Cand.merc / MSc EBA - Applied Economics and Finance
Master's Thesis

Capital Structure Determinants in Oil & Gas Companies

A study of factors critical to capital structures in the timeframe 1997-2014

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Abstract

How a company determines its capital structure and how specific events in time (booms/recessions) effects that structure, has in earlier academic work been thoroughly researched for multiple industries but has yet to be done for the oil & gas industry. By looking at how the leverage ratio of multiple oil & gas companies changes through a timespan of 17 years, this thesis aims to give an insight into what are the major determinants to those changes. What decides the capital structure of an oil & gas company. By using both firm specific- and macroeconomic factors in a panel data regression model, the thesis tries to find which of the three corporate finance theories, trade-off theory, pecking order theory and market timing theory dominates when companies choose a capital structure. The results indicate that firm size and tangibility are the most prominent firm specific factors, with GDP growth rate and lagged term spread as the most influential macroeconomic factors. Other than that, I have found a slightly higher degree of explanatory power from the model when adding time-invariant factors than time-variant factors. This means that to some degree, unobserved company specific factors seems to be of significance when a company decides its leverage ratio. The regression results indicate that the companies do not follow only one single capital structure theory. But the trade-off theory seems to dominate followed by the pecking order theory when looking at firm specific factors. When looking at macro factors, a combination of pecking order theory and market timing theory seems to give the best explanation to the reasoning behind the companies choices.

1. Introduction

When a company of interest is raising capital, a rational investors would like to know the reasoning behind the choice made. Why was equity chosen over debt or vice versa? If possible, why not internal financing? Being aware of what the driving factors are when a company is choosing a certain capital structure could help investors make a better and more informed decision on whether or not to invest and if choosing to invest, what type of investment they should proceed with.

Knowing how and why industry peers behave as they do, can be of valuable to a company. As competition in many markets is fierce, one tries to avoid pitfalls and adapt to the present economic environment. By shedding a light on the capital structure and getting a more detailed picture of what are the determinants behind different capitalization schemes can be of value both for oneself and for the industry as a whole.

Governments and agencies tries to facilitate for industry activity so that jobs are created. With a successful industry comes economic growth, which again gives possibilities for taxation. Understanding what drives industry players who makes a specific choice of capital, could be an important factor regulatory agencies should consider.

The oil & gas industry is of great importance to the world economy. According to EIA (U.S. Energy Information Administration, 2013) our world's energy demand will increase with 56% by 2040. According to Mohn (2008), at that point in time (2008), the oil & gas industry supplied 60% of the worlds energy consumption. An accurate and more detailed understanding of what determines the capital structure of companies supplying to the above stated increased demands could be of importance to both investors, industry players and regulatory agencies. More on how and why this thesis is necessary in the sub-chapter *1.5 Contribution of this study*.

1.1 Problem Statement and delimitations

This thesis aims to analyse which factors are the major determinants of capital structure decisions for globally listed Oil & Gas companies (from here on out referred to as; E&P companies, short for Exploration & Production companies). My research question is

"What are the determinants for capital structure decisions in E&P companies, in the time frame 1997-2014?"

Through studies and internships my interest for the offshore sector and the way it's financed as grown through the years. It is, in my opinion, crucial to have good insight into what's driving the various capital structure decisions in all matter of financing. As I was free to choose a topic to write my thesis about, I therefore decided to combine offshore and corporate finance to get an interesting topic to further investigate.

The terms "oil & gas company" and "E&P company" are often used for any and all companies which in one way or another has some degree of activity connected to the actual production of oil and gas. This thesis will use the terms only on company who's main operations in the actual production part (see more on the lifecycle of oil and gas in the next sub-chapter).

In terms of geographical dispersion the picture bellow illustrates that most of the upstream oil and gas production is taking place in the American, European and Middle Eastern regions. The sample companies in this study will comprise of publicly listed non-OPEC [1]member companies. The reason behind the choice of excluding all OPEC member companies are because most of the relevant companies are state controlled, with difficulties in obtaining credible company data. Another reason is because OPEC is known for running its organization as a cartel. By collaborating and coordinating their total production output they are; to a certain degree able to manipulate prices to adhere to they're on political goals (Smith, 2002). By not including companies with which solely operates onshore, I try to avoid potential outliers from companies how operates under very different cost schemes than those whom both operate on –and offshore. With significantly less demanding production environments and with that lower cost of

[1] Organization of the Petroleum Exporting Countries (OPEC), is according to their website a gathering of petroleum exporting countries how's mission is to unify their policies to ensure stabilization of oil markets to secure an efficient, economic and regular supply of petroleum to consumers (www.opec.org).

productions, "only onshore" production companies are not included so that potential bias in the regression results is avoided.

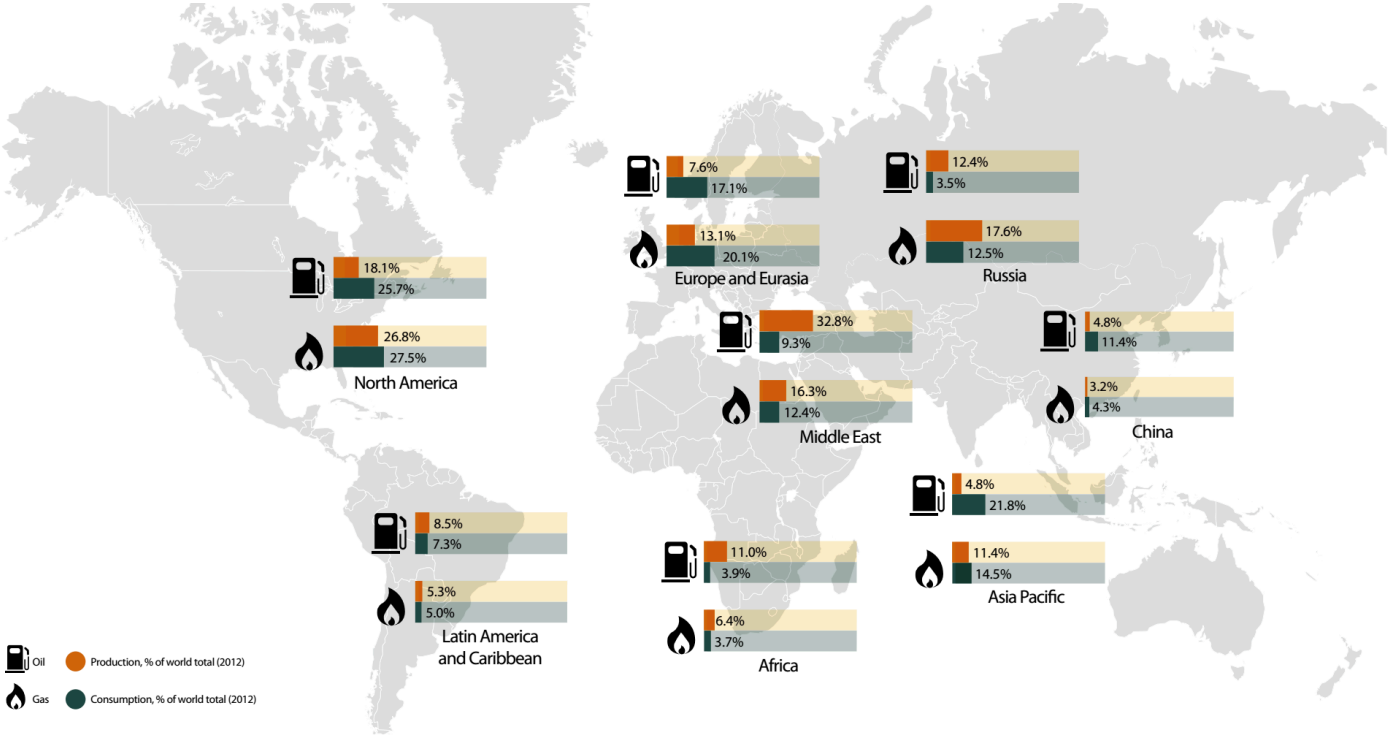

Figure 1: Map Source: BP Statistical Review of World Energy; US Energy Information Adm; The Beijing Axis Analysis (2014)

1.2 Outlines

I will in this chapter continue by providing a short general introduction to the E&P industry and how it's financed. I will then shed a light on some of the aspects that make the capital structure decisions of the E&P companies interesting from both a theoretical and practical view. Thereafter I will present how this thesis contributes to earlier studies on the same matter. In chapter 2 I will give an introduction to the relevant corporate finance theories and how significant earlier empirical research have found these theories them to be in the matter of explaining capital structure determinants. Chapter 3 will contain a literature review of previous empirical research done on the topic of capital structure. Chapter 4 will contain an explanation of the methodology. Chapter 5 gives an explanation to which variables are used in the regression

and why they have been chosen. Chapter 6 talks on the data gathering process and the representativeness of the sample used. Chapter 7 contains the main analysis, discussion of results, reflections on the thesis and the conclusion. Chapter 8 is the appendix.

1.3 The E&P Industry

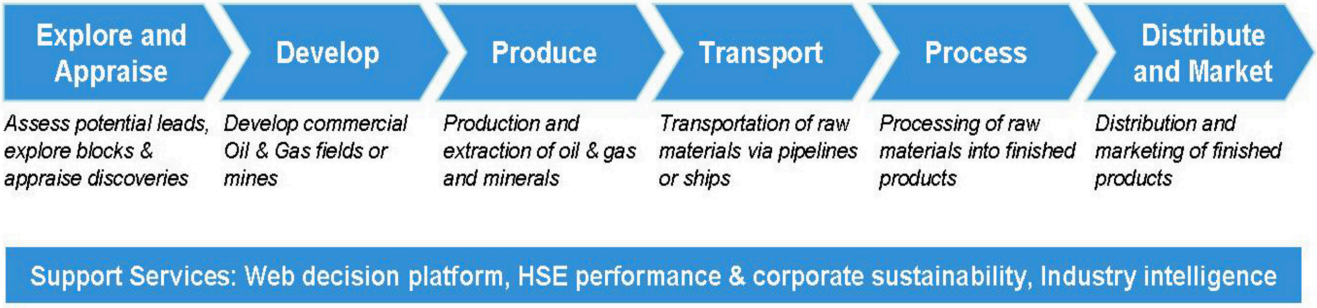

Figure 2. Illustration of oil and gas lifecycle (Airbus, 2015)

Crude oil and natural gas are naturally found in sub-surface environments amidst the earths crust. Its origins is decomposed organic materials like plants and animals – compressed in sedimentary rock foundations such as sandstone, limestone and shale. This can occur both "onshore" and "offshore". This organic material is eventually, through a large timespan, turned into hydrocarbons like oil or gas. Exploration and Production (E&P) companies focus on finding these hydrocarbon reservoirs, extracting the oil/gas through drilling wells then produce and sell these resources which later will be refined into well-known products like gasoline, heating oil, diesel fuel, butan, propane, paraffin etc. Searching, drilling and pumping oil up from the ground are activities usually referred to as the *upstream* oil and gas activity. Represented by the three first brackets in the picture above. *Midstream* being the transportation from the oilfield to the refineries, shown in the forth bracket in the picture. Finally, *downstream* being the refining and selling of the final product shown as the last to brackets in the picture (Airbus, 2015 and PGS Dover, 2015). This thesis will research and have a focus on the *upstream* activity of E&P companies.

