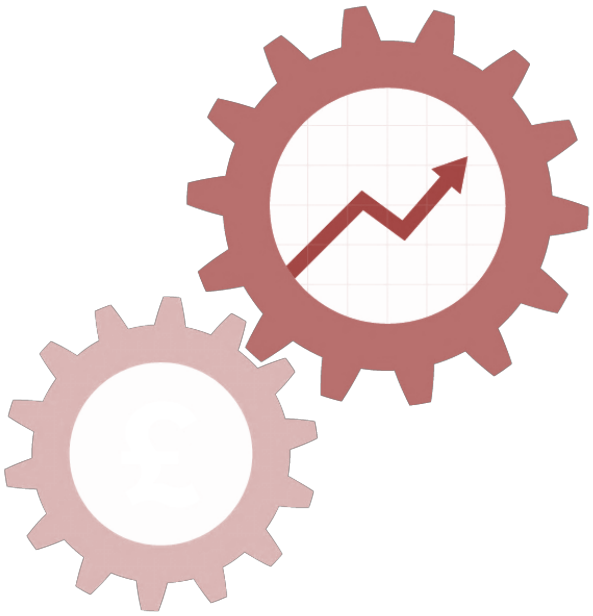
What determines the gearing ratio of integrated oil companies?

An empirical study of determinants in the sample period 2007-2018, emphasizing the case of Equinor ASA



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MASTER'S THESIS

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What determines the gearing ratio of integrated oil companies?

An empirical study of determinants in the sample period 2007-2018, emphasizing the case of Equinor ASA

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EXECUTIVE SUMMARY

PROBLEM STATEMENT

What are the determinants of the gearing ratio for integrated oil companies? Emphasizing the case Equinor ASA.

RESEARCH QUESTIONS

1. Have the determinants of the gearing ratio changed in general during the sample period?
2. Do the determinants of gearing seems to be affected by the oil crisis?
3. Does credit rating affect a company's gearing ratio?
4. Does the effect of the independent variables differ between oil and non-oil industries?
5. Which determinants affect the gearing ratio of Equinor ASA in comparison to its peers?

HYPOTHESES

1. The determinants of the gearing ratio have not changed during the sample period.
2. Determinants of gearing have not been affected by the oil crisis.
3. Credit ratings do not affect a company's gearing ratio.
4. The oil industry, as compared to other industries, does not differ in determinants of the gearing ratio.
5. The determinants of Equinor ASA's gearing do not differ from that of its peers.

ANALYSIS

To analyze the determinants of gearing ratio, we have utilized panel data regressions. Our sample period from Q1 2007 - Q3 2018 has been divided into three sub-periods; before, during, and after the 2014 oil crisis. To get a more complete perception of what drives the gearing ratio of oil companies, we have studied the case of Equinor ASA against a set of peers. Our regressions consist of a dependent variable and nine explanatory variables. The dependent variable is the gearing ratio of 56 selected companies, and the explanatory variables are; current ratio, profitability, size, LIBOR, tangibility, tax shield, robustness, oil price, and credit rating. To uncover possible relationships with gearing, we have tested the impact of these independent variables' regression coefficients on the dependent variable.

MAIN RESULTS

Firstly, our study concludes that there is no significant relationship between credit rating and gearing. This was astonishing to us as economic intuition, as well as conversations with professionals, suggest that credit ratings play a vital role in ensuring a company's access to capital. The factor was not found significant in any of our time periods.

Secondly, a significant relationship was found between liquidity and the gearing ratio. This was found in all of our sample periods, including the comparison of Equinor ASA against its peers. Additionally, liquidity was found to have a frequently stronger effect on oil companies compared to non-oil companies. The latter is supported by our finding that liquidity is the only common determinant when investigating Equinor ASA and its peers.

Our thesis contributes to existing research and discussion on the subject of capital structure. It can further be of relevance to top management by providing knowledge of what determinants to be especially aware of when attempting to manage their company's gearing.

Preface

The recent decade has presented several happenings which have had an impact on how industries determine and control their gearing ratio. We will focus particularly on the oil crisis of 2014.

Living in Stavanger, a city highly concentrated around oil activity, we quickly developed an interest in the oil industry. Given the increasing global emphasis on debt, we focus our attention on the determinants of the gearing ratio. The topic captured our interest as gaining insight on what determines a firm's leverage is of great relevance and will continue to be important in the future. This motivated us to take a closer look at what determines the gearing ratio of integrated oil companies.

The time spent working on our thesis has proven challenging, but most importantly, enlightening and exciting. Great teamwork has been key in writing our thesis, and we are left with a lot of new knowledge about the subject.

We want to thank our supervisor, Mads R. Holm, for his guidance in shaping our thesis. In addition, we would like to make a special thanks to our dear friend Dr. Kenneth A. Kavajecz, for his help and support throughout the entire process.

This thesis concludes our MSc in Business Administration with the specialization Applied Finance, at the University of Stavanger.

Stavanger, 13.06.2019

Mats Henrik Oldebråten Hansen Marie Evje

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1. Introduction

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1. Introduction

The capital structure of a company is one of the most important and frequently discussed aspects of a firm. It is defined as the balance between debt and equity, which in turn represents a company's gearing ratio. By design, the capital structure reflects the financial health of the company, and it controls the limits a firm can operate within financially. This again creates a framework in which the company is free to chase the opportunities they desire.

Due to the importance of capital structure, our thesis seeks to explain which factors that are important in determining the gearing ratio of integrated oil companies in contrast to non-oil companies and if these determinants have changed over time.[1] To better understand the determinants of gearing for the oil industry, we take a closer look at the case Equinor ASA against a set of peers; Total S.A., ConocoPhillips, Chevron Corp., and Royal Dutch Shell plc.

Our thesis applies regression analysis in studying the relationship between the gearing ratio and nine independent variables that we have selected.[2] Further, by looking at the development of gearing across industries, we are capturing general trends in the determinants of capital structure. The sample period of our study extends from 2007 to 2018, a time frame chosen to grasp a longer period of economic development and to capture the oil crisis of 2014.
The oil crisis is of interest because it represents a shock to the global economy. It is reasonable to believe that this event had an impact on industries' choice of gearing, as well as its determinants. Including this happening in our study will allow us to capture any changes in the gearing ratio and its determinants that could follow from extraordinary events like said crisis.

Several theories take into account the challenges of capital structure and leverage. In our paper, we focus on two common theories of capital structure and firm financing. These theories are the capital structure irrelevance theory of Miller and Modigliani and the pecking order hypothesis of Myers and Majluf. Whereas Miller and Modigliani argued that capital structure is irrelevant for a firm's value, a later revised version of their theorem claims that

[1] When writing "non-oil companies", we refer to companies representing the various industries that are included in our thesis. Industries included beyond the oil industry is; technology, healthcare, shipping, and construction.
[2] The nine independent variables are; current ratio, profitability, size, LIBOR, tangibility, tax shield, robustness, oil price, and credit rating.

there are benefits to be found for a firm to lever in the form of tax shield benefits. Myers and Majluf (1984) contribute by exploring a preferred ranking of financing. This ranking is determined by asymmetric information in the market. These theories, inter alia, show that managing a firm's capital structure is a complex process. Be aware that the ability of theories to explain variations in capital structure and gearing may change over time.

Our thesis takes on a global approach and contributes with additional knowledge to existing research and discussion on our field of study. Further, the answer to our problem statement can contribute to providing insight into where managers should focus their attention when looking to manage leverage more optimally. Our research can further help a company acknowledge the effect a crisis has on the gearing ratio, preparing them for a future shock to the economy.

1.1 Problem Statement

The objective of our thesis is to uncover the determinants of leverage of integrated oil companies. Questions we will attempt to answer, include checking whether the gearing ratio and its determinants have changed during our sample period and if the determinants of gearing have changed as a consequence of the 2014 oil crisis. Our research focuses on the oil industry in particular and looks at the said industry in contrast to other, non-oil companies representing the various industries that are included in our study. Additionally, we are going to look specifically into what changes have occurred to the gearing ratio of Equinor ASA compared to its peers.

Our problem statement is as follows,

What are the determinants of the gearing ratio for integrated oil companies? Emphasizing the case Equinor ASA.

And with our thesis, we will attempt to answer the following research questions:

1. Have the determinants of the gearing ratio changed in general during the sample period?

2. Do the determinants of gearing seem to be affected by the oil crisis?

3. Does credit rating affect a company's gearing ratio?

4. Does the effect of the independent variables differ between oil and non-oil industries?

5. Which determinants affect the gearing ratio of Equinor ASA in comparison to its peers?

Our hypotheses are as stated below:

1. The determinants of the gearing ratio have not changed during the sample period.

2. Determinants of gearing have not been affected by the oil crisis.

3. Credit ratings do not affect a company's gearing ratio.

4. The oil industry, as compared to other industries, does not differ in determinants of the gearing ratio.

5. The determinants of Equinor ASA's gearing do not differ from that of its peers.

Please note that our hypotheses are linked directly to our research questions. The hypotheses and research questions are therefore to be viewed as an entirety, that we use as a tool to answer our problem statement.

1.2 Structure

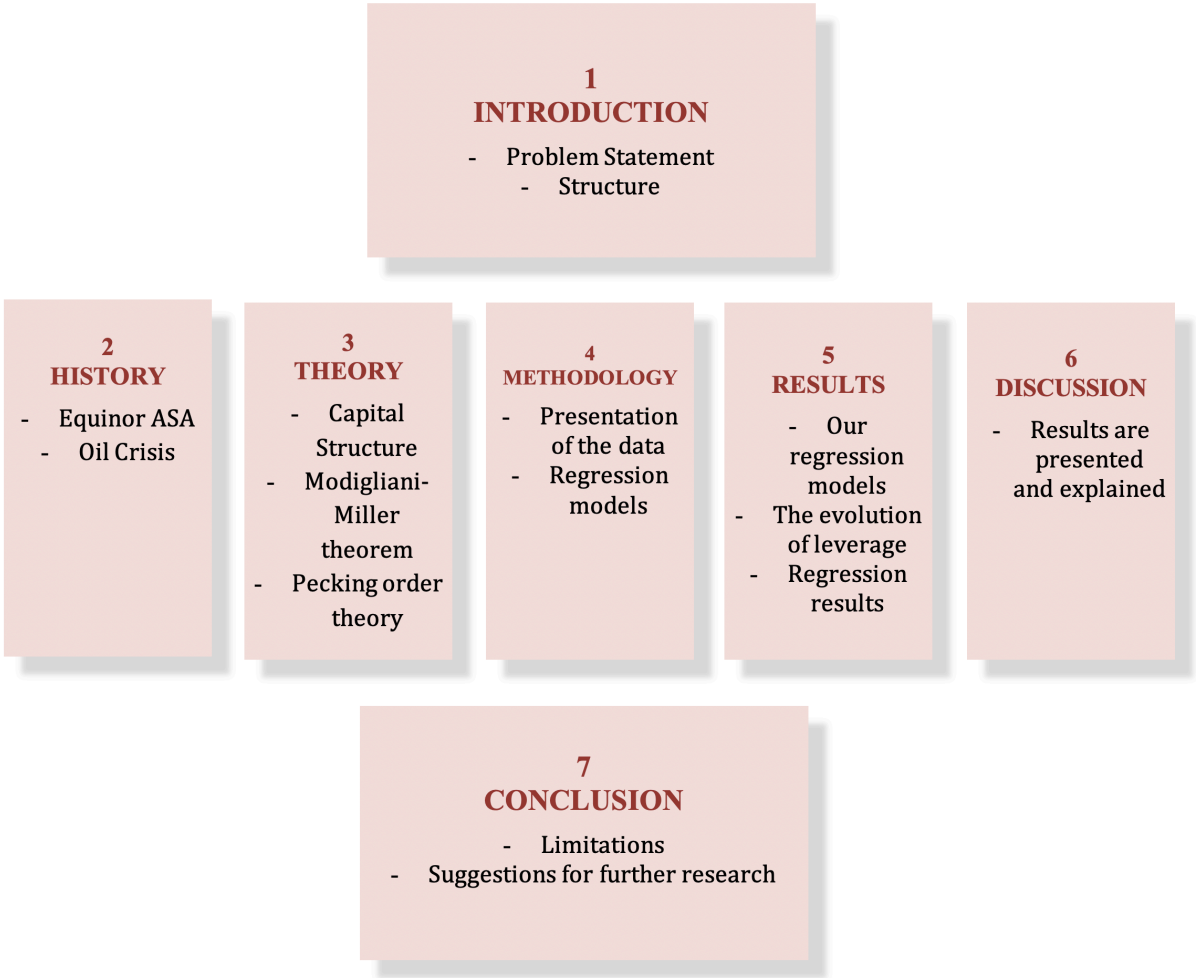

Figure 1: Structure

Our thesis is composed of seven chapters, including; introduction, history, theory, methodology, econometric analysis, discussion, and conclusion. This structure is illustrated in figure 1.

In chapter two, we briefly look at the history of Equinor ASA and the oil crisis of 2014. The purpose of this is to enable us to recognize better why knowledge about determinants of gearing applies to the real world, and how these topics affect our study.

Chapter three begins with describing the general theory about capital structure and the gearing ratio. Subsequently, the theories that function as the theoretical foundation of our thesis are presented. Also, we introduce two additional perspectives related to our topic; credit rating, and professional opinions on managing the gearing ratio of a company.

In chapter four, the data and methods used in our study are presented. We will also introduce our dependent variable, and describe the independent variables applied in our thesis. This chapter functions as a basis that will help us reach answers to our research questions and our problem statement. The primary tool used is panel data regression.

In chapter five, we will describe our regression models as well as tools that we have used in determining the most suitable model design for our thesis. After this, we present and explain the results of our regression analyses.

Chapter six contains the discussion and interpretation of our regression results. Our results will be discussed with respect to our hypotheses.

Finally, chapter 7 concludes our thesis. Our key findings will be summarized before drawing our final conclusion. As a last remark, we end our study by presenting the limitations of our thesis and providing suggestions for further research.

2. History

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2. History

In this chapter, we will briefly introduce the history of Equinor ASA and the course of the 2014 oil crisis. The chapter is important in understanding the basics of the two subjects, which are an essential part of the foundation of the topic studied in our thesis. These matters are included to recognize better what could drive changes in determinants of gearing.

2.1 Equinor ASA

Equinor ASA is a broad energy company with a particular focus on oil and gas. They are a global firm with operations worldwide, counting 30 countries and growing. In addition to being among the world's largest offshore operators, they are the largest operator in Norway, where the Norwegian State has an ownership stake of 67%. Total revenue of the year 2018 mounted to $79,595 million, and their daily oil and gas production the same year was 2.11 million barrels of oil equivalents.[3] In choosing the relevant peers of Equinor ASA, we have exclusively chosen companies with global operations and an investment-grade credit rating.

2.2 Oil Crisis

The official start of the oil crisis is a debatable topic, but consensus suggests 2014 as its beginning. On the 19th of June 2014, the price of Brent oil closed at $114.88/barrel.[4] After this, the oil price fell nearly continuously until the first quarter of 2016. Furthermore, there are several accepted causes of the oil crisis. We are going to focus on two main developments, the booming US shale oil production and a shock from OPEC.[5]

The US shale oil production used to be comprehensive, complex, and costly. However, in 2014, new technology allowed the US to drill for oil in a much faster and cost-efficient way, leading their production of oil to skyrocket. This quickly made the nation pass Saudi-Arabia

[3] Equinor, u.d.

[4] Fredriksen & Johansen 2015

[5] OPEC (Organization of the Petroleum Exporting Countries). OPEC is an international trade organization consisting of oil exporting countries. The mission of the organization is to "coordinate and unify the petroleum policies of its member countries and ensure the stabilization of oil markets in order to secure an efficient, economic and regular supply of petroleum to consumers, a steady income to producers and a fair return on capital for those investing in the petroleum industry". https://www.opec.org/opec_web/en/about_us/23.htm

as the world's largest oil producer. Combined with other geopolitical factors, the world was now in a situation with an oversupply of oil. Following the simple laws of supply and demand, the oil price was forced downwards.

Given an oversupply in the market and growing concerns with investors, OPEC was expected to cut production to mitigate the reigning oversupply. However, in November 2014, OPEC decided not to cut production and rather battle the US shale oil industry for market share. This led to a reduction in investments in oil companies across the world, and the immediate need to cut costs to remain liquid sent thousands of people into unemployment.

Thus, in essence, what caused the oil price to drop was a combination of the factors mentioned above, which in turn led to a concerned sentiment in the market. The uncertainty of geopolitical factors combined with increasing unemployment rates kept the oil price falling.

The oil crisis is interesting to look at because the oil price directly affects the earnings of the oil industry. Further, it controls the capital spent on investments as well as industry demand for funding. A shock to the economy of this magnitude has the potential to alter the factors that are important in determining the gearing ratio, which makes the crisis noteworthy. Because of this, we expect that our variables are of greater importance after the crisis and that the determinants of gearing might have changed as a consequence of altered market dynamics. We suspect that companies are more considerate regarding their leverage when they have experienced the effects of a recession.

3. Theory

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3. Theory

This chapter establishes the theoretical framework in our thesis. Theories of capital structure are essential in understanding which factors could affect the relationship between debt and equity in a company, and hence its value. The two main theories are the Miller Modigliani theorem and the pecking order theory, both crucial in creating an understanding of the complex process of managing a firm's capital structure.

We find it natural to begin with explaining the capital structure and the gearing ratio, before we introduce our two main theories. After reviewing these theories, we move ahead with elaborating three related factors.

Next, we explain the fundamentals of credit ratings before providing a different perspective on our topic by presenting professional opinions on how to manage a firm's capital structure.

It is important to note that not all theoretical elements are included in our empirical analyses in later chapters.

3.1 Capital Structure

The capital structure focuses on how a firm funds its investments and operations. The structure is commonly divided into two sources of capital, which are debt and equity. Whereas debt can consist of long-term notes payable and bond issues, equity usually consists of preferred stock, common stock, or retained earnings. [6]

The significance of capital structure builds on the concept that financing is necessary for a firm to conduct business. When raising the capital of a firm, several factors need to be taken into consideration. These factors can be divided into three groups that are in line with theories that are to be presented. The groups are; tax shield, financial distress, and agency cost.

[6] Nejati & Nejatic 2011: 271

When looking at capital structure, a natural way to proceed is by taking a look at the gearing ratio. This ratio represents the sum of a firm's capital structure decisions and is thus important when trying to understand not only a company's gearing, but also what determines this key measure.

3.1.1 Gearing Ratio

The gearing ratio is a measure that evaluates how much of a company's operations are funded using debt compared to how much is received from shareholders as equity. This ratio is essential for both internal and external parties in evaluating the financial stability of an entity. The ratio is fundamental in our study as it functions as the dependent variable in our regressions. There is no universal measure of the gearing ratio, and industries use different methods to measure leverage.

