	0.0815** (0.0278)	-0.350*** (0.0394)
Non-debt tax shield	0.531*** (0.146)	-0.269* (0.125)	0.254 (0.178)
Constant	0.514*** (0.0604)	0.287*** (0.0520)	0.569*** (0.0736)
R-Squared	0.268	0.436	0.183
F- Statistics	51.98***	109.50***	31.73***
Observations	858	858	858

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

5.4 RANDOM AND FIXED EFFECTS REGRESSION MODELS

From observing the results from random and fixed effects regression models in Table 10, the factor size is found significant and negatively related to STDTA at a 1 percent level. Furthermore, the models indicate no other significant relationship between size and the other debt ratios.

The growth factor is positively related to TDTA at a 5 percent significance level in both models. This indicates that growing companies tend to finance their investments with a larger portion of debt. The result is in line with the pecking order theory, which states debt grows

when investments exceed retained earnings. Growth firms may have difficulties in financing their growth opportunities, instead they will have to use debt or equity as an optional source of funding. On the other hand, the results are opposed to the predictions of trade-off theory, which assumes a negative relationship between growth and leverage. The theory anticipates growth firms may lose more of their value when they go into financial distress, increasing the expected bankruptcy costs. Furthermore, other empirical studies made by for example Rajan and Zingales (1995) found a negative relationship between growth and leverage.

None of the models find any significant relationship between the variable age and the leverage ratios. This indicates that neither the FE or RE model is able to conclude that age is a determining factor of capital structure of Norwegian companies.

The factor tangibility is significant in both models for all capital structure ratios except in the FE model when looking at STDTA. Again, the tangibility shows a negative relationship to STDTA while both LTDTA and TDTA are positively related. For the RE model, the results imply that an increase in tangibility of 1 percent would result in an increase in LTDTA and TDTA of 0.44 and 0.25 percent respectively. The same relationships between tangibility and capital structure were found by Song (2015) studying the companies in the Swedish market.

The profitability factor is also significant at a 1 percent level in both models and for all debt ratios. The factor is positively related to LTDTA and negatively related to both STDTA and TDTA. The results are therefore in line with both the pecking order and the trade-off theory. Also, other empirical studies end up with similar results (Booth et al., 2001 and Jensen, Solberg and Zorn, 1992).

The factor NDTS is positive and significantly related to STDTA and LTDA in both regression models, whereas no significant relationship is found to LTDTA. For the FE model, this indicates that an increase of 1 percent in the non-debt tax shield, will on average result in an increase of 1.15 and 1 percent in the STDTA and TDTA respectively.

Overall, the F-squared and Wald chi-squared values are all high and significant indicating a good fitness of both models. When looking at the R-squared, the values are again moderate and similar to the pooled OLS regression. For the FE model, the R-squared varies from about 0.05 to 0.40 and for the RE model we observe a similar range of values. The results imply that

the independent variables are able to explain between 5 to 40 percent of the variation in capital structure of Norwegian companies.

TABLE 10 - FIXED AND RANDOM EFFECT MODELS

Variables	Fixed Effect	Fixed Effect	Fixed Effect	Random Effect	Random Effect	Random Effect
	(1) STDTA	(2) LTDTA	(3) TDTA	(4) STDTA	(5) LTDTA	(6) TDTA
Size	-0.0292** (0.0106)	0.00589 (0.0116)	-0.0141 (0.0122)	-0.0222** (0.00794)	-0.00800 (0.00685)	-0.0136 (0.00952)
Growth	0.000173 (0.0000895)	0.0000750 (0.0000983)	0.000248* (0.000103)	0.000153 (0.0000894)	0.0000832 (0.0000977)	0.000234* (0.000103)
Age	-0.000879 (0.000971)	0.000472 (0.00107)	-0.000974 (0.00112)	0.000109 (0.000306)	0.000279 (0.000230)	0.000575 (0.000383)
Tangibility	-0.0833 (0.0535)	0.284*** (0.0587)	0.240*** (0.0615)	-0.138** (0.0428)	0.439*** (0.0382)	0.252*** (0.0509)
Profitability	-0.422*** (0.0228)	0.0742** (0.0251)	-0.360*** (0.0263)	-0.422*** (0.0224)	0.0831*** (0.0243)	-0.357*** (0.0258)
Non-debt tax shield	1.148*** (0.146)	-0.155 (0.161)	1.030*** (0.168)	1.064*** (0.139)	-0.208 (0.145)	0.918*** (0.161)
Constant	0.740*** (0.150)	0.0415 (0.165)	0.679*** (0.172)	0.601*** (0.111)	0.209* (0.0950)	0.582*** (0.133)
R-Squared	0.395	0.051	0.279	0.393	0.048	0.277
F-Statistics	84.36***	6.92***	49.94***			
Wald Chi-Squared				511.42***	162.88***	305.15***
Observations	858	858	858	858	858	858

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

5.5 BREUSCH-PAGAN AND F-TEST

To evaluate whether a RE model or a pooled OLS model is most appropriate to use, we are performing a Breusch-Pagan Lagrange Multiplier (LM) test. The null hypothesis indicates that pooled OLS model is most appropriate. From Table 11 we can observe that the p-values

are zero, meaning that we are able to reject the null hypothesis in all models, and a RE model is most appropriate in our study.

When comparing the FE model to pooled OLS, we are performing a F-test for individual effects. Similar to the LM test, the null hypothesis is that a pooled OLS model is the most appropriate model to use. From Table 11 we can observe that the p-values are zero indicating that we once again reject the null hypothesis and a FE model is more appropriate in our study.

TABLE 11 - BREUSCH-PAGAN LAGRANGE MULTIPLIER TEST AND F-TEST

Variables	LM test (p-values)	F-test (p-values)	Appropriate model
STDTA	0.000	0.000	Fixed and Random
LTDTA	0.000	0.000	Fixed and Random
TDTA	0.000	0.000	Fixed and Random

The table illustrates whether FE or RE is the most appropriate model for our paper compared to OLS. The Breusch-Pagan Lagrange Multiplier (LM) test evaluates RE against OLS, while F-test evaluates FE against OLS.

5.6 CHOICE OF MODEL

The LM-test and F-test indicated that the FE and RE models were more appropriate than a pooled OLS model. Next step is to evaluate whether a RE or a RE model is most appropriate to use in our sample. To do so, we are performing a Hausman test using STATA. The null hypothesis is that the preferred model is the RE model, whereas the alternative hypothesis is that the appropriate model is a FE model. Essentially, the test investigates if there is any correlation between the unique error terms and the regressors in the model. The null hypothesis of the test is that there is no correlation between the two.

Table 12 shows that for STDTA, the p-value is below 5 percent and we reject the null hypothesis, indicating that a fixed effects model is more appropriate. On the other hand, for LTDTA and TDTA, the p-values are above 5 percent, indicating that we cannot reject the null hypothesis, and a random effects model is more appropriate. As can be seen from the table,

the test favors the RE model for two out of three variables. Due to the majority, we consider a random effects model to be most appropriate in our study.

TABLE 12 - HAUSMAN TEST

Variables	P-values	Efficient and consistent model
STDTA	0.0081	Fixed Effects
LTDTA	0.0528	Random Effects
TDTA	0.2598	Random Effects

The table presents an evaluation of whether FE or RE is the most appropriate model for our thesis. This has been applied on the three independent variables (STDTA, LTDTA and TDTA). A p-value lower than 5 percent favors RE model, while p-value higher than 5 percent favors FE model.

5.7 AUTOCORRELATION AND HETEROSCEDASTICITY

When performing regression analysis, heteroscedasticity and autocorrelation issues might exist. These problems in our data can lead to inefficiency of the model coefficients (Gujarati, 2004, p.427). To deal with these potential issues, we first have to test our data. To do so, a modified Wald test was performed for heteroscedasticity, and a Wooldridge test was performed for autocorrelation.

Heteroscedasticity is considered to be present if the error terms in the model do not have a constant variance. The null hypothesis indicates a homoscedastic data set. As can be observed from Table 13, the p-values are zero for all models indicating that we reject the null hypothesis. This concludes that heteroscedasticity problems do exist in the data set, affecting the regression models.

The problem with autocorrelation is that it causes the standard errors of the coefficients in the model to appear smaller than they are, increasing the R-squared values (Gujarati, 2004, p.452). The problem is most severe in macro panels spanning over longer time periods. Even though our data covers only 11 years, we still included the Wooldridge test as a reference. The null hypothesis of the test is that there is no autocorrelation. When observing the p-values

in Table 13, we can see that we reject the null hypothesis for STDTA and keep it for LTDA and TDTA. The results thereby indicate that autocorrelation is present in two out of three regression models.

According to both tests, we observe heteroscedasticity problems occurring from cross-sectional data and autocorrelation occurring from time series data. In order to control and remove these issues of heteroscedasticity and autocorrelation, we employ the Feasible General Least Square (FGLS) model (Gujarati, 2004 p.483).

TABLE 13 - AUTOCORRELATION AND HETEROSCEDASTICITY

Variables	Autocorrelation	Heteroscedasticity
	Wooldridge test	Modified Wald test
STDTA	0,3059	0
LTDTA	0,0017	0
TDTA	0,0019	0

A Wooldridge test and Modified Wald test is applied for the three independent variables (STDTA, LTDTA and TDTA) for autocorrelation and heteroscedasticity. A p-value higher than 5 percent indicates no correlation or heteroscedasticity and vice versa if the p-value is lower than 5 percent.

5.8 FGLS REGRESSION MODEL

The outcome from the FGLS model is reported in Table 14. Similar as the results from previous regression models, we find a negative and significant relationship between size and all dependent variables. The result supports the pecking order theory, stating that asymmetric information between insiders and capital markets is lower in larger companies, which results in the prediction that larger companies issue more equity compared to smaller companies (Rajan and Zingales, 1995). The result is in line with several other empirical studies, such as Titman and Wessels (1988) and Chakraborty (2010). On the other hand, the negative relationship contradicts the trade-off theory, stating that larger firms have a greater debt capacity and better access to the debt markets compared to smaller firms. Hence, the theory ends up with a positive expectation regarding the relationship between size and leverage. The

negative results of our study imply that an increase in the asset size of Norwegian companies, on average results in a decrease of the leverage ratios.

The FGLS model finds no significant relationship between the factor growth and capital structure. Both the trade-off theory and the agency theory predict a negative relationship between growth and leverage. Other empirical studies such as Butt (2016), found a negative relationship when studying the US market between 1990 and 2012. Similarly, Rajan and Zingales (1995) studying capital structure in G7 countries also found a significant and negative relationship between growth and leverage. Most previous empirical studies have found results supporting the trade-off theory. However, since the coefficient is not significant in our study, we cannot conclude that growth is a determining factor of capital structure in the Norwegian market.

When observing the factor age, we find the coefficients positive and significant at a 0.1 percent level for both LTDA and STDA. These results are in line with empirical studies by Frank and Goyal (2009) investigating the US market between 1950 and 2003. The result is also supported by the predictions of the trade-off theory, arguing that larger and more mature companies may gain from diversification benefits, hence lowering their cost of debt. On the other hand, the results are opposed the predictions of the pecking order theory, stating that more mature companies have a higher ability of using internally generated funds before issuing debt. Our results thereby conclude that in the Norwegian market, more mature companies tend to finance their assets with a larger portion of debt compared to younger companies.

Tangibility is once again found to be significant for all ratios of capital structure at a 0.1 percent significance level. The results are similar to the pooled OLS regression, where STDTA is negatively related to tangibility while LTDTA and TDTA are positively related. These results support the findings of Frydenberg (2004) who also studied capital structure of Norwegian companies between 1990 and 2000. The findings imply the Norwegian firms with large portions of fixed assets still tends to finance their assets using long-term debt. Similar results have also been found in earlier studies (Rajan and Zingales, 1995). The results support the trade-off theory, which predicts a positive relationship between tangibility and leverage. In practice, the result may be explained by companies with more fixed assets could use these

as collateral, hence increasing their leverage ratio. This implies that lenders view tangible assets as risk reducing collateral. For LTDTA, the numbers indicate that a 1 percent increase in tangibility would on average, result in a 0.5 percent increase in the long-term debt ratio.