1.4 E&P Financing

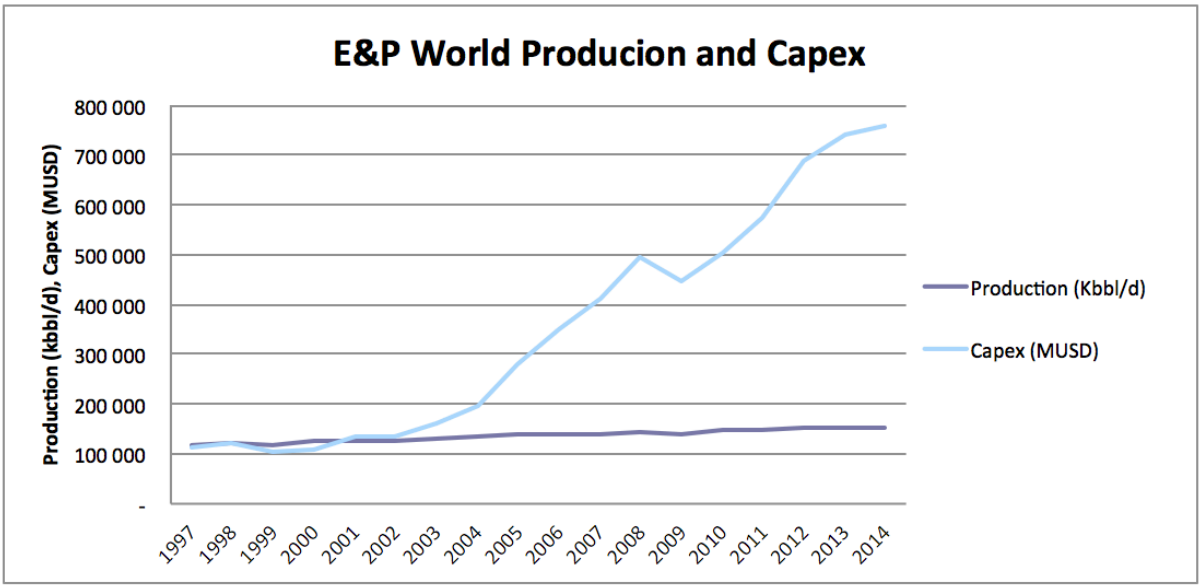

Figure 3. Industry output and capital expenditures. Source: Rystad Energy, UCube. 2015.

The E&P-market has experienced a period of major capital expenditures, peaking in 2013 at more than $700 billion in *upstream* capex (EY, 2014). According to EY (2014) the average fundraising in the E&P industry has come by debt. The two main components of liability the last five years have been; bank loans and corporate bonds (ref picture below). The last five years have been characterized by a lack of traditional public equity financing, parallel to this one have observed first a tightening and now a more slack corporate credit condition. These changes are mostly the results of the changes forced upon the banking sector after the crisis in 08. Banks were forced to tighten their lending policies due to new governmental legislation. Even though many jurisdictions have mostly rebuilt their balance sheet, we still see a difficult lending market for small-to-medium sized E&P-companies. In response to these increased political and economical uncertainties, companies have begun to diversify the source of their funding. This has lead to a shift from traditional bank-led financing to non-bank and capital markets-based financing (EY, 2014).

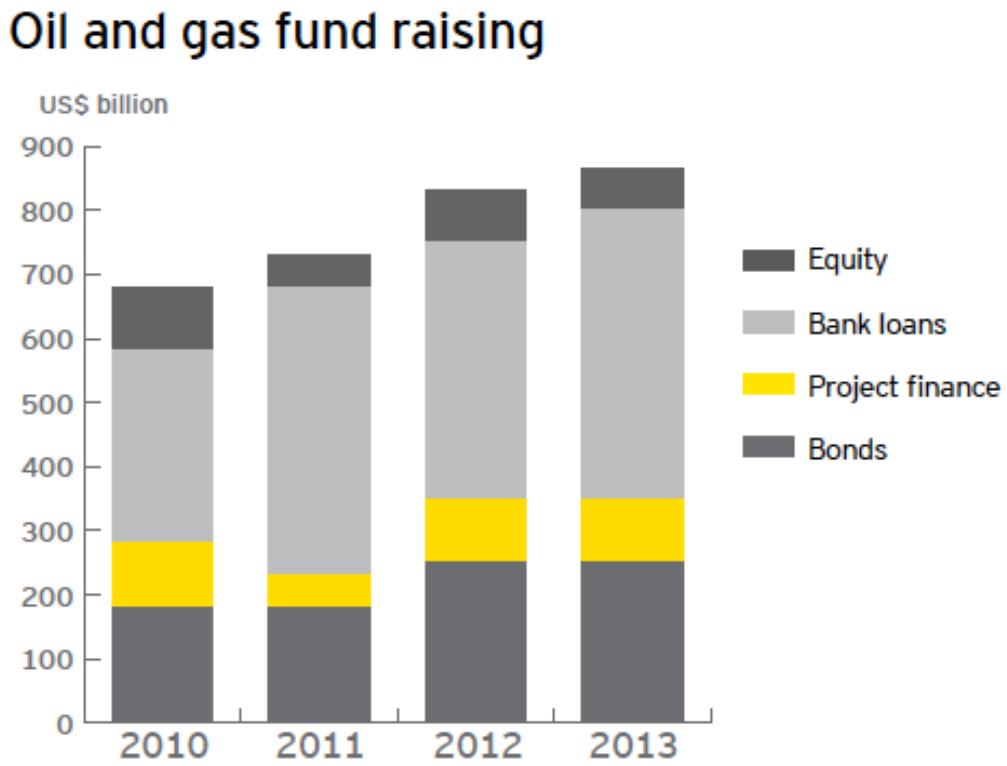

Figure 4: EY, Funding challenges in the oil and gas sector 2014.

The effect of a oil price hike on the global economy and further external imbalance of countries is widely recognized (IEA, 2004. Thomas, Mühleisen, & Pant, 2010). The impact of oil prices on the finance of oil and gas companies has given rise to a heated discussion amongst the consumer and supplier of oil and gas products. The consumers accuse the E&P companies for exercising "price gauging" through strategies like "rocket and feather" pricing strategy[2] which has a negative impact on the retail consumer level and increased profits for the suppliers (Dayanandan and Donker 2011). The E&P companies defend their position by arguing that that the price of their products are a reflection of the supply-demand balance, and that their effort to supply the market with this precious commodity requires upfront capital expenditures in the billion dollar class; so the reason for the high prices should be blamed on the governmental tax policies (Dayanandan et al. 2011).

[2] *A price strategy where the E&P company´s stock raise steeply, like a rocket shooting into the sky, when commodity price for oil rises and adjust slowly, like a feather when the underlying oil price falls (Dayanandan and Donker, 2011)*

In general E&P financing require high upfront capital costs and long tenors (Dayanandan et al. 2011). Although the impact of oil price volatility on macro-economic variables, like GDP growth, inflation, interest rates and stock returns on offshore companies has been extensively research (Hamilton 1983. Bohi, 1989. Mork, 1989. Driesprong, Jacobsen and Maat, 2008. Gogineni, 2010), there is to my knowledge given little academic attention to research how E&P companies choose their leverage ratios. This topic is of interest because of how a company choose to balance its financing may have a major impact on both shareholders and stakeholders.

Debt is in many cases used as gearing to increase the return on a companies share. A company might take on more debt to increase their cash reserves, which then could use to pay out dividend. A company might try to make itself attractive by making an effort of, on a long-term basis, pay out dividend (Seadrill, 2015). With that, they might seem more attractive to investors, than a peer company not having the same dividend-policy. How a balance sheet looks might make the company seem more or less attractive to both suppliers and customers. It is to be expected that both suppliers and customers would want a trading partner that they could rely on, that would deliver as promised without being hindered because financial disturbance. Depending on how a company is financed might make it more or less prone to external macroeconomic events. A sharp and unexpected rise in the interest rate, or a sudden fall in crude oil prices might in an extreme scenario lead to financial insolvency or bankruptcy. To position oneself for future governmental policies, a company might choose one or the other way to build up its balance sheet so that all parties perceive the company to be well positioned for the future events. By shedding a light on the matter at hand, through a comprehensive and econometric analysis of leverage-ratio determinants, this paper might contribute to both the energy industry and further the corporate finance literature. To the energy industry the thesis might contribute by giving a more detailed picture on what are the common denominators are in our time, when choosing a leverage-ratio through a 17 year period off ups and downs. To the corporate finance literature through testing which theoretical approach with regards to financing holds most weight in real-life decision making. Here seen from the energy industry.

In the following subsection I will try to highlight some of the aspects that I preliminary find to be the most relevant when analysing the E&P capital structure determinants. They are as follow, irreversible and risky investments, prices dynamics and asymmetry, homogeneity and governmental intrusion. The choice of topics to analyse is based, partly on observations from existing literature (Dayanandan et al. 2011. Mohn and Osmundsen, 2011), and partly on my own

perspective on what I initially think is relevant when later running regressions on leverage-ratio. I recognize that the above stated topics do not completely cover all relevant factors affecting the E&P industry, but given the certification from earlier research, that the topics might be of relevance, gives me the confidence that they are at least worth a discussion if not further analyses.

1.4.1 Irreversible and risky investments

Modern theories suggest a negative link between risk and capital expenditures, meaning that industries, like the E&P industry with large irreversible investments and at times high levels of uncertainty, a volatile business framework could be bad for both investment and economic growth (Mohn et al. 2011). Since the early 2000s we have seen that oil price volatility has increased (Ebrahim, Inderwildi and King, 2014), economists and policy makers are concerned with the sustainability of different price levels. At the core of this discussion is the muted response in oil investment and supply, to the sharp rise of oil prices ahead of the previous financial crisis and its equal downturn shortly after. Consumers have raised concerns about the security of supply (Mohn et al. 2011).