In our thesis, we have decided to focus on one specification of the gearing ratio. This measure is the traditional debt-to-equity ratio, which we have retrieved from Thomson Reuters Eikon. We have used this gearing ratio in our study to create a better foundation for comparing companies in our analysis. The ratio is calculated by dividing a company's total liabilities by its shareholders' equity, as seen in the formula below.

$$(1)\ Gearing\ Ratio = \frac{Total\ Liabilities}{Total\ Shareholders\ Equity}$$

A high gearing ratio indicates that a company has a higher level of financial leverage, which implies that they have greater exposure to a decline in the economy. However, the degree of leverage is likely to be determined by industry-specific factors, meaning that a gearing ratio that is considered high in the tech-industry could represent normal levels in other industries. Due to fluctuations in market conditions, companies often manage the gearing ratio within an acceptable range.

Moving on, we find it appropriate to present our two main theories of capital structure. These are important in understanding the intricate process of determining a company's gearing ratio and will help us find an answer to our hypotheses and research questions.

3.1.2 Modigliani-Miller Theorem

When Merton Miller and Franco Modigliani published their paper on their theory of capital structure irrelevance in 1958, they laid the foundation for modern thinking on capital structure.[7] The basic theorem states that in the absence of factors like bankruptcy costs, agency costs, asymmetric information, and taxes, the value of a firm is not affected by how the firm itself is capitalized. That is, given perfect capital markets and a fixed investment policy, a firm's total value is independent of how they choose to finance their operations, investments or distribute their dividends. This is supported by the law of one price which argues that leverage will not affect a firm's total value, "it merely changes the allocation of cash flows between debt and equity, without altering the total cash flows of the firm."[8]

Assuming a general set of strict, but simplified conditions that need to hold for a perfect capital market to be present, Miller and Modigliani presented two propositions that show that the results above regarding a firm's choice of capital structure hold. These conditions are:

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 decisions do not change the cash flows generated by its investments, nor do they reveal new information about them[9]

Under these conditions, Miller and Modigliani demonstrate the following propositions regarding capital structure concerning determining a firm's value.

MM Proposition I, without taxes

"In a perfect capital market, the total value of a firm is equal to the market value of the total cash flows generated by its assets and is not affected by its choice of capital structure."[10]

[7] Miller & Modigliani 1958: 261-297
[8] Berk & DeMarzo 2014: 483
[9] Berk & DeMarzo 2014: 483
[10] Berk & DeMarzo 2014: 483

That is, the following equation holds:

$$(2)\ V_U = V_L$$

Where V_U is the value of an unlevered firm, the price of purchasing a firm composed only of equity, and V_L is the value of the levered firm, the price of purchasing a firm consisting of a mix of debt and equity.

MM Proposition II without taxes

"The cost of capital of levered equity increases with the firm's market value debt-equity ratio."[11]

The equation for this proposition is derived from the theory of weighted average cost of capital (WACC). It gives that as the proportion of debt in a firm's capital structure increases, the required return on equity rises in a linear fashion. This is connected to the risk that debt adds to the equity-holders in a levered company, as shown in the figure below.

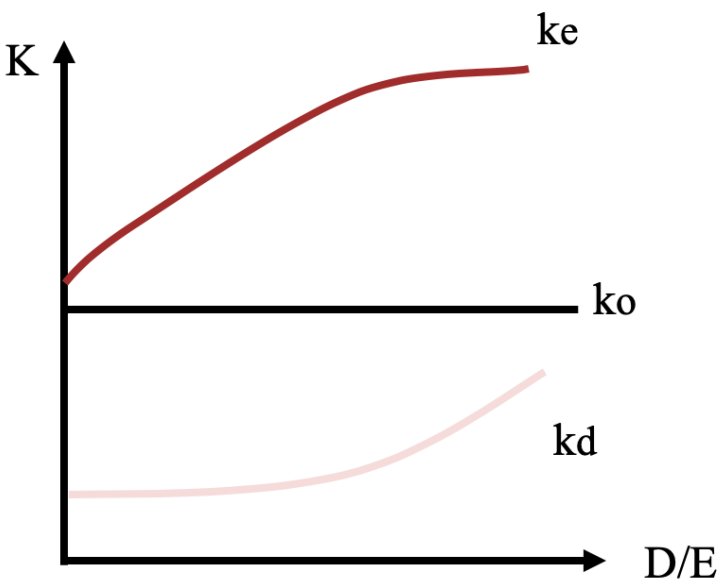

Figure 2: Proposition II with risky debt[12]

When the firm gets more levered, as in it gets a higher debt to equity ratio, the cost of equity (k_e) increases. However, the WACC (k_o) remains constant. The cost of borrowing money (k_d)

[11] Berk & DeMarzo 2014: 489
[12] Retrieved freely from https://en.wikipedia.org/wiki/Modigliani–Miller_theorem#Proposition_II

will remain constant until a certain debt level where the risk of bankruptcy becomes an issue. K is the cost of capital.

The equation for proposition II is as follows:

$$(3)\ r_E = r_0 + \frac{D}{E}(r_0 - r_D)$$ [13]

Where R_E is the expected return on equity, also known as the cost of equity and R_D is the expected rate of return on borrowings, also known as the cost of debt. R_0 is the unlevered cost of equity, and $\frac{D}{E}$ is the debt to equity ratio.

For the above results to hold, we have implicitly assumed that both firms and investors can borrow money at the same rate. However, as the real world poses a set of different conditions that are not found in a perfect capital market, Miller and Modigliani revised their theorem at a later stage to incorporate taxes.

MM Proposition I with taxes

In this case, the formula looks much as above except for an added term to consider taxes. The equation is as follows:

$$(4)\ V_L = V_U + T_C D$$

Where V_L and V_U are the same as previously stated, and $T_C D$ is the tax rate, T_C, times the value of debt D. This equation shows that there are benefits to be found for firms to be levered, as corporations can deduct tax from interest payments. Unlike the MM Proposition I without corporate taxes, MM I *with* corporate taxes states that the firm with the greater proportion of debt is more valuable as this firm would benefit from the interest tax shield.

MM Proposition II with taxes

To add taxes to this proposition, we add the term for tax, T_C. By doing this, we get the following equation:

$$(5)\ r_E = r_0 + \frac{D}{E}(r_0 - r_D)(1 - T_C)$$

[13] Berk & DeMarzo 2017: 531

R_E is the cost of levered equity, composed of the unlevered equity plus a financing premium. The remaining terms are as stated previously. In this way, Miller and Modigliani incorporated taxes and the same reasoning regarding firm value and taxes from earlier stands.[14]

However, knowing that the real world is not as simple as the MM theorem assumes, the theorem teaches us that the matter of capital structure is important namely because one or more of the assumptions are violated in reality. The revised theorem that includes taxes shows how firm value can benefit from adding a tax to the equation, which is supported by Kraus and Litzenberger (1973). By using the theorem and its equations, one can get a step closer to finding the factors that determine and affects an optimal capital structure.

3.1.3 The Pecking Order Theory

The pecking order theory was first introduced by Gordon Donaldson (1961). He discovered that managers preferred to use internal means as the primary source of financing.[15] From this theory, Myers and Majluf (1984) continued the research. They developed and based their method on ranking the different financial possibilities accessible to a firm. The goal of their theory is to retain the highest value possible without increasing the asymmetric information. Asymmetric information is when outside investors have limited access to information about the performance of the firm in comparison to the managers.[16] This indicates that they need to select a financing method that has a lower information cost, and that is, to a smaller extent affected by asymmetric information.

Unlike the MM theorem, Myers, and Majluf (1984) separated the rankings between internal and externals means of funding. Internal means is the preferred option which distinguishes between either internal equity or retained earnings as the source of financing, due to asymmetric information. If these options are not accessible to the company, external means are preferred when raising capital. External factors include sources such as debt issue, hybrid securities, or equity issue. The latter is in this context seen as a last resort when it comes to obtaining financing.[17] Debt is the preferred source of external funding due to lower

[14] Berk & DeMarzo 2017: 525-531
[15] Donaldson 1961: 67
[16] Tirole 2006: 237
[17] Myers & Majluf 1984: 187

information cost. However, debt is restricted, and will not be accessible at some point. This increases the risk of financial distress.[18]

The pecking order theory is thus carried out when a firm prefers internal above external financing. If external financing is selected, companies will first use debt instead of issuing equity due to the adverse effect this decision will have on a firm.[19] In essence, "when corporations decide on the use of debt finance, they are reallocating some expected future cash flows away from equity claimants in exchange for cash up front."[20]

In general, the pecking order theory is applied when companies are considering different methods of financing. However, observations show that this theory is not applicable in every case. The approach should be highly accurate when dealing with firms that have a high amount of adverse selection problems. These problems are usually seen in small firms with high growth. However, opposing this theory, Helwege and Liang (1996) and Frank and Goyal (2003) discovered that small, high growth firms do not behave accordingly. They observed that larger firms were more likely to follow the pecking order theory compared to small firms. Additionally, they found that adverse selection problems increase with the size of the firm. [21] In a similar study, Frank and Goyal (2003) found that internal financing is not an optimal source to cover investment expenditure, which implies that part of the focus should be on external financing.[22]

The theories we now have revised goes to show that managing a firm's capital structure is a complex process. We note that the theories' ability to explain variations in capital structure and the gearing ratio may change over time. This is supported by Myers (2001), who believed that there is no general theory of the debt-equity choice and that the existing approaches have different objectives.[23]

Moving on, we will present the three factors that relate to the theories used in our thesis. We chose to include them as we see these factors as important to be aware of when looking at the topic of our study.

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[18] Tirole 2006: 238
[19] Myers 1984: 576
[20] Frank & Goyal 2009: 3
[21] Frank & Goyal 2003: 218
[22] Frank & Goyal 2003: 241
[23] Myers 2001: 81

3.1.4 Interest Tax Shield

When a firm takes on debt, it can take advantage of an interest tax shield, which allows a corporation to deduct tax from its interest payments. Further, it incentivizes the firm to take on more debt since this benefit grows exponentially as the firm gears up. This is supported by the MM theory, where Miller and Modigliani state that in a world with taxes, the value of the firm increases proportionately with the amount of debt undertaken. The variable included representing this tax shield takes into account the magnitude of the debt and is explained further in chapter 4.1.2. *Independent variables*.

3.1.5 Financial Distress

The cost of Financial distress can be seen from a magnitude of perspectives. In general, this cost relates to the risk of a firm not being able to pay its financial obligations and is relevant regardless of whether or not the firm goes on to be liquidated.[24] The cost of financial distress is represented by a variety of factors, each taken into account in our later analysis through related explanatory variables presented in chapter 4.1.2. *Independent variables*. Included in our study are variables like the current ratio, return on equity, and LIBOR. These variables all have the potential to affect a firm's cost of financial distress. This can be exemplified by a sudden increase in LIBOR, increasing the cost of debt for companies in the long term. Given a highly levered company that is running close to its financial limit, this increased cost of debt could prove fatal, particularly if a majority of the debt matures at the same time. We will not discuss the probability of such events in our study.

3.1.6 Agency Costs

Agency costs are present in several aspects of business conduct and are essential in maintaining a firm's financial flexibility.

One can, to a certain extent, distinguish between agency costs related to debt. More explicitly, agency costs between claimants. This cost revolves around the shareholders, owners of the firm, who have an incentive to take advantage of the bondholders by appropriating value from them either implicitly or explicitly. This can be done in several ways. Examples include letting collateral depreciate, making the bondholders less protected, and taking on risky NPV

[24] Lasfer 2014

projects. The latter can be seen as gambling with the bondholders' money. These actions are typically done to generate higher returns to shareholders. Therefore, an indicator of agency costs between shareholders and bondholders related to debt would be factors like aging collateral and the presence of bond covenants. This is also in line with the pecking order theory.

Conclusively, the three factors presented above emphasize the importance of capital structure as they are essential in increasing the value of a firm, minimizing financial risk and to maximize returns.

3.2 Credit Rating

Credit ratings are important as they send a signal to the public and the creditors about the financial health of a company. Besides, the ratings create security to potential lenders and make it easier for a company to obtain financing. For this reason, we have included the credit rating as an independent variable as we believe that it could have a particular effect on the gearing ratio of companies. This relationship is investigated in our third hypothesis.

A credit rating is an evaluation done by credit rating agencies such as Moody's, Standard & Poor's (S&P) or Fitch, and is generally paid for by the companies seeking them. These agencies measure the creditworthiness of the borrower by estimating its ability to pay back their debt or financial obligations without defaulting. The credit score is divided into different grades dependent on factors which determine the financial health of the borrower. The credit score lets the lender know the level of risk they are undertaking by lending out money to a firm. A high credit score implies a lower risk for the lender, as this indicates that the company in question is able to serve its liabilities in a sufficient manner. This lowers the risk of financial distress, easing a firm's access to funding. Conversely, a low credit score implies an increase in the risk of financial distress.

In our thesis, we have decided to focus on the rating performed by Standard & Poor's (S&P). This rating is an important enabler for companies to gain access to capital markets, which contributes to financial flexibility. We separate between an investment-grade and non-

investment grade rating. That is, companies rated BBB- and above are considered investment-grade, otherwise not. The ratings are presented in table 1 below.

S&P	Rating description
AAA	Investment-grade
AA+	
AA	
AA-	
A+	
A+	
A-	
BBB+	
BBB	
BBB-	
BB+	Non-investment grade
BB	
BB-	
B+	
B	
B-	
CCC+	
CCC	
CCC-	
CC	
C	
D	

Table 1: Rating description

3.3 Professionals

To get a better understanding of the factors that drive the choice of gearing for different firms, we contacted several professionals representing various industries. We asked questions aimed at uncovering possible industry-specific traits that are considered when determining leverage. The response indicates that professionals use a consensus-based way to measure the gearing ratio and that they did not see the need to find their own specification.

Further, professionals state that due to policies and regulations, the gearing ratio has to be reported regularly. Companies report to both credit rating agencies and the creditors, usually the banks. For this reason, they have to monitor and maintain their gearing ratio within certain covenants.

While theory gives that it is possible to calculate an optimal gearing ratio, professionals we have been in touch with states that they operate within a range of optimal gearing ratios. This practical approach is necessary to sustain the flexibility they need to conduct their business efficiently. The range varies depending on the nature of the firm's business and the industry they operate within. It is important that the firm's gearing ratio does not exceed the limits as to what leverage is accepted given their current credit rating. This is crucial to maintain a favorable rating and preserving the company's access to capital.

Professionals further express that the oil crisis has been a great learning process for most businesses and industries. It has led to new ways of looking at the gearing ratio and the importance of it, e.g., by creating a stress test to prepare for unexpected events. However, the dramatic drop in oil prices during the oil crisis was of a magnitude considered unlikely by the industries. Hence, firms generally did not predict these extreme changes. This caught the companies off guard, and several firms were dramatically affected due to a high gearing ratio that was impossible to manage under severe conditions.

Further, professionals have stated that the gearing ratio varies depending on the industry, growth of the company, and the number of assets the company has. This explains that the oil crisis will influence an oil company or a company that is highly correlated with oil prices to a greater extent compared to other companies with a lower correlation to oil prices. According to professionals, firms with an uncertain future will use equity as a first resort, while diversified companies can easily gear up due to lower risks.

The theories presented are of relevance when considering which factors that are important when determining the capital structure of a company. Both the MM theorem and the pecking order theory are essential theories in this process. To further investigate what factors are important in determining the gearing ratio for integrated oil companies, we find it reasonable to present our methodology. This part of our thesis will bring to attention the fundamentals our data and analyses are built upon.

4. Methodology

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4. Methodology

As mentioned, the purpose of our study is to examine what the determinants of an oil company's gearing ratio is, and to better understand the contributing factors in deciding the right level of debt. To achieve this, our paper is based on empirical financial data, using regression analysis as the primary tool to process data and arrive at results and conclusions. The statistical computations have been executed in Microsoft Excel and Stata 15.

We will go through the data specifications applied in our thesis before we go on to present our independent variables. Next, we proceed to elaborate on essential econometric contexts that we use in processing our data.

The theory on the method is derived from Wooldridge (2014).

4.1 Data

The dependent variable used in our thesis is the gearing ratio of 56 mature companies. We have defined these selected firms as mature because their age exceeds ten years. At that point, it is reasonable to expect that the companies are well-established in their respective industries. Further, we have separated between oil and non-oil companies. Non-oil companies are limited to the technology, healthcare, shipping, and construction industry. We have further selected nine independent variables that are used in our analyses to explain the gearing ratio. These are; current ratio, profitability, size, LIBOR, tangibility, tax shield, robustness, oil price, and credit rating. The variables will be described further in chapter 4.1.2. *Independent variables*.

The time scope of our study is January 2007 - December 2018. For the regression analysis, we have studied two main periods, where one period comprises the entire sample, and the other period captures the oil crisis of 2014. The latter is further divided into three sub-periods, covering the oil crisis both before, during, and after. The reason for studying these periods, in particular, is to see how the gearing ratio has behaved over time. We aim to uncover determinants that have proven significant, and if they show any response to a shock in the economy as represented by the oil crisis.

All data used in our study have been obtained in quarterly terms and are organized as panel data. In general, larger sample sizes lead to increased precision. In this case, however, daily data, which would have provided the largest sample size, seemed unreasonable as a firm typically do not adjust their gearing ratio daily. A quarterly time interval has thus been deemed more appropriate for our thesis.

As our study comprises a global industry, USD is used as the main currency. Data collected in other currencies have been converted to USD.

4.1.1 Panel Data

In our regression, we are following a mix of companies over a specific time period, and for this reason, it is appropriate for us to use panel data. A panel data set is created by combining cross-sectional and repeated time sections.[25] One of the advantages of panel data is that it increases the sample size extensively, which makes it more applicable when studying the dynamics of change. Further, it can be divided into a balanced- and an unbalanced panel. Whereas an unbalanced panel has units that do not appear in each time period, a balanced panel has units that appear in the same time periods. Our data has a strongly balanced panel.

Next, we move on to present the independent variables that have been used in performing our analyses.

4.1.2 Independent Variables

The nine independent variables in our study are selected as we have a reason to believe they have a significant effect on the gearing ratio of a firm. The variables are used as proxies for firm characteristics, and the number of variables helps avoid the omitted variable bias. Omitted variable bias may occur when independent variables are correlated with both dependent variables and at least one of the independent variables.