When looking at profitability, the coefficients are significant for all ratios at a 0.1 percent level. Similar to the other regression models, the factor is negatively related to STDTA and TDTA, and positively related to LTDTA. The negative relationship between profitability and STDTA and TDTA is in line with the predictions of the pecking order theory. The theory predicts that profitable firms prefer internal funding, such as retained earnings when financing their investments. Hence, our study supports the theory for the factors STDTA and TDTA. The results are supporting the findings of Frydenberg (2004), who also found that profitable firms in Norway tend to finance their assets with less debt. Moreover, our findings are also in line with the conclusions of several other empirical studies, such as Rajan and Zingales (1995) and Booth et al. (2001). On the other hand, the positive relationship between profitability and LTDTA is in line with the trade-off theory, stating that profitable firms have a lower probability of bankruptcy compared to less profitable firms. Hence, a positive relationship is expected. Also, the positive finding supports empirical studies made by Jensen et al. (1992). Since our results are contradicting with a negative relationship to two variables and a positive relationship to one variable, it is difficult to draw any clear conclusion.

The final independent factor, non-debt tax shield is found to be significant only for STDTA and LTDA, where it is positively related to STDTA and negatively related to LTDTA. The positive relationship found for the STDTA is in line with empirical studies made by Bradley et al. (1984) and Chakraborty (2010), which implies that companies with a high level of non-debt tax shield would prefer more debt. A possible reason of the positive relationship was suggested in the study by Bradley et al. (1984). They argued that non-debt tax shields may be seen as a measure of the "securability" of a firm's assets, with a larger portion of securable assets used as collateral, leading to higher leverage ratios. Another explanation may be that since only tangible assets are depreciated, these may be financed with mainly debt. Hence, a positive relation is expected. On the other hand, the negative relationship between the factor and LTDTA is in line with the trade-off theory, which supports the substitution between non-debt tax shields and leverage. Most empirical studies support the positive findings, including the study by Song (2006) investigating the Swedish market. Again, we end up with

contradicting results with negative relationship between non-debt tax shield and LTDTA and a positive relationship to STDTA. The finding makes it once again difficult to present any clear conclusion about the relationship between non-debt tax shield and capital structure.

Although the results we obtain from OLS and FGLS are similar, we should be cautious when choosing the appropriate regression model. As mentioned previously, an OLS regression model is not always efficient, due to presence of autocorrelation and heteroscedasticity in the regression model. (Wooldridge, 2015).

TABLE 14 - FGLS REGRESSION MODEL

	(1) STDTA	(2) LTDTA	(3) TDTA
Size	-0.0123**	-0.0157***	-0.0117*
	(0.00435)	(0.00374)	(0.00531)
Growth	-0.0000268	0.0000948	0.0000615
	(0.000134)	(0.000115)	(0.000164)
Age	-0.0000846	0.000439***	0.000650***
	(0.000131)	(0.000112)	(0.000159)
Tangibility	-0.212***	0.527***	0.292***
	(0.0253)	(0.0218)	(0.0309)
Profitability	-0.392***	0.0815**	-0.350***
	(0.0322)	(0.0277)	(0.0393)
Non-debt tax shield	0.531***	-0.269*	0.254
	(0.145)	(0.125)	(0.177)
Constant	0.514***	0.287***	0.569***
	(0.0601)	(0.0517)	(0.0733)
Wald Chi-Squared	314.47***	662.38***	191.96***
Observations	858	858	858

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

5.9 SUMMARY – DETERMINANTS OF CAPITAL STRUCTURE

The outcome from the regression models deviates substantially from each other, which makes it very difficult to draw a clear conclusion. However, the findings from OLS and FGLS are very similar. The differences between these two are found in the standard errors and the fitting of the models. The mixed findings opens-up for many ways a reader can analyze and interpret the results. Given the circumstances, we have chosen to lend more weight on the significance level of the coefficients and on the FGLS regression model. A factor with a high significance level is considered to have substantially more effect than a low significant factor. In addition, the presence of autocorrelation and heteroscedasticity in our data makes the FGLS model the most appropriate. Also, the standard errors in the FGLS model is generally lower compared to the other regression models, indicating more precise coefficients. Additionally, we have included the theories supporting our findings, which is based on the sign of the majority of the significant independent variables.

Size

For the factor size, both OLS and FGLS regressions find a significantly negative relationship to capital structure. According to the models, size has the highest effect on long-term debt. However, observing the RE and FE models, size is only significantly negative to short-term debt. The negative relationship is in line with the pecking order theory stating that the problem of asymmetric information is lower in larger companies. Hence, this would result in large companies in Norway to issue more equity compared to small companies. Overall, our findings imply that the size of a company is a determining factor of capital structure in the Norwegian market.

Growth

Neither the OLS nor FGLS regression model finds any significant relationship between growth and capital structure. However, when using both FE and RE models, the factor is

found to be positively related to the total debt ratio. The pecking order theory predicts that growth firms in general have a high demand for funding, and that they may not have been able to generate enough funds internally. Hence, the use of debt is a reasonable solution. The positive relationship between growth and TDTA can therefore be considered as in line with the pecking order theory. Overall, the factor shows a very weak-to-no effect as a determining factor of capital structure in the Norwegian market.

Age

The factor age is found to be positive and significantly related to long-term and total debt in both the OLS and FGLS regression models. These results are in line with the trade-off theory, predicting that large and mature companies may gain from diversification benefits and thereby lowering their cost of debt. For the FE and RE models, we find no sign of any relationship between the factor and capital structure. Due to the high significance level in both the OLS and FGLS model, the variable age can be considered as a determining factor of capital structure in Norwegian companies.

Tangibility

All four regression models find a significant relationship between tangibility and capital structure. In OLS, FGLS and RE models, the factor is positively related to long-term and total debt while it is negatively related to short-term debt. In FE model the factor is found positively related long-term and total debt, while no significant relationship is found to short-term debt. The positive relationship to long-term and total debt is in line with the predictions of the trade-off theory. The theory predicts that companies with large tangible assets may use these as collateral and thereby improve the terms when issuing debt. Hence, the theory predicts a positive relationship between tangibility and leverage. In general, since all regression models finds significant results, we can conclude that tangibility is a determining factor of capital structure in the Norwegian market.

Profitability

Profitability is found to be significantly related to leverage in all regression models. The factor is positively related to long-term debt and negatively related to short-term and total debt. The positive relationship to long-term debt is in line with the trade-off theory, stating that profitable firms faces a lower risk of bankruptcy, hence better terms when it comes to issuing external debt. The negative relationship to short-term and total debt is in line with the pecking order. The theory states that profitable firms are able to use internally generated funds at a larger extension compared to less profitable firms. Hence, a negative relationship is expected. According to the significant findings, profitability is a determining factor of capital structure in Norway.

Non-debt tax shield (NDTS)

According to the OLS and FGLS models, the factor NDTS is positively related to short-term debt and negatively related to long-term debt. In the FE and RE regression models, the factor is found to be positively related to both short-term and long-term debt. Furthermore, the significantly negative relationship with long-term debt is in line with both the trade-off and pecking order theories. The factor can be characterized as a substitute of debt financing. Hence, the theory predicts a negative relationship between NDTS and leverage. The overall assessment of the factor implies that NDTS is a factor that determines the capital structure of Norwegian companies.

TABLE 15 - SUMMARY OF THE FINDINGS DETERMINING CAPITAL STRUCTURE

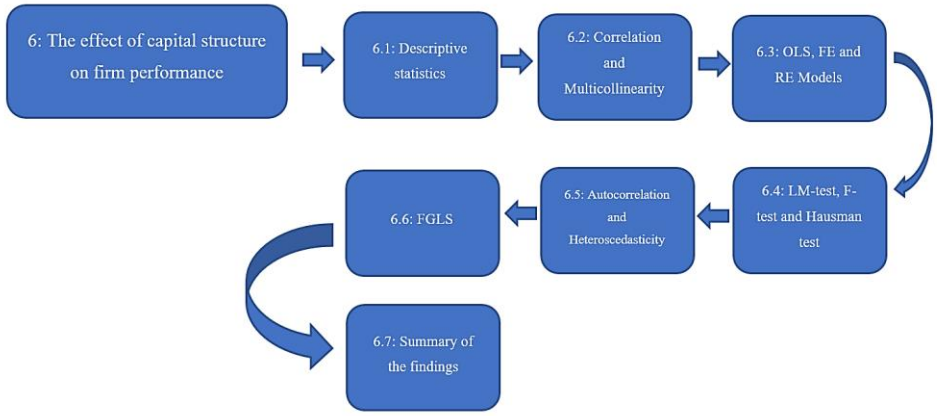
Variables	STDTA	LTDTA	TDTA	Supporting theory
Size	-	-	-	Pecking Order theory
Growth	n/a	n/a	n/a	n/a
Age	n/a	+	+	Trade-off theory
Tangibility	-	+	+	Mixed support for pecking order and trade-off theory
Profitability	-	+	-	Mixed support for pecking order and trade-off theory
Non-debt tax shield	+	-	n/a	Mixed support for pecking order and trade-off theory

The table presents a summary of the results from our findings in relation to determining the capital structure. In addition, the relationship between capital structure and the factors (Size, Growth, Age, Tangibility, Profitability and Non-debt tax shield) according to the pecking order and trade-off theory.

6 RESULTS - CAPITAL STRUCTURE AND FIRM PERFORMANCE

The following chapter presents the results from investigating the relationship between capital structure and firm performance. We will begin by presenting the descriptive statistics of the performance ratios. In the subsequent section, the issue of multicollinearity will be investigated through the correlation matrix and a VIF-test. Moreover, we present and analyze the results from the regression models in accordance to the relationship between capital structure and firm performance. In the last section, we will summarize the overall findings to provide an overview of the relationship between capital structure and firm performance in the Norwegian market.

FIGURE 24: THE STRUCTURE OF THE CHAPTER



6.1 DESCRIPTIVE STATISTICS

Table 16 presents a summary of the descriptive statistics of the dependent variables used as proxies of firm performance. The descriptive statistics shows number of observations, median, mean, standard deviation, maximum and minimum values of the variables. However,

since we have already presented the descriptive statistics for debt ratios and control variables in the previous chapter, we decided to not include them here.

The mean (median) of the performance measures ROA, ROE and Tobin Q are 0.02 (0.03), 0.07 (0.09) and 1.7 (1.2) respectively. This implies that on average, the return on assets and return on equity has on average been 2 and 7 percent annually. The mean value of Tobin's Q of 1.7 suggests that on average, Norwegian listed firms have a market value that is higher than their book value. Since the market to book ratio is higher than 1, the market may expect the firms to grow in the future. The figures also reveal that the value of Tobin's Q varies a lot from 0.12 to 50.71. The high variation also results in the highest standard deviation among the performance measures. However, large spreads are also observed for ROA and ROE, where the value for ROA ranges from -4.23 to 2.09 and the ROE ranges from -4.07 to 3.42. The results imply that there has been a significant gap in the performance ratios of the firms during the period.

TABLE 16 - DESCRIPTIVE STATISTICS FOR PERFORMANCE MEASURES

Variables	Obs.	Mean	Median	Std. Dev.	Min	Max
ROA	858	0.020	0.030	0.210	-4.230	2.090
ROE	858	0.070	0.090	0.430	-4.070	3.420
Tobin Q	858	1.700	1.200	2.210	0.120	50.710

The table shows the descriptive statistics of the performance ratios of listed Norwegian companies during 2006-2016.

6.2 CORRELATION AND MULTICOLINEARITY ANALYSIS

Correlation

In this section, we will present the correlation between the independent, dependent and control variables. Since we have already discussed the relationship between the leverage ratios and control variables, this section will only focus on their correlation to the chosen performance measures. Again, important to notice is that in statistics, correlation does not imply causation.

The correlation between capital structure and firm performance in Table 17 displays both positive and negative relationships. Both STDTA and TDTA have a negative correlation to ROA while a very low and positive correlation is found between LTDTA and ROA. The performance measures of ROE and Tobin's Q are found to have similar signs in their relationship to capital structure, but their values vary substantially. The highest correlation is 0.41 and found between Tobin's Q and short-term debt, while the lowest correlation of 0.005 is found between ROE and total debt. Additionally, ROE has the lowest correlation with the capital structure ratios.

The correlation between the dependent variables, ROA, ROE and Tobin Q is found to be moderate. We observe positive correlations among the variables, except between ROA and Tobin's Q, where we find a negative correlation. Additionally, this is the highest correlated variables with a value of -0.48. Finally, the lowest correlation between the dependent variables is equivalent to 0.16, which is found between ROE and Tobin's Q.

When observing the correlation between the control variables and the performance measures, the highest coefficient is found between size and Tobin's Q, where a negative relation is found. Furthermore, the factor size is also found to be highest correlated to all performance ratios. Overall, we find low correlation between the control variables and the dependent variables.