Studies on the interaction amongst E&P companies and financial markets have shown that investments fell sharply after the 1998 oil price shock. Following this, the oil investments acted more sluggishly when adjusting to the new increased oil prices after the recovery began in 2002 (Osmundsen, Mohn, Misund and Asche, 2007). According to Mohn et al (2011) it takes more to convince the E&P companies that a change is steady when the oil price increases contrary to when it decreases, i.e. an increase in oil price do not increase the exploration (drilling) activity on the short run. But, a decrease in the oil price causes an instantaneous drop in drilling activities and other exploration related oil-service activities. Thus, oil price instability has empirically shown to have a negative effect on non-OPEC countries exploration investments. This is something that OPEC takes into consideration when they sett their production rates. Their claimed interest to strive for price stability may therefore be questionable, as volatility in oil prices will slow down non-OPEC member's investment rates and with that benefit OPEC members (Aune, Mohn, Osmundsen, Rosendahl 2010).

So, according to Mohn et al (2011) theory and research on investment behaviour show the implications of irreversible investment and real options for decision making[3]. The idea is that investment could not be reversed. This provided the company making the investment with a real option to defer. If investments are to be made today, then the net present value must be larger than the option value. That, investments will respond negatively to increased uncertainty according to the theory (Dixit and Pindyck, 1994). This is really relevant for the entire oil industry, as large sums of capital investments are committed on long time frames, with each project having a field-specific sequence of investments. The irreversible character of oil-field investments is especially notable for E&P companies; once they start drilling the well, there is no way back. Once the platform is built and the pumps have started running, a significant fall in the oil price isn't enough for the production to stop (Bloombergview, 2015), there has to occur a dramatic event, like a 1000-year storm or a accident like Deepwater Horizon before production is stopped.[4]

1.4.2 Price Dynamics and Asymmetry

Theory suggests that in models of irreversible investment the costs of adjustment are asymmetrical. Bernanke (1983) was the first to stress what is called the bad news principle, this principle reflects the fact that the decision to invest is made in such a way as to only expose your company to good news and reduces the exposure to bad news (Bernanke, 1983). Dixit et al. (1994) find evidence that there is an asymmetry in the adjustment costs when dealing with irreversible investments (like exploration of an oilfield) because of the option value to delay (Dixit et al. 1994). Their models introduce the threshold values of expected profitability on the specific projects, and with that determining which region and which project to invest in, which to disinvest in and which to delay investment in.

As a somewhat comparable example this can also be seen in other large international industries, like the shipping industry. Here newbuild prices on ship investments are settled in an equilibrium

[3] Real Options (Stewart Myers, 1997) explains it as the application of option theory, where one has the right – but not he obligation – to undertake a certain business initiative, f.ex deferring, expanding, staging or contracting a capital investment project (Adam Borison, Stanford University. 2003)

[4] 20 April 2010, a gas release and subsequent explosion occurred on the Deepwater Horizon oil rig, in the Gulf of Mexico. 11 people died, significant environmental problems due to oil spills, large economical cost for BP due to their responsibility for the rig and field (www.Bp.com).

process between supply and demand, but also depending market factors like commodity prices, freight rates and orderbook (Alizadeh and Nomikos, 2009). From the time the contract is signed up until delivery date, market conditions might have changed (freight rates gone up or down) and customers buying ships might want to postpone the delivery date due to less prospers outlooks. In the E&P industry one observes that these aspects (with concern to contract terms) make values not symmetrical around an equilibrium/or zero, this because of the option value (Mohn et al. 2011). For the oil and gas industry, the bad news principle would imply that an increase in oil price is irrelevant for the value of the option to wait (not a bad news). On the other hand, news about a decrease in oil price will increase the value of the option to wait with the investment, and with that put a restriction on the current exploration effort of the E&P companies (Mohn et al. 2011).

1.4.3 Homogeneity in Operations

A third and interesting aspect when looking at E&P-company financing is that most companies occur as quite homogeneous in the manner of how their end product is perceived (you are indifferent to where you buy your gasoline as long as price is equal). Previous research (Ernst and Steinhubl, 1997) has classified oil and gas as a commodity industry and should therefore focus on cost cutting (which is not wrong), but what could be misleading is that this classification has only focused on the end product (the consumption of the oil/gas product) and neglected the rage of activities that occurs before the product can be sold to end user (Yusuf et al. 2014).

So, Yusuf et al. (2014) has shown that the matter of gaining market share over competitors is a bit more complex than just cost cutting. Their research has provided us with results that show a high significant correlation between increased market demand and the need for a standardized product, contrary to a customized product. Today the E&P industry exhibits traits of increased complexity and volatility and decreasing predictability as shown in the above stated author's analytical results. Yusuf´s et al (2014) model suggest increased customer enrichment (giving the customer what they want), mastering change (don't lag behind on tech/innovation change) and leverage the impact of human capital to be able to stay competitive and increase business performance (Yusuf et al. 2014).

1.4.4 Governmental Interference

A forth and final aspect that increase the complexity of E&P financing is governmental interference. With well above 60% of today´s primary energy supply, oil & gas plays a significant role in the world energy market (Mohn, 2008). As international E&P companies generate foreign income and employ large numbers of workers, both domestically and internationally the need for a good understanding of how each government plays its role, might be important to fully grasp the picture of oil & gas supply (Mohn, 2008).

The effect of government on operations can be seen in the example of Royal Dutch Shell´s expansion period after the merger of the British and Dutch enterprises in 1907. The company benefitted from associations with the ruling powers of both nations to obtain oil concessions, protection from competitors and market access. This again created difficulties for the company, as from the 1920s and onward the European imperialism was on retreat, and the former colonies now looked at Shell´s presence as suspicious and unwanted (van der Putten, 2007).

This thesis has a focus on the near past (17 years back) and todays situation. In present time we see countries where the E&P industry plays a vital part (both in positive and less positive terms) of the economy (World-factbook, CIA. 2015). Not only as a source of revenue, through taxation, but also as a job creator, contributor to nations economic growth and security of energy supply to national consumption. Less positive, and more challenging are the environmental issues that comes along with the E&P industry activity. Problems relating to decreasing air and water quality are matter of concern for governmental agencies like EPA (United States Environmental Protection Agency). Strict regulations on operations might increase the cost and difficulties of operations in a given country, as operational methods and practices has come under increased scrutiny from governmental agencies (EPA. 2015. UK Environmental Agency. 2015).

1.5 Contribution of this study

This thesis aims to analyse which factors are the major determinants of capital structure decisions for globally listed E&P companies. Given results generated from Filbeck and Gorman (2000) empirical research on capital structure in asset intensive industries, one could expect the E&P companies to have high levels of leverage-ratio given their industry and the world's reliability on the resources they extract from subsurface environments. Capital-intensive industries, like the

E&P industry, whose day-to-day operations evolve around heavy manufacturing, one would think depended more on debt than for ex. web-based service firms. An industry with steady income and generally high level of capital expenditures would suggest a major weight of leverage in the company's balance sheet (Damodaran, 2012). This would differ from, ex. a software developer, where the chance for success involves a high rate of risk with concerns to the level of commercial success of the software being developed (Damodaran, 2012).

First off, there are to my knowledge scares research done on capital structure decisions for E&P companies in a dynamic setting. By a dynamic setting, contrary to static, I mean to look at a larger timeframe. A static situation analysis might only research a booming/recession period, or a steady growth period and how these specific periods affect a capital structure. By looking at a period of 17 years, I am able to included situations where the industry and world economy have experienced booming periods, recessions and "steady growth" periods. Secondly, the inclusion of macroeconomic factors (Industry factors, Brent Crude oil price, Term spread, GDP growth, MSCI World Index) might prove to shed a more detailed light on decisions made. Depending on what determinates (macro factors or firms-specific) you look at, *why* do one, of the capital structures mentioned above, dominant compared to others theories? With a longer time frame together with the inclusion of multiple firm specific and macro specific variables I will try to create a more holistic picture of what are the driving factors behind E&P companies' capital structures.

2. Capital Structure Theory

Aswath Damodaran on the theory of capital structure decisions; *"Invest in projects that yield a greater return than the minimum acceptable hurdler rate"* (Quote from Damodaran lecture note on Debt-equity-ratio). Hurdle rates being the cost of financing.

The theory of capital structure explains which determinants influence the relationship between a company's value and its capital structure. This dynamic can be seen through how debt and equity affect firm value through changing the cost of capital, otherwise called the Weighted Cost of Capital (WACC) (Harris and Raviv, 1991). The company choose a mix of equity vs. debt to optimize their capital structure with a target of maximizing firm value, i.e. when WACC is minimized, and the market value of company assets are maximized, there is a possibility to obtain optimal capital structure (Myers, 2001).

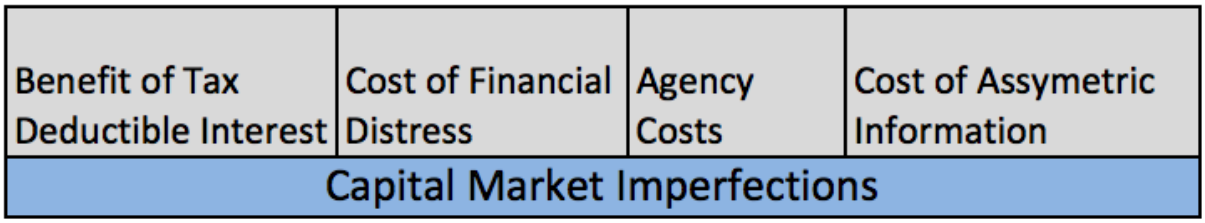

Figure 5: Capital Market Imperfections (Berk & DeMarzo, 2014)

The Miller & Modigliani theorem (M&M, 1958) laid the groundwork for capital structure theory. Their statement said as follows; if you have perfect competition, then your company's capital structure becomes irrelevant. This statement is of course highly theoretical and not applicable to any real-life situation as effects of taxes, risk in returns, cost of bankruptcy, agency costs and asymmetric information are not taken into account. If you introduce market imperfections to the M&M theorem the attractiveness of debt and equity changes, and thereby making the choice of capital structure very relevant (Graham & Leary, 2011). There is no universally agreed up on theory that explains what the optimal leverage ratio looks like. However, there are several applicable conditional theories. By taking into account the above stated imperfections, trade-off

theory, the pecking order theory and the market timing theory emerge as more applicable real-life versions of the M&M-theorem (Myers, 2001; Graham & Leary, 2011).