Current Ratio

As a measure of liquidity, we have decided to use the natural log of the current ratio because it measures a firm's ability to pay its short-term obligations, including obligations due within

[25] Wooldridge 2014

one year. Compared to an industry average, a lower than average current ratio may indicate an increased risk of financial distress, which subsequently affects a firm's options when it comes to determining their funding. The pecking order theory predicts firms with high liquidity to borrow less. Additionally, a firm's assets are prone to manipulation by managers in favor of shareholders against creditors. This increases the agency cost of debt and connects the variable to the matter of agency costs. Therefore, we expect the relationship between liquidity and leverage to be negative. This comes from the pecking order theory, which says that a firm with higher liquidity prefers to use funds generated internally when financing new investments.[26]

Profitability

To create an independent variable representing profitability, we have chosen to use return on equity (ROE) as a proxy. This measure is included as an explanatory variable as we wish to uncover the effects of a company's profitability on its choice of gearing. Researchers such as Friend and Lang (1988) and Kester (1986) examine the impact of profitability on firm gearing and find a negative relationship between profitability and leverage. This supports the pecking order theory, which claims that firms prefer internally generated capital to external financing and debt over equity in the case of external financing. The pecking order theory thus suggests a negative relationship between internally generated funds that are identified as profitability, and leverage.

Size

To measure firm value and size, we use the individual company's stock price multiplied with its total common shares outstanding. This gives us the firm's market cap. We examine the impact of this variable on the gearing ratio by using the natural logarithm of the individual firm's market cap. Logging this variable makes the measure more applicable to our dataset as it reduces the magnitude of variation in company size that is represented in our data. In general, a larger firm might be able to lower transaction costs associated with long-term debt issuance. The large firm might also possess a better chance of having a debt analyst informing the public about the issue, which mitigates asymmetric information and its consequence, adverse selection. This partakes in reducing risk and may improve the firm's ability to take on

[26] Deesomsak, Paudyal & Pescetto 2004; Mazur 2007; Viviani 2008

debt, making the variable relate to Myers & Majluf's (1984) pecking order theory where asymmetric information and adverse selection are central. However, large firms tend to have a more diluted ownership-structure and hence less control over managers. To decrease the risk of financial distress that involves personal loss, managers might then issue less debt. The opposite goes for small-cap companies.

Finally, larger companies are often more diversified than smaller firms, reducing the risk due to a lower risk of bankruptcy. Because of the reasoning presented above, we expect the relationship between leverage and size to be positive. Including this variable will allow us to see if firm size is significant in explaining the choice of gearing for the industries included in our thesis. Thus, in explaining a firm's choice of gearing ratio, size has an effect in several aspects.

LIBOR

London Interbank Offered Rate (LIBOR) is used as a global benchmark for the interest rate. It measures how much the banks have to compensate when borrowing money from each other. The idea is that when LIBOR increases, it will result in banks having to charge a higher rate when lending out money, which in turn increases a company's cost of debt. The variable is included to capture that relationship. We find it fair to assume that an increasing LIBOR will increase a firm's cost of capital, which will impact the gearing ratio and affect the ability to take on debt. Therefore, we expect the relationship between LIBOR and the gearing ratio to be negative. The data collected is listed on a monthly basis. However, as we are utilizing quarterly data in our thesis, we have calculated the average for each of the three months to create a quarterly LIBOR rate.

Tangibility

The tangibility ratio is a proxy for agency costs and it measures total fixed assets to total assets. This factor will naturally vary across firms, which is why we have taken the natural log of the ratio to improve its fit. Agency cost theory implies that firms with high leverage are likely to underinvest or that they do not invest in the best interest of the firm. Moreover, firms that are not able to provide collateral will eventually have to issue equity instead of debt.[27]

[27] Scott 1977: 1-19

This indicates that the wealth will be reallocated from debt holders to equity holders. However, when a firm has a high asset tangibility, it gives the debtholder security due to the option of collateralization if the debt should go into default. This variable thus relates to both the MM theory and the pecking order theory, and it is associated with both financial distress and agency costs. A higher tangibility ratio implies a higher asset value, which lowers the risk of creditors in the case of bankruptcy. Additionally, this security provides a lesser need for monitoring and thus reduces agency costs. Based on this, we would expect the relationship between leverage and the tangibility of assets to be positive.

Tax Shield

To get a more accurate understanding of a firm's choice of leverage, we have included a tax shield variable that depends on the company's debt level and tax rate. According to the MM Theorem, the tax shield works as an incentive for a firm to take on debt as the tax shield will increase proportionately when the company increases its gearing. This follows from the increased interest expense that results from higher leverage, and the higher the tax rate is, the higher the tax shield becomes. In essence, this means that a firm can deduct tax off its interest payments, which implies a positive effect of the tax deductibility on debt issuance.[28] To create this variable we have divided the firm's provision for income taxes by its net income before taxes, which gives us the effective tax rate for the firm, and thus the magnitude of the tax shield. By itself, we believe that this variable has a positive effect on leverage as the greater the tax shield, the greater the incentive to take on debt.

Robustness

The free cash flow (FCF) of a company is the cash flow in excess of that which is required to fund positive NPV projects that are discounted at the appropriate cost of capital. FCF also includes the cash flow that is not paid out in dividends.[29]

As a proxy for robustness, we have created a ratio from dividing free cash flow by total assets. The output tells us how robust a company is in the way that the stronger a firm's cash flows are, the easier it becomes to finance its assets. Thus, this measure says something about a firm's opportunities to use internal financing, which is the preferred source of funding in

[28] De Angelo & Masulis 1994; Homaifar et al. 1994; Walsh and Ryan 1997
[29] Jensen, M., C 1986: 323

Myers and Majluf's pecking order theory. However, this excess cash opens up for agency costs. A reason could be that managers have different incentives in deciding what to do with excess cash. Opportunities revolve around whether the cash should be paid out as a dividend, invested, or spent on activities that do not benefit the shareholders. Thus, the higher this ratio, the greater we expect the agency costs to be as a manager with a substantial amount of excess cash on his hands needs more monitoring than a manager who does not face the same temptations. We expect the relationship between Robustness and gearing to be negative as a consequence of imminent agency costs.

Oil Price

Given our thesis' focus on the oil industry, we have chosen to include the oil price as an explanatory variable. It is calculated from monthly data by averaging the spot price of the last three months to get an estimate of quarterly prices. To make the variable fit our regressions better, we have taken the natural log of it. We expect a positive relationship between the oil price and leverage as a higher oil price increases a firm's income, which in turn enables companies to raise their gearing.

Credit Rating

The rating variable is included as the better a company's credit rating is, the easier access it has to the capital markets. This access is vital for companies in need of capital, which is why a high rating is sought after. The variable can thus be linked to the cost of financial distress as a higher rating should indicate a more robust business, and hence a lower probability of bankruptcy. Together, these factors should make it easier to obtain financing. Therefore, we expect the variable to be positive and significantly associated with the gearing ratio. It further relates to both theories included in our paper, as access to funding is key in evaluating tradeoffs and decisions regarding debt. This makes it an important explanatory variable in our analyses. The variable is set up as a dummy variable, returning 1 if the firm is rated investment-grade and 0 if not.

Now that our independent variables have been presented, we continue to take a look at essential econometric contexts. These will help us to understand the implications that have been present in creating our analyses.

4.1.3 Type of Data

In general, there are two types of data; quantitative and qualitative. Quantitative data is measured numerically, and qualitative data is non-numerical. In our study, we primary use quantitative data that has been organized systematically and used in our regression analyses. The main sources of data can be divided into primary and secondary data. Primary data is collected by the researcher himself, whereas secondary data is data that already exist, like historical stock prices. Secondary data can also be seen as an interpretation or rendering of primary sources. This study largely builds on the use of secondary data.

4.1.4 Data Credibility

Data credibility is crucial as it concerns whether or not the provider of data or source of data can be relied upon. All data used in our thesis is available in the public domain and have been collected from credible sources. Thomson Reuters Eikon is the origin of data in our study as it is a generally accepted source of credible information. Eikon is a software product provided by Thomson Reuters for financial professionals that offers access to both real-time and historical market data, fundamental data and analytics, amongst others.

4.1.5 Logarithmic Values

Regressions are estimated using logarithmic values where we see fit. This is done to avoid problems that often occur with time series data. Log scale normalizes the data and usually removes skewness, and simultaneously works as a deflator over time. In our case, it adjusts for trend and seasonality. Nominal numbers would weigh changes from higher numbers more in contrast to changes from smaller numbers, whereas we do not have this problem when using log values. Moreover, log scale makes it easier to compare results with other studies, as most studies use log scale values.

4.2 Regression Models

To determine what factors have the most significant impact on a firm's gearing ratio, several multiple linear regression models have been estimated. The regression models are set up in the following format:

$$(6)\ Y_t = \beta_1 X_{t1} + \beta_2 X_{t2} + \ldots + \beta_k X_{tk} + u_t$$

In the equation above, Y is the dependent variable, the X's are the independent variables, and u_t is the error term. The error term (u_t) is a residual variable representing stochastic variation in the dependent variable that is not explained by the independent variables of the regression model. T represents the number of observations, and k is the number of independent variables used in the equation. The objective of the multiple regression is to capture the relationship between the dependent variable and a set of independent variables. The beta coefficients in this equation explains the relationship between the dependent variable and the independent variable. This excludes the parameter β_0, where β_0 is a constant intercept in the regression equation.[30]

4.2.1 Ordinary Least Squares

The most common method of linear regression is Ordinary Least Squares (OLS). This method is used to estimate the regression coefficients by minimizing the sum of squared residuals.[31] More specifically, the purpose of OLS is to minimize the sum of squares between the observed observation and those estimated by a linear function.

4.2.2 OLS Assumptions

OLS provides the best estimates for the regression coefficient when the following assumptions hold:

1. Linear in Parameters

The stochastic process follows the linear model: $Y_t = \beta_0 + \beta_1 X_{t1} + \beta_2 X_{t2} + \ldots + \beta_k X_{tk} + u_t$

[30] Wooldridge 2014: 4-5, 18-19, 59-60
[31] Wooldridge 2014: 27

2. No Perfect Collinearity

In the sample (and therefore in the underlying time series process), no independent variable is constant nor a perfect linear combination of the others. This assumption allows the explanatory variables to be correlated, but it eliminates perfect correlation in the sample. For this assumption to hold, the sample size (n), must contain at least k + 1 observations. K is the number of independent variables in the model.

3. Zero Conditional Mean: $E\ (u_t \mid X)\ =\ 0$

The expected value of the error term, u_t, given the explanatory variables for all time periods is equal to zero. This assumption implies that the error term, u_t, is uncorrelated with each explanatory variable in every time period. If u_t is independent of the explanatory variables and E (u_t) is zero, then this assumption automatically holds.

4. Homoscedasticity: $Var\ (u_t \mid X)\ =\ Var\ (u_t)\ =\ \sigma^2$

The error terms are homoscedastic, meaning that they are the same for all values of the independent variables. When the assumption does not hold, the error terms are heteroscedastic.

5. No Serial Correlation: $Corr\ (u_t, u_s)\ =\ 0$, for all $t\ \neq\ s$

Conditional on the independent variables, the errors terms in two different time periods are uncorrelated.

6. $u \sim N\ (0, \sigma^2)$

The errors terms (u_t) are independent of the explanatory variables and normally distributed.

If assumptions 1 through 3 holds, the OLS-estimators are unbiased, thus E (β_j) = β_j , j = 0, 1, 2, …, k. For OLS to be Best Linear Unbiased Estimator (BLUE), assumptions 1 through 5 need to hold. Further, to perform an exact statistical inference for any sample size, assumption 6 needs to hold.[32]

[32] Wooldridge 2014: 279-285

4.2.3 Hypothesis Testing

Hypothesis testing is used to test the probability of a hypothesis being true based on results from a regression analysis. The first step of hypothesis testing is to specify a null hypothesis (H_0) and an alternative hypothesis (H_1).[33] When Creating these hypotheses, two errors might occur. Type I errors occur when the null is rejected even though it is true, while type II errors happen when the null is false but is not rejected. These errors will be identified depending on the significance level selected. The most commonly used significance level is 5%, which explains that the recognized probability of a type I error is 5%.[34]

4.2.4 Analytical Interpretation

The essential statistical measures in our regression analysis are presented below.
The R-squared (R^2) is used to measure how well the data sample fits the regression line. In other words, the R^2 represents how much of the variance in a dependent variable that is explained by the independent variables in the regression. This value is always between 0 and 100%. A high value indicates that the variation is explained to a large extent by the independent variables and vice versa. This usually means that the higher the R^2, the better the model fits the data. However, there are some exceptions to this statement where a high R^2 is not always considered the best fit, and a low R^2 might not always be a bad fit. [35]

The modified version of R-squared is the adjusted R-squared. In comparison to R-squared, Adjusted R-squared measures only the percentage of the independent variables that explains the variation of the dependent variable. The R^2 will always increase when adding an independent variable. However, the adjusted R^2 only increases if the new independent variable improves the model beyond what is expected from random causes. As a result, the adjusted R^2 is the most appropriate measurement in a multiple regression.[36] On the contrary, this specification of R^2 is not displayed in the output of panel data regressions. We will therefore use the ordinary measure of R^2 in our analyses.

[33] Wooldridge 2014: 97-99
[34] Minitab 2016
[35] Minitab 2013
[36] Minitab 2013

The p-value represents the lowest significance level for which a null hypothesis can be rejected. This null hypothesis says that each of the beta coefficients are not statistically different from zero, implying that the independent variables have no effect on the dependent variable. The null hypothesis will be rejected at the 5% level in our study. At this significance level, the null is rejected if the p-value is below 0.05 due to strong evidence against the null hypothesis. Conversely, if the p-value exceeds 0.05, one fails to reject the null due to weak evidence against the alternative hypothesis.[37] Significance levels of 5% and 1% are preferred. Also, the p-value is always between zero and one. The independent variable has a significant effect on the dependent variable if the null hypothesis is rejected.[38]

4.2.5 Homoscedasticity and Serial Correlation

One of the main assumptions in an OLS regression is homoscedasticity, which means that the error terms are constant across all the values of the independent variables. However, if the assumption of homoscedasticity is violated and the error terms differ across the values of independent variables we have heteroscedasticity. [39] Another OLS assumption is serial correlation, which occurs when there is a correlation between the error term in two time periods. These assumptions are commonly violated in panel data.

To account for these issues, we have applied robust standard errors in our regressions. This method is used to obtain unbiased standard errors of OLS coefficients, which makes them robust to serial correlation and heteroscedasticity. If there is no heteroscedasticity or serial correlation in the regression, the robust standard errors will become conventional OLS standard errors. This makes robust standard errors appropriate even when assumptions 4 and 5 are not violated. As mentioned earlier, heteroscedasticity and serial correlation violate the Gauss Markov assumptions that are necessary to obtain BLUE.

[37] Rumsey 2017
[38] Wooldridge 2014: 109-110
[39] Statistic Solutions 2013

5. Econometric Analysis

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5. Econometric Analysis

In this part of our thesis, we will present the results from the regression analyses we have performed. We will analyze the data in an attempt to answer the presented research questions as well as hypotheses that are all linked to the problem statement.

The chapter is initiated by presenting our regression models, before we proceed to introduce our hypotheses.

Next, we report the results from a model choice test used to determine which model fits our data better. We also report the results from the unit root tests that have been applied to test our data for stationarity.

After that, we look at the evolution of leverage for all given sectors, where we aim to create an impression of how the gearing ratio has evolved for the industries studied in our thesis.

The chapter is rounded off by presenting the results from our regression analyses. Based on these results, we will move on to discuss their meaning in order to capture the essence of our results. This will end in a conclusion where we gather our findings and connect them to our problem statement.

5.1 Our Regression Models

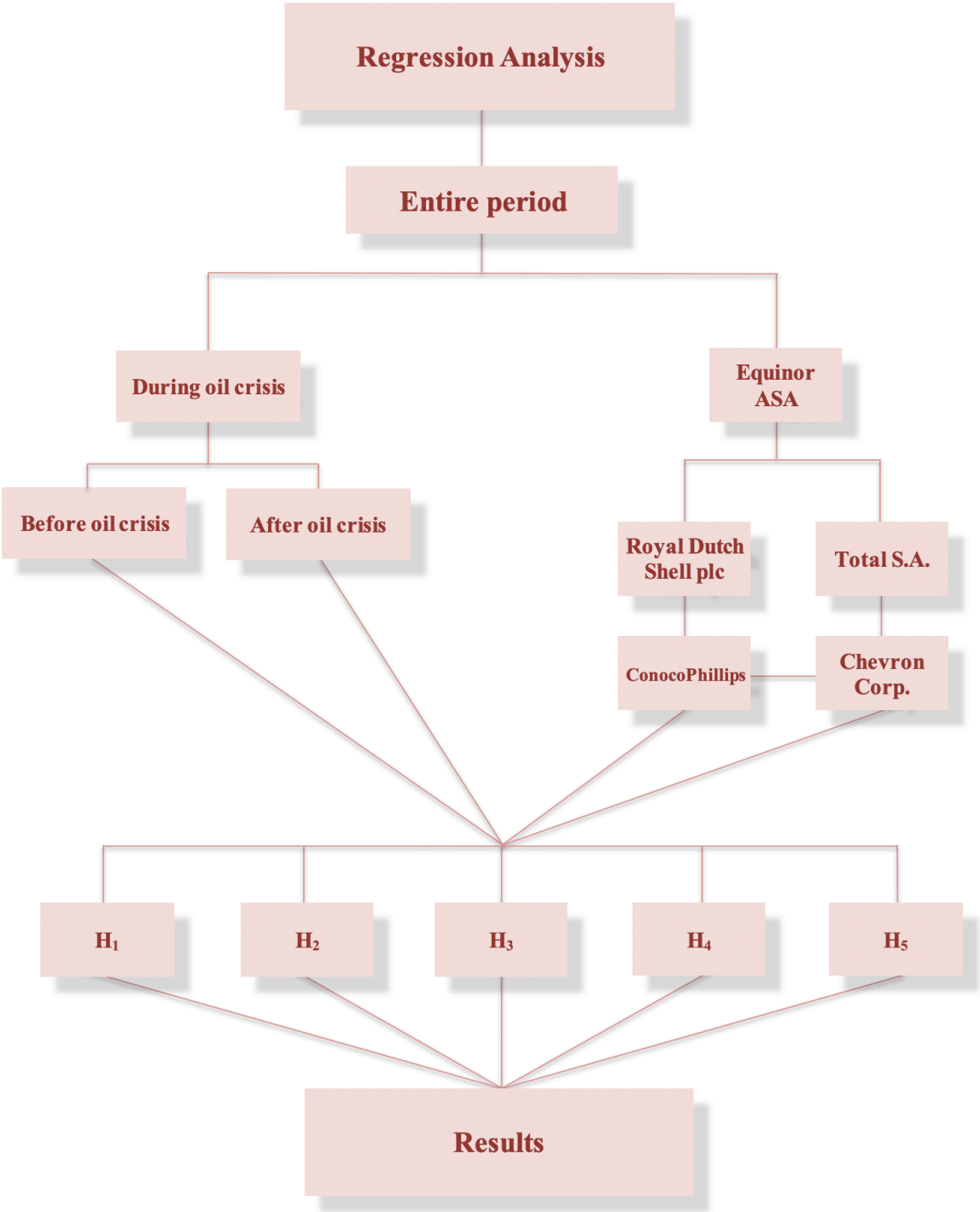

Figure 3: Regression analysis

Figure 3 provides a graphical representation of the regression analysis performed in our thesis. Three different models have been used in our regressions. Model 1 is applied to the entire sample period, Model 2 is applied to the entire sample period including dummies as well as the three sub-periods, and Model 3 is used when comparing Equinor ASA to its selected peers. The dependent variable in our models is the gearing ratio as elaborated in chapter 3.1.1 *Gearing Ratio*. The independent variables used in all of our models are as presented in chapter 4.1.2 *Independent Variables*. Our models are:

Model 1:

$$LogGearing = \beta_0 + \beta_{1\,Log(CurrentRatio)} + \beta_{2\,Profitability} + \beta_{3\,Size} + \beta_{4\,LIBOR} + \beta_{5\,Log(Tangibility)} + \beta_{6\,TaxShield} + \beta_{7\,Robustness} + \beta_{8\,Log(OilPrice)} + \beta_{9\,Rating} + u$$

Model 2:

$$LogGearing = \beta_0 + \beta_{1\,Log(CurrentRatio)} + \beta_{2\,Profitability} + \beta_{3\,Size} + \beta_{4\,LIBOR} + \beta_{5\,Log(Tangibility)} + \beta_{6\,TaxShield} + \beta_{7\,Robustness} + \beta_{8\,Log(OilPrice)} + \beta_{9\,Rating} + \beta_{10\,OilLogCurrentRatio} + \beta_{11\,OilProfitability} + \beta_{12\,Oilsize} + \beta_{13\,OilLIBOR} + \beta_{14\,OilLogTangibility} + \beta_{15\,OilTaxShield} + \beta_{16\,OilRobustness} + \beta_{17\,OilLogOilPrice} + \beta_{18\,Rating} + u$$

Model 3:

$$LogGearing = \beta_0 + \beta_{1\,Log(CurrentRatio)} + \beta_{2\,Profitability} + \beta_{3\,Size} + \beta_{4LIBOR} + \beta_{5\,Log(Tangibility)} + \beta_{6\,TaxShield} + \beta_{7\,Robustness} + \beta_{8\,Log(OilPrice)} + u$$

5.1.1 Our Hypothesis Tests

Hypothesis testing has been used to investigate how the determinants of the gearing ratio have changed with respect to the scenarios presented in our research questions.