TABLE 17 - CORRELATION

Variables	ROA	ROE	Tobin Q	STDTA	LTDTA	TDTA	Size	Growth	Age	Tangibility	Non-debt tax shield
ROA	1										
ROE	0.3232	1									
Tobin Q	-0.4809	0.1556	1								
STDTA	-0.3816	0.0636	0.4072	1							
LTDTA	0.0569	-0.0647	-0.0787	-0.288	1						
TDTA	-0.292	0.005	0.2673	0.5455	0.4975	1					
Size	0.1478	0.0773	-0.2606	-0.2789	0.1741	0.0468	1				
Growth	0.0035	0.0059	-0.0181	-0.0139	0.025	0.0096	0.0087	1			
Age	0.0445	0.0243	-0.1435	-0.0657	-0.0381	0.0399	0.4597	0.0098	1		
Tangibility	-0.0115	-0.069	-0.1082	-0.3012	0.643	0.2875	0.3333	0.0012	-0.1562	1	
Non-debt tax shield	-0.0617	-0.0679	0.0302	0.1334	-0.022	0.0654	-0.1379	-0.0482	-0.1958	0.0635	1

The table shows the correlation coefficients between the chosen variables.

Multicollinearity

The correlation between independent variables seems to be lower than 0.7, which indicates that there is low risk of collinearity problems in the model. Furthermore, to make sure this is the case, a VIF test was performed. As Table 18 shows, the highest VIF value is 4.79, indicating that there is a low level of multicollinearity between the variables and confirms that this is not a serious issue in this study.

TABLE 18 - VARIANCE INFLATION FACTOR

Variables	VIF	1/VIF
TDTA	4.79	0.209
STDTA	4.18	0.239
LTDTA	3.84	0.26
Tangibility	2.25	0.445
Size	1.73	0.579
Age	1.56	0.643
Non-debt tax shield	1.07	0.933
Growth	1	0.997
Mean VIF	**2.55**	

The table shows the results from the VIF test examining for multicollinearity.

6.3 POOLED OLS REGRESSION

Table 19 presents the results from ordinary least squares regression from testing the relationship between capital structure and firm performance. ROA, ROE and Tobin Q are used as dependent variables, while STDTA, LTDTA and TDTA are the independent variables. We have also included five control variables, which are size, growth, age, tangibility and non-debt tax shield.

We find a negative and significant relationship between STDTA and ROA at a 0.1 percent significance level, which indicates that an increase in short-term debt is associated with a decrease in ROA. Similarly, a negative relationship is found between TDTA and ROA, suggesting that an increase in total debt will result in a reduction of ROA. These results are in line with the empirical findings of Abor (2005) and Ebaid (2009). On the other hand, our

findings indicate a significantly positive relationship between LTDTA and ROA. The coefficient implies that in increase of 1 percent in long-term debt, would on average increase the performance measured by ROA by 0.19 percent. Furthermore, when observing the control variables, size and tangibility are the only significant factors affecting ROA.

Considering the relationship between capital structure and ROE, we find positive relationship to STDTA and LTDTA, and negative relationship to TDTA. However, none of the coefficients are statistically significant, indicating that capital structure does not influence the performance measured by ROE of the Norwegian companies. Furthermore, the only control variable that is significant in explaining the variation in ROE is the size of the enterprises, where a positive coefficient of about 0.03 is found.

Our results indicate a significant and positive relationship between STDTA and Tobin's Q, implying that an increase in short-term debt is associated with an increase in the market performance measure. Also, TDTA is positively related to Tobin's Q with a coefficient of 1.64, suggesting that 1 percent increase in total-debt would result in an increase of 1.64 percent in Q-value. On the other hand, LTDTA is found to be negatively insignificant related to the market performance ratio. Moreover, the factor size is the only control variable that is significantly related to Tobin's Q, where a negative relation is found. This indicates that larger companies in Norway tend to have a lower price to book valuation compared to smaller companies.

When looking at the fitness of the regression models, we find that all F-statistics are significant at a minimum of 1 percent level, indicating that the models are well fitted. However, the R-squared values can be considered as low, ranging from 0.027 for ROE to 0.206 for Tobin`s Q. For the ROE regression model, this means that the model is only able to explain about 3 percent of the change in ROE, while for Tobin's Q, the model is able to explain about 21 percent of the changes. The R-squared values for ROE are low but similar to the regression models in other empirical studies (Vatavu, 2015; Salim and Yadav, 2012).

TABLE 19 - POOLED OLS

Variables	(1) ROA	(2) ROE	(3) Tobin`s Q
STDTA	-0.222***	0.185	2.237***
	(0.0584)	(0.131)	(0.602)
LTDTA	0.186**	0.00968	-0.909
	(0.0571)	(0.128)	(0.589)
TDTA	-0.162**	-0.0392	1.645**
	(0.0541)	(0.122)	(0.558)
Size	0.0166***	0.0349***	-0.187***
	(0.00433)	(0.00972)	(0.0446)
Growth	-0.0000116	0.0000318	-0.000660
	(0.000131)	(0.000294)	(0.00135)
Age	-0.000197	-0.000478	-0.00249
	(0.000130)	(0.000293)	(0.00134)
Tangibility	-0.149***	-0.137	0.0944
	(0.0323)	(0.0725)	(0.333)
Non-debt tax shield	0.0513	-0.592	-2.534
	(0.143)	(0.322)	(1.477)
Constant	-0.0726	-0.380**	3.526***
	(0.0628)	(0.141)	(0.648)
R-Squared	0.185	0.027	0.206
F-Statistics	24***	2.99**	27.51***
Observations	858	858	858

Standard errors in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

6.4 FIXED AND RANDOM EFFECTS REGRESSION MODELS

The outcomes of the fixed and random effects regression models are presented in Table 20. The dependent and independent variables used in this model are identical to the ones used in the pooled OLS model.

We will begin by investigating the relationship between the debt ratios and ROA, where the findings are quite similar to each other. The differences between the models are found in the coefficients and their significance level. STDTA and TDTA is found to be significant and negatively related to ROA, while LTDTA is significantly positive using the RE model. The highest coefficient is found for the factor STDTA, with values of -0.57 in the FE model and -0.39 in the RE model. This indicates that a 1 percent increase in short-term debt would result in a decrease of 0.57 percent in ROA in the FE model and 0.39 percent in the RE model. The

negative results are in line with Vătavu (2015), investigating the relationship between capital structure and performance in listed Romanian companies between 2003-2010. Furthermore, when looking at the control variables, size, age, tangibility and NDTS are found to be significant factors influencing ROA. Finally, both regression models have almost identical R-squared values of 0.37 and 0.35. This means that FE is able to explain 37 percent and RE 35 percent of the movement in ROA with the independent variables.

The findings of both the FE and RE model with relation to ROE appears to be very poor. None of the models find any significant relationship between capital structure and ROE. Furthermore, the only control variables that are significant in the FE model turns out to be tangibility and NDTS, which are found to be negatively related to ROE. When using the RE model, the only control variables that are found significant are size and tangibility. The poor results are in line with the substantially low R-squared values found in both models, which are estimated to 0.03 and 0.02. This means that independent variables are only able to explain 3 percent in FE model and 2 percent in RE model in relation to ROE.

When looking at the relationship between capital structure and Tobin's Q, the findings of the FE and RE models are similar. STDTA and TDTA are again found to have a positive and significant effect on Tobin's Q, while LTDTA turns out to be insignificant. The positive relationship between the short-term debt ratio and Tobin's Q is in line with the conclusion of studies made by Zeitun and Tian (2007). The results indicate that a 1 percent increase in short-term debt and total debt, everything else equal, will increase the Q-value with 4.8 and 3.7 percent in FE model and 3.8 and 4 percent in RE model. Furthermore, the relationship between the control variables and Tobin's Q seems to be very poor. There are only two factors, size and NDTS, that are found negatively significant. Finally, the R-squared values of the FE and RE models equals 0.56 and 0.55, which means that the independent variables are able to explain 56 and 55 percent of the variation in Tobin's Q.

Overall, the F-statistics are significant at 1 percent level in FE models, which indicates a good fitness. For the RE models, we also observe Wald Chi-Squared values to be significant at a 1 percent level. This means that explanatory variables in the RE models are significant and able to explain the dependent variables. However, even the poor results we obtained for ROE, both models appear to have significant F-values and Wald Chi Squared values. Although the R-

squared can be considered to be quite low, the independent variables are able to explain the dependent variables. Overall, the R-squared values are higher in the FE and RE models compared to the pooled OLS model. This indicates that these models are able to explain the variation of the dependent variable more precisely.

TABLE 20: FIXED AND RANDOM EFFECTS MODELS

Variables	FE (1) ROA	FE (2) ROE	FE (3) Tobin Q	RE (4) ROA	RE (5) ROE	RE (6) Tobin Q
STDTA	-0.571*** (0.0806)	-0.0731 (0.210)	3.848*** (0.623)	-0.391*** (0.0681)	0.155 (0.140)	3.792*** (0.624)
LTDTA	0.0537 (0.0677)	-0.173 (0.176)	0.141 (0.522)	0.138* (0.0617)	-0.00479 (0.134)	-0.0495 (0.536)
TDTA	-0.191* (0.0771)	0.324 (0.201)	4.738*** (0.595)	-0.165** (0.0639)	-0.00326 (0.130)	4.012*** (0.593)
Size	0.0627*** (0.0137)	0.0540 (0.0357)	-0.978*** (0.106)	0.0197** (0.00613)	0.0353** (0.0109)	-0.486*** (0.0769)
Growth	0.000150 (0.000117)	0.000102 (0.000305)	-0.00176 (0.000905)	0.0000843 (0.000122)	0.0000606 (0.000294)	-0.00177 (0.000966)
Age	-0.00464*** (0.00126)	-0.00638 (0.00327)	0.00575 (0.00971)	-0.000327 (0.000191)	-0.000540 (0.000329)	0.000221 (0.00274)
Tangibility	-0.281*** (0.0708)	-0.610*** (0.184)	0.285 (0.546)	-0.183*** (0.0404)	-0.159* (0.0784)	-0.0832 (0.446)
Non-debt tax shield	0.719*** (0.197)	-1.148* (0.514)	-14.06*** (1.524)	0.194 (0.166)	-0.669 (0.344)	-10.64*** (1.513)
Constant	-0.360 (0.199)	-0.208 (0.517)	13.21*** (1.533)	-0.0480 (0.0877)	-0.379* (0.157)	6.472*** (1.096)
R-Squared	0.373	0.033	0.558	0.353	0.020	0.547
F-Statistics	57.41***	3.27**	121.76***			
Wald Chi-Squared				297.533***	21.45**	726.07***
Observations	858	858	858	858	858	858

Standard errors in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

6.5 BREUSCH-PAGAN LM-TEST AND F-TEST

To evaluate whether a random effects model or a pooled OLS model is most appropriate to use, we are performing a Breusch-Pagan Lagrange Multiplier (LM) test. The null hypothesis of the test indicates that a pooled OLS model is most appropriate. From Table 21, we find that the p-values are below 5 percent for ROA and Tobin's Q, meaning that we are able to reject the null hypothesis, and a random effects model is more appropriate. For ROE, the p-value is

above 5 percent, indicating that we cannot reject the null hypothesis, and a pooled OLS regression model is most appropriate.

To evaluate whether a fixed effects model or a pooled OLS model is most appropriate, we are performing a F-test for individual effects. Similar to the LM test, the null hypothesis indicates that a pooled OLS model is a more appropriate to use. From Table 21, we can observe that the p-values are below 5 percent for all performance measures, indicating that we reject the null hypothesis and that a fixed effects model is most appropriate.

TABLE 21 - BREUSCH PAGAN LAGRANGE MULTIPLIER TEST AND F-TEST

Variables	LM test (p-values)	F-test (p-values)	Appropriate model
ROA	0	0	Random and Fixed
ROE	0.0676	0.0062	OLS and Fixed
Tobin Q	0	0	Random and Fixed

The table illustrates whether FE or RE is the most appropriate model for our study compared to OLS. The Breusch Pagan Lagrange Multiplier (LM) test evaluates RE against OLS, while F-test evaluates FE against OLS.

6.6 CHOICE OF THE MODEL

The results from LM-test and F-test indicates that fixed and random effects models are more appropriate to use compared to pooled OLS. The next step is to evaluate the most efficient model between FE and RE for our sample. To solve this issue, a Hausman test was applied. The null hypothesis suggests that RE model is most appropriate, whereas the alternative hypothesis implies that FE estimates are consistent. As previously mentioned, the purpose of the test is to investigate whether there is any correlation between the unique error terms and the regressors used in the model. The null hypothesis implies that there is no correlation between the two regression models. According to Table 22, the p-values are below 5 percent and we are able to reject the null hypothesis. In conclusion, a fixed effects model is most appropriate to estimate the effect of capital structure on firm performance in the Norwegian market.