2.1 The Trade-off Theory

The initial idea comes from Miller and Modigliani´s (1958) research; they assumed that there is in fact an optimal leverage-to-equity ratio. That there is a trade-off between the benefits from debt and the costs of debt. More current trade-off theory assumes that there are positive effects to leverage-financing within a capital structure, it differs from M&M in the way that it takes into consideration financial distress, here in the form of taxation on corporate income and the risk of bankruptcy real risks (Kraus, Liztenberger, 1973).

Kraus et al (1973) states that since interest on debt is tax deductible there is an advantage, up until a certain point, of increasing the leverage-ratio. If a company is able to meet its debt obligations, an increase in leverage will reduce the corporate income tax liability and therefore increase the after-tax earnings. However if the company is not able to pay the fixed amounts on its debt obligations on time, there may occur insolvency issues and the company might go into bankruptcy.

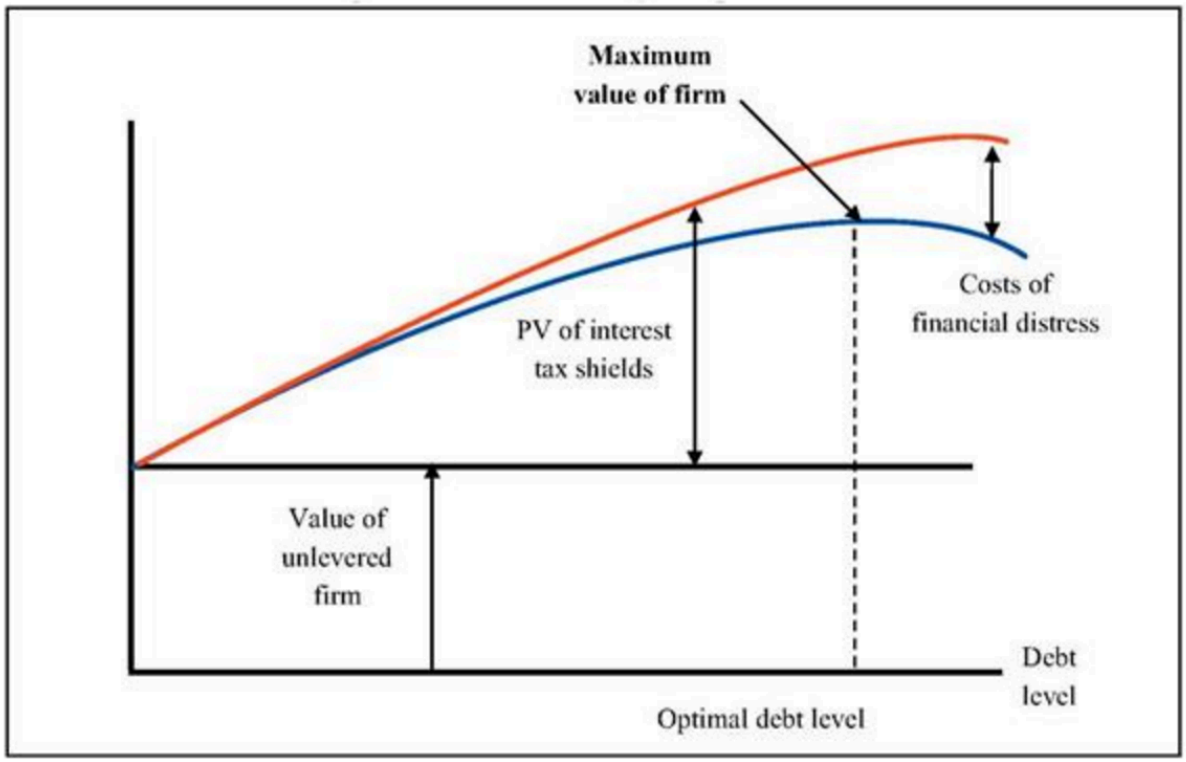

Figure 6: Graph to illustrate the Trade-off theory and its effect on firm value (Berk & DeMarzo, 2014. page 551)

While the marginal cost (here in the form of bankruptcy) increases as leverage increases, the marginal benefit of increased debt decreases as the leverage-ratio increases. We see a concave shaped curve. This means that there is an optimal point, where a marginal increase in leverage gives less benefit (in the form of firm value) that what it costs. The equilibrium is acknowledged as the *optimal leverage ratio.*

In today´s trade-off theory the pros and cons of using debt as capital is mostly assessed/debated/explained by using two arguments. One, the tax-bankruptcy perspective (as explained above) and two, the agency perspective (Drobetz, Gounopoulos, Merikas, Schröder 2013. and Frank and Goyal, 2009). The agency problem is related to the potential manager-shareholder conflict (Myers, 1977). Since no one can predict the future. Jensen (1986) argues that managers with substantial free cash flow, announcing "permanent" increases in dividends have a weak foundation behind these claims. By taking on debt instead of issuing stocks, the manager are bonding their promise on usage of free cash flow to dividends in the future. This because of the seniority debt-holders has over other shareholders. Contrary to equity holders the debt holders have the right to take the company into bankruptcy, if they don't deliver on promised

principal or interest payments. Thus, taking on debt might restrain manager activities towards risky projects and lofty promises, e.t. debt reduce the agency cost associated with free cash flows (Jensen, 1986).

Even though a higher level of leverage might decrease they agency cost of equity, it might also increase the bondholder-shareholder conflict (Anwer, Billings, Morton, Stanford-Harris. 2002.).

Conflict	Benefit of Debt	Cost of Debt
*Managerial prequisites *Overinvestment	*Increase managerial ownership *Reduce free cash flow	*Assets substitution
*Failure to liquidate	*Allows investors option to liquidate	*Bondholder-shareholder conflicts

Figure 7: Highlights from agency models (Harris, Raviv 1991. page 303)

Graham (2003), Fama, French (2002) and Hennessy, Whited (2005) are all sceptical to the empirical relevance of the trade-off theory. Critics are directed at the fact that empirical findings show that the decision behind the choice of either equity or debt remain elusive despite its vast theoretical base. The decision between the two types of capital have shown very different characteristics, so arguing based on the trade-off between them is to simple, and the area deserves further work (Frank & Goyal, 2009). Graham's (2003) findings also point out that tax effects are more complex and harder to identify than previously though. Even though these critics are of relevance, trade-off theory is still recognized as one of the leading theories explaining capital structures (Drobetz 2013, Frank & Goyal 2009).

2.2 The Pecking Order Theory

Myers & Majulf (1984) build their research on Akerlof (1970) model called "Market for Lemons"[5] which shows that a market can deteriorate if the potential buyers cannot verify the quality of the product they are offered Akerlof´s paper discusses the issue of information asymmetry, in the

[5] *Faced with the risk of purchasing a lemon (a bad product), the buyer will demand a discount, which in turn discourages the potential sellers who do not have lemons (Myers & Majulf, 1984. page 196)*

sense that the person selling knows more about the product than the person buying it. This can potentially create a problem between firm insiders and outsiders having to do with adverse selection when raising capital (Myers & Majulf, 1984, Drobetz et al. 2013, Myers 1984).

Myers (1984) introduced The Pecking Order Theory to challenge The Trade-off Theory (stated above), by saying that a company first off, prefers internal to external financing, secondly prefers debt over equity if it issues securities. This hypothesis is consistent with recent research done with aggregated data on corporate financing. So, the pecking order theory ranks the different types of financing according to how prone they are to information asymmetry.

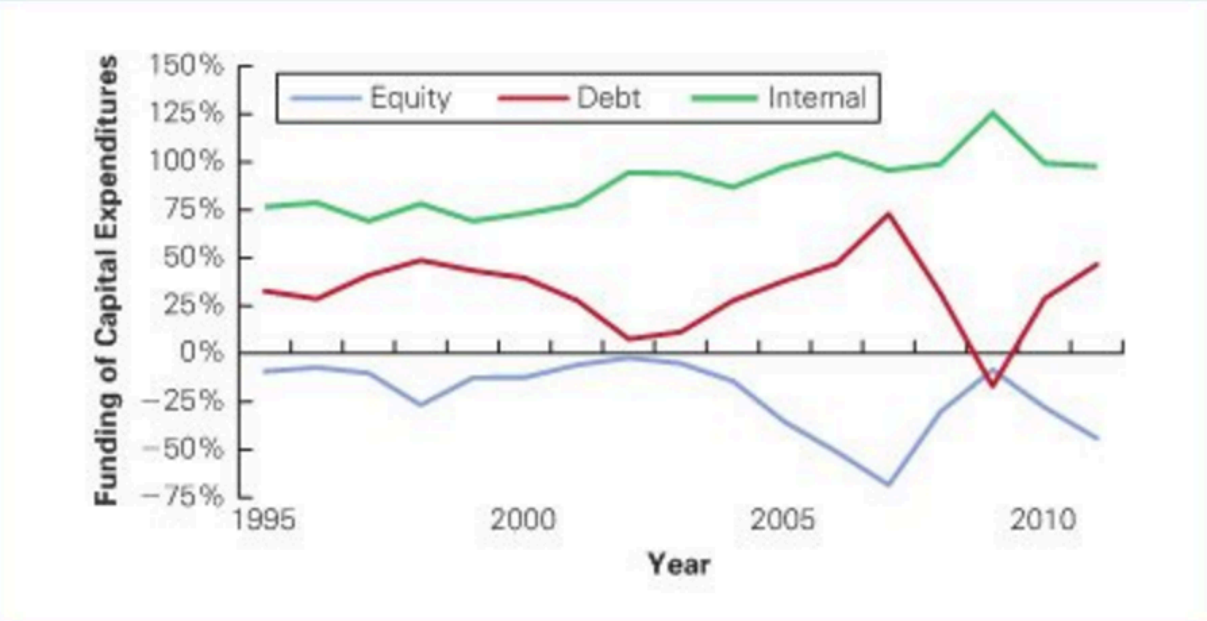

Figure 8: Source of funding for capex, U.S. Corporations (Berk & DeMarzo, 2014. page 570)

Equity has significant adverse selection, debt has a minor amount of adverse selection, while retained earnings has non at all. The figure above shows that companies rather repurchase (internal financing) than issue new shares (external), and would rather use debt than external equity if internal were not sufficient. If a company announces that it will issue new securities, a rational external investor would revalue the company´s security because the drop in valuation of equity when issuing new stocks will make the security look undervalued. On the other side of the scale, if you look at it from the insiders perspective, retained earnings is the optimal financing

source, as it reveals the least amount of information. If retained earnings are not possible, you would use debt. Contrary to the trade-off theory, the pecking order theory does not believe there's a leverage-ratio equilibrium. So considering the macroeconomic aspects, f.ex. high oil prices and increased earnings for E&P-companies, the leverage-ratio should decrease if the pecking order theory is to hold. This since internal funding, from retained earnings, is preferred over alternative funding methods. So, if recent years have shown increased profits the agency problem shareholders-managers should be mitigated, and we should see less debt being issued (Frank & Goyal, 2009).