The null hypotheses are stated as follows: $H_0: \beta_X = 0$

This hypothesis shows that the independent variable, X, does not affect our dependent variable.

The alternative hypotheses are presented as follows: $H_1: \beta_X \neq 0$

This hypothesis shows that the independent variable, X, affects our dependent variable. When the null hypothesis is rejected, one or more of our independent variables are significantly different from zero.

Our hypotheses apply to our research questions in a direct manner, and covers all of our sample periods. The hypotheses tests in our thesis are presented in Table 2 below.

Hypotheses	H_0	H_1
1	$H_0 = \beta_{1-9} = 0$	$H_0 = \beta_{1-9} \neq 0$
2	$H_0 = \beta_{1-19} = 0$	$H_0 = \beta_{1-19} \neq 0$
3	$H_0 = \beta_9 = 0$	$H_0 = \beta_9 \neq 0$
4	$H_0 = \beta_{1-19} = 0$	$H_0 = \beta_{1-19} \neq 0$
5	$H_0 = \beta_{1-8} = 0$	$H_0 = \beta_{1-8} \neq 0$

Table 2: Our hypotheses

5.1.2 Unit Root Test

We have used the unit root test to check for stationarity. If the data shows an upward or downward trend over time, the regression results can be spurious and untrue. Therefore, all the variables should be stationary and not show a gradually upward or downward movement over time. The graph below displays the difference between stationarity and non-stationarity.

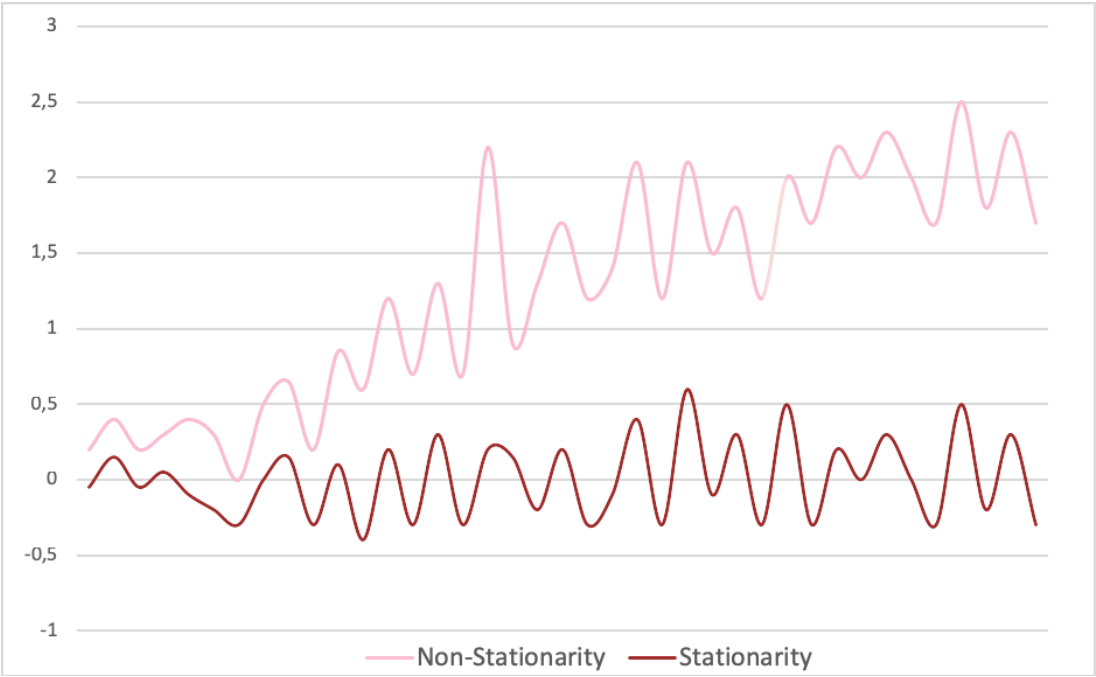

Figure 4: Stationarity illustration

In our regressions, we have tested all of our variables for stationarity with the Levin-Lin-Chu and Harris-Tzavalis test.[40] The results show both tests to be significant for all variables, dummies excluded. We thus discard the null hypothesis and conclude that our data is stationary. We chose to apply two tests as unit root tests by themselves have limited power. The results are presented in Appendix 1.

5.1.3 Hausman Test

We used the Hausman specification test to determine which model is more appropriate for our regressions. This test checks if the variation in the coefficients is unsystematic, and is used to differentiate between the random effect (RE) and fixed effect (FE) models. These models are usually applied if the OLS does not give consistent estimates. The main difference between the models is that the RE model is considered a more accurate estimate and has a higher degree of freedom than the FE model. Enhanced degrees of freedom typically gives significantly lower standard errors and increases the probability of significant estimates. Further, the FE model will have weaker consistent results due to increased standard errors, which makes it hard to identify significant estimates.[41]

[40] Wooldridge 2014: 613-618
[41] Reyna-Torres 2007

The Hausman test resulted in the use of the fixed effect model to estimate the coefficient of our independent variables. The FE model, in comparison to the RE model, does not assume that all the independent variables are uncorrelated with an unobserved effect. This makes the FE model more appropriate to use in our regressions. The results from the Hausman test is presented in Appendix 2.

5.2 The Evolution of Leverage

Our analysis begins with studying the evolution of leverage across the five selected industries. We have included this part in our thesis as we find it advantageous to establish a better understanding of the drivers of the gearing ratio for the selected industries. The goal is that this will give us a more solid foundation when moving on to present our findings and enable us to provide more accurate interpretations.

First, we will look at the average gearing ratio for each industry.

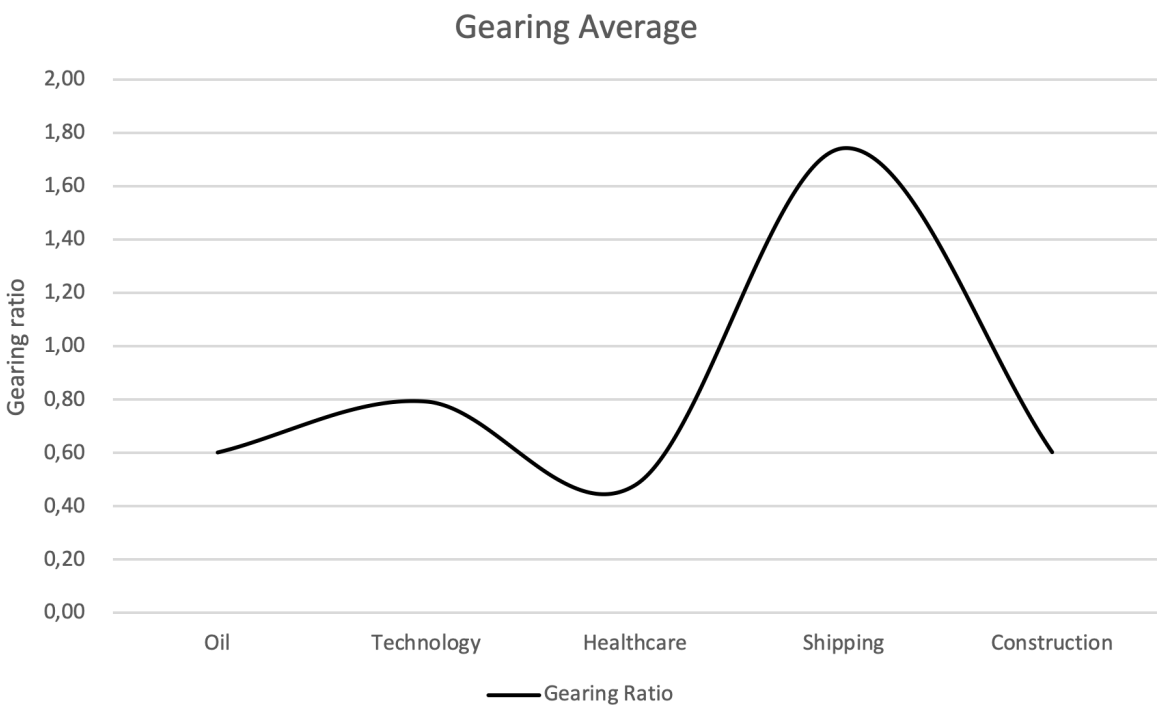

Figure 5: Average gearing ratio across industries

The average is found by first calculating the average of the individual company's gearing ratio, then using these numbers to calculate an industry average. Looking at the figure

presented above, it is clear that the shipping industry has a substantially higher average gearing ratio than the other industries. This is no surprise, however, as ships can be exceptionally costly to acquire.

Figure 6 shows how the gearing ratio of a representative sample of our oil companies has evolved during our sample period. These companies correspond to the selected peers of Equinor ASA.

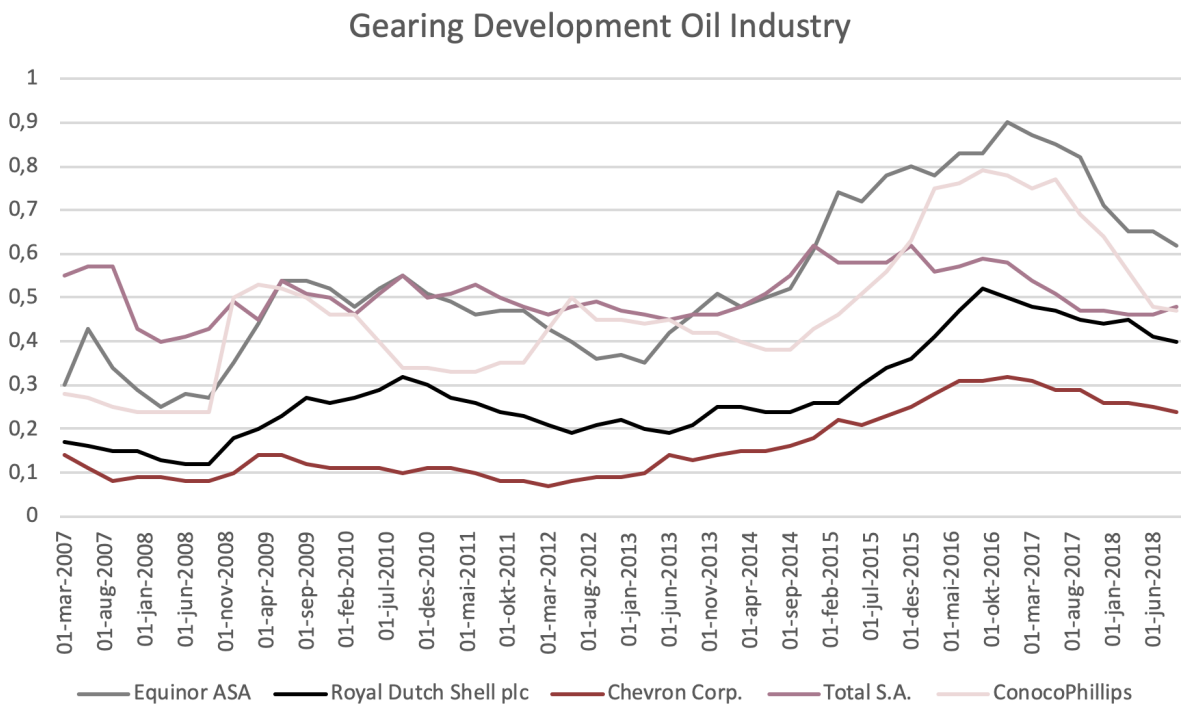

Figure 6: Development in gearing ratio: Oil industry. Entire period

Firstly, we notice that when looking at the debt levels of 2007 versus today, it seems that it has evolved to be somewhat higher than what it was just 10 years ago. Reasons for this are hard to determine, but they are likely to be found in differences at the firm-specific level, where firms due to the nature of their business emphasize different factors in determining their gearing ratio.

Secondly, there appears to be an upward sloping trend in the gearing ratio from about 2013 onwards. It is likely that this is because of strong economic growth in the aftermath of the financial crisis of 2008 and indicates an increased use of debt in the oil industry. Additionally, the world has seen strengthened macroeconomic factors which underpin the strong global economic growth of the past decade. This also supports the increased level of debt mentioned

above; when the future looks brighter, firms often lever up to take advantage of new opportunities, which continues to fuel economic growth.

However, the oil crisis of 2014 made its impact with extremely low oil prices and forced the industry to cut costs and lower their break even. This enabled the oil industry to make good money as the oil prices slowly started to climb. In the wake of an event like this, lots of opportunities reveal themselves as the market sentiment brightens, and the future looks promising. Expectations are key within finance, and the notion of better times ahead may thus be a reasoning behind the increase in the gearing ratio that seems to occur after the oil crisis.

Moving on, we take a look at the gearing of the tech industry, as represented in the figure below. The tech industry is interesting to look at as the cash flows of this industry often flow in by different means than that of more traditional industries, e.g., social media companies where subscriptions are the way they get paid. This gives rise to interesting opportunities regarding leverage.

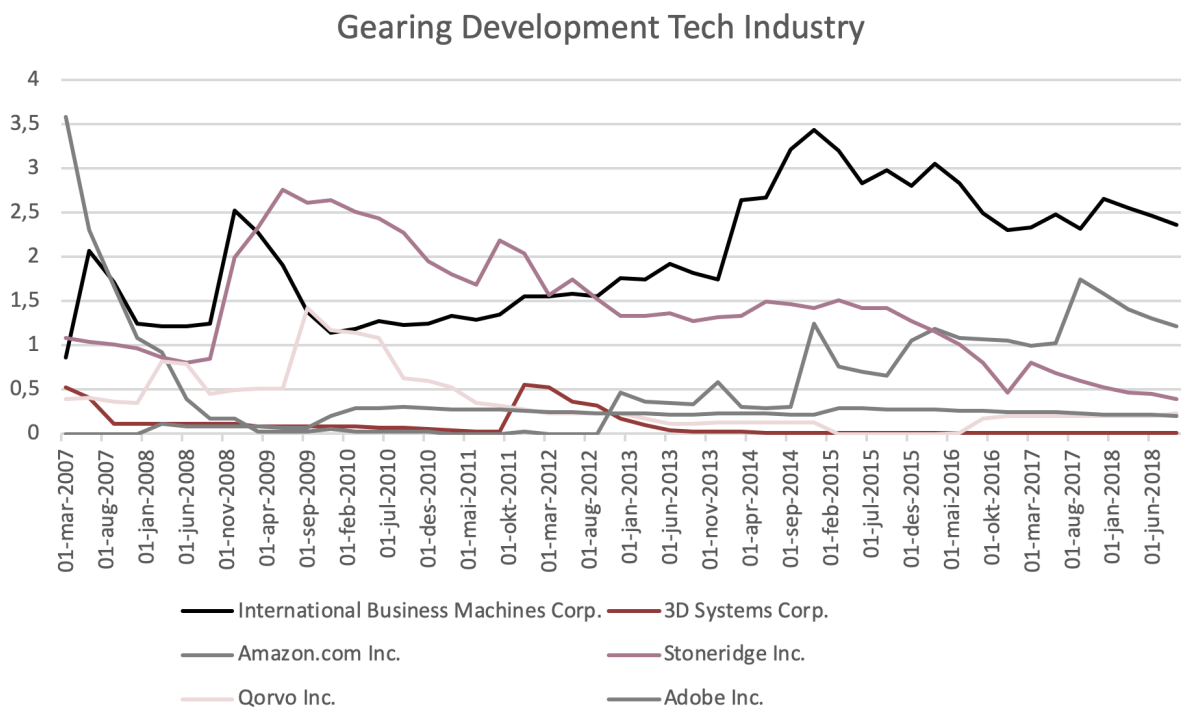

Figure 7: Development in gearing ratio: Tech industry. Entire period

We observe that the tech industry appears to be geared high in general, with some exceptions like Qorvo Inc. and 3D Systems Corp. This could stem from several factors. One might be that in our time, contemporary tech companies are often highly valued due to promising

prospects, which allow these companies to take on more debt than its competitors. If we look at how the gearing ratio in the tech industry has evolved, it does not appear to move in any particular direction. Disregarding some exceptions, it seems to stay at about the same level across time.