TABLE 22 - HAUSMAN TEST

Variables	P-values	Efficient and consistent model
ROA	0	Fixed Effects
ROE	0.0063	Fixed Effects
Tobin Q	0	Fixed Effects

The table presents an evaluation of whether FE or RE is the most appropriate model for our thesis. This has been applied on the three independent variables (ROA, ROE and Tobin Q). A p-value lower than 5 percent favors RE model, while p-value higher than 5 percent favors FE model.

6.7 AUTOCORRELATION AND HETEROSCEDASTICITY

Heteroscedasticity and autocorrelation may be present in the data, which can lead to inefficiency of the model coefficients. Therefore, to investigate whether these issues exist, two different tests were adapted.

First, to test for heteroscedasticity, a modified Wald test was performed. The null hypothesis of the test implies that our data sample is homoscedastic. As can be observed from Table 23, the p-values in the Wald test are zero for all models, concluding that we should reject the null hypothesis and that heteroscedasticity problems do exist in our sample.

To determine for autocorrelation, a Wooldridge test was performed. The null hypothesis of the test indicates no autocorrelation in our data. When observing the p-values in Table 23, they are below 5 percent for ROA and Tobin Q, whereas they are above 5 percent for ROE. This means that we reject the null hypothesis for ROA and Tobin Q, and that autocorrelation is present within these models. For ROE, we find no sign of autocorrelation in the data.

To deal with the presence of heteroscedasticity and autocorrelation, we applied the Feasible General Least Square (FGLS) model to investigate the relationship between capital structure and firm performance in the Norwegian market.

TABLE 23 - AUTOCORRELATION AND HETEROSCEDASTICITY

Variables	Autocorrelation	Heteroscedasticity
	Wooldridge test	Modified Wald test
ROA	0.0434	0
ROE	0.2033	0
Tobin Q	0	0

A Wooldridge test and Modified Wald test is applied for the three independent variables (ROA, ROE and Tobin Q) for autocorrelation and heteroscedasticity. A p-value higher than 5 percent indicates no correlation or heteroscedasticity and vice versa if the p-value is lower than 5 percent.

6.8 FGLS REGRESSION

After performing several tests, we came up with the conclusion that a FGLS regression model would be the most appropriate model to use. However, the findings from other regression models are still important. We expect the majority of the regression models to generate similar relationship, which can be seen as a robustness test to examine how certain our "core" regression models behave.

We will now investigate the outcomes from the FGLS model, which is presented in Table 24. The model indicates that all ratios of capital structure affects the variation in ROA. As for the independent variables, STDTA and TDTA are found to be significantly negative in relation to ROA on at least a 1 percent level. This suggests that an increase in short-term and total debt would result in a decrease in ROA. The findings are in line with the study made by Vatavu (2015), who investigated the relationship of capital structure decision and firm performance in Romania. The negative relationship could be explained by higher cost of leverage and strong covenant attached to it. LTDTA is found to be positive and significantly related to ROA with a coefficient of 0.186. This implies that an increase in the long-term debt ratio of 1 percent, would result in an increase in ROA of 0.186 percent. The positive relationship may be a result of companies getting lower interest on their long-term financing, resulting in increased performance.

The ratios STDTA and LTDTA are found to be positively related to ROE while TDTA is found to be negatively related to ROE. However, once again, none of the coefficients turns out to be statistically significant. Surprisingly, the only significant variable related the ROE is the control variable size, which is found to be positively related to the performance measure.

When investigating Tobin's Q with the debt ratios, we find a positive and significant relationship to both STDTA and TDTA. This indicates that an increase in debt, would on average result in an increase in Q-value. The result of STDTA is in line with the findings of Salim and Yadav (2012) studying firms in Malaysia. On the other hand, we find a negative but insignificant relationship between LTDTA and Tobin's Q, indicating that the long-term debt ratio in general do not affect the market performance of the companies.

In the last section we will briefly discuss the relationship between performance ratios and the control variables. According to the findings in Table 24, size and tangibility are the only control variables that has significant effect on firm performance. Size is positively related to ROA and ROE, which indicates that larger firms on average tend to perform better than smaller firms in Norway. This could be a result from diversification benefits and economies of scale within their business. On the other hand, size is found to be significantly negative in relation to Tobin`s Q, which indicates that larger firms on average tend to have lower market value of assets to their book value. Furthermore, the factor tangibility is found to be significantly negative in relation to ROA. This indicates that firms with large portions of fixed assets tend to underperform compared to firms with low ratios of fixed assets.

TABLE 24 – FGLS REGRESSION MODEL

Variables	(1) ROA	(2) ROE	(3) Tobin Q
STDTA	-0.222*** (0.0581)	0.185 (0.130)	2.237*** (0.599)
LTDTA	0.186** (0.0568)	0.00968 (0.128)	-0.909 (0.586)
TDTA	-0.162** (0.0539)	-0.0392 (0.121)	1.645** (0.555)
Size	0.0166*** (0.00431)	0.0349*** (0.00967)	-0.187*** (0.0444)
Growth	-0.0000116 (0.000130)	0.0000318 (0.000293)	-0.000660 (0.00134)
Age	-0.000197 (0.000130)	-0.000478 (0.000291)	-0.00249 (0.00134)
Tangibility	-0.149*** (0.0321)	-0.137 (0.0721)	0.0944 (0.331)
Non-debt tax shield	0.0513 (0.143)	-0.592 (0.320)	-2.534 (1.469)
Constant	-0.0726 (0.0625)	-0.380** (0.140)	3.526*** (0.645)
Wald Chi-Squared	194.06***	24.20**	222.38***
Observations	858	858	858

Standard errors in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

6.9 SUMMARY OF THE RELATIONSHIP BETWEEN LEVERAGE AND FIRM PERFORMANCE

The coefficients obtained in the FGLS and OLS models are very similar to each other, which we also observed in chapter 5. The differences in the models can be detected in the standard deviation and the confidence interval of the coefficients. Furthermore, we will follow the same summarizing approach as in the previous chapter where we choose to lend more weight on the coefficients with highest significance level and on the findings of the FGLS model. The presence of autocorrelation and heteroscedasticity makes the FGLS the most efficient model for investigating the relationship between capital structure and firm performance. Also,

the standard errors are in general lower in the FGLS model, indicating more precise values of the coefficients.

STDTA – ROA, ROE and Tobin Q

The relationship between the short-term debt ratio and ROA is found to be significantly negative in all regression models. The findings are in line with the results of Tifow and Sayilir (2015). Furthermore, the relationship between STDTA and Tobin's Q is significantly positive, which implies that an increase in the short-term debt will result in an increase of the market performance ratio. This result is in line with Salim and Yadav (2012). Lastly, no significant relationship is found between short-term debt and ROE in neither of the regression models. Overall, the findings suggest that short-term debt has a significant relationship on the performance of Norwegian companies, but the direction of the relationship varies depending on which measurement is used.

LTDTA – ROA, ROE and Tobin Q

The relationship between the long-term debt ratio and the chosen performance measures can be considered as weak. The FE model presents only non-significant results, whereas the OLS, FGLS and RE models presents a moderate positive relationship between the ratio and ROA. The positive relationship between LTDTA and ROA is in line with the findings of Tifow and Saylili (2015) studying firms in Turkey between 2008-2013. Finally, no regression model finds the leverage ratio to be significantly related to ROE or Tobin's Q. Overall, we can conclude that LTDTA has a low effect on the performance of listed Norwegian companies.

TDTA – ROA, ROE, Tobin Q

The relationship between the total debt ratio and the performance measures is similar in all regression models. As with the other debt ratios, no significant relationship is found to the

performance measure ROE. The effect of total debt on performance is found to be higher in the FE and RE models compared to the OLS and FGLS, especially regarding the relationship to Tobin's Q. Total debt is found to be negatively related ROA which in in line with most empirical studies, for example Vatavu (2015) and Ebaid (2009). On the other hand, total debt is found have a significantly negative relationship to Tobin's Q which contradicts most empirical studies, for example Le and Phan (2017) and Salim and Yadav (2012). Overall, we can conclude that total debt has an effect on firm performance but it is difficult to interpret whether the relationship is positive or negative.

Control variables

When looking at the relationship between the control variables and the performance measures, we obtain mixed results. In general, size and tangibility are the only variables that seems to affect the performance of Norwegian firms. The variable size mainly has a positive impact on both ROA and ROE, and a negative impact on Tobin's Q. This result is in line with Chadha and Sharma (2015), which indicates that larger firms tend to perform better in terms of ROA and ROE but have a lower market to book value. Furthermore, the factor tangibility tends to affect mainly ROA, where a negative relationship is found. The result indicates that firms with large portions of fixed assets tend to achieve a lower return on their assets compared to firms with lower ratios of fixed assets. Overall, the effect of control variables on firm performance is very weak, since majority of them were insignificant in the regression models.

TABLE 25 - SUMMARY OF THE FINDINGS

Variables	ROA	ROE	Tobin`s Q
STDTA	-	n/a	+
LTDTA	+	n/a	n/a
TDTA	-	n/a	+
Size	+	+	-
Growth	n/a	n/a	n/a
Age	n/a	n/a	n/a
Tangibility	-	n/a	n/a
Non-debt tax shield	n/a	n/a	n/a

The table presents summary result of our findings in relation to firm performance, capital structure and control variables.

7 CONCLUSION

This paper has been divided in two main parts. The first part investigates the determining factors of capital structure, while the second part investigates the relationship between capital structure and firm performance. By using panel data for listed Norwegian companies over the period 2006-2016, we have performed empirical analysis by using several regression models.

During the first part of the thesis, three leverage ratios based on book values was applied and used as proxies of capital structure. According to our findings, the factors size, age, tangibility, profitability and non-debt tax shield are all important determinants of capital structure in the Norwegian market. The empirical results provide evidence that there exist differences in the relationship to the three leverage ratios. While size, tangibility and profitability are significantly related to all leverage ratios, age is only related to long-term and total debt. Furthermore, non-debt tax shield is only related to short-term and long-term debt. Our results regarding determinants of capital structure are similar to the findings of Song (2015) and Nasimi (2016).

An interesting finding in our study is the existence of differences between the three debt ratios. Size is found to be negatively related to all leverage ratios while tangibility and profitability both are negatively related to short-term debt but positively related to long-term debt. Furthermore, the factor age is found positively related to both long-term and total debt, while no relationship is found to short-term debt. Finally, non-debt tax shield is found positively related to short-term debt while negatively related to long-term debt. The differences in financing decisions regarding debt structure between the determining factors opens-up for ideas for further research.

In general, our results support both the pecking order and trade-off theory when it comes to financing behavior of companies in the Norwegian market. Specifically, we can say that larger companies tend to have lower debt ratios compared to small companies. In addition, we conclude that profitable firms in general prefer to finance their assets with less debt compared to low profit firms. Moreover, our findings indicate that Norwegian firms in general were financing their assets with more debt compared to many other countries. We also observed increasing leverage ratios over the period, which could be explained by actions made by the

Norwegian Central Bank by lowering the key policy rate. Notable is also that Norwegian companies tend to finance their assets with similar amount of short- and long-term debt.

During the second part of the thesis, return on assets, return on equity and Tobin's Q were used as proxies of performance. Our results indicate that both short-term and total debt have a negative impact on ROA, whereas long-term debt is positively related to ROA. These results are in line with the findings of Tifow and Sayilir (2015). Opposite results were found for Tobin's Q, where both short-term and total debt have a positive impact on the market performance measure. The positive relationship between short-term debt and Tobin's Q could support the argument by Myers (1977), who stated that firms with large portions of short-term debt tend to experience a high growth rate and high performance. The result is also similar to the findings of Zeitun and Tian (2007). Surprisingly, no significant relationship was found between capital structure and ROE. Furthermore, the control variables displayed weak-to-no relationship to firm performance. The only significant factors were size and tangibility.

8 FURTHER RESEARCH

After finishing this research paper, we realized there are several other pieces of the puzzle regarding the determinants of capital structure and its effect on firm performance for the future investigation.

Macroeconomic factors have from previous studies proved to be significant in relation to capital structure and firm performance. A deeper understanding of the Norwegian economic factors would be interested to study to uncover how important they are on the firm performance and managers choice of funding. Furthermore, we could go deeper in the topic and investigate how important the Central Banks role is for the company's performance and decisions regarding capital structure.