Other studies have shown that a large portion of tangible assets is negatively correlated with leverage and that profitability is negatively correlated to leverage, which again confirms that companies prefer internal to external financing (Psillaki, Dakalakis, 2009). Leary & Roberts (2010) concluded that the pecking order was a too simple and abstract theory and that it would be hard to apply to real life events. The different forms of capital carry such different characteristics that a more intricate model would have to be applied. Later the same researchers expanded the model to include more factors associated with alternative theories (trade-off, and later explained market-timing), which led to a significant increase in the predictive accuracy of the model. They conclude that information asymmetry is indeed a significant factor when choosing a financing structure and that Fama French (2005) where correct in their statement when saying that the pecking order and trade-off theory are acting as "stable mates", each playing a significant role and having an element of truth to it, which can help explain a companies financing decision (Leary & Roberts, 2013).

2.3 Market Timing Theory

Firms tend to issue equity securities in a positive market with high stock prices and will shy away when the stock market is in a slump. Baker & Wurgler (2002) have documented the above stated; companies tend to issue equity when the stock markets are positive and market-to-book ratios are high, which again have a continuing significant effect on capital structure. In other words the company tries to take advantage of market imperfections to optimally fund their company. They look at both equity and debt markets, and choose the type of financing that yields highest potential returns for the company. If neither looks favourable, the company might postpone the

issuances, and vice versa, if the market looks good, the company might issue securities just to secure capital for the future (Frank & Goyal, 2009).

Even though Frank & Goyal (2009) proclaimed that the theory still needs a significant development to explain all findings, it has received some support by empirical researchers. Baker & Wurgler (2002) suggests that companies do not care if the capital obtained is debt or equity, but rather seeks the form of financing that looks most valuable to the company, given the financial market at that time. Changes in the capital structure as a result of equity issuance endure because companies are not simultaneously changing their debt to meet the target leverage-ratio. So, the capital structure observed is not a result of dynamical changes to meet a target ratio, but reflects the company's attempts to optimally time the equity markets (Baker & Wurgler, 2002).

3. Review of previous empirical research

The literature on capital structure determinants can be divided into macroeconomic factors and firm financial factors. Here I will summarize previous empirical research done, which again will form the foundation of this thesis.

3.1 Macroeconomic Factors

The standard analytical framework for examining the effects of commodity prices on a firm's financial performance is based on the risk-reward model developed by Fama & French (2004). Building on that foundation further empirical studies have looked at the relationship between oil price changes and stock price movements at both firm and aggregated level. Al-Mudhaf & Goodwin (1993) found that shocks in the oil price had a positive effect on the returns of EP companies (naturally!). Summing up the main findings on how oil prices affect firm performance has shown that there is a positive correlation between the financial performance of oil producing companies and the crude oil price, and vice versa for companies not having oil as a net output factor but as a input (Dayanandan & Donker, 2011). The above stated research does not directly relate to my thesis, but indirectly through having gearing (leverage) as an independent variable. These researches are included to show what empirically has been done when looking at capital structures in connection to macro economic variables and levels of debt.

Apart from Dayanandan et al (2011) research on oil price effects on stock returns, there is scarce attention given to researching the effects macroeconomic factors have on a companies capital structure (Halling, Yu and Zechner, 2012). Halling et al (2012) presents earlier developed models, which provides evidence of both pro-cyclical and counter-cyclical movements between market-boom/recession and leverage-ratios. They argue that none of the theoretical models presented has an analytical approach to leverage-ratios, which means that each prediction must be derived from specific real life estimates. This means that leverage movement is largely an empirical question.

Results from three relevant findings on the subject of leverage ratios taking into consideration macroeconomic factors are as follow; First, Korajczyk and Levy (2003) show that financially

unconstrained firms have counter-cyclical movements in both their book and market leverage. Financially constrained firms have a pro-cyclical tendency when it comes to leverage ratios. Second, in contrast to Korajczyk et al (2003), Halling et al (2012) finds that both financially constrained and unconstrained firms have target leverage ratios that tend to act counter-cyclically. Finally, Dayanandan et al (2011) finds that gearing (leverage) is statistically significantly negative correlated with firm performance (here represented by ROE). This means that their findings suggest that when the market is down, the firms are preforming badly, leverage is increasing. So the industries leverage-ratio is perceived as having counter-cyclical market movements. This understanding is supported by the fact that oil price shows a statistically positive relationship with ROE, which adds up when looking at the earlier studies and the effect of oil price increases on performance of firms having oil as and output.

3.2 Firm Financial Factors

Table 3.2: Previous empirical research on capital structure determinants

	Faulkender and Petersen	Lemmon et al.	Frank and Goyal	Gropp and Heider	Drobetz
Market-to-book	-*	-***	-***	-***	+*
Profits	-*	-***	-***	-***	-***
Tangibility	+	+***	+***	+*	+***
Size	-***	+***	+***	+**	+
Dividend Payer	-***	-/+	-***	-	-
Firm Fixed Effects	Yes	Yes	No	Yes	Yes
Year Fixed Effects	No	Yes	No	Yes	Yes
Sample Industry	Non-financial publicly traded	Non-financial firms	Publicly traded American firms	Large US and European banks	Global Shipping Companies

The above stated "+" and "-" gives an indication on previous emirpical research results from standard leverage regressions. Column 1, 4 have market leverage as the dependant variable. Column 2,3 and 5 has book leverage as the dependent variable. A "+" indicates a positive relationship with the dependant variable, "-" indicates a negative relationship"-
* Statistical significance at 10% level.
** Statistical significance at the 5% level.
*** Statistical significance at the 1% level.

Rajagopal, S., & Venkatachalam (2000) investigated 25 petroleum refining companies and how financial performance is correlated with the firms`oil betas. They find a strong correlation between financial performance and stock market determined oil exposures (oil betas). The correlation is estimated to be in the range of 0,55-0,66 (Rajagopal et al. 2000). This could mean that a potential change in a company's market beta might affect its capital structure.

Lemmon et al (2008) conducted an empirical research on all non-financial firms – the dataset was based on year observations in the Compustat database in the period 1965-2003. The results of the analysis suggested that corporate capital structures are more sustainable over time than previously though. A company with high levels of leverage tends to remain highly levered through a period of 20 years. The leverage factor is controlled for company's entry and exit, as well as for previously though significant variables determining capital structure. They find that a variation in the capital structure is largely driven by factors unaffected by time. Factors that remains stable over a longer period of time.

What Lemmon et al (2008) also find is that even though an indebt company tends to stay indebt, there is also occurring a convergence in leverage-ratios. Companies with a relative high level of leverage tend to, in time, move towards a more moderate leverage-ratio. In the presence of transitory or short-term components, leverage-ratios tend to converge over time, in the mean time in the presence of a permanent or long-run components, leverage appeared to be persistent over time. The researchers observed a significant difference between levered and not-levered companies (Lemmon et al, 2008). Lemmon et al (2008) find that firm size and tangibility has a positive significant relationship with book leverage. Market-to-book, profitability, cash flow volumes and dividend paying has a significant negative relationship to book leverage. Most of the same traits can be found in Faulkender and Petersen (2006) research. They used the Compustat database to research non-financial firms in the years 1986-2000. They found that both size and profitability have a negative highly statistical relationship with book leverage. Also, both market-to-book and profits have a negative relationship with tangibility having a positive relationship.

Frank and Goyal (2009) investigated what factors were important for capital structure decisions in publicly traded companies. Their dataset consisted of traded American firms from the period 1950-2003. They found that factors having a positive effect on market leverage were; median industry leverage, tangibility, log of assets and expected inflation. Factors having a negative effect on market leverage were: market-to-book assets ratio and profits. They also found that companies paying dividend tended to have a lower leverage-ratio. There were also conducted a similar test on book leverage. Much of the results were the same, except; the impact of firm size, market-to-book ratio and inflation unreliable predicators.

Gropp and Heider (2010) investigated the capital structure of U.S. and European banks from 1991-2004. Their research uncovered that the same capital structure determinants of non-

financial firms found inter alia in Lemmon et al (2005) were also present in the banking sector on the two continents. They found that Market-to-book ratio, Profitability, Dividends and Asset risk all have significant negative effect on Market leverage. On the other hand, Size had a significant positive effect on Market leverage. Quite similar effects were found on Book leverage. The research is concluded with a observation that what drives capital structure in this data sample are cross-sectional factors which are stable over a longer time horizon. This means that unobserved firm specific, time-invariant factors are the main determinates of a companies capital structure. (Gropp, Heider, 2010).

Finally the last and most recent study done on capital structure with leverage as a dependent variable is preformed by Drobetz, Gounopoulos, Merikas and Schröder (2013). Drobetz et al (2013) studied 115 listed shipping companies and what determinants affected their capital structure in the horizon 1992-2010. Their study is of interest as the approach used has shown to yield results of significance and is also applicable for my research. They found tangibility was significantly positively related to book leverage. Profitability, In line with common perception the shipping industry is highly leveraged; to increase the explanatory power (R-squared) firm-fixed effects is added to the standard OLS regression. This observation, as is the same in Lemmon et al (2008), implies that to a large extent, firm specific time-invariant determinates largely drives the changes in capital structure.

4. Methodology

4.1 OLS Multiple-Regression

To be able to properly evaluate the effects and relative importance the independent variables has on my dependent variable and again on E&P companies' capital structure, I have chosen to build the analysis on an Ordinary Least Squares Multiple Regression. Instead of using a single regression model, with one explanatory variable, a multiple model is meant to increase the explanatory powers and variance of the estimated values. The idea is that by including another independent factor you would get a "sharper/clearer image" of what you are looking at (Stock&Watson 2012).

- (1) $y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_n x_{ni} + \varepsilon$

Equation 1 shows us the general multiple regression formula. Here β_0 is the constant value (intercept), $\beta_1 \ldots . \beta_n$ are vector of regression coefficients on the estimated value y, with ε representing the error term. The coefficients are estimated by minimizing the errors between the predicted y and y.