Next, the healthcare industry is interesting to view in contrast to the oil industry as the world does not only depend on petroleum products, but also healthcare products to a great extent.

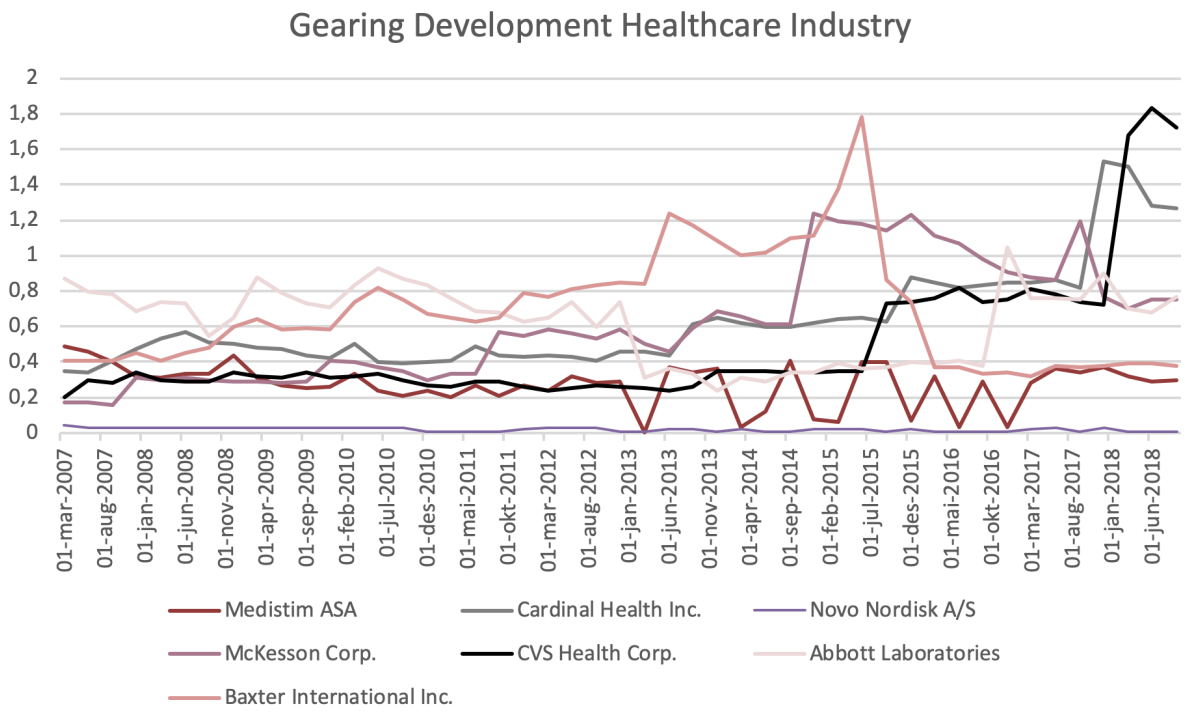

Figure 8: Development in gearing ratio: Healthcare industry. Entire period

When looking at the graph above, we see that until 2013, the debt level of the healthcare industry has been relatively stable for a longer period of time. However, looking at the period from 2013 and up to today, we observe significant variations in gearing. This is likely to stem from industry-specific factors. Considering the development in the gearing ratio of these firms, it is not clear by looking at the panels above what direction it is heading in. However, it seems like the interval in which the firms keep their gearing ratio has changed. This is implied by the graph spreading out at the end of our sample period.

Moving on to the shipping industry, figure 9 below shows that the gearing in the shipping sector is relatively stable over time.

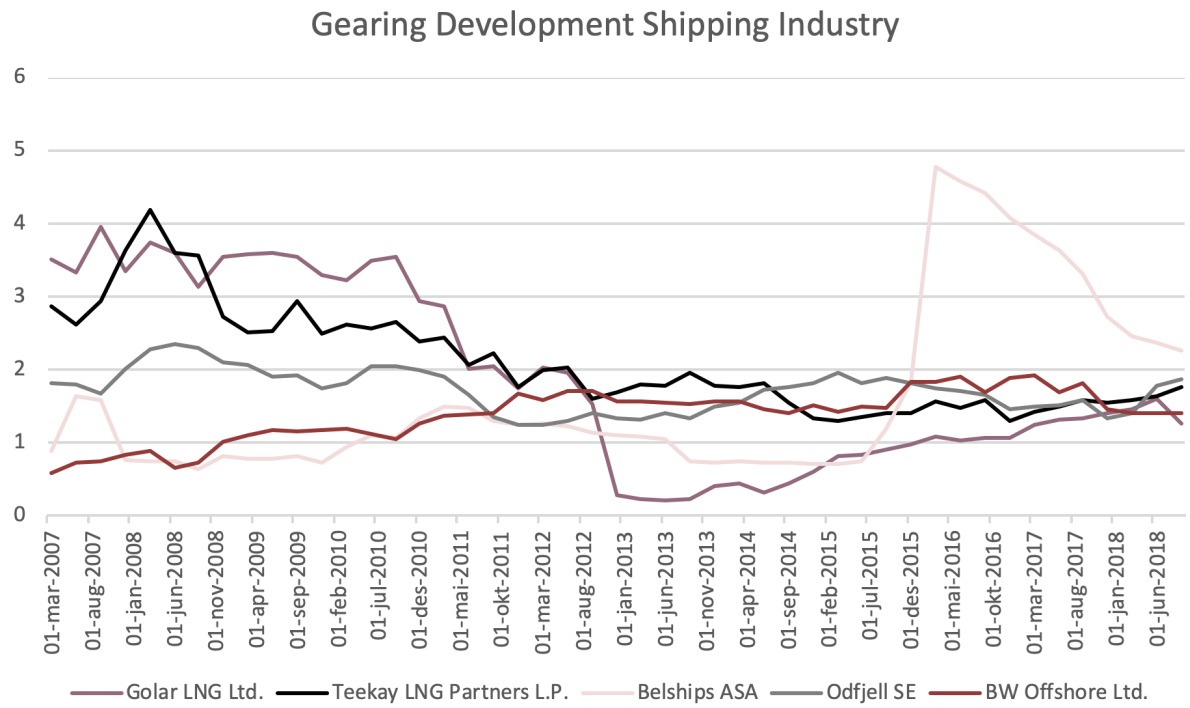

Figure 9: Development in gearing ratio: Shipping industry. Entire period

We notice that the debt ratio in this industry is generally at a much higher level seen in comparison with the other industries included. As mentioned before, this may be because of the substantial cost associated with purchasing a vessel, which requires a considerable amount of funding.

Finally, we look at the construction industry, where it appears that the sector is moving towards an overall more equal level in terms of the debt ratio, approaching the range 0.5-1.0. This is shown in figure 10 below.

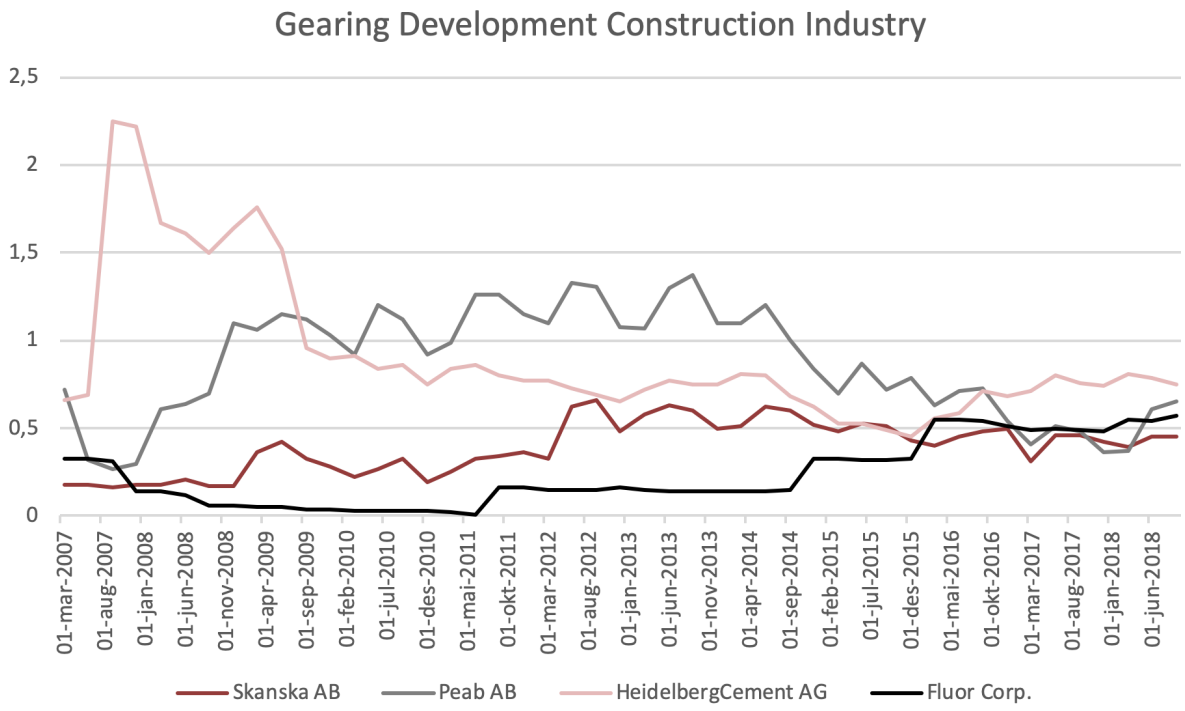

Figure 10: Development in gearing ratio: Construction industry. Entire period

Here, the development in the gearing ratio seems to be relatively small across our sample period, implying stable access to capital for construction companies. This observation appears reasonable as, given an increase in the global population over time, there will continue to be a demand for construction services. In turn, this creates more secure conditions for obtaining financing.

5.3 Regression Results

To present our results in a meaningful manner, we have chosen to extract key findings into tables representing a selection of our results. Full Stata outputs are to be found in the appendices. Numbers reported in the tables include observations, coefficients, R^2, and p-values for the coefficients. To establish the presence of apparent relationships between the dependent and the independent variables more certainly, Stata conducts an F-test automatically where the null hypothesis gives all coefficients to be equal to zero. The p-value of this F-test is also reported, and is denoted as "Prob > F". We will comment on variables that have proven significant at the 5% level or higher. When using the term "non-oil

companies," we refer to firms from the various industries we have included in addition to the oil industry. Further, each coefficient we comment on has been rounded to two decimal places.

Panel Data	Robust OLS
Observations: 2,632	
LogCurrentRatio	-0.19 (0.009***)
Profitability	-0.33 (0.008***)
Size	-0.13 (0.148)
LIBOR	0.00 (0.581)
LogTangibility	0.07 (0.450)
TaxShield	0.00 (0.483)
Robustness	-0.22 (0.172)
LogOilPrice	-0.41 (0.000***)
Rating	-0.06 (0.445)
R^2	0,1935
Prob > F	(0.0000***)

Note: P<0.10*, P<0.05**, P<0.01***

Table 3: Panel data regression: No dummy. Entire period

The table above shows key results from the regression covering all companies across the entire sample period. For this regression, no specific industry has been taken into account as we wish to start with getting an impression of which determinants of the gearing ratio seem important at a general level.

With a p-value of 0.0000, we reject the null hypothesis and conclude that there is a significant relationship between the dependent and independent variables. R^2 shows that the independent variables explain 19.35% of the variation in the dependent variable. The results show a negative relationship between gearing and LogCurrentRatio, Profitability and LogOilPrice, all significant at the 5% level. The corresponding coefficients are -0.19, -0.33 and -0.41,

respectively. This implies that for a 1 unit increase in the mentioned variables, the gearing ratio decreases by the magnitude of the coefficients. In general, our results indicate that considering all industries, the variation in liquidity, profitability, and the oil price are all significant factors in determining a firm's gearing.

Going forward, a dummy variable is included to separate the explanatory variables' effect on oil and non-oil companies. We have included this dummy as we suspect that determinants of gearing are dependent on the industry in question. The dummy enables us to see if the variables' significance changes when looking at oil against non-oil companies. In the appendix, the dummy version of the independent variable is named "Oil," followed by the name of the original variable.

Panel Data - Dummy	Robust OLS	With Oil Dummy
Obs: 2,632	*Coefficient (p-value)*	*Coefficient (p-value)*
LogCurrentRatio	-0.14 (0.037**)	0.99 (0.000***)
Profitability	0.01 (0.966)	-0.01 (0.949)
Size	-0.10 (0.488)	0.09 (0.562)
LIBOR	0.01 (0.435)	-0.01 (0.379)
LogTangibility	0.23 (0.204)	-0.25 (0.180)
TaxShield	0.00 (0.395)	-0.00 (0.130)
Robustness	0.04 (0.869)	-0.03 (0.897)
LogOilPrice	-0.18 (0.236)	0.16 (0.308)
Rating	0.14 (0.194)	-0.14 (0.210)
R^2	0.1312	
Prob > F	(0.0000***)	

Note: P<0.10*, P<0.05**, P<0.01***

Table 4: Panel data regression: Dummy. Entire period

Table 4 above summarises the results from the regression model comprising all industries across the entire sample period. The regression is significant at the 1% level. However, it's R^2 is not particularly high at 13.12%. This would stem from the fact that only one variable, LogCurrentRatio, is significant in the regression. Its coefficient is -0.14, indicating that a 1 unit increase in this variable results in a drop of 0.14 units in gearing ratio for non-oil companies. OilLogCurrentRatio is positive and significant at the 5% level, and adding these two coefficients together gives the number 0.85. Seen as this number is larger in magnitude than the original LogCurrentRatio coefficient, we conclude that liquidity has a stronger effect on the gearing ratio of oil companies as compared to other industries. In this case, the effect is negative for non-oil companies and positive for oil companies.

Panel Data - Before Oil Crisis	Robust OLS	With Oil Dummy
Obs: 1,008	*Coefficient (p-value)*	*Coefficient (p-value)*
LogCurrentRatio	-0.28 (0.084*)	0.97 (0.000***)
Profitability	-0.44 (0.023**)	0.43 (0.031**)
Size	0.05 (0.796)	-0.05 (0.803)
LIBOR	-0.19 (0.602)	0.12 (0.746)
LogTangibility	0.61 (0.286)	-0.65 (0.255)
TaxShield	0.00 (0.190)	0.00 (0.934)
Robustness	0.05 (0.893)	-0.00 (0.988)
LogOilPrice	-0.15 (0.658)	0.13 (0.687)
Rating	-0.05 (0.767)	0.04 (0.819)
R^2	0.1361	
Prob > F	(0.0000***)	

Note: P<0.10*, P<0.05**, P<0.01***

Table 5:Panel data regression: Dummy. Before oil crisis

Moving on, we look at the regression outputs for the pre-oil crisis period. The regression is significant at the 1% level, and the independent variables explain approximately 13.61% of the variation in gearing. Both Profitability and OilProfitability are significant at the 5% level, but looking at their coefficients added together, they are close to canceling out. Interpreting this gives profitability to have a significant, negative effect on gearing for non-oil companies, but no significantly different effect on oil companies. OilLogCurrentRatio is also significant at the 5% level with a coefficient of 0.97. However, the latter factor is not significant in its original form with its p-value of 0.084. This means that the relationship between liquidity and gearing ratio, in this case, is significantly different for oil companies compared to non-oil companies. For non-oil companies, the coefficient appears to be negative, but not significantly different from zero.

Panel Data – During Oil Crisis	Robust OLS	With Oil Dummy
Observations: 448	*Coefficient (p-value)*	*Coefficient (p-value)*
LogCurrentRatio	0.06 (0.582)	1.00 (0.000***)
Profitability	-0.19 (0.547)	0.20 (0.526)
Size	0.14 (0.479)	-0.14 (0.481)
LIBOR	0.09 (0.647)	-0.10 (0.614)
LogTangibility	0.16 (0.609)	-0.13 (0.686)
TaxShield	0.00 (0.506)	-0.00 (0.458)
Robustness	-0.68 (0.188)	0.69 (0.189)
LogOilPrice	-0.36 (0.039**)	0.36 (0.039**)
Rating	0.01 (0.668)	
R^2	0.2292	
Prob > F	(0.0000***)	

Note: P<0.10*, P<0.05**, P<0.01***

Table 6: Panel data regression: Dummy. During oil crisis

Next, table 6 above shows the regression outputs from the oil crisis period. Looking at our results, the regression is statistically significant at the 5% level, and we thus reject the null hypothesis and conclude that there is a significant relationship between the gearing ratio and the explanatory variables. The regression has the highest R^2 of the regressions so far with its 22.92% and shows a positive and significant relationship between OilLogCurrentRatio and gearing. However, the variable is not significant in its original form. This shows that liquidity as a determinant of gearing during the oil crisis is significantly different from zero for oil companies but not for non-oil companies. The coefficient of OilLogCurrentRatio is 1.00, meaning that a 1 unit increase in the current ratio is associated with a 1.00 unit increase in the gearing ratio. LogOilPrice is statistically significant at the 5% level, as is OilLogOilPrice. However, we observe that the sum of these two coefficients added together is approximately equal to zero, and conclude that the oil price does not have a significantly different effect on oil companies versus non-oil companies.

Panel Data - After Oil Crisis	Robust OLS	With Oil Dummy
Observations: 392	*Coefficient (p-value)*	*Coefficient (p-value)*
LogCurrentRatio	0.12 (0.285)	1.00 (0.000***)
Profitability	0.01 (0.953)	0.01 (0.982)
Size	0.00 (0.984)	0.01 (0.951)
LIBOR	0.09 (0.104)	-0.10 (0.103)
LogTangibility	0.35 (0.663)	-0.25 (0.744)
TaxShield	0.02 (0.061*)	-0.02 (0.061*)
Robustness	-0.00 (1.000)	0.01 (0.975)
LogOilPrice	-0.32 (0.381)	0.33 (0.364)
Rating	-0.03 (0.523)	
R^2	0.1353	
Prob > F	(0.0000***)	

Note: P<0.10*, P<0.05**, P<0.01***

Table 7:Panel data regression. Dummy. After oil crisis

Table 7 summarises the key results from the post-oil crisis period. The regression is significant with a p-value of 0.0000 and has an R^2 of 13.53%. We, therefore, conclude that there is a significant relationship between the dependent and independent variables. In this case, however, only the dummy variable OilLogCurrentRatio is significant at the 5% level. This means that the relationship of the current ratio with gearing is significantly different for oil companies from that of non-oil companies. For oil companies, the coefficient is positive and statistically significant. For non-oil companies, it is positive, but not statistically significant.