In this paper we have only used secondary data to analyze our problem statement. We chose the dependent and the independent variables based on previous studies. A further analysis on this topic could be a combination of previous studies and conducting interviews from the

Norwegian companies. The choice of the variables would be better tailored towards the Norwegian market and could provide a more accurate result.

As mentioned earlier in this study, the energy, shipping and seafood industries are large sectors in the Norwegian economy. Analyzing which factors determines the capital structure and its effect on firm performance in those sectors would be an interesting topic. Furthermore, the findings of these three sectors could be compared to each other to identify key characteristics of each industry. In order to increase the number of observations, the Scandinavian countries all together could be investigated, instead of focusing only the Norwegian market.

Finally, when it comes to capital structure, this paper focuses solely on how companies are financing their assets in terms of debt and equity. During our study, we have limited the debt structure to short-term and long-term debt. An interesting topic for further research would be to look deeper into the topic of debt structure and the decisions regarding different types of debt and the link to performance.

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10 APPENDIX

APPENDIX 1: OLS REGRESSION MODEL – DETERMINE THE CAPITAL STRUCTURE (SHORT-TERM DEBT)

```
. regress stdta size growth age tangebility profitability nondebttaxshield
```

Source	SS	df	MS	Number of obs	=	858
				F(6, 851)	=	51.98
Model	12.1007077	6	2.01678462	Prob > F	=	0.0000
Residual	33.0154957	851	.038796117	R-squared	=	0.2682
				Adj R-squared	=	0.2631
Total	45.1162034	857	.052644345	Root MSE	=	.19697

stdta	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
size	-.0122627	.0043683	-2.81	0.005	-.0208365	-.0036889
growth	-.0000268	.0001346	-0.20	0.842	-.0002911	.0002375
age	-.0000846	.0001311	-0.65	0.519	-.000342	.0001728
tangebility	-.2117258	.0253985	-8.34	0.000	-.2615768	-.1618748
profitability	-.3922806	.032334	-12.13	0.000	-.4557443	-.3288168
nondebttaxshield	.5305387	.1457749	3.64	0.000	.2444183	.8166592
_cons	.5144768	.0603792	8.52	0.000	.3959672	.6329864

The figure illustrates a OLS regression model, where independent variable is short-term debt and the dependent variables are size, growth, age, tangibility, profitability and non-debt tax shield

APPENDIX 2: OLS REGRESSION MODEL – DETERMINE THE CAPITAL STRUCTURE (LONG-TERM DEBT)

```
. regress ltdta size growth age tangebility profitability nondebttaxshield
```

Source	SS	df	MS	Number of obs	=	858
				F(6, 851)	=	109.50
Model	18.8716896	6	3.1452816	Prob > F	=	0.0000
Residual	24.4449018	851	.028724914	R-squared	=	0.4357
				Adj R-squared	=	0.4317
Total	43.3165914	857	.050544447	Root MSE	=	.16948

ltdta	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
size	-.0157439	.0037588	-4.19	0.000	-.0231214	-.0083663
growth	.0000948	.0001159	0.82	0.414	-.0001326	.0003222
age	.0004391	.0001128	3.89	0.000	.0002176	.0006606
tangebility	.5272949	.0218546	24.13	0.000	.4843996	.5701901
profitability	.0814972	.0278224	2.93	0.003	.0268887	.1361058
nondebttaxshield	-.2694045	.1254348	-2.15	0.032	-.5156023	-.0232067
_cons	.2874305	.0519544	5.53	0.000	.1854567	.3894043

The figure illustrates a OLS regression model, where independent variable is long-term debt and the dependent variables are size, growth, age, tangibility, profitability and non-debt tax shield

APPENDIX 3: OLS REGRESSION MODEL – DETERMINE THE CAPITAL STRUCTURE (TOTAL DEBT)

```
. regress tdta size growth age tangebility profitability nondebttaxshield
```

Source	SS	df	MS	Number of obs	=	858
				F(6, 851)	=	31.73
Model	10.9880897	6	1.83134828	Prob > F	=	0.0000
Residual	49.1134786	851	.057712666	R-squared	=	0.1828
				Adj R-squared	=	0.1771
Total	60.1015683	857	.070130185	Root MSE	=	.24023

tdta	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
size	-.0117282	.0053278	-2.20	0.028	-.0221855	-.001271
growth	.0000615	.0001642	0.37	0.708	-.0002609	.0003838
age	.0006496	.00016	4.06	0.000	.0003357	.0009636
tangebility	.291593	.0309777	9.41	0.000	.2307913	.3523946
profitability	-.3498486	.0394367	-8.87	0.000	-.4272532	-.2724439
nondebttaxshield	.2541707	.1777969	1.43	0.153	-.0948011	.6031425
_cons	.5685053	.0736425	7.72	0.000	.423963	.7130476

The figure illustrates a OLS regression model, where independent variable is total debt and the dependent variables are size, growth, age, tangibility, profitability and non-debt tax shield

APPENDIX 4: FIXED EFFECTS REGRESSION MODEL - DETERMINE THE CAPITAL STRUCTURE (SHORT-TERM DEBT)

```
. xtreg STDTA Size Growth Age Tangibility Profitability Nondebttaxshield, fe

Fixed-effects (within) regression               Number of obs      =       858
Group variable: id                              Number of groups   =        78

R-sq:                                           Obs per group:
     within  = 0.3954                                         min =        11
     between = 0.0892                                         avg =      11.0
     overall = 0.1822                                         max =        11

                                                F(6,774)           =     84.36
corr(u_i, Xb)  = -0.3447                        Prob > F           =    0.0000
```

STDTA	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Size	-.0292177	.0105793	-2.76	0.006	-.0499852	-.0084501
Growth	.0001733	.0000895	1.94	0.053	-2.39e-06	.000349
Age	-.0008787	.0009709	-0.91	0.366	-.0027845	.0010272
Tangibility	-.0832755	.0534503	-1.56	0.120	-.1882003	.0216493
Profitability	-.4215339	.0228391	-18.46	0.000	-.4663678	-.3767001
Nondebttaxshield	1.148258	.146439	7.84	0.000	.860793	1.435722
_cons	.7398952	.1498487	4.94	0.000	.4457371	1.034053
sigma_u	.18304021					
sigma_e	.12395806					
rho	.68557775	(fraction of variance due to u_i)				

F test that all u_i=0: F(77, 774) = 17.85 Prob > F = 0.0000

The figure illustrates a fixed effects regression model, where independent variable is short-term debt and the dependent variables are size, growth, age, tangibility, profitability and non-debt tax shield

APPENDIX 5: FIXED EFFECTS REGRESSION MODEL - DETERMINE THE CAPITAL STRUCTURE (LONG-TERM DEBT)

```
. xtreg LTDTA Size Growth Age Tangibility Profitability Nondebttaxshield, fe

Fixed-effects (within) regression               Number of obs      =       858
Group variable: id                              Number of groups   =        78

R-sq:                                           Obs per group:
     within  = 0.0509                                         min =        11
     between = 0.5384                                         avg =      11.0
     overall = 0.3647                                         max =        11

                                                F(6,774)           =      6.92
corr(u_i, Xb)  = 0.3099                         Prob > F           =    0.0000
```

LTDTA	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Size	.005893	.0116209	0.51	0.612	-.0169192	.0287051
Growth	.000075	.0000983	0.76	0.446	-.0001179	.000268
Age	.0004718	.0010665	0.44	0.658	-.0016217	.0025653
Tangibility	.2841146	.0587126	4.84	0.000	.1688598	.3993693
Profitability	.0741672	.0250876	2.96	0.003	.0249194	.123415
Nondebttaxshield	-.1551854	.1608561	-0.96	0.335	-.4709513	.1605805
_cons	.0414518	.1646015	0.25	0.801	-.2816665	.3645701
sigma_u	.13114603					
sigma_e	.13616188					
rho	.48124227	(fraction of variance due to u_i)				

F test that all u_i=0: F(77, 774) = 7.07 Prob > F = 0.0000

The figure illustrates a fixed effects regression model, where independent variable is long-term debt and the dependent variables are size, growth, age, tangibility, profitability and non-debt tax shield

APPENDIX 6:FIXED EFFECTS REGRESSION MODEL - DETERMINE THE CAPITAL STRUCTURE (TOTAL DEBT)

```
. xtreg TDTA Size Growth Age Tangibility Profitability Nondebttaxshield, fe

Fixed-effects (within) regression               Number of obs      =       858
Group variable: id                              Number of groups   =        78

R-sq:                                           Obs per group:
     within  = 0.2791                                         min =        11
     between = 0.0246                                         avg =      11.0
     overall = 0.0784                                         max =        11

                                                F(6,774)           =     49.94
corr(u_i, Xb)  = -0.3426                        Prob > F           =    0.0000
```

TDTA	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Size	-.0141058	.0121638	-1.16	0.247	-.0379837	.0097721
Growth	.0002484	.0001029	2.41	0.016	.0000464	.0004504
Age	-.0009735	.0011163	-0.87	0.383	-.0031648	.0012178
Tangibility	.2398097	.0614556	3.90	0.000	.1191703	.3604491
Profitability	-.3600631	.0262597	-13.71	0.000	-.4116117	-.3085145
Nondebttaxshield	1.030419	.1683712	6.12	0.000	.6999005	1.360937
_cons	.6791397	.1722916	3.94	0.000	.3409256	1.017354
sigma_u	.23035175					
sigma_e	.14252326					
rho	.72316277	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(77, 774) = 21.35                     Prob > F = 0.0000
```

The figure illustrates a fixed effects regression model, where independent variable is long-term debt and the dependent variables are size, growth, age, tangibility, profitability and non-debt tax shield

APPENDIX 7: RANDOM EFFECTS REGRESSION MODEL - DETERMINE THE CAPITAL STRUCTURE (SHORT-TERM DEBT)

```
. xtreg STDTA Size Growth Age Tangibility Profitability Nondebttaxshield,re

Random-effects GLS regression                   Number of obs      =       858
Group variable: id                              Number of groups   =        78

R-sq:                                           Obs per group:
     within  = 0.3932                                         min =        11
     between = 0.1482                                         avg =      11.0
     overall = 0.2483                                         max =        11

                                                Wald chi2(6)       =    511.42
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

STDTA	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Size	-.0222263	.0079435	-2.80	0.005	-.0377953	-.0066573
Growth	.000153	.0000894	1.71	0.087	-.0000221	.0003282
Age	.0001091	.0003062	0.36	0.722	-.0004911	.0007092
Tangibility	-.1378467	.0428066	-3.22	0.001	-.2217462	-.0539472
Profitability	-.4223924	.0224418	-18.82	0.000	-.4663775	-.3784072
Nondebttaxshield	1.063687	.1390307	7.65	0.000	.7911918	1.336182
_cons	.6009481	.1110537	5.41	0.000	.3832868	.8186095
sigma_u	.15438312					
sigma_e	.12395806					
rho	.60801786	(fraction of variance due to u_i)				

The figure illustrates a random effects regression model, where independent variable is short-term debt and the dependent variables are size, growth, age, tangibility, profitability and non-debt tax shield

APPENDIX 8: RANDOM EFFECTS REGRESSION MODEL - DETERMINE THE CAPITAL STRUCTURE (LONG-TERM DEBT)

```
. xtreg LTDTA Size Growth Age Tangibility Profitability Nondebttaxshield,re

Random-effects GLS regression                   Number of obs      =       858
Group variable: id                              Number of groups   =        78

R-sq:                                           Obs per group:
     within  = 0.0483                                         min =        11
AppData\Local\Temp\STD00000000.tmp"                           avg =      11.0
                                                              max =        11

                                                Wald chi2(6)       =    162.88
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

LTDTA	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Size	-.0079961	.0068479	-1.17	0.243	-.0214178	.0054256
Growth	.0000832	.0000977	0.85	0.395	-.0001083	.0002746
Age	.0002786	.0002297	1.21	0.225	-.0001715	.0007288
Tangibility	.4394972	.0381602	11.52	0.000	.3647046	.5142897
Profitability	.083108	.0243137	3.42	0.001	.035454	.130762
Nondebttaxshield	-.2082671	.1447658	-1.44	0.150	-.4920028	.0754686
_cons	.208523	.0949537	2.20	0.028	.0224173	.3946287
sigma_u	.10375205					
sigma_e	.13616188					
rho	.36733165	(fraction of variance due to u_i)				

The figure illustrates a random effects regression model, where independent variable is long-term debt and the dependent variables are size, growth, age, tangibility, profitability and non-debt tax shield

APPENDIX 9: RANDOM EFFECTS REGRESSION MODEL - DETERMINE THE CAPITAL STRUCTURE (TOTAL DEBT)