- (2) $\sum_{i=1}^{n}(Y_i - \beta_o - \beta_1 x_{1i} - \cdots - \beta_n x_{ni})^2$

The OLS-estimator is consistent and valid when the conditions of normality, linearity, homoscedasticity, multicollinearity and autocorrelation are realized[6]. Possible threats and how to handle them related to these conditions will be stated in chapter *7.4 Regression Conditions.*

When doing regression analysis one needs to consider the possibility of omitted-variable bias (Stock&Watson, 2012). Omitted-variable bias may occur when the regression is incorrectly leaving out one or more variables which might have a causal effect on the already included variables. For the bias to occur, two conditions must be fulfilled. (1), the omitted variable correlates with the regressor, and (2), the omitted variable plays a part in determining a independent variable. The degree of omitted variable bias can be seen in the error term, with a

[6] *More on the condition off these factors in the appendix chapter 8.2.*

high error term variable one can increase the regressions explanatory power by including more omitted variables into the model (Stock & Watson, 2012).

4.2 Fixed Effect Model

The fixed effects model allows for $\boldsymbol{Cov\ (Xk,it,\ uit) \neq 0}$ which makes it a good device when analysing panel data[7] (Stock & Watson, 2012). Having a dataset were all variables appear in each time-period and each entity, it is said that you have a balanced panel data. The data set in this thesis on the other hand is unbalanced. This in the sense that there are missing data points. Some years some firm observations are missing. By using the fixed effects model one can adjust for either the unobserved effects that varies across entities, and are constant over time, or effects that vary over time, but are constant across entities. It is also possible to adjust for both simultaneously, not just one by one.

- $(3)\ Y_{it} = \beta_0 + \beta_1 X_{1,it} + \cdots + \beta_k X_{k,it} + \alpha_i + \lambda_t + u_{it}$

The above stated formula illustrates the fixed effects regression. Here $i = 1, \dots, n$; $t = 1, \dots, T$; $X_{n,it}$ is the value of the nth regressor for entity i in time period t, and $\alpha_1, \dots, \alpha_n$ and $\lambda_1, \dots, \lambda_t$ are the specific intercepts for the entities/time-periods (dummy variables). To prevent a possible dummy variable trap of perfect multicollinearity, I only include $n-1$ and $t-1$ as dummy variables.

One also needs to consider a "special case" of the fixed effects model (Borenstein, Hedges, Higgins and Rothstein, 2009). Here one assumes no fixed effects, where the correlation between the independent variables and the error term are zero and the key explanatory variable is constant over time. This is called a Random Effects Model. So, we have a case where $Cov(X_{k,it}, u_{it}) = 0$. Here there one assumes that all relevant factors that may be of significant impact on the dependent variable has been accounted for, or we have an error term u_{it}, which is very small (Woolridge, 2009). If the assumption for the random effects model holds, it will be more efficient

[7] *Panel data – a data set containing both cross-sectional and time series dimensions (Woolridge, 2009).*

and therefore chosen over the fixed effects model. Nevertheless, if the assumption does not hold, the random effects model is not consistent (Woolridge, 2009).

To decide which model is best applicable, one performs a Hausman test (Woolridge, 2009). The idea is that one uses the random effects model, if the null hypothesis holds and is not rejected. The operation is to test whether or not there is $Cov(X_{k,it}, u_{it}) = 0$. If there are high levels of consistency it means that both random and fixed effects model is applicable and one has a failure to reject either. When the unobserved effect u_{it} correlates with one or more of the explanatory variables, the fixed effects model yields superior results (Woolridge, 2009).

4.3 Qualitative fact checking

All mentions of talks both in person, via telephone and email conversations are only done as check-ups, not in depth interviews, on observations and topics from theory and/or empirical research results . The reason observations and topics are not being definite, is mainly due to difficulties in obtaining real and trustworthy historical data on the matter. So, all referencing to talks with "industry players" are only done to confirm and create a better understanding of the overall picture on what empirical research are telling or not telling us. This is mentioned, as this is a thesis with a quantitative approach.

5. Regression specifications

This section contains the discussion and reasoning behind the choice of variables for the econometrics regression done further on in the paper. The choice of dependent and independent variables are defined and chosen based on previous empirical research.

5.1.1 The dependent variable

In choosing the most appropriate dependent variable for this type of work, previous researchers have been torn between market and book leverage. First of, you have those how support the use of market leverage as the left-hand side variable. Supporters of using market leverage argue that the use of book leverage might act a wedge, "straitening out" the balance sheet and that it is not managerially a relevant number (Welch, 2004). Others say that applying a "book variable" is backwards-looking that it measures what as taken place in the past. So if one assumes that markets are forward looking, using a backwards-looking ratio might create biases in the analysis (Barclay, Morellec and Smith 2006). Based on reasoning from the above stated articles, Frank & Goyal (2006) thinks that market leverage, as the dependent variable, is the most appropriate.

But, there are also academics how believe that using book leverage is the most appropriate variable when analysing a firm's capital structure. Myers (1977) do not argue that book values on the balance sheet is more accurate than market values (at present time), but that they are based on assets already in place. A large amount of a company's market value on the other hand is based on future assets not yet in place. Assets defined and given an amount based on estimated growth opportunities. Graham and Harvey (2001) find in their research evidence to support the Myers (1977) claim. They found that decision makers in a firm do not adjust their choice of capitalization based on changes in market.

Even though Frank and Goyal (2009) stated that market leverage would be the most appropriate variable to use, they also observed that firm executives found market leverage was too volatile to serve as a proper foundation when issuing new capital. Non-controllable macro economical factors have a significant impact on leverage market value. So, an ever-changing market value of leverage would demand constant adjustments by the management, to the point were it gets ineffective. Lastly, Getzmann and Lang (2010) most recent research also supports the earlier

statements; that book values of leverage, would be more appropriate to use. This since estimates for the future are to a large extent affected by individual perceptions. By only taking into consideration actual events that has happened, one would avoid the bias create from future estimates.

Taking into account the above stated factors; I have decided to base this study on book leverage. Only interest bearing debt is included, this is done to get a more clear cut image, as some debt types whose costs are included in a companies operating expenses. So, the definition for the dependant variable used is:

$$\text{Leverage} = \frac{\text{Long term Debt + Short Term portion of Long Term Debt}}{\text{Total Book Value of Assets}}$$

5.1.2 The Independent Variables

This sub-chapter presents the independent variables and what effect theory predicts them to have and finally, based on that, what I predict them to have on my dependent variable. First there will be a discussion of the firm specific variables included and not. Then an examination of the relevant macroeconomic factors.

Table 5.1.2: Previous research and thesis predictions from theory

	Trade-Off Theory	Pecking Order Theory	Market Timing Theory	Prediction for E&P-companies
Firm Specific Variables:				
Market-to-Book	-	+	-	-
Asset Tangibility	+	-		+
Firm Size	+	-		+
Profitability	+/-	-		-
Dividend Status	-	+/-		-
Macro Specific Varaiables:				
Cycle of Macroeconomic Variables	+	-	-	-

This tabel displays how each independant varaibles is affecting is affecting, through the trade-off theory, pecking order theory and the market timing theory, a E&P-company´s leverage ratio.
The macroeconmic variables are trends shown either with a "+" sign, indicating that the effect is pro-cyclical with leverage ratio, or a "-" sign, indicating that it is counter-cyclical with the leverage-ratio.

Company Specific Variables

Market-To-Book

The market to book ratio, or more commonly known as the price to book ratio, is a financial measurement of a company's present market price compared to its book value. The trade-off theory states that companies who are expected to grow, way experience a higher degree of financial distress cost and face higher agency cost related to debt because of possible issues with underinvestment (Myers, 1977). Therefore, based on the trade-off theory, one would expect a negative relationship between the market to book variable and leverage. The pecking order theory on the other hand tells us that if we hold profitability constant, companies with expected growth opportunities are expected to have a higher level off leverage. This means that debt will increase if the sum of investments is higher than the sum of retained earnings (Leary, Roberts 2010). Drobetz et al (2013) find that most of the research done up until now cohere with the trade-off theory and claims that there is a significant negative relationship between leverage ratios and market-to-book ratio. The finds from Drobetz et al. (2013) are compatible with the findings from market timing theory. If this theory is correct in saying that the "timing aspect" is what's driving the changes in capital structure, a high market to book ratio will reduce a companies leverage

(Frank & Goyal, 2009). The rationality behind this statement is issuance of new equity to existing shareholders is cheaper than obtaining new debt.

Collecting and weighing the above stated findings and how they correlate, for this analysis market to book will be considered to have a negative relationship with leverage. The formula is;

$$\textit{Market-to-Book} = \frac{\textit{Market Value of Assets}}{\textit{Total Book Value of Assets}}$$

Tangibility

Tangible assets are assets that have a physical form. It's a measurement of the amount a company can use as collateralized value. Following the school of though from the trade-off theory you would expect that a company with a large amount of fixed tangible assets to have lower costs associated with financial distress. This because tangible assets are easier to quantify, it's easier to understand the extent of its value, which again reduces the presence of adverse selection. This gives a lower degree of agency costs associated with debt, and a higher leverage capacity (Drobetz et al, 2013). So, according to the trade-off theory one would expect that a higher degree of tangibility would be associated with a higher leverage-ratio. On the other hand, Harris and Raviv (1991) suggests that according to the pecking order theory a lower degree of adverse selection due to a high degree of asset tangibility you would get an increased company transparency and with that make a equity capitalization less costly. Since equity financing is preferred over debt, according to the pecking order, a high degree of asset tangibility would give a negative relationship with leverage. However, Frank and Goyal (2009) states that under the pecking order, adverse selection is about the amount of assets in place. So increased tangibility would also mean increased adverse selection. Due to the fact that Frank and Goyal (2009) have a hard time finding concrete evidence for a negative relationship, and that Drobetz et al (2013) state that most empirical research finds a positive relationship it will, in this analysis be predicted to be a positive relationship.

$$\text{Tangibility} = \frac{\text{Net Property, Plant \& Equiqment (PPE)}}{\text{Total Book Value of Assets}}$$

Firm size

Large companies are often associated with a higher degree of diversity and lower risk of default. According to the trade-off theory you would then find a negative relationship between firm size and expected bankruptcy costs, which again gives a positive relationship between leverage and firm size (Drobetz et al, 2013). On the other hand, according to the pecking order theory it is common to interpreted a negative relationship between firm size and leverage. Here one regards the size of the firm as a proxy for information. So, the larger the firm the more information is provided to the outsiders, and with that, giving a lower cost of issuing equity. This would then give a negative relationship between leverage and firm size. But according to Drobetz et al. (2013) a major part of the empirical research done finds a significant positive relationship between firm size and leverage (Drobetz et al, 2013; Rajan and Zingales, 1995; Frank and Goyal, 2009). Firm size is estimated as the natural logarithm of total book assets.