Equinor ASA vs. Peers

To improve our knowledge of what drives the gearing ratio of oil companies at an individual level, we are taking a closer look at the case of Equinor ASA. We have done this to gain a better understanding of the determinants of gearing in the oil industry. It will also help us to find out if these determinants differ when looking at Equinor ASA versus its peers and consequently to answer our fifth hypothesis.

Table 8 below summarises the regression outputs for Equinor ASA and its peers.

	Equinor ASA	**Royal Dutch Shell plc**	**Total S.A.**	**ConocoPhillips**	**Chevron Corp.**
Obs: 47	*Coefficient (p-value)*	*Coefficient (p-value)*	*Coefficient (p-value)*	*Coefficient (p-value)*	*Coefficient (p-value)*
LogCurrentRatio	0.78 (0.000***)	1.78 (0.007***)	-0.83 (0.019**)	0.39 (0.000***)	-0.51 (0.016**)
Profitability	0.22 (0.532)	0.15 (0.869)	-0.64 (0.086*)	-0.14 (0.210)	-1.43 (0.235)
Size	0.16 (0.477)	1.15 (0.000***)	0.02 (0.523)	-0.78 (0.000***)	-0.13 (0.592)
LIBOR	-0.03 (0.004***)	-0.05 (0.000***)	-0.01 (0.374)	0.01 (0.224)	0.02 (0.054*)
LogTangibility	2.11 (0.010**)	0.51 (0.184)	-0.32 (0.268)	1.44 (0.000***)	2.71 (0.000***)
TaxShield	-0.00 (0.973)	-0.01 (0.638)	-0.02 (0.062*)	0.01 (0.558)	-0.18 (0.038**)
Robustness	0.46 (0.376)	-2.58 (0.002***)	-0.04 (0.936)	-1.03 (0.071*)	-0.05 (0.429)
LogOilPrice	-0.52 (0.008***)	-0.72 (0.000***)	-0.23 (0.001***)	0.03 (0.814)	-0.19 (0.288)
R^2	0.8230	0.8648	0.5156	0.9176	0.9253
Prob > F	(0.0000***)	(0.0000***)	(0.0003***)	(0.0000***)	(0.0000***)

Note: P<0.10*, P<0.05**, P<0.01***

Table 8: OLS regression outputs: Equinor ASA vs. Peers

Looking at the regression outputs for Equinor ASA, we observe a high R^2 at 82.3%. The regression is significant with a p-value of 0.0000 and thus shows a significant relationship

between the independent variables and the dependent variable. Looking at the determinants of Equinor ASA's gearing ratio, we see a positive and significant relationship for both LogCurrentRatio and LogTangibility. The coefficients are 0.78 and 2.11, respectively, and both variables are significant at the 5% level. The regression gives LogOilPrice and LIBOR to have a significant negative effect on gearing, where a 1 unit increase in oil price leads to a 0.52 unit drop in gearing. The corresponding number for LIBOR is -0.03 units.

Considering Royal Dutch Shell plc, the regression is statistically significant and has an R^2 of 86.48%. It has a total of 5 significant variables. LIBOR and LogOilPrice are both highly significant with a p-value of 0.000. The relationship between gearing and LogCurrentRatio is positive and significant at the 5% level, meaning that an increase in this variable corresponds to an increase in this company's gearing ratio. As opposed to Equinor ASA, Size and Robustness is significant in explaining the gearing ratio. The relationship with gearing is positive for Size and negative for Robustness, with the coefficients of 1.15 and -2.58, respectively.

When it comes to the regression outputs for Total S.A., the overall p-value of the model shows a significant relationship between the dependent and the independent variables. The R^2 is in the lower range when compared to the other oil companies, but is still fairly good with its 51.56%. Both LogCurrentRatio and LogOilPrice are significant, and they are associated with a negative effect on gearing ratio. A 1 unit increase in LogCurrentRatio leads to a 0.83 unit decrease in the gearing ratio. The corresponding number for LogOilPrice is -0.23. We observe that unlike the case of Equinor ASA, LIBOR is no longer significant in explaining the gearing ratio.

Studying the regression for ConocoPhillips, it is highly significant with a p-value of 0.0000, which makes sense given its high R^2 of 91.76%. In this case, we have three significant independent variables, which are LogCurrentRatio, Size, and LogTangibility. Size is the only variable with a negative effect on the gearing ratio where a 1 unit increase in Size is associated with a 0.78 unit decrease in gearing. Both LogCurrentRatio and LogTangibility have a positive impact on the gearing ratio and a 1 unit increase in these variables is associated with a 0.39 and 1.44 unit increase in gearing, respectively. Compared to Equinor ASA, Size is now a highly significant determinant, whereas LIBOR and LogOilPrice have lost their explanatory effect on the gearing ratio.

Finally, we have Chevron Corp. The regression is significant at the 1% level, and it has the highest R^2 of the oil companies being compared. The R^2 is 92.53%, indicating that the independent variables explain more than 90% of the variation in gearing. In the regression, three out of nine explanatory variables are significant at the 5% level. However, only LogTangibility is highly significant with its p-value of 0.000. This distinguishes Chevron Corp. from Equinor ASA where this factor is not significant. We observe a positive relationship between LogTangibility and gearing ratio, and a negative relationship between gearing, LogCurrentRatio, and TaxShield. The coefficients are 2.71, -0.51 and -0.18, respectively. Both LIBOR and LogOilPrice have lost their significance as compared to the case of Equinor ASA.

6. Discussion

6. Discussion

In this chapter, we discuss and interpret the results from the regression analyses we presented in chapter 5.3 *Regression results*. Please note that in most cases, we interpret our regression results from a holistic approach when answering our hypotheses. We begin by stating our hypotheses before we move on to systematically present our findings related to the respective hypotheses. The outcome of our analysis will be discussed with respect to our expectations, theory, and previous research.

Hypotheses:

1. The determinants of the gearing ratio have not changed during the sample period.

2. Determinants of gearing have not been affected by the oil crisis.

3. Credit ratings do not affect a company's gearing ratio.

4. The oil industry, as compared to other industries, does not differ in determinants of the gearing ratio.

5. The determinants of Equinor ASA's gearing do not differ from that of its peers.

Hypothesis 1: The determinants of the gearing ratio have not changed during the sample period.

Looking at the regressions presented in the previous chapter, excluding the comparison of Equinor ASA vs. its peers, one-third of our independent variables have a significant explanatory effect on the gearing ratio of the included industries. To our surprise, factors such as Size, LIBOR, and TaxShield do not have a significant impact on gearing in any of the cases presented. This contradicts previous research such as Bauer (2004) who finds, e.g., Size to have a positive, significant effect on gearing. However, the variables Profitability, LogCurrentRatio, and LogOilPrice are all significant prior to the oil crisis. Profitability is negative and significant which is consistent with what we expected given the pecking order theory. It is also in line with the findings of both Bauer (2004) and M'Ng, Rahman, &

Sannacy (2017). The variable is also present in the pre-crisis period indicating its importance before the oil crisis.

After the oil crisis, however, only liquidity as represented by LogCurrentRatio remains significant. Our dummy separating the oil industry from other industries indicates that the variable's importance is greater to oil companies as looking at the post-crisis results, this variable is significantly different for oil companies than for non-oil companies. The variable's effect on oil companies, in general, is positive. Our expectation, however, was for this variable to be negative as predicted by the pecking order theory. Thus it appears that for non-oil companies, liquidity has a negative relation with leverage, but for oil companies, the relationship is positive, as opposed to the findings made by Sheikh & Wang (2011). Based on the results discussed above, we thus reject this hypothesis as determinants of gearing have changed during our sample period.

Hypothesis 2: Determinants of gearing have not been affected by the oil crisis.

This hypothesis addresses the oil crisis and is included as economic intuition gives reason to expect that the determinants of gearing can be affected by shocks to the economy in some way. We believe this as changes to the oil price directly affect the cash flow of particularly the oil industry, possibly forcing this industry to make different considerations when determining their level of debt. The results presented previously tell us that prior to the oil crisis, both Profitability and LogCurrentRatio, adjusted for oil companies, had a significant impact on gearing. Looking at the regression covering the oil crisis, LogCurrentRatio adjusted for oil companies is still significant. However, Profitability has lost its effect, and LogOilPrice progresses as a significant explanatory factor of gearing. This seems reasonable as the majority of companies included in our study are firms in the oil industry, making the oil price an important factor in determining the gearing ratio. Moving on to the post-oil crisis period, only liquidity represented by LogCurrentRatio remains significant, but its significance only applies to companies within the oil industry.

However, due to the limited number of significant explanatory variables in our regressions, it is difficult to assert with certainty that the factors have changed as a consequence of the oil crisis. Despite this, our results point in this direction, and we thus reject the hypothesis and conclude that the determinants of gearing were affected by the oil crisis. Post-crisis it seems

that general factors like profitability and oil prices lose their explanatory power, confirming that the crisis has altered the determinants of gearing.

This result relates to both theories included in our study. The increased importance of liquidity could be a consequence of firms that have gotten nervous and now wish to be more solidly funded. This is in line with the pecking order theory as it gives internal financing to be the preferred option of funding. As for the MM theory, an oil crisis makes it more challenging to use tax shields, particularly if the firm no longer makes money. Additionally, a crisis increases the cost of financial distress. These reasons make it seem reasonable that the determinants of gearing are affected by a shock to the economy.

Hypothesis 3: Credit ratings do not affect a company's gearing ratio.

To our surprise, a relationship between credit rating and the gearing ratio of companies was not found significant in any of our regressions. A reason for this may be that other factors play a more vital role in determining the gearing of a company, undermining the explanatory power of credit ratings. We suspect that these components interact with the credit rating in such a way that the rating itself does not automatically correspond to an easier access to funding. This is unexpected as conversations with professionals as well as economic intuition implies that the increased safety of a higher rating should result in a more convenient access to the capital markets. The latter suggests that the ratings are of importance in reality. Nevertheless, given the variable's effect on gearing in our analysis, this may indicate that the interaction between credit rating and gearing work differently given a theoretical approach.

We expected a positive relationship between credit rating and leverage. However, the coefficient of the variable proved to be mostly negative and insignificant. Based on the discussion above, we fail to reject the hypothesis and conclude that credit rating does not have a significant effect on a firm's gearing ratio.

Hypothesis 4: The oil industry, as compared to other industries, does not differ in determinants of the gearing ratio.

Given the nature of the different industries we have included, our intuitive expectation was that the determinants of the oil industry would differ from other industries. We expected this

because the oil industry, to a certain extent, is a more capital intensive business due to its requirement for considerable investments. Indeed, our results are just in line with our expectations. Focusing on the regressions containing a dummy to separate oil and non-oil companies, the variable that recurs as a determinant of gearing is the LogCurrentRatio, implying that liquidity plays a central role in considering a firm's leverage. Our results show that liquidity has a significantly stronger impact on the gearing of oil companies than on the other industries. Looking at the other variables, Profitability and LogOilPrice are determinants both before and during the oil crisis. When it comes to the oil price, we found that this determinant, once significant, has a stronger impact on oil companies than on non-oil companies. Conclusively, our findings show that the determinants of gearing for oil versus non-oil companies differ and we thus reject this hypothesis. However, it is clear to us that by choosing different industries, perhaps industries with more similarities to the nature of the operations in an oil company, our results might have differed.

Hypothesis 5: The determinants of Equinor ASA's gearing do not differ from that of its peers.

To answer this hypothesis, we ran regressions for Equinor ASA and the selected peers; Total S.A., ConocoPhillips, Chevron Corp., and Royal Dutch Shell plc. The regressions were run using data from the entire sample period, and the companies were chosen on the basis that we perceive them to be relevant peers of Equinor ASA based on their operations and global scope. A key criterion has been for all peers to be of investment-grade rating to ensure a more accurate and realistic comparison.

Looking at the results for these five companies, it is clear that liquidity plays a central role in determining the gearing ratio of an oil company. This is in line with our findings done on a wider range of firms. The variable is significant in explaining the gearing of every company. However, the relationship is only negative in two cases. In the other three cases, it contradicts both the findings of Sheikh & Wang (2011) as well as our expectations. Looking at the remaining variables, both tangibility and oil price appear in three out of five cases, all with the same sign. That is, the relationship between tangibility and gearing appears to be positive, and the relationship between oil price and gearing seem to be negative. The latter is surprising as we were expecting a higher oil price to enable higher leverage and thus yield a positive relationship between these factors.

Furthermore, it is worth noting that our tax shield variable only appears significant for Chevron Corp. The coefficient is negative, which contradicts the findings of Bauer (2004) as well as our anticipations. Additionally, assuming that companies desire the highest possible firm value, our result is not in line with the MM theorem. Economic intuition, together with the MM theorem gives that as the tax rate of a company increases, so should the firm's gearing as benefits of leverage increase proportionately. This should result in a positive coefficient for this variable.

Based on the results highlighted above, we reject the hypothesis and conclude that the determinants of gearing for Equinor ASA differ from that of its peers. We think this is because of company-specific factors that contribute to making the leverage decision complex, which in turn makes it infeasible for firms to have identical determinants of gearing. There is only one variable that is significant in explaining the gearing ratio of Equinor ASA and all of its peers. This variable is the LogCurrentRatio, and the variation evident for the remaining independent variables makes the rejection of this hypothesis inevitable.

7. Conclusion

7.1 Limitations 68
7.2 Suggestions for Further Research 69

7. Conclusion

The objective of this thesis was to gain an understanding of which factors are important in determining the gearing ratio of integrated oil companies in comparison to non-oil companies. Two main periods have been studied, one that covers the entire sample period from 2007 to 2018, and one that concentrates on the oil crisis of 2014. The latter period was divided into three sub-periods to enable us to examine whether a shock to the economy affects the determinants of gearing.

We have examined if and in what way the explanatory variables current ratio, profitability, size, LIBOR, tangibility, tax shield, robustness, oil price, and credit rating affect the gearing ratio of several industries, with a particular focus on the oil industry. Additionally, we have studied how these variables affect the gearing ratio of Equinor ASA against a selection of peers.

The results of our study show that only a handful of determinants are statistically significant in explaining the gearing ratio on a general basis. These variables include LogCurrentRatio, Profitability, and LogOilPrice. Our findings give an increase in Profitability and LogOilPrice to have a negative impact on gearing for both oil and non-oil companies. LogCurrentRatio had a negative impact on gearing for non-oil companies but a significantly different, positive effect on oil companies. We further found that the determinants of gearing do in fact, differ between oil and non-oil companies.

We found that the determinants of gearing were affected by a shock to the economy, leaving LogCurrentRatio as the only remaining significant determinant post-crisis. It was also found that the determinants of gearing ratio have changed, in general, during our sample period.

No significant relationship was found between credit rating and gearing ratio in any of our regressions. This was surprising as we expected an investment-grade rating to be vital for a company's access to capital.

Our results further show that when looking at oil companies at an individual level, the explained variance as well as the number of significant variables increases. However, our findings give only LogCurrentRatio to be significant for all five companies. The results also

show that the significant variables of Equinor ASA's peers vary to a great extent. We found Size to have a significant, ambiguous impact on gearing, and LIBOR, TaxShield, and Robustness to have a negative effect. Finally, LogTangibility had a positive impact on the gearing of Equinor ASA.

Our study has two main discoveries. First, LogCurrentRatio is a significant determinant in all of our regressions. Second, credit ratings does not appear to have an explanatory effect on gearing in any of our sample periods. The other determinants mentioned seem to be significant explanatory variables of gearing only on an occasional basis.

We therefore conclude that liquidity, as represented by the current ratio, is the single most important determinant of the gearing ratio of integrated oil companies. Using regression analysis, it was found that this variable occurred as significant in all time periods, as well as in the comparison of Equinor ASA against its peers. Additionally, liquidity frequently had a significantly stronger effect on the gearing ratio of oil companies. This supports it being the only common determinant when looking at Equinor ASA against its peers. Further, an important discovery is that credit ratings do not appear to have any explanatory effect on the gearing ratio of neither oil nor non-oil companies.

The key findings presented above led to the rejection of four out of our five hypotheses. Our results indicate that decisions of capital structure are supported both by the MM theorem and the pecking order theory. However, these theories alone cannot explain capital structure or its determinants as multiple factors and theories play a role in this.

Our paper is of relevance to finance managers who are interested in which determinants to be aware of when attempting to determine an optimal level of gearing. Efficiently doing this could potentially save firms costs of financing as well as provide great company value. It could also create a basis for a company to increase its financial capability. Additionally, knowing what factors that are affected by a shock to the economy could help firms manage risk more efficiently. Lastly, our thesis serves as an addition to existing research on the topic of capital structure and its determinants.

7.1 Limitations

Given the immense time spent on gathering data, we have not been able to ensure the quality of all our observations. However, data has been gathered from credible sources, and we do not expect substantial deviations in our dataset. Further, we chose to exclude several companies due to inconsistency in their data. This led to our final dataset being smaller than the initial one, which could cause problems with outliers. It could also give trouble relating to the OLS assumptions. However, our regressions are run with settings that take the latter problem into consideration, so this should not have a decisive effect on our results.

Additionally, our choice of variables could limit the representativeness of our results. There is a multitude of studies on capital structure concerning the gearing ratio, and the process of picking out the most relevant variables is thus challenging. To do things differently, we could have used a different specification of the gearing ratio as a dependent variable and chosen different explanatory variables. This is something that might have altered the conclusion we arrived at to some extent. Perhaps the true relationship concerning the determinants of the gearing ratio would be better depicted, but not necessarily.

Moreover, the sub-periods covering the oil crisis have a relatively small sample size, which could result in decreased statistical power in our regressions. This might explain why the number of significant variables in our regressions is limited.

Finally, the companies included are to be considered as mature, given that they have all existed from the year 2007 onwards. Our results are therefore not to be considered representative of young companies.

7.2 Suggestions for Further Research

The following suggestions for further research represent ideas for analyses our time and resources did not allow us to pursue.

A natural way to continue our work would be to elaborate on the limitations expressed previously. Although the topic of our thesis is broadly defined, we have reached several interesting conclusions.

Another way to develop our research could be to expand our collection of determinants to see if a greater number of variables would yield different results in what determines a firm's gearing ratio. It could also be interesting to replace our current variables with a new set of variables, rerun regressions, and explore whether other determinants of gearing would provide better models with increased statistical power. This could provide more profound insights into what determines a company's gearing ratio. Additionally, it could be interesting to include a broader range of industries to see if this has any effect on which determinants that are significant in explaining a company's gearing ratio.

Considering the entry of IFRS 16, it could contribute to the further development of our topic to consciously take into account its consequences. This is because IFRS 16 changes the way firms account for leasing obligations on their balance sheets, which directly affects a firm's gearing ratio.[42]

Given our thesis' focus on the oil industry and the case Equinor ASA, it could also be of interest to investigate the impact of government ownership. This could be particularly appealing to look at in the context of the Norwegian oil industry, where the most significant participant Equinor ASA is owned 67% by the Norwegian government.[43] This would provide knowledge about how government influence affects the gearing of a company. Perhaps there is a relationship between government ownership and credit ratings, where government ownership hypothetically leads to better credit ratings.