```
. xtreg TDTA Size Growth Age Tangibility Profitability Nondebttaxshield,re

Random-effects GLS regression                   Number of obs     =       858
Group variable: id                              Number of groups  =        78

R-sq:                                           Obs per group:
     within  = 0.2768                                         min =        11
     between = 0.1040                                         avg =      11.0
     overall = 0.1654                                         max =        11

                                                Wald chi2(6)      =    305.15
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =    0.0000
```

TDTA	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Size	-.0135575	.0095157	-1.42	0.154	-.0322079	.0050929
Growth	.0002341	.0001026	2.28	0.022	.0000331	.0004351
Age	.0005746	.0003833	1.50	0.134	-.0001767	.001326
Tangibility	.2522845	.050881	4.96	0.000	.1525596	.3520094
Profitability	-.3571033	.025799	-13.84	0.000	-.4076684	-.3065381
Nondebttaxshield	.9175802	.1607034	5.71	0.000	.6026074	1.232553
_cons	.5821325	.1334141	4.36	0.000	.3206458	.8436193
sigma_u	.1986988					
sigma_e	.14252326					
rho	.6602862	(fraction of variance due to u_i)				

The figure illustrates a random effects regression model, where independent variable is total debt and the dependent variables are size, growth, age, tangibility, profitability and non-debt tax shield

APPENDIX 10:HAUSMAN TEST - DETERMINE THE CAPITAL STRUCTURE (SHORT-TERM DEBT)

```
. hausman FixedSTDTA RandomSTDTA
```

	Coefficients (b) FixedSTDTA	(B) RandomSTDTA	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
Size	-.0292177	-.0222263	-.0069913	.0069873
Growth	.0001733	.000153	.0000203	4.77e-06
Age	-.0008787	.0001091	-.0009877	.0009213
Tangibility	-.0832755	-.1378467	.0545713	.0320082
Profitabil~y	-.4215339	-.4223924	.0008584	.0042411
Nondebttax~d	1.148258	1.063687	.0845708	.0459875

```
                b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                chi2(6) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                        =       17.35
              Prob>chi2 =      0.0081
              (V_b-V_B is not positive definite)
```

The figure illustrates the Hausman test, between random and fixed effects models for short-term debt. This is for the first part of our thesis, where we want to find out which factors determine the capital structure

APPENDIX 11: HAUSMAN TEST - DETERMINE THE CAPITAL STRUCTURE (LONG-TERM DEBT)

```
. hausman fixedLTDTA randomLTDTA
```

	Coefficients (b) fixedLTDTA	(B) randomLTDTA	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
size	.005893	-.0079961	.0138891	.0093888
growth	.000075	.0000832	-8.11e-06	.0000112
age	.0004718	.0002786	.0001932	.0010414
tangebility	.2841146	.4394972	-.1553826	.0446203
profitabil~y	.0741672	.083108	-.0089408	.006183
nondebttax~d	-.1551854	-.2082671	.0530817	.0701252

```
                b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                chi2(6) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                        =       12.44
              Prob>chi2 =      0.0528
```

The figure illustrates the Hausman test, between random and fixed effects models for long-term debt. This is for the first part of our thesis, where we want to find out which factors determine the capital structure

APPENDIX 12: HAUSMAN TEST - DETERMINE THE CAPITAL STRUCTURE (TOTAL DEBT)

```
. hausman fixedTDTA randomTDTA
```

	Coefficients (b) fixedTDTA	(B) randomTDTA	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
size	-.0141058	-.0135575	-.0005483	.0075769
growth	.0002484	.0002341	.0000143	8.35e-06
age	-.0009735	.0005746	-.0015481	.0010484
tangebility	.2398097	.2522845	-.0124748	.0344661
profitabil~y	-.3600631	-.3571033	-.0029598	.004897
nondebttax~d	1.030419	.9175802	.1128385	.0502321

```
                b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                chi2(6) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                        =         7.71
              Prob>chi2 =       0.2598
```

The figure illustrates the Hausman test, between random and fixed effects models for total debt. This is for the first part of our thesis, where we want to find out which factors determine the capital structure

APPENDIX 13: BREUSCH AND PAGAN LAGRANGE MULTIPLIER TEST FOR RANDOM EFFECT (SHORT-TERM DEBT)

```
Breusch and Pagan Lagrangian multiplier test for random effects

        stdta[id,t] = Xb + u[id] + e[id,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+------------------------------
                   stdta |    .0526443       .2294436
                       e |    .0153656       .1239581
                       u |    .0238341       .1543831

        Test:   Var(u) = 0
                             chibar2(01) =  1470.35
                          Prob > chibar2 =   0.0000
```

APPENDIX 14: BREUSCH AND PAGAN LAGRANGE MULTIPLIER TEST FOR RANDOM EFFECT (LONG-TERM DEBT)

```
Breusch and Pagan Lagrangian multiplier test for random effects

        ltdta[id,t] = Xb + u[id] + e[id,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+------------------------------
                   ltdta |    .0505444       .2248209
                       e |    .0185401       .1361619
                       u |    .0107645        .103752

        Test:   Var(u) = 0
                             chibar2(01) =   494.96
                          Prob > chibar2 =   0.0000
```

APPENDIX 15: BREUSCH AND PAGAN LAGRANGE MULTIPLIER TEST FOR RANDOM EFFECT (TOTAL DEBT)

```
Breusch and Pagan Lagrangian multiplier test for random effects

        tdta[id,t] = Xb + u[id] + e[id,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+------------------------------
                    tdta |    .0701302        .264821
                       e |    .0203129       .1425233
                       u |    .0394812       .1986988

        Test:   Var(u) = 0
                                 chibar2(01) =  1735.01
                              Prob > chibar2 =   0.0000
```

APPENDIX 16: MODIFIED WALD TEST FOR FIXED EFFECTS REGRESSION MODEL (SHORT-TERM DEBT)

```
. xttest3

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (78)  =    2.6e+05
Prob>chi2 =     0.0000
```

APPENDIX 17: MODIFIED WALD TEST FOR FIXED EFFECTS REGRESSION MODEL (LONG-TERM DEBT)

```
. xttest3

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (78)  =    2.5e+06
Prob>chi2 =     0.0000
```

APPENDIX 18: MODIFIED WALD TEST FOR FIXED EFFECTS REGRESSION MODEL (TOTAL DEBT)

```
. xttest3

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (78)  =    4.0e+07
Prob>chi2 =     0.0000
```

APPENDIX 19: WOOLDRIDGE TEST FOR AUTOCORRELATION (SHORT-TERM DEBT)

```
. xtserial STDTA Size Growth Age Tangibility Profitability Nondebttaxshield

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,      77) =      1.062
           Prob > F =      0.3059
```

APPENDIX 20: WOOLDRIDGE TEST FOR AUTOCORRELATION (LONG-TERM DEBT)

```
. xtserial LTDTA Size Growth Age Tangibility Profitability Nondebttaxshield

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,      77) =     10.622
          Prob > F =      0.0017
```

APPENDIX 21:WOOLDRIDGE TEST FOR AUTOCORRELATION (TOTAL DEBT)

```
. xtserial TDTA Size Growth Age Tangibility Profitability Nondebttaxshield

Wooldridge test for autocorrelation in panel data
h Age Tangibility Profitability Nondebttaxshield,fe
H0: no first-order autocorrelation
    F(  1,      77) =     10.313
          Prob > F =      0.0019
```

APPENDIX 22: FEASIBLE GENERALIZED LEAST SQUARES REGRESSION MODEL - DETERMINE THE CAPITAL STRUCTURE (SHORT-TERM DEBT)

```
. xtgls stdta size growth age tangebility profitability nondebttaxshield

Cross-sectional time-series FGLS regression

Coefficients:  generalized least squares
Panels:        homoskedastic
Correlation:   no autocorrelation

Estimated covariances      =         1          Number of obs      =       858
Estimated autocorrelations =         0          Number of groups   =        78
Estimated coefficients     =         7          Time periods       =        11
                                                Wald chi2(6)       =    314.47
Log likelihood             =  180.0728          Prob > chi2        =    0.0000
```

stdta	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
size	-.0122627	.0043504	-2.82	0.005	-.0207893	-.003736
growth	-.0000268	.0001341	-0.20	0.841	-.0002896	.000236
age	-.0000846	.0001306	-0.65	0.517	-.0003406	.0001714
tangebility	-.2117258	.0252947	-8.37	0.000	-.2613025	-.1621492
profitability	-.3922806	.0322018	-12.18	0.000	-.455395	-.3291661
nondebttaxshield	.5305387	.145179	3.65	0.000	.2459931	.8150844
_cons	.5144768	.0601324	8.56	0.000	.3966195	.6323341

The figure illustrates a FGLS regression model, where independent variable is short-term debt and the dependent variables are size, growth, age, tangibility, profitability and non-debt tax shield

APPENDIX 23: FEASIBLE GENERALIZED LEAST SQUARES REGRESSION MODEL - DETERMINE THE CAPITAL STRUCTURE (LONG-TERM DEBT)

```
. xtgls ltdta size growth age tangebility profitability nondebttaxshield

Cross-sectional time-series FGLS regression

Coefficients:  generalized least squares
Panels:        homoskedastic
Correlation:   no autocorrelation

Estimated covariances      =         1          Number of obs      =       858
Estimated autocorrelations =         0          Number of groups   =        78
Estimated coefficients     =         7          Time periods       =        11
                                                Wald chi2(6)       =    662.38
Log likelihood             =   309.011          Prob > chi2        =    0.0000
```

ltdta	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
size	-.0157439	.0037434	-4.21	0.000	-.0230808	-.008407
growth	.0000948	.0001154	0.82	0.411	-.0001314	.0003209
age	.0004391	.0001124	3.91	0.000	.0002188	.0006594
tangebility	.5272949	.0217653	24.23	0.000	.4846357	.569954
profitability	.0814972	.0277087	2.94	0.003	.0271892	.1358053
nondebttaxshield	-.2694045	.124922	-2.16	0.031	-.5142472	-.0245618
_cons	.2874305	.051742	5.56	0.000	.1860179	.388843

The figure illustrates a FGLS regression model, where independent variable is long-term debt and the dependent variables are size, growth, age, tangibility, profitability and non-debt tax shield

APPENDIX 24: FEASIBLE GENERALIZED LEAST SQUARES REGRESSION MODEL - DETERMINE THE CAPITAL STRUCTURE (TOTAL DEBT)

```
. xtgls tdta size growth age tangebility profitability nondebttaxshield

Cross-sectional time-series FGLS regression

Coefficients:  generalized least squares
Panels:        homoskedastic
Correlation:   no autocorrelation

Estimated covariances      =         1          Number of obs      =       858
Estimated autocorrelations =         0          Number of groups   =        78
Estimated coefficients     =         7          Time periods       =        11
                                                Wald chi2(6)       =    191.96
Log likelihood             =  9.692621          Prob > chi2        =    0.0000
```

tdta	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
size	-.0117282	.0053061	-2.21	0.027	-.0221279	-.0013286
growth	.0000615	.0001635	0.38	0.707	-.0002591	.000382
age	.0006496	.0001593	4.08	0.000	.0003374	.0009619
tangebility	.291593	.0308511	9.45	0.000	.231126	.3520599
profitability	-.3498486	.0392755	-8.91	0.000	-.4268272	-.27287
nondebttaxshield	.2541707	.1770701	1.44	0.151	-.0928804	.6012218
_cons	.5685053	.0733415	7.75	0.000	.4247586	.712252

The figure illustrates a FGLS regression model, where independent variable is total debt and the dependent variables are size, growth, age, tangibility, profitability and non-debt tax shield

APPENDIX 25: POOLED OLS REGRESSION MODEL- CAPITAL STRUCTURE AND FIRM PERFORMANCE (ROA)

```
.  eststo: reg ROA STDTA LTDTA TDTA Size Growth Age Tangibility Nondebttaxshield
```

Source	SS	df	MS	Number of obs	=	858
				F(8, 849)	=	24.00
Model	7.06073079	8	.882591348	Prob > F	=	0.0000
Residual	31.2177517	849	.036770026	R-squared	=	0.1845
				Adj R-squared	=	0.1768
Total	38.2784825	857	.044665674	Root MSE	=	.19176

ROA	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
STDTA	-.2215275	.0583717	-3.80	0.000	-.3360974	-.1069577
LTDTA	.1855908	.0571124	3.25	0.001	.0734928	.2976888
TDTA	-.1620942	.0541401	-2.99	0.003	-.2683583	-.0558301
Size	.0165569	.0043295	3.82	0.000	.008059	.0250547
Growth	-.0000116	.0001311	-0.09	0.930	-.0002689	.0002458
Age	-.0001969	.0001303	-1.51	0.131	-.0004527	.0000589
Tangibility	-.1489311	.0322955	-4.61	0.000	-.2123195	-.0855427
Nondebttaxshield	.0513455	.1432699	0.36	0.720	-.2298591	.3325502
_cons	-.07264	.062848	-1.16	0.248	-.1959956	.0507156