$$\text{Size} = \text{Ln (Total Book Value of Assets)}$$

Profitability

The pecking order theory suggests that a company would choose internal over external financing if possible. If one chose to hold investments and dividends constant over time, you would see that companies how are profitable over time would decrease their leverage as time went on. Thus you would have a negative relationship between profitability and leverage (Frank & Goyal, 2009). But a highly profitable company could experience agency problems between management and investors. Here the trade-off theory shows how leverage can be used as a disciplinary tool to "keep management in check". The agency model described by Jensen and Meckling (1976), Easterbook (1984), and Jensen (1986) states that highly profitable firms use leverage to diminish agency conflicts. However, according to Frank and Goyal (2009), current research suggests that

the trade-off approach on profitability is more complex than what the above stated papers are based upon. They say that there is a certain active "back-and forth" trade-off in relation to profits, which could lead to lower leverage levels. According to Drobetz et al (2013) the first argument, that the pecking order theory dominates when it come to profitability and leverage, have received the greatest amount of support in recent research and is therefore also used in this analysis. It is here presumed that profitability has an inverse relationship with leverage.

$$\text{Profitability} = \frac{\text{Earnings Before Interest, Depreciations and Amortizations}}{\text{Total Book Value of Assets}}$$

Dividend status

In the short run, generally speaking, companies try to level out their dividends year-to-year in order to account for sudden changes. In the long run a company tries to express a predictable and constant dividend policy relative to earnings, so as to gain and hold investor trust (Brav, Alon, Graham, Harvey, Campbell, 2005). Following the pecking order theory, the relationship is inconclusive. First you have the fact that research have shown that companies paying out dividend take on more leverage, as it is preferred over equity as a way of financing. Secondly, dividend payouts acts as a way for the market to monitor the company. With higher transparency you would get lower information asymmetry and with that make equity issuing more preferable (Drobetz et al, 2013). Frank and Goyal (2009) has shown that most firms follow the trade-off approach, and it is observed a negative relationship between dividend payouts and leverage. Correspondingly, this is also what will be expected from the E&P companies.

$$\text{Dividend Payer} = 1 \text{ if dividends} > 0 \text{ in year } i$$

Taxes (not included)

As outlined by Frank & Goyal (2009), the agency cost, in regards to the conflict between management and stockholder/bondholder is likely quite as important as taxation, when discussing the trade-off theory in capital structure. There have been finding that prove, the well-

known fact, that tax effects are relatively hard to clearly identify in the data when doing empirical research (Frank & Goyal, 2009).

When an E&P company goes into and concession (production agreement) for a shelf, they pay some form of corporate income tax. Other payments might included royalties, bonuses (depending on the extent of the find), rentals, resources taxes, special petroleum or windfall profit taxes, export duties etc (EY, *Global Oil and Gas tax guide*. 2015). The schemes might differ from country-to-country and from year-to-year, making it really hard to get a sensible tax rate to use as an independent variable. But, I will give a prompt insight into to how different income taxation is exercised in different countries. This so the reader can get an understanding of how different countries "attack" the problem of taxation.

The net revenue tax rate on NCS (Norwegian Continental Shelf) is very high, 78%, which naturally gives a dominant of long-term contracts. One does not want short-term contracts, when tax rates are so large. The high tax rate on revenue is to outweigh the tax relief granted on all exploration costs the E&P company might take on as drilling and well construction commences (EY, *Global Oil and Gas tax guide*, 2015). In UK, which accounts for the third highest rig activity in Europe, the E&P industry is much less regulated (Ringlund et al. 2007). Ringlund et al (2007) estimated an error-correction model for rig usage in the six most active regions in the world. They found that oil price elasticity's in E&P exploration had a significant negative relationship with the degree of regulation. The same goes for the US activities, where the oil licenses are sold on auction, after that you start exploring, then potentially you can spud the well and finally after that start production (EY, *Global Oil and Gas tax guide*, 2015). This gives a lower initial net tax rate but an increased upfront capital demand compared to NCS where most of the initial fazes is subsidized (Conversation with Professor Finn Kinserdal, NHH). With the high tax shield (78%) companies are granted on NCS, you see a tendency for companies to shift exploration spending into Norway when the Brent Crude price is low, and out of Norway in reverse situations. This suggests that E&P company exploration response to changes in oil prices is lower in regulated, high-tax countries like Norway compared to USA (Mohn et al, 2011).

All companies in my sample have through the thesis timeframe operated under very different tax regimes, depending on where they were located and when in time, so a common tax rate is not obtainable. Estimating a tax rate that could be used as an independent variable would in my case only increase the chance of biasness in my regression results.

5.1.3 Additional Variables (Macroeconomical Variables)

Macroeconomic variables impact the global E&P industry in a significant way, although some more than others (Dayanandan & Donker, 2010). Introducing macroeconomic variables I might be able to get a more detailed picture of what determines an E&P company's capital structure decision. I will here give a review of the variables most likely to have a significant impact on E&P company´s balance sheet. Following the outlines of the works from Hovakimian, Opler and Titman (2001), Korajczyk and Levy (2003) and Drobetz et al. (2013), I feel pretty confident that the approach might generate some results of interest.

Business Cycles

Inline with Korajczk and Levy (2003) and Halling et al. (2012) I also expect E&P companies book leverage ratio to exhibit a counter-cyclical behaviour with macro economical trends.

E&P specific indicators like industrial production and industrial capital expenditures are extracted from Rystad Energy database. They are included to show how industry specific factors affect book leverage. Industrial production is showing total industry oil production output. How much a company produces each year is affecting earnings. Indications of a positive market could give increased demand; production would follow and increase, which again would give the industry increased earnings. The same goes for capital expenditures, where a positive market outlook would make companies prone to increase capital investments. Following the empirical research mentioned above and as stated by the pecking order theory, I expected industry factors to act counter-cyclical with my dependent variable.

The Brent Crude oil price growth is also included as a macro variable. Positive growths in the price have shown to have a positive effect of E&P earnings (Dayanandan & Donker, 2011). Following the pecking order theory and Dayanandan & Donker (2011) I expect a negative relationship between leverage and Brent Crud Oil prices. US Shale oil has since 2007 been a critical part of the world energy market (PWC, *Shale Oil: the next energy revolution*, 2013). As it is a critical part in the increase of US energy independence and the fact they were the world largest energy consumer up until 2011 (International Energy Analysis, EIA, 2015), I find it as a factor

worth including when researching book leverage ratio. As with the Brent Crude I also expect a counter-cyclical relationship between US Shale and book leverage ratio.

As the American economy is the worlds largest (World Bank, *GDP report*, 2014) it has shown empirically to be a good indicator for the general state of world economy, when testing its effect up against a sample of book leverage ratio (Drobetz et al. 2013). Halling et al. (2012) argues for a negative relationship, with the basis in companies' market timing behaviour. In times of downturn, higher bankruptcy costs inline with lower revenue and cash flow streams gives the trade-off theory substance to claim a positive relationship. Even so, inline with Drobetz et al. (2013) and Halling et al. (2012), this thesis expects the US economy to display a counter-cyclical relationship with book leverage ratio.

To account for market cyclicality a lagged term spread will be included. This is determined by taking a 10-year US treasury bill and subtracting a 1-year US treasury bill. According to Dahlquist & Harvey (2001), a small difference between the two treasury bills could indicate a economic downturn (recession). So, following Ferson and Harvey (1994) and Drobetz et al (2013) offshore companies has shown a negative relationship with between leverage and lagged term spread, which is in line with a counter-cyclical ratio. The logic is also sound for E&P companies, and it will therefore be expected that the leverage-ratio and lagged term spread would have a negative relationship.

The real growth rate of GDP in the G7 countries is included as a indicator for the trend of the world economy. Inclusion of the real GDP growth as a proxy as in line with the research done by Drobetz et al. (2013). In times of growth and prosperity we see a higher level of economic activity in the markets, this again leads to a higher demand for energy (to fuel the activity), which again is something suppliers of oil and gas (as a energy source) would like to take advantage off (Dayanandan & Donker, 2011). With this in mind, one would expect the growth rate of GDP to have an impact on leverage ratios. The pecking order and trade-off theory are pointing in opposite directions when it comes to if it is a negative or positive effect. Taking into account previous empirical research on similar topics, I would expect a negative (following the pecking order theory) relationship between GDP growth and leverage ratios.

The MSCI World Index might also be wise to include. Following the pecking order, a world with positive outlooks give easier access to equity capital through increased stock prices, more projects to invest in. Adhering to the pecking order theory one would see a decrease in leverage ratios. But with a higher level of free cash flow, one could also experience an increase in agency costs and a need to decrease the issue. Taking into account the above stated and following the assumption of a counter-cyclical practice I expect a negative relationship between MSCI and leverage.

The Major Currency Index or "The Real Trade Weighted US Dollar Index" is an index that shows the weighted value of the US dollar against 7 other currencies around the world (St. Louis FED, 2015). Ex. If the index increased today, you would need a larger amount of "local" currency to buy the same amount of dollar, compared with yesterday's closing price. When setting the terms for a new loan contract, most E&P companies demand that the contract is denominated in US dollar (Mohn et al. 2011). But, some cost occurring in an E&P company might be denominated in a local currency. E&P companies are therefore exposed to a certain degree of risk (depends on the level of hedging) to fluctuations in the dollar value. Given the thoughts of the pecking order theory, I presume a counter-cyclical relationship between the index and book leverage.

6. Data Gathering

This chapter contains an overview of the data sample used in the analysis, an elaboration on the process of gathering the data and a discussion on the validity and reliability to the data sample.

The starting point when trying to access reliable data was to determine which database to use, through CBS system. After researching relevant earlier empirical work in coordination with the list of accessible databases through the CBS network, I found that ThomsonOne Worldscope could be relevant. This database is well known and often used for gathering information on thesis researching topics similar to mine, see Bessler et al (2013), Drobetz et al (2013) both using the ThomsonOne Worldscope database. It offers in depth information on company financials, stock prices, revenues, market values vs. book values, ownership structure etc. Although the interface and user-friendliness is not that good, the amount of data and reliability of the source (Thomson Reuters), is recognised as a trusted partner in delivering broad and deep information on company financials (CBS library databases).