[42] IFRS 16 stands for International Financial Reporting Standards. It is a new edit of existing regulations concerning leasing.
[43] Equinor, u.d.

It could further yield noteworthy results to focus on professional opinions to a greater extent. This approach would give a more practical perspective on the topic of our study, which could result in outcome with added hands-on, applicable value to the real world. After all, theory and reality do not always correspond. Doing this would foster an even deeper understanding of what managers consider to be the most important factors when managing a company's leverage.

The kind of debt companies take on would be another natural perspective to take, where we could look at the composition of debt a firm undertakes. Given the right set of independent variables, this could answer questions like what determines a firm's choice of gearing, with respect to the different kinds of debt being taken on.

Finally, we have concentrated our paper on one specification of gearing ratio. However, given the immense amount of companies and industries that exist, it could be of interest to perform a more in-depth analysis of different specifications of the gearing ratio. This might yield results that could strengthen the significance and validity of our findings.

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9. Appendix

1. Unit Root Test

```
import excel "/Users/marieevje/Desktop/Marie_Mats_Data_Master.xlsx", sheet("Panel Data")
firstrow c
> lear

. egen time = group (Date)

. xtset CompanyID time
       panel variable:  CompanyID (strongly balanced)
        time variable:  time, 1 to 47
                delta:  1 unit

. xtunitroot llc LogGearing

Levin-Lin-Chu unit-root test for LogGearing
-------------------------------------------
Ho: Panels contain unit roots               Number of panels  =     56
Ha: Panels are stationary                   Number of periods =     47

AR parameter: Common                        Asymptotics: N/T -> 0
Panel means:  Included
Time trend:   Not included

ADF regressions: 1 lag
LR variance:     Bartlett kernel, 11.00 lags average (chosen by LLC)
--------------------------------------------------------------------------------
                    Statistic      p-value
--------------------------------------------------------------------------------
 Unadjusted t       -10.8835
 Adjusted t*         -1.7175        0.0429
--------------------------------------------------------------------------------

. xtunitroot llc LogCurrentRatio

Levin-Lin-Chu unit-root test for LogCurrentRatio
------------------------------------------------
Ho: Panels contain unit roots               Number of panels  =     56
Ha: Panels are stationary                   Number of periods =     47

AR parameter: Common                        Asymptotics: N/T -> 0
Panel means:  Included
Time trend:   Not included

ADF regressions: 1 lag
LR variance:     Bartlett kernel, 11.00 lags average (chosen by LLC)
--------------------------------------------------------------------------------
                    Statistic      p-value
```

```
-------------------------------------------------------------------------------
 Unadjusted t       -15.4397
 Adjusted t*         -5.8326        0.0000
-------------------------------------------------------------------------------

. xtunitroot llc Profitability

Levin-Lin-Chu unit-root test for Profitability
----------------------------------------------
Ho: Panels contain unit roots               Number of panels  =     56
Ha: Panels are stationary                   Number of periods =     47

AR parameter: Common                        Asymptotics: N/T -> 0
Panel means:  Included
Time trend:   Not included

ADF regressions: 1 lag
LR variance:     Bartlett kernel, 11.00 lags average (chosen by LLC)
-------------------------------------------------------------------------------
                    Statistic      p-value
-------------------------------------------------------------------------------
 Unadjusted t       -24.8390
 Adjusted t*        -15.2073        0.0000
-------------------------------------------------------------------------------

. xtunitroot llc Size

Levin-Lin-Chu unit-root test for Size
-------------------------------------
Ho: Panels contain unit roots               Number of panels  =     56
Ha: Panels are stationary                   Number of periods =     47

AR parameter: Common                        Asymptotics: N/T -> 0
Panel means:  Included
Time trend:   Not included

ADF regressions: 1 lag
LR variance:     Bartlett kernel, 11.00 lags average (chosen by LLC)
-------------------------------------------------------------------------------
                    Statistic      p-value
-------------------------------------------------------------------------------
 Unadjusted t       -10.0515
 Adjusted t*         -2.7636        0.0029
-------------------------------------------------------------------------------

. xtunitroot llc LIBOR

Levin-Lin-Chu unit-root test for LIBOR
--------------------------------------
Ho: Panels contain unit roots               Number of panels  =     56
Ha: Panels are stationary                   Number of periods =     47
```

```
AR parameter: Common                        Asymptotics: N/T -> 0
Panel means:  Included
Time trend:   Not included

ADF regressions: 1 lag
LR variance:     Bartlett kernel, 11.00 lags average (chosen by LLC)
--------------------------------------------------------------------------------
                    Statistic      p-value
--------------------------------------------------------------------------------
 Unadjusted t       -30.2043
 Adjusted t*        -21.1689        0.0000
--------------------------------------------------------------------------------

. xtunitroot llc LogTangibility

Levin-Lin-Chu unit-root test for LogTangibility
-----------------------------------------------
Ho: Panels contain unit roots               Number of panels  =     56
Ha: Panels are stationary                   Number of periods =     47

AR parameter: Common                        Asymptotics: N/T -> 0
Panel means:  Included
Time trend:   Not included

ADF regressions: 1 lag
LR variance:     Bartlett kernel, 11.00 lags average (chosen by LLC)
--------------------------------------------------------------------------------
                    Statistic      p-value
--------------------------------------------------------------------------------
 Unadjusted t       -10.6031
 Adjusted t*         -4.1365        0.0000
--------------------------------------------------------------------------------

. xtunitroot llc TaxShield

Levin-Lin-Chu unit-root test for TaxShield
------------------------------------------
Ho: Panels contain unit roots               Number of panels  =     56
Ha: Panels are stationary                   Number of periods =     47

AR parameter: Common                        Asymptotics: N/T -> 0
Panel means:  Included
Time trend:   Not included

ADF regressions: 1 lag
LR variance:     Bartlett kernel, 11.00 lags average (chosen by LLC)
--------------------------------------------------------------------------------
                    Statistic      p-value
--------------------------------------------------------------------------------
 Unadjusted t       -30.4503
 Adjusted t*        -19.0813        0.0000
--------------------------------------------------------------------------------
```

```
. xtunitroot llc Robustness

Levin-Lin-Chu unit-root test for Robustness
-----------------------------------
Ho: Panels contain unit roots               Number of panels  =     56
Ha: Panels are stationary                   Number of periods =     47

AR parameter: Common                        Asymptotics: N/T -> 0
Panel means:  Included
Time trend:   Not included

ADF regressions: 1 lag
LR variance:     Bartlett kernel, 11.00 lags average (chosen by LLC)
--------------------------------------------------------------------------------
                    Statistic      p-value
--------------------------------------------------------------------------------
 Unadjusted t       -24.9941
 Adjusted t*        -14.5786        0.0000
--------------------------------------------------------------------------------

. xtunitroot llc LogOilPrice

Levin-Lin-Chu unit-root test for LogOilPrice
--------------------------------------------
Ho: Panels contain unit roots               Number of panels  =     56
Ha: Panels are stationary                   Number of periods =     47

AR parameter: Common                        Asymptotics: N/T -> 0
Panel means:  Included
Time trend:   Not included

ADF regressions: 1 lag
LR variance:     Bartlett kernel, 11.00 lags average (chosen by LLC)
--------------------------------------------------------------------------------
                    Statistic      p-value
--------------------------------------------------------------------------------
 Unadjusted t       -18.6568
 Adjusted t*         -7.4180        0.0000
--------------------------------------------------------------------------------

. xtunitroot llc Rating

Levin-Lin-Chu unit-root test for Rating
---------------------------------------
Ho: Panels contain unit roots               Number of panels  =     56
Ha: Panels are stationary                   Number of periods =     47

AR parameter: Common                        Asymptotics: N/T -> 0
Panel means:  Included
Time trend:   Not included
```

```
ADF regressions: 1 lag
LR variance:     Bartlett kernel, 11.00 lags average (chosen by LLC)
--------------------------------------------------------------------------------
                     Statistic      p-value
--------------------------------------------------------------------------------
 Unadjusted t        -3.7860
 Adjusted t*         24.1985        1.0000
--------------------------------------------------------------------------------
```

2. Hausman Test

```
egen time = group (Date)

. xtset CompanyID time
       panel variable:  CompanyID (strongly balanced)
        time variable:  time, 1 to 47
                delta:  1 unit

. xtreg LogGearing LogCurrentRatio Profitability Size LIBOR LogTangibility TaxShield
Robustness LogOilPrice
> Rating, fe

Fixed-effects (within) regression               Number of obs     =      2,632
Group variable: CompanyID                       Number of groups  =         56

R-sq:                                           Obs per group:
     within  = 0.1164                                         min =         47
     between = 0.2311                                         avg =       47.0
     overall = 0.1935                                         max =         47

                                                F(9,2567)         =      37.58
corr(u_i, Xb)  = 0.0796                         Prob > F          =     0.0000

------------------------------------------------------------------------------
     LogGearing |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
----------------+-------------------------------------------------------------
LogCurrentRatio |  -.1971955   .0352827    -5.59   0.000     -.266381   -.1280101
  Profitability |  -.3301794   .0629289    -5.25   0.000     -.453576   -.2067828
           Size |  -.1318501    .022021    -5.99   0.000    -.1750307   -.0886694
          LIBOR |   .0043387   .0031883     1.36   0.174    -.0019131    .0105906
 LogTangibility |   .0686996   .0223874     3.07   0.002     .0248003    .1125989
      TaxShield |    .000216    .000393     0.55   0.583    -.0005547    .0009866
            Robustness |  -.2236573   .0880545    -2.54   0.011    -.3963224   -.0509923
    LogOilPrice |  -.4125023   .0342171   -12.06   0.000    -.4795982   -.3454064
         Rating |  -.0548138   .0269708    -2.03   0.042    -.1077006    -.001927
          _cons |    1.10417   .1046609    10.55   0.000     .8989416    1.309398
----------------+-------------------------------------------------------------
        sigma_u |  .31901879
        sigma_e |   .2334507
            rho |  .65125451   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

```
F test that all u_i=0: F(55, 2567) = 70.71                   Prob > F = 0.0000

. estimate store fe

. xtreg LogGearing LogCurrentRatio Profitability Size LIBOR LogTangibility TaxShield
Robustness LogOilPrice
> Rating, re

Random-effects GLS regression                   Number of obs     =      2,632
Group variable: CompanyID                       Number of groups  =         56

R-sq:                                           Obs per group:
     within  = 0.1162                                         min =         47
     between = 0.2494                                         avg =       47.0
     overall = 0.2052                                         max =         47

                                                Wald chi2(9)      =     357.47
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =     0.0000

------------------------------------------------------------------------------
     LogGearing |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
----------------+-------------------------------------------------------------
LogCurrentRatio |  -.2118877   .0349872    -6.06   0.000    -.2804614   -.1433141
  Profitability |    -.33277   .0629913    -5.28   0.000    -.4562307   -.2093094
           Size |  -.1239983   .0204411    -6.07   0.000     -.164062   -.0839345
          LIBOR |   .0041375   .0031921     1.30   0.195     -.002119     .010394
 LogTangibility |   .0648249   .0215045     3.01   0.003     .0226768    .1069729
      TaxShield |   .0002176   .0003941     0.55   0.581    -.0005549    .0009902
            Robustness |  -.2565071   .0877025    -2.92   0.003    -.4284008   -.0846134
    LogOilPrice |   -.413864   .0343063   -12.06   0.000     -.481103   -.3466249
         Rating |  -.0719175    .026437    -2.72   0.007     -.123733   -.0201019
          _cons |   1.086324   .1062968    10.22   0.000     .8779865    1.294662
----------------+-------------------------------------------------------------
        sigma_u |  .27766898
        sigma_e |   .2334507
            rho |  .58586989   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. estimate store re

. hausman fe re

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |       fe           re         Difference          S.E.
-------------+----------------------------------------------------------------
LogCurrent~o |   -.1971955    -.2118877        .0146922        .0045567
Profitabil~y |   -.3301794      -.33277        .0025906               .
        Size |   -.1318501    -.1239983       -.0078518        .0081906
       LIBOR |    .0043387     .0041375        .0002012               .
LogTangibi~y |    .0686996     .0648249        .0038748        .0062252
   TaxShield |     .000216     .0002176       -1.68e-06               .
```

```
        Robustness |   -.2236573    -.2565071        .0328498        .0078657
 LogOilPrice |   -.4125023     -.413864        .0013617               .
      Rating |   -.0548138    -.0719175        .0171037        .0053395
------------------------------------------------------------------------------
                           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(9) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       40.18
                Prob>chi2 =      0.0000
                (V_b-V_B is not positive definite)
```

3. Panel

```
xtreg LogGearing LogCurrentRatio Profitability Size LIBOR LogTangibility TaxShield Robustness
LogOilPrice
> Rating, fe vce(robust)

Fixed-effects (within) regression               Number of obs     =      2,632
Group variable: CompanyID                       Number of groups  =         56

R-sq:                                           Obs per group:
     within  = 0.1164                                         min =         47
     between = 0.2311                                         avg =       47.0
     overall = 0.1935                                         max =         47

                                                F(9,55)           =      15.20
corr(u_i, Xb)  = 0.0796                         Prob > F          =     0.0000

                                 (Std. Err. adjusted for 56 clusters in CompanyID)
------------------------------------------------------------------------------
                |               Robust
     LogGearing |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
----------------+-------------------------------------------------------------
LogCurrentRatio |  -.1971955   .0729138    -2.70   0.009     -.343318    -.051073
  Profitability |  -.3301794   .1207987    -2.73   0.008    -.5722653   -.0880935
           Size |  -.1318501   .0899162    -1.47   0.148    -.3120461     .048346
          LIBOR |   .0043387   .0078111     0.56   0.581     -.011315    .0199925
 LogTangibility |   .0686996   .0903013     0.76   0.450    -.1122683    .2496675
      TaxShield |    .000216   .0003057     0.71   0.483    -.0003966    .0008286
            Robustness |  -.2236573    .161718    -1.38   0.172    -.5477475    .1004328
    LogOilPrice |  -.4125023    .092818    -4.44   0.000    -.5985137    -.226491
         Rating |  -.0548138   .0712107    -0.77   0.445    -.1975231    .0878955
          _cons |    1.10417   .2843101     3.88   0.000     .5343999     1.67394
----------------+-------------------------------------------------------------
        sigma_u |  .31901879
        sigma_e |   .2334507
            rho |  .65125451   (fraction of variance due to u_i)
```

4. Panel Data – Dummy

```
import excel "/Users/marieevje/Desktop/Marie_Mats_Data_Master.xlsx", sheet("Panel Data")
firstrow c
> lear

. egen time = group (Date)

. xtset CompanyID time
       panel variable:  CompanyID (strongly balanced)
        time variable:  time, 1 to 47
                delta:  1 unit

. gen OilLogCurrentRatio = Oil*LogGearing

. gen OilProfitability = Oil*Profitability

. gen OilSize = Oil*Size

. gen OilLIBOR = Oil*LIBOR

. gen OilLogTangibility = Oil*LogTangibility

. gen OilTaxShield = Oil*TaxShield

. gen OilRobustness = Oil*Robustness

. gen OilLogOilPrice = Oil*LogOilPrice

. gen OilRating = Oil*Rating

. xtreg LogGearing LogCurrentRatio Profitability Size LIBOR LogTangibility TaxShield
Robustness LogOilPrice
> Rating OilLogCurrentRatio OilProfitability OilSize OilLIBOR OilLogTangibility OilTaxShield
OilRobustness O
> ilLogOilPrice OilRating, fe vce(robust)

Fixed-effects (within) regression               Number of obs     =      2,632
Group variable: CompanyID                       Number of groups  =         56

R-sq:                                           Obs per group:
     within  = 0.4012                                         min =         47
     between = 0.0658                                         avg =       47.0
     overall = 0.1312                                         max =         47

                                                F(18,55)          =    4357.77
corr(u_i, Xb)  = -0.3928                        Prob > F          =     0.0000

                                 (Std. Err. adjusted for 56 clusters in CompanyID)
```

```
------------------------------------------------------------------------------
                   |               Robust
        LogGearing |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------------+----------------------------------------------------------------
   LogCurrentRatio |  -.1433318   .0670005    -2.14   0.037    -.2776039   -.0090598
     Profitability |   .0081403   .1928045     0.04   0.966    -.3782485    .3945291
              Size |    -.10252   .1469687    -0.70   0.488    -.3970519    .1920118
             LIBOR |   .0111474   .0141675     0.79   0.435    -.0172449    .0395397
    LogTangibility |   .2341331   .1822522     1.28   0.204    -.1311085    .5993747
         TaxShield |   .0002552   .0002977     0.86   0.395    -.0003413    .0008518
               Robustness |   .0400395   .2421788     0.17   0.869    -.4452977    .5253767
       LogOilPrice |  -.1794905   .1498696    -1.20   0.236     -.479836    .1208549
            Rating |   .1421361   .1081507     1.31   0.194    -.0746027    .3588749
OilLogCurrentRatio |   .9891578   .0093806   105.45   0.000     .9703586    1.007957
  OilProfitability |  -.0125159   .1938896    -0.06   0.949    -.4010794    .3760477
           OilSize |   .0857635    .147182     0.58   0.562    -.2091958    .3807229
          OilLIBOR |  -.0128671   .0145011    -0.89   0.379    -.0419279    .0161937
 OilLogTangibility |  -.2501078   .1841859    -1.36   0.180    -.6192246     .119009
      OilTaxShield |  -.0004904   .0003194    -1.54   0.130    -.0011304    .0001497
            OilRobustness |  -.0312658   .2409204    -0.13   0.897    -.5140811    .4515496
    OilLogOilPrice |   .1566269   .1523757     1.03   0.308    -.1487407    .4619946
         OilRating |  -.1374965   .1085066    -1.27   0.210    -.3549487    .0799556
             _cons |   .3386232   .1683898     2.01   0.049     .0011624     .676084
-------------------+----------------------------------------------------------------
           sigma_u |  .39292941
           sigma_e |  .19252298
               rho |  .80640675   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