```
(est1 stored)
```

The figure illustrates a OLS regression model, where independent variable is ROA and the dependent variables are short-term debt, long-term debt, total debt, size, growth, age, tangibility and non-debt tax shield

APPENDIX 26: POOLED OLS REGRESSION MODEL- CAPITAL STRUCTURE AND FIRM PERFORMANCE (ROE)

```
.  eststo: reg ROE STDTA LTDTA TDTA Size Growth Age Tangibility Nondebttaxshield
```

Source	SS	df	MS	Number of obs	=	858
				F(8, 849)	=	2.99
Model	4.43702068	8	.554627585	Prob > F	=	0.0026
Residual	157.292122	849	.185267517	R-squared	=	0.0274
				Adj R-squared	=	0.0183
Total	161.729142	857	.188715452	Root MSE	=	.43043

ROE	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
STDTA	.1854122	.1310253	1.42	0.157	-.0717594	.4425837
LTDTA	.0096791	.1281985	0.08	0.940	-.2419441	.2613023
TDTA	-.0392462	.1215267	-0.32	0.747	-.2777742	.1992818
Size	.0348719	.0097183	3.59	0.000	.0157971	.0539467
Growth	.0000318	.0002944	0.11	0.914	-.0005459	.0006096
Age	-.0004782	.0002925	-1.63	0.102	-.0010524	.000096
Tangibility	-.1367088	.0724927	-1.89	0.060	-.2789948	.0055772
Nondebttaxshield	-.5920391	.3215937	-1.84	0.066	-1.223251	.0391729
_cons	-.3800865	.141073	-2.69	0.007	-.6569792	-.1031938

```
(est2 stored)
```

The figure illustrates a OLS regression model, where independent variable is ROE and the dependent variables are short-term debt, long-term debt, total debt, size, growth, age, tangibility and non-debt tax shield

APPENDIX 27: POOLED OLS REGRESSION MODEL-CAPITAL STRUCTURE AND FIRM PERFORMANCE (TOBIN Q)

```
. eststo: reg TobinQ STDTA LTDTA TDTA Size Growth Age Tangibility Nondebttaxshield
```

Source	SS	df	MS	Number of obs	=	858
				F(8, 849)	=	27.51
Model	860.119973	8	107.514997	Prob > F	=	0.0000
Residual	3318.49529	849	3.90871059	R-squared	=	0.2058
				Adj R-squared	=	0.1984
Total	4178.61526	857	4.87586378	Root MSE	=	1.977

TobinQ	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
STDTA	2.236945	.601828	3.72	0.000	1.0557	3.41819
LTDTA	-.908761	.5888439	-1.54	0.123	-2.064521	.2469994
TDTA	1.644716	.5581987	2.95	0.003	.5491044	2.740327
Size	-.1866682	.0446385	-4.18	0.000	-.2742829	-.0990535
Growth	-.0006601	.001352	-0.49	0.626	-.0033138	.0019936
Age	-.0024941	.0013437	-1.86	0.064	-.0051314	.0001432
Tangibility	.0943669	.332975	0.28	0.777	-.5591839	.7479177
Nondebttaxshield	-2.533574	1.47715	-1.72	0.087	-5.432868	.3657212
_cons	3.525745	.647979	5.44	0.000	2.253916	4.797573

```
(est3 stored)
```

The figure illustrates a OLS regression model, where independent variable is Tobin Q and the dependent variables are short-term debt, long-term debt, total debt, size, growth, age, tangibility and non-debt tax shield

APPENDIX 28: FIXED EFFECTS REGRESSION MODEL – CAPITAL STRUCTURE AND FIRM PERFORMANCE (ROA)

```
. eststo: xtreg ROA STDTA LTDTA TDTA Size Growth Age Tangibility Nondebttaxshield,fe

Fixed-effects (within) regression               Number of obs      =       858
Group variable: id                              Number of groups   =        78

R-sq:                                           Obs per group:
     within  = 0.3730                                         min =        11
     between = 0.0010                                         avg =      11.0
     overall = 0.0551                                         max =        11

                                                F(8,772)           =     57.41
corr(u_i, Xb)  = -0.8761                        Prob > F           =    0.0000
```

ROA	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
STDTA	-.5709727	.0806484	-7.08	0.000	-.729289	-.4126565
LTDTA	.0537413	.0676571	0.79	0.427	-.0790723	.1865549
TDTA	-.1912281	.0770893	-2.48	0.013	-.3425576	-.0398985
Size	.0627261	.0137086	4.58	0.000	.0358156	.0896367
Growth	.00015	.0001172	1.28	0.201	-.0000801	.0003801
Age	-.004635	.001258	-3.68	0.000	-.0071045	-.0021656
Tangibility	-.2814948	.070771	-3.98	0.000	-.4204213	-.1425684
Nondebttaxshield	.719079	.1973757	3.64	0.000	.3316222	1.106536
_cons	-.3602815	.1986068	-1.81	0.070	-.750155	.029592
sigma_u	.28463125					
sigma_e	.16184521					
rho	.75567429	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(77, 772) = 5.45                     Prob > F = 0.0000
(est1 stored)
```

The figure illustrates a Fixed effect regression model, where independent variable is ROE and the dependent variables are short-term debt, long-term debt, total debt, size, growth, age, tangibility and non-debt tax shield

APPENDIX 29: FIXED EFFECTS REGRESSION MODEL – CAPITAL STRUCTURE AND FIRM PERFORMANCE (ROE)

```
. eststo: xtreg ROE STDTA LTDTA TDTA Size Growth Age Tangibility Nondebttaxshield,fe

Fixed-effects (within) regression               Number of obs      =       858
Group variable: id                              Number of groups   =        78

R-sq:                                           Obs per group:
     within  = 0.0328                                         min =        11
     between = 0.0014                                         avg =      11.0
     overall = 0.0023                                         max =        11

                                                F(8,772)           =      3.27
corr(u_i, Xb)  = -0.8919                        Prob > F           =    0.0011
```

ROE	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
STDTA	-.0730793	.2099467	-0.35	0.728	-.4852134	.3390547
LTDTA	-.1732435	.1761271	-0.98	0.326	-.5189883	.1725013
TDTA	.3242717	.2006814	1.62	0.107	-.0696744	.7182177
Size	.0539791	.0356867	1.51	0.131	-.0160753	.1240335
Growth	.0001016	.0003051	0.33	0.739	-.0004973	.0007006
Age	-.0063784	.0032748	-1.95	0.052	-.0128069	.0000501
Tangibility	-.6104967	.1842334	-3.31	0.001	-.9721546	-.2488388
Nondebttaxshield	-1.147888	.5138149	-2.23	0.026	-2.156528	-.1392483
_cons	-.2076289	.5170198	-0.40	0.688	-1.22256	.8073025
sigma_u	.37466553					
sigma_e	.42132074					
rho	.4415876	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(77, 772) = 1.48                     Prob > F = 0.0062
(est2 stored)
```

The figure illustrates a fixed effects regression model, where independent variable is ROE and the dependent variables are short-term debt, long-term debt, total debt, size, growth, age, tangibility and non-debt tax shield

APPENDIX 30: FIXED EFFECTS REGRESSION MODEL – CAPITAL STRUCTURE AND FIRM PERFORMANCE (TOBIN Q)

```
. eststo: xtreg TobinQ STDTA LTDTA TDTA Size Growth Age Tangibility Nondebttaxshield,fe

Fixed-effects (within) regression               Number of obs      =       858
Group variable: id                              Number of groups   =        78

R-sq:                                           Obs per group:
     within  = 0.5579                                         min =        11
     between = 0.0513                                         avg =      11.0
     overall = 0.1701                                         max =        11

                                                F(8,772)           =    121.76
corr(u_i, Xb)  = -0.7430                        Prob > F           =    0.0000
```

TobinQ	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
STDTA	3.848025	.6225689	6.18	0.000	2.625896	5.070153
LTDTA	.1408645	.5222815	0.27	0.787	-.8843958	1.166125
TDTA	4.737529	.5950942	7.96	0.000	3.569334	5.905723
Size	-.9778616	.1058241	-9.24	0.000	-1.185599	-.7701245
Growth	-.0017618	.0009047	-1.95	0.052	-.0035378	.0000143
Age	.0057452	.0097109	0.59	0.554	-.0133176	.0248081
Tangibility	.2850396	.5463198	0.52	0.602	-.7874088	1.357488
Nondebttaxshield	-14.05719	1.52365	-9.23	0.000	-17.04818	-11.06621
_cons	13.21253	1.533154	8.62	0.000	10.20288	16.22217
sigma_u	2.4420659					
sigma_e	1.2493707					
rho	.79255714	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(77, 772) = 17.58                     Prob > F = 0.0000
(est3 stored)
```

The figure illustrates a fixed effects regression model, where independent variable is Tobin Q and the dependent variables are short-term debt, long-term debt, total debt, size, growth, age, tangibility and non-debt tax shield

APPENDIX 31:RANDOM EFFECTS REGRESSION MODEL– CAPITAL STRUCTURE AND FIRM PERFORMANCE (ROA)

```
. eststo: xtreg ROA STDTA LTDTA TDTA Size Growth Age Tangibility Nondebttaxshield,re

Random-effects GLS regression                   Number of obs      =       858
Group variable: id                              Number of groups   =        78

R-sq:                                           Obs per group:
     within  = 0.3533                                         min =        11
     between = 0.0358                                         avg =      11.0
     overall = 0.1808                                         max =        11

                                                Wald chi2(8)       =    297.53
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

ROA	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
STDTA	-.3914232	.0681214	-5.75	0.000	-.5249386	-.2579078
LTDTA	.1377409	.0617131	2.23	0.026	.0167853	.2586964
TDTA	-.1653638	.0638769	-2.59	0.010	-.2905601	-.0401674
Size	.0196753	.0061262	3.21	0.001	.0076681	.0316824
Growth	.0000843	.0001223	0.69	0.491	-.0001554	.000324
Age	-.0003272	.0001907	-1.72	0.086	-.000701	.0000465
Tangibility	-.1834681	.0404198	-4.54	0.000	-.2626894	-.1042468
Nondebttaxshield	.1935763	.1658593	1.17	0.243	-.131502	.5186546
_cons	-.0480178	.0876904	-0.55	0.584	-.2198878	.1238522
sigma_u	.0659837					
sigma_e	.16184521					
rho	.14252614	(fraction of variance due to u_i)				

```
(est4 stored)
```

The figure illustrates a RE regression model, where independent variable is ROA and the dependent variables are short-term debt, long-term debt, total debt, size, growth, age, tangibility and non-debt tax shield

APPENDIX 32: RANDOM EFFECTS REGRESSION MODEL– CAPITAL STRUCTURE AND FIRM PERFORMANCE (ROE)

```
. eststo: xtreg ROE STDTA LTDTA TDTA Size Growth Age Tangibility Nondebttaxshield,re

Random-effects GLS regression                   Number of obs      =       858
Group variable: id                              Number of groups   =        78

R-sq:                                           Obs per group:
     within  = 0.0202                                         min =        11
     between = 0.1178                                         avg =      11.0
     overall = 0.0272                                         max =        11

                                                Wald chi2(8)       =     21.45
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0061
```

ROE	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
STDTA	.1545436	.1403228	1.10	0.271	-.120484	.4295711
LTDTA	-.0047947	.1341024	-0.04	0.971	-.2676306	.2580411
TDTA	-.0032559	.1304799	-0.02	0.980	-.2589919	.25248
Size	.0353088	.0108786	3.25	0.001	.0139872	.0566305
Growth	.0000606	.0002936	0.21	0.837	-.0005149	.0006361
Age	-.00054	.0003295	-1.64	0.101	-.0011858	.0001057
Tangibility	-.1587807	.0784255	-2.02	0.043	-.3124919	-.0050695
Nondebttaxshield	-.6692752	.3435722	-1.95	0.051	-1.342664	.004114
_cons	-.3788683	.1572628	-2.41	0.016	-.6870977	-.0706388
sigma_u	.07263571					
sigma_e	.42132074					
rho	.02886388	(fraction of variance due to u_i)				

```
(est5 stored)
```

The figure illustrates a RE regression model, where independent variable is ROE and the dependent variables are short-term debt, long-term debt, total debt, size, growth, age, tangibility and non-debt tax shield

APPENDIX 33: RANDOM EFFECTS REGRESSION MODEL– CAPITAL STRUCTURE AND FIRM PERFORMANCE (TOBIN Q)

```
. eststo: xtreg TobinQ STDTA LTDTA TDTA Size Growth Age Tangibility Nondebttaxshield,re

Random-effects GLS regression                   Number of obs     =       858
Group variable: id                              Number of groups  =        78

R-sq:                                           Obs per group:
     within  = 0.5473                                         min =        11
     between = 0.0405                                         avg =      11.0
     overall = 0.1861                                         max =        11

                                                Wald chi2(8)      =    726.07
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =    0.0000
```

TobinQ	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
STDTA	3.79169	.6241822	6.07	0.000	2.568316	5.015065
LTDTA	-.0494987	.5358871	-0.09	0.926	-1.099818	1.000821
TDTA	4.011814	.5927826	6.77	0.000	2.849981	5.173646
Size	-.4857941	.0769164	-6.32	0.000	-.6365474	-.3350408
Growth	-.0017713	.0009664	-1.83	0.067	-.0036655	.0001229
Age	.0002211	.0027411	0.08	0.936	-.0051513	.0055935
Tangibility	-.0832101	.4455873	-0.19	0.852	-.9565451	.7901249
Nondebttaxshield	-10.64286	1.512619	-7.04	0.000	-13.60754	-7.678181
_cons	6.472066	1.095509	5.91	0.000	4.324909	8.619224
sigma_u	1.2184706					
sigma_e	1.2493707					
rho	.48748085	(fraction of variance due to u_i)				

```
(est6 stored)
```

The figure illustrates a RE regression model, where independent variable is Tobin Q and the dependent variables are short-term debt, long-term debt, total debt, size, growth, age, tangibility and non-debt tax shield

APPENDIX 34: HAUSMAN TEST – CAPITAL STRUCTURE AND FIRM PERFORMANCE (ROA)

```
. hausman ROAFixed ROARandom
```

	Coefficients (b) ROAFixed	(B) ROARandom	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
STDTA	-.5709727	-.3914232	-.1795495	.04317
LTDTA	.0537413	.1377409	-.0839996	.0277302
TDTA	-.1912281	-.1653638	-.0258643	.0431568
Size	.0627261	.0196753	.0430509	.0122636
Growth	.00015	.0000843	.0000657	.
Age	-.004635	-.0003272	-.0043078	.0012434
Tangibility	-.2814948	-.1834681	-.0980267	.0580929
Nondebttax~d	.719079	.1935763	.5255027	.1069947

```
                b = consistent under Ho and Ha; obtained from xtreg
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(8) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =      225.09
                Prob>chi2 =      0.0000
                (V_b-V_B is not positive definite)
```

APPENDIX 35: HAUSMAN TEST - CAPITAL STRUCTURE AND FIRM PERFORMANCE (ROE)

```
. hausman ROEFixed ROERandom
```

	Coefficients (b) ROEFixed	(B) ROERandom	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
STDTA	-.0730793	.1545436	-.2276229	.1561638
LTDTA	-.1732435	-.0047947	-.1684487	.114181
TDTA	.3242717	-.0032559	.3275276	.1524731
Size	.0539791	.0353088	.0186702	.0339881
Growth	.0001016	.0000606	.000041	.0000829
Age	-.0063784	-.00054	-.0058384	.0032581
Tangibility	-.6104967	-.1587807	-.451716	.1667075
Nondebttax~d	-1.147888	-.6692752	-.4786131	.3820522

```
                b = consistent under Ho and Ha; obtained from xtreg
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(8) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       21.33
                Prob>chi2 =      0.0063
```

APPENDIX 36: HAUSMAN TEST - CAPITAL STRUCTURE AND FIRM PERFORMANCE (TOBIN Q)

```
. hausman TobinQFixed TobinQRandom
```

	Coefficients (b) TobinQFixed	(B) TobinQRandom	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
STDTA	3.848025	3.79169	.0563341	.
LTDTA	.1408645	-.0494987	.1903632	.
TDTA	4.737529	4.011814	.7257151	.0524018
Size	-.9778616	-.4857941	-.4920675	.0726816
Growth	-.0017618	-.0017713	9.55e-06	.
Age	.0057452	.0002211	.0055241	.009316
Tangibility	.2850396	-.0832101	.3682498	.3160969
Nondebttax~d	-14.05719	-10.64286	-3.414333	.1830077

```
                b = consistent under Ho and Ha; obtained from xtreg
     B = inconsistent under Ha, efficient under Ho; obtained from xtreg

  Test:  Ho:  difference in coefficients not systematic

              chi2(8) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                      =      226.05
            Prob>chi2 =      0.0000
            (V_b-V_B is not positive definite)
```

APPENDIX 37: BREUSCH AND PAGAN LAGRANGE MULTIPLIER TEST FOR RANDOM EFFECT (ROA)

```
. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        ROA[id,t] = Xb + u[id] + e[id,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                 --------+------------------------------
                     ROA |    .0446657        .2113426
                       e |    .0261939        .1618452
                       u |    .0043538        .0659837

        Test:   Var(u) = 0
                                 chibar2(01) =   123.85
                              Prob > chibar2 =   0.0000
```

APPENDIX 38: BREUSCH AND PAGAN LAGRANGE MULTIPLIER TEST FOR RANDOM EFFECT (ROE)

```
. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        ROE[id,t] = Xb + u[id] + e[id,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                 --------+------------------------------
                     ROE |    .1887155        .4344139
                       e |    .1775112        .4213207
                       u |    .0052759        .0726357

        Test:   Var(u) = 0
                                 chibar2(01) =     2.23
                              Prob > chibar2 =   0.0676
```

APPENDIX 39: BREUSCH AND PAGAN LAGRANGE MULTIPLIER TEST FOR RANDOM EFFECT (TOBIN Q)

```
. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        TobinQ[id,t] = Xb + u[id] + e[id,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                 --------+------------------------------
                   TobinQ |    4.875864       2.208136
                        e |    1.560927       1.249371
                        u |    1.484671       1.218471

        Test:   Var(u) = 0
                                chibar2(01) =   714.77
                            Prob > chibar2 =   0.0000
```

APPENDIX 40: MODIFIED WALD TEST FOR FIXED EFFECTS REGRESSION MODEL (ROA)

```
. xttest3

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (78)  =    1.0e+06
Prob>chi2 =     0.0000
```

APPENDIX 41: MODIFIED WALD TEST FOR FIXED EFFECTS REGRESSION MODEL (ROE)

```
. xttest3

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (78)  =    2.1e+05
Prob>chi2 =     0.0000
```

APPENDIX 42: MODIFIED WALD TEST FOR FIXED EFFECTS REGRESSION MODEL (TOBIN Q)

```
. xttest3

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (78)  =   55516.38
Prob>chi2 =     0.0000
```

APPENDIX 43:SERIAL CORRELATION – ROA, ROE AND TOBIN Q

```
. xtserial ROA STDTA LTDTA TDTA Size Growth Age Tangibility Nondebttaxshield

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,       77) =      4.216
           Prob > F =      0.0434

. xtserial ROE STDTA LTDTA TDTA Size Growth Age Tangibility Nondebttaxshield

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,       77) =      1.647
           Prob > F =      0.2033

. xtserial TobinQ STDTA LTDTA TDTA Size Growth Age Tangibility Nondebttaxshield

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,       77) =    106.287
           Prob > F =      0.0000
```

APPENDIX 44: FEASIBLE GENERALIZED LEAST SQUARED – CAPITAL STRUCTURE AND FIRM PERFORMANCE (ROA)

```
. eststo: xtgls ROA STDTA LTDTA TDTA Size Growth Age Tangibility Nondebttaxshield

Cross-sectional time-series FGLS regression

Coefficients:  generalized least squares
Panels:        homoskedastic
Correlation:   no autocorrelation

Estimated covariances      =         1          Number of obs      =       858
Estimated autocorrelations =         0          Number of groups   =        78
Estimated coefficients     =         9          Time periods       =        11
                                                Wald chi2(8)       =    194.06
Log likelihood             =  204.0925          Prob > chi2        =    0.0000
```

ROA	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
STDTA	-.2215275	.0580648	-3.82	0.000	-.3353324	-.1077226
LTDTA	.1855908	.0568121	3.27	0.001	.0742412	.2969404
TDTA	-.1620942	.0538554	-3.01	0.003	-.2676488	-.0565396
Size	.0165569	.0043068	3.84	0.000	.0081158	.0249979
Growth	-.0000116	.0001304	-0.09	0.929	-.0002672	.0002441
Age	-.0001969	.0001296	-1.52	0.129	-.000451	.0000572
Tangibility	-.1489311	.0321257	-4.64	0.000	-.2118962	-.085966
Nondebttaxshield	.0513455	.1425165	0.36	0.719	-.2279816	.3306727
_cons	-.07264	.0625175	-1.16	0.245	-.195172	.049892

```
(est1 stored)
```

The figure illustrates a FGLS regression model, where independent variable is ROA and the dependent variables are short-term debt, long-term debt, total debt, size, growth, age, tangibility and non-debt tax shield

APPENDIX 45: FEASIBLE GENERALIZED LEAST SQUARED – CAPITAL STRUCTURE AND FIRM PERFORMANCE (ROE)

```
. eststo: xtgls ROE STDTA LTDTA TDTA Size Growth Age Tangibility Nondebttaxshield

Cross-sectional time-series FGLS regression

Coefficients:  generalized least squares
Panels:        homoskedastic
Correlation:   no autocorrelation

Estimated covariances      =         1          Number of obs     =       858
Estimated autocorrelations =         0          Number of groups  =        78
Estimated coefficients     =         9          Time periods      =        11
                                                Wald chi2(8)      =     24.20
Log likelihood             =  -489.651          Prob > chi2       =    0.0021
```

ROE	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
STDTA	.1854122	.1303363	1.42	0.155	-.0700423	.4408667
LTDTA	.0096791	.1275244	0.08	0.939	-.2402641	.2596223
TDTA	-.0392462	.1208876	-0.32	0.745	-.2761816	.1976893
Size	.0348719	.0096672	3.61	0.000	.0159244	.0538193
Growth	.0000318	.0002928	0.11	0.914	-.0005421	.0006057
Age	-.0004782	.000291	-1.64	0.100	-.0010486	.0000921
Tangibility	-.1367088	.0721115	-1.90	0.058	-.2780448	.0046272
Nondebttaxshield	-.5920391	.3199026	-1.85	0.064	-1.219037	.0349585
_cons	-.3800865	.1403311	-2.71	0.007	-.6551305	-.1050426

```
(est2 stored)
```

The figure illustrates a FGLS regression model, where independent variable is ROE and the dependent variables are short-term debt, long-term debt, total debt, size, growth, age, tangibility and non-debt tax shield

APPENDIX 46: FEASIBLE GENERALIZED LEAST SQUARED – CAPITAL STRUCTURE AND FIRM PERFORMANCE (TOBIN Q)

```
. eststo: xtgls TobinQ STDTA LTDTA TDTA Size Growth Age Tangibility Nondebttaxshield

Cross-sectional time-series FGLS regression

Coefficients:  generalized least squares
Panels:        homoskedastic
Correlation:   no autocorrelation

Estimated covariances      =         1          Number of obs     =       858
Estimated autocorrelations =         0          Number of groups  =        78
Estimated coefficients     =         9          Time periods      =        11
                                                Wald chi2(8)      =    222.38
Log likelihood             = -1797.742          Prob > chi2       =    0.0000
```

TobinQ	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
STDTA	2.236945	.5986633	3.74	0.000	1.063587	3.410304
LTDTA	-.908761	.5857474	-1.55	0.121	-2.056805	.2392828
TDTA	1.644716	.5552634	2.96	0.003	.5564194	2.733012
Size	-.1866682	.0444037	-4.20	0.000	-.2736979	-.0996385
Growth	-.0006601	.0013449	-0.49	0.624	-.0032961	.0019759
Age	-.0024941	.0013366	-1.87	0.062	-.0051137	.0001256
Tangibility	.0943669	.3312241	0.28	0.776	-.5548203	.7435541
Nondebttaxshield	-2.533574	1.469383	-1.72	0.085	-5.41351	.3463635
_cons	3.525745	.6445715	5.47	0.000	2.262408	4.789082

```
(est3 stored)
```

The figure illustrates a FGLS regression model, where independent variable is Tobin Q and the dependent variables are short-term debt, long-term debt, total debt, size, growth, age, tangibility and non-debt tax shield