5. Before Oil - Dummy

```
import excel "/Users/marieevje/Desktop/Marie_Mats_Data_Master.xlsx", sheet("B oil Crisis")
firstrow
>  clear

. egen time = group (Date)

. xtset CompanyID time
       panel variable:  CompanyID (strongly balanced)
        time variable:  time, 1 to 18
                delta:  1 unit

. gen OilLogCurrentRatio = Oil*LogGearing

. gen OilProfitability = Oil*Profitability

. gen OilSize = Oil*Size

. gen OilLIBOR = Oil*LIBOR
```

```
. gen OilLogTangibility = Oil*LogTangibility

. gen OilTaxShield = Oil*TaxShield

. gen OilRobustness = Oil*Robustness

. gen OilLogOilPrice = Oil*LogOilPrice

. gen OilRating = Oil*Rating

. xtreg LogGearing LogCurrentRatio Profitability Size LIBOR LogTangibility TaxShield
Robustness LogOilPrice
> Rating OilLogCurrentRatio OilProfitability OilSize OilLIBOR OilLogTangibility OilTaxShield
OilRobustness O
> ilLogOilPrice OilRating, fe vce(robust)

Fixed-effects (within) regression               Number of obs     =      1,008
Group variable: CompanyID                       Number of groups  =         56

R-sq:                                           Obs per group:
     within  = 0.2571                                         min =         18
     between = 0.1238                                         avg =       18.0
     overall = 0.1361                                         max =         18

                                                F(18,55)          =     769.45
corr(u_i, Xb)  = -0.4018                        Prob > F          =     0.0000

                                  (Std. Err. adjusted for 56 clusters in CompanyID)
------------------------------------------------------------------------------------
                   |               Robust
        LogGearing |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------------+----------------------------------------------------------------
   LogCurrentRatio |  -.2807319   .1594426    -1.76   0.084     -.600262    .0387983
     Profitability |  -.4381028   .1875006    -2.34   0.023    -.8138624   -.0623432
              Size |   .0523489   .2016093     0.26   0.796    -.3516851    .4563829
             LIBOR |  -.1930304    .367865    -0.52   0.602    -.9302483    .5441874
    LogTangibility |   .6136476   .5698792     1.08   0.286    -.5284158    1.755711
         TaxShield |   .0001562   .0001177     1.33   0.190    -.0000795     .000392
               Robustness |    .046554   .3460531     0.13   0.893    -.6469519      .74006
       LogOilPrice |  -.1459724   .3274691    -0.45   0.658    -.8022352    .5102904
            Rating |  -.0456958   .1534806    -0.30   0.767    -.3532778    .2618862
OilLogCurrentRatio |   .9692121   .0265304    36.53   0.000     .9160441     1.02238
  OilProfitability |   .4329714   .1960077     2.21   0.031     .0401632    .8257795
           OilSize |  -.0506337   .2023146    -0.25   0.803    -.4560812    .3548138
          OilLIBOR |    .122621   .3762993     0.33   0.746    -.6314997    .8767417
 OilLogTangibility |  -.6496661   .5652581    -1.15   0.255    -1.782469    .4831364
      OilTaxShield |   .0002135   .0025781     0.08   0.934    -.0049531      .00538
            OilRobustness |   -.004907   .3387469    -0.01   0.988    -.6837709     .673957
    OilLogOilPrice |   .1326313    .327626     0.40   0.687    -.5239459    .7892085
         OilRating |   .0357872   .1559155     0.23   0.819    -.2766745    .3482488
             _cons |   .2268806   .3837672     0.59   0.557    -.5422061    .9959673
-------------------+----------------------------------------------------------------
```

```
           sigma_u |  .37828836
           sigma_e |  .16132575
               rho |  .84611664   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

6. Oil Crisis - Dummy

```
import excel "/Users/marieevje/Desktop/Marie_Mats_Data_Master.xlsx", sheet("O Panel") firstrow
clea
> r

. egen time = group (Date)

. xtset CompanyID time
       panel variable:  CompanyID (strongly balanced)
        time variable:  time, 1 to 8
                delta:  1 unit

. gen OilLogCurrentRatio = Oil*LogGearing

. gen OilProfitability = Oil*Profitability

. gen OilSize = Oil*Size

. gen OilLIBOR = Oil*LIBOR

. gen OilLogTangibility = Oil*LogTangibility

. gen OilTaxShield = Oil*TaxShield

. gen OilRobustness = Oil*Robustness

. gen OilLogOilPrice = Oil*LogOilPrice

. gen OilRating = Oil*Rating

. xtreg LogGearing LogCurrentRatio Profitability Size LIBOR LogTangibility TaxShield
Robustness LogOilPrice
> Rating OilLogCurrentRatio OilProfitability OilSize OilLIBOR OilLogTangibility OilTaxShield
OilRobustness O
> ilLogOilPrice OilRating, fe vce(robust)
note: OilRating omitted because of collinearity

Fixed-effects (within) regression               Number of obs     =        448
Group variable: CompanyID                       Number of groups  =         56

R-sq:                                           Obs per group:
     within  = 0.5285                                         min =          8
     between = 0.1904                                         avg =        8.0
     overall = 0.2292                                         max =          8
```

```
                                                F(17,55)          =   13328.88
corr(u_i, Xb)  = -0.0731                        Prob > F          =     0.0000

                                  (Std. Err. adjusted for 56 clusters in CompanyID)
------------------------------------------------------------------------------
                   |               Robust
        LogGearing |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------------+----------------------------------------------------------------
   LogCurrentRatio |   .0643879   .1163376     0.55   0.582    -.1687579    .2975336
     Profitability |  -.1893579   .3121305    -0.61   0.547    -.8148813    .4361656
              Size |   .1385136   .1941261     0.71   0.479    -.2505238    .5275509
             LIBOR |   .0886527   .1927744     0.46   0.647    -.2976758    .4749812
    LogTangibility |    .164154   .3190892     0.51   0.609    -.4753151    .8036231
         TaxShield |   .0025497   .0038084     0.67   0.506    -.0050824    .0101818
               Robustness |  -.6807935   .5111903    -1.33   0.188    -1.705242    .3436547
       LogOilPrice |  -.3561705    .168247    -2.12   0.039     -.693345   -.0189959
            Rating |   .0044745   .0103676     0.43   0.668    -.0163027    .0252517
OilLogCurrentRatio |   .9991274   .0044087   226.63   0.000     .9902922    1.007963
  OilProfitability |   .1996627   .3132302     0.64   0.526    -.4280647    .8273902
           OilSize |   -.134722   .1897525    -0.71   0.481    -.5149945    .2455505
          OilLIBOR |  -.1000258   .1974339    -0.51   0.614    -.4956923    .2956406
 OilLogTangibility |  -.1309141   .3219586    -0.41   0.686    -.7761336    .5143054
      OilTaxShield |  -.0028299   .0037833    -0.75   0.458    -.0104119    .0047521
            OilRobustness |   .6862946    .516452     1.33   0.189    -.3486983    1.721288
    OilLogOilPrice |   .3570628   .1690438     2.11   0.039     .0182914    .6958342
         OilRating |          0  (omitted)
             _cons |  -.0268812   .3278045    -0.08   0.935    -.6838161    .6300536
-------------------+----------------------------------------------------------------
           sigma_u |  .39356233
           sigma_e |  .11848454
               rho |  .91689697   (fraction of variance due to u_i)
```

7. After Oil Dummy

```
. import excel "/Users/marieevje/Desktop/Marie_Mats_Data_Master.xlsx", sheet("A Oilcrisis ")
firstrow
>  clear

. egen time = group (Date)

. xtset CompanyID time
       panel variable:  CompanyID (strongly balanced)
        time variable:  time, 1 to 7
                delta:  1 unit

. gen OilLogCurrentRatio = Oil*LogGearing

. gen OilProfitability = Oil*Profitability

. gen OilSize = Oil*Size
```

```
. gen OilLIBOR = Oil*LIBOR

. gen OilLogTangibility = Oil*LogTangibility

. gen OilTaxShield = Oil*TaxShield

. gen OilRobustness = Oil*Robustness

. gen OilLogOilPrice = Oil*LogOilPrice

. gen OilRating = Oil*Rating

. xtreg LogGearing LogCurrentRatio Profitability Size LIBOR LogTangibility TaxShield
Robustness LogOilPrice
> Rating OilLogCurrentRatio OilProfitability OilSize OilLIBOR OilLogTangibility OilTaxShield
OilRobustness O
> ilLogOilPrice OilRating, fe vce(robust)
note: OilRating omitted because of collinearity

Fixed-effects (within) regression               Number of obs      =       392
Group variable: CompanyID                       Number of groups   =        56

R-sq:                                           Obs per group:
     within  = 0.3254                                         min =         7
     between = 0.1302                                         avg =       7.0
     overall = 0.1353                                         max =         7

                                                F(17,55)           =   1689.33
corr(u_i, Xb)  = -0.5094                        Prob > F           =    0.0000

                                   (Std. Err. adjusted for 56 clusters in CompanyID)
------------------------------------------------------------------------------------
                   |               Robust
        LogGearing |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------------+----------------------------------------------------------------
   LogCurrentRatio |   .1145418   .1060346     1.08   0.285    -.0979564    .3270399
     Profitability |   .0127815   .2172107     0.06   0.953    -.4225185    .4480815
              Size |   .0015141   .0731294     0.02   0.984    -.1450405    .1480688
             LIBOR |   .0924463   .0560005     1.65   0.104    -.0197812    .2046739
    LogTangibility |   .3538261   .8065785     0.44   0.663    -1.262593    1.970246
         TaxShield |   .0192184   .0100365     1.91   0.061    -.0008952    .0393321
               Robustness |  -.0001861   .3624063    -0.00   1.000    -.7264645    .7260924
       LogOilPrice |  -.3184617   .3609674    -0.88   0.381    -1.041857    .4049332
            Rating |  -.0248804   .0386753    -0.64   0.523    -.1023874    .0526265
OilLogCurrentRatio |   1.000653   .0112181    89.20   0.000      .978171    1.023134
  OilProfitability |    .004663   .2101674     0.02   0.982    -.4165218    .4258479
           OilSize |   .0045931   .0739713     0.06   0.951    -.1436487    .1528349
          OilLIBOR |  -.0885723   .0534501    -1.66   0.103    -.1956887     .018544
 OilLogTangibility |  -.2527043   .7688224    -0.33   0.744    -1.793459     1.28805
      OilTaxShield |  -.0192828    .010071    -1.91   0.061    -.0394656       .0009
            OilRobustness |   .0113464   .3599226     0.03   0.975    -.7099546    .7326473
    OilLogOilPrice |   .3333737   .3641413     0.92   0.364    -.3963818    1.063129
```

```
         OilRating |          0  (omitted)
             _cons |   .2165117   .4621102     0.47   0.641    -.7095778    1.142601
------------------+----------------------------------------------------------------
           sigma_u |  .49911262
           sigma_e |  .10879973
               rho |  .95463749   (fraction of variance due to u_i)
```

8. EQUINOR

```
import excel "/Users/marieevje/Desktop/Marie_Mats_Data_Master.xlsx", sheet("Equinor") firstrow
clear

reg LogGearing LogCurrentRatio Profitability Size LIBOR LogTangibility TaxShield Robustness
LogOilPrice Ra
> ting
note: Rating omitted because of collinearity

      Source |       SS           df       MS      Number of obs   =        47
-------------+----------------------------------   F(8, 38)        =     22.09
       Model |  .848407293         8  .106050912   Prob > F        =    0.0000
    Residual |  .182444406        38  .004801169   R-squared       =    0.8230
-------------+----------------------------------   Adj R-squared   =    0.7858
       Total |   1.0308517        46   .02240982   Root MSE        =    .06929

------------------------------------------------------------------------------
     LogGearing |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
----------------+-------------------------------------------------------------
LogCurrentRatio |   .7758173   .1646953     4.71   0.000      .442409    1.109225
  Profitability |   .2168621   .3437048     0.63   0.532     -.478932    .9126561
           Size |    .157363   .2188715     0.72   0.477    -.2857191    .6004452
          LIBOR |  -.0303569   .0100512    -3.02   0.004    -.0507046   -.0100092
 LogTangibility |   2.112804   .7774588     2.72   0.010     .5389211    3.686687
      TaxShield |  -.0006347   .0185459    -0.03   0.973     -.038179    .0369096
            Robustness |   .4568815    .509868     0.90   0.376    -.5752923    1.489055
    LogOilPrice |  -.5152898   .1824401    -2.82   0.008    -.8846204   -.1459591
         Rating |          0  (omitted)
          _cons |   .3782741    .878116     0.43   0.669    -1.399379    2.155927
```

9. ROYAL

```
import excel "/Users/marieevje/Desktop/Marie_Mats_Data_Master.xlsx", sheet("Royal") firstrow
clear

. reg LogGearing LogCurrentRatio Profitability Size LIBOR LogTangibility TaxShield Robustness
LogOilPrice Ra
> ting
note: Rating omitted because of collinearity
```

```
      Source |       SS           df       MS      Number of obs   =        47
-------------+----------------------------------   F(8, 38)        =     30.37
       Model |   1.1620968         8    .1452621   Prob > F        =    0.0000
    Residual |  .181729027        38  .004782343   R-squared       =    0.8648
-------------+----------------------------------   Adj R-squared   =    0.8363
       Total |  1.34382583        46  .029213605   Root MSE        =    .06915

------------------------------------------------------------------------------
     LogGearing |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
----------------+-------------------------------------------------------------
LogCurrentRatio |    1.77968   .6234945     2.85   0.007     .5174811    3.041878
  Profitability |   .1537007   .9265231     0.17   0.869    -1.721947    2.029349
           Size |   1.146951   .2682885     4.28   0.000     .6038289    1.690072
          LIBOR |  -.0532185   .0131763    -4.04   0.000    -.0798925   -.0265446
 LogTangibility |   .5142306   .3797682     1.35   0.184    -.2545699    1.283031
      TaxShield |  -.0057025   .0120274    -0.47   0.638    -.0300507    .0186456
            Robustness |  -2.575091   .7942843    -3.24   0.002    -4.183035   -.9671463
    LogOilPrice |  -.7187451   .1300986    -5.52   0.000    -.9821159   -.4553742
         Rating |          0  (omitted)
          _cons |  -5.219712   1.418076    -3.68   0.001    -8.090457   -2.348968
```

10. TOTAL

```
import excel "/Users/marieevje/Desktop/Marie_Mats_Data_Master.xlsx", sheet("Total") firstrow
clear

. reg LogGearing LogCurrentRatio Profitability Size LIBOR LogTangibility TaxShield Robustness
LogOilPrice

      Source |       SS           df       MS      Number of obs   =        47
-------------+----------------------------------   F(8, 38)        =      5.06
       Model |  .052341013         8  .006542627   Prob > F        =    0.0003
    Residual |   .04916885        38  .001293917   R-squared       =    0.5156
-------------+----------------------------------   Adj R-squared   =    0.4137
       Total |  .101509862        46  .002206736   Root MSE        =    .03597

------------------------------------------------------------------------------
     LogGearing |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
----------------+-------------------------------------------------------------
LogCurrentRatio |  -.8265384   .3360639    -2.46   0.019    -1.506864   -.1462127
  Profitability |  -.6426235   .3648967    -1.76   0.086    -1.381318    .0960713
           Size |   .0186878   .0289635     0.65   0.523    -.0399457    .0773213
          LIBOR |   -.005794   .0064436    -0.90   0.374    -.0188383    .0072503
 LogTangibility |  -.3153788   .2805641    -1.12   0.268    -.8833511    .2525935
      TaxShield |  -.0187141   .0097512    -1.92   0.062    -.0384544    .0010262
            Robustness |  -.0363373   .4495099    -0.08   0.936    -.9463226     .873648
    LogOilPrice |  -.2257936   .0610766    -3.70   0.001    -.3494367   -.1021505
          _cons |   .0654597   .1832483     0.36   0.723    -.3055072    .4364266
```

```
------------------------------------------------------------------------------
```

11. CONOCOPHILIPS

```
. import excel "/Users/marieevje/Desktop/Marie_Mats_Data_Master.xlsx", sheet("ConocoPhillips")
firstr
> ow clear

. reg LogGearing LogCurrentRatio Profitability Size LIBOR LogTangibility TaxShield Robustness
LogOilPrice

      Source |       SS           df       MS      Number of obs   =        47
-------------+----------------------------------   F(8, 38)        =     52.88
       Model |   .91603961         8  .114504951   Prob > F        =    0.0000
    Residual |   .08228994        38  .002165525   R-squared       =    0.9176
-------------+----------------------------------   Adj R-squared   =    0.9002
       Total |  .998329551        46  .021702816   Root MSE        =    .04654

------------------------------------------------------------------------------
     LogGearing |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
----------------+-------------------------------------------------------------
LogCurrentRatio |   .3901586   .0920184     4.24   0.000     .2038771    .5764401
  Profitability |  -.1436765   .1126143    -1.28   0.210    -.3716523    .0842993
           Size |  -.7796619   .1453795    -5.36   0.000    -1.073967   -.4853565
          LIBOR |    .013256   .0107173     1.24   0.224    -.0084401    .0349521
 LogTangibility |   1.437197   .2930316     4.90   0.000     .8439854    2.030409
      TaxShield |   .0067591   .0114389     0.59   0.558    -.0163977     .029916
            Robustness |  -1.027702   .5530209    -1.86   0.071    -2.147234      .09183
    LogOilPrice |   .0305602   .1292227     0.24   0.814    -.2310376    .2921579
          _cons |   3.677621   .5602957     6.56   0.000     2.543362     4.81188
------------------------------------------------------------------------------
```

12. CHEVRON

```
. import excel "/Users/marieevje/Desktop/Marie_Mats_Data_Master.xlsx", sheet("Chevron")
firstrow clea
> r

. reg LogGearing LogCurrentRatio Profitability Size LIBOR LogTangibility TaxShield Robustness
LogOilPrice

      Source |       SS           df       MS      Number of obs   =        47
-------------+----------------------------------   F(8, 38)        =     58.81
       Model |  1.83043672         8  .228804589   Prob > F        =    0.0000
    Residual |  .147852543        38  .003890856   R-squared       =    0.9253
-------------+----------------------------------   Adj R-squared   =    0.9095
       Total |  1.97828926        46  .043006288   Root MSE        =    .06238
```

LogGearing	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
LogCurrentRatio	-.510327	.2020734	-2.53	0.016	-.9194031	-.1012508
Profitability	-1.433808	1.188916	-1.21	0.235	-3.840643	.9730269
Size	-.1329911	.2460877	-0.54	0.592	-.6311696	.3651875
LIBOR	.0241248	.0121569	1.98	0.054	-.0004857	.0487352
LogTangibility	2.711759	.6954636	3.90	0.000	1.303866	4.119651
TaxShield	-.1751641	.0815258	-2.15	0.038	-.3402045	-.0101238
Robustness	-.0501074	.0626972	-0.80	0.429	-.1770313	.0768164
LogOilPrice	-.1940345	.1799083	-1.08	0.288	-.5582399	.1701709
_cons	.9557183	1.165283	0.82	0.417	-1.403274	3.31471

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