After a couple of days gathering information on my companies, I noticed that some firm-year observations were missing. Since this thesis is about catching the general trend it is of importance to fill these holes in the dataset as best as possible. Orbis – Bureau van Dijk (also found through the CBS system) is also an adequate place to search for company information. Although not as comprehensive as ThomsonOne Worldscope, it was still of use to me, when finding missing information on specific firm-year observations, also as a way check that the information gathered from ThomsonOne Worldscope was valid and reliable. For industry specific macroeconomic factors, I was lucky to get in touch with Rystad Energy. They are, I believe after doing some research, the leading big data provider in the E&P industry. They offer field-by-field analysis, company and industry data on everything from production rate to capital- and operational expenditures. Rystad Energy started their operations in 2004 as an independent globally used and quoted oil and gas consultancy firm. Their database has up-to-date information on all major, relevant oil-fields in the world (Rystad Energy homepage, 2015). When I asked for some proof of credibility and reliability, I got a picture showing all companies who has and is currently using their database. For more on which companies this is, see *chapter 8.3 Appendix* for international citation and references.

6.1 Data set sampling

Table 6.1: Number of year observations and company by country

Country	# of Companies	Sum of Observations
Norway	3	46
USA	3	54
France	1	18
Netherlands	1	18
Brazil	1	18
United Kingdom	2	36
Russia	2	29
Italy	1	18
Sweden	1	14
China	3	48
Canada	1	18
Spain	1	18
Austria	1	18
Total	21	353

The table shows firm-year observations and the number of firms in the data sample presented by country. In total, the sample consists of 21 companies and 353 observation from ThomsonOne Worldscope and checked and complemented from Orbis - Bureau van Dijk.

This data sample consists of data on 21 companies with a grand total of 353 firm year observations in a timespan from 1997 to 2014. The table above shows how total observations per country for the thesis time frame. So, each observation is one company year-specific value. The firm specific data is collected from ThomsonOne Worldscope with an annual interval. Missing data points are filled in manually from Orbis data bank. All necessary data is converted to year specific dollar value, so that it is easier to compare. Generally speaking, an E&P company may vary widely from its competitors when it comes to the services it provides and how it operates, and still operates within the same industry code. In the process of gathering the appropriate sample of companies, some prerequisites had to be met for the company to be relevant for this analysis. More on the size of my sample compared to the total industry in the next sub-chapter.

So, the requirements for the company to be included in this sample are that; it is publicly traded and that the main operational activity in the firm is to explore and develop oil & gas-fields. It was also required that all firm year observations had no missing data points on total book value of

assets. In the next sub-chapter, more on the representativeness and how large a share my sample is to the grand total.

At the beginning of the sampling process, lists comprised by Forbs were used to find the biggest and most influential E&P-companies in the world. The different lists generated by Forbs (Forbs, *The worlds biggest oil companies,* 2015) have different parametric to estimate the size of a company (Turnover, daily barrel production etc). By finding the companies that kept reappearing in the different list, I had a starting point for which companies to include. These are all well-known industry giants, f.ex. ExxonMobil, Shell, Statoil, BP, Sinopec etc. I met with Espen Erlingsen (Senior Analyst at Rystad Energy) at their office to get an introduction on how to use their database (software called UCube), we also talked about which companies to include and which to avoid when doing my analysis. The advise I got from Rystad Energy, was a confirmation of what has already been researched and empirically proven by Smith (2002); that that the large Middle Eastern companies how's a member of OPEC do in fact acts as a cartel and can therefore not be trusted when it comes to validity and reliability of the data they present. I therefore tried to avoid all Middle Eastern companies, as they have shown a tendency to manipulate presented data for personal benefices. Also, companies which solely had activity based onshore production were excluded, as these operate under entirely different scheme, in everything from demand of capital, to risk of production etc (imagine pumping up oil from swallow grounds on sand, compared to bad weathered ultra deep waters in the North Sea).

When gathering the macroeconomic variables, a need for trustworthy and updated information was of some importance. Rystad Energy´s database was the preferred source for all oil & gas specific variables, like Crude Oil Production growth, Industry Capex, Crude Oil price development. The Economic Growth rate/Recession are gathered from Dayanandan & Donker (2011). MSCI from homepage database. Term spread, G7 GDP growth rate and Annual Changes in "Major currency Index" are all gathered from FRED the database of St. Louis Federal Reserve.

6.2 Representativness of Sample

Because this thesis only consists of 21 companies, one could question how representative this analysis could be for the worldwide E&P industry. 353 firm year observations could be perceived

as a limited number and be of disadvantage and potentially affect the results. I have also chosen to only include publicly listed companies, which in many cases has its advantages, with respect to availability and validity of data. Known companies that have been excluded are some major players like; Pemex (Mexican state-owned) and Sonatrach (Algerian state-owned) Saudi Aramco (Saudi state-owned). If one included the above stated companies, other factors might create regression results of less significance, because each company might have its own specific socio-political goal (Boardman & Vining, 1989). In answering this thesis research question, the above-mentioned companies might make choices based on entirely different reasons that a publicly listed one (protect national interests, job creation, securing energy supply), I therefore try to avoid including companies which are family/state-controlled when trying to find determinants for capital structure decisions. There is also the matter of less transparency, with regards to collusion and corruption in a non-public company. As has been discussed earlier, with the examples from OPEC companies.

In spite of the somewhat smaller data set, there are indicators that this dataset is representative for the total global industry. The inclusion of the biggest and most significant companies along with a group of smaller more "single-minded" companies can give a clear indication on entire industry trends. This is validated through researching the database of Rystad Energy. When looking at total world production output per day, my data sample represents 34% of industry total. If you look at free cashflow or capex, this thesis sample of companies has even a stronger presence in the industry. As of 31.12 2014, the 21 companies in this thesis represented 62% of the industry free cashflows and 66% of the industry capex (see table 8.3.1. sub-chapter 8.3).

The data sample includes both large and major industry players, like Shell, BP, ExxonMobil etc. But also smaller less diversified companies, like Det Norske Oljeselskap, OMV or Tullow. Det Norkse Oljeselskap differs from the larger more diversified player with a policy to only operate on NCS (Norwegian Continental Shelf). The though behind including companies which vary widely in their company parametric is that I hope to catch "the general industry trend". More on the results and explanatory power of my data sample in sub-chapter 7.5 *Regression Results*.

When it comes to geographical spread, the sample is to a certain degree skewed towards Europe and the Western parts of the world. The reason behind this is mostly due to the fact that reliability of valid data is of great importance, so when it comes to data from before "the coming

of internet" around year 2000, generally speaking; data from before these days are hard to come by and not always trustworthy.

Taking into account all aspects stated above, I believe this sample, in general, to be representative for the E&P-industry. That said, the more critical reader should take into account the matters stated on the size of the sample and observations.

7. Main Analysis

This section will contain a presentation of descriptive statistics on firm and macroeconomic factors, the regression analyses done, a discussion of the coefficients effect on the dependent variable, their statistical significance and an overall reflection of the explanatory power of the models. Lastly you can find a reflection on further research based on this thesis and a thesis conclusion.

7.1 Descriptive Statistics

7.1.1 Firms specific descriptive

Earlier empirical research has done similar analyses on capital structure determinants, in both similar and different industries. In an attempt to create a more comprehensive picture of the data gathered, results from Bessler et al. (2013), Dayanandan & Donker (2011) Drobetz et al. (2013) will used as comparables when analysing the descriptive statistics.

But first, I will give a study of the leverage ratios and how they have evolved through the time period of this thesis

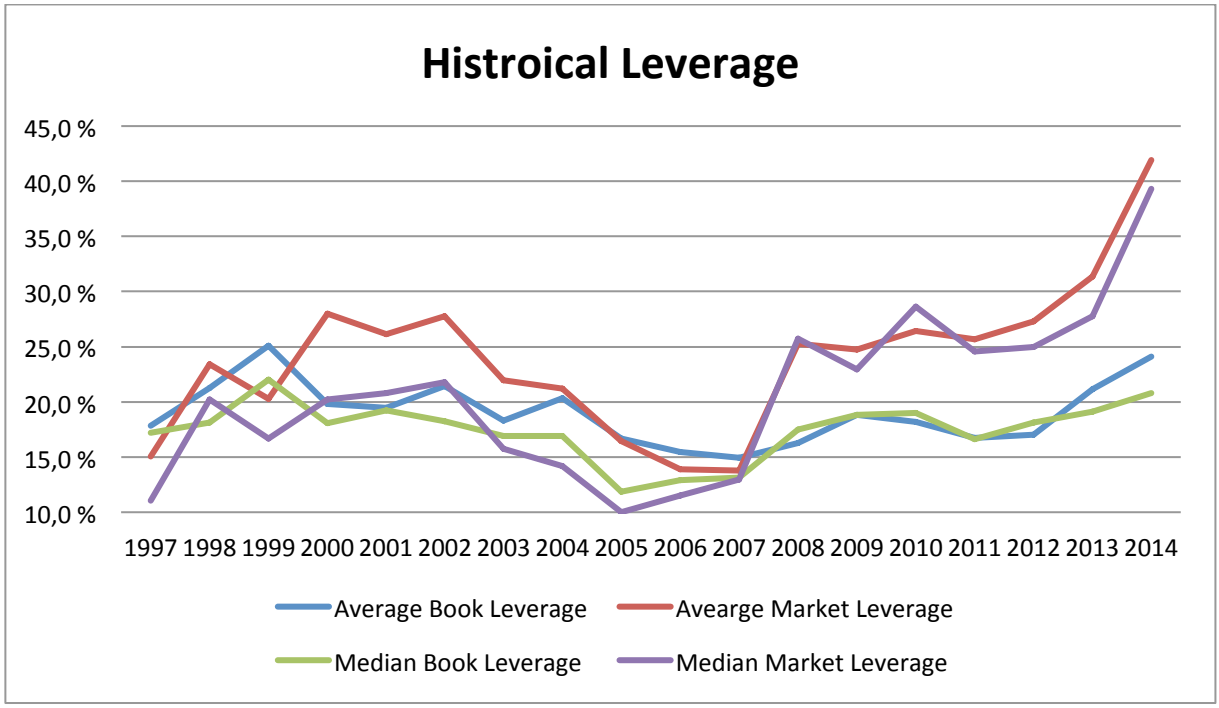

Figure 9: E&P companies mean and median leverage ratios. Source ThomsonOne Worldscope, 2015.

As can be seen from the graph above, there are significant differences between the average book- and market leverage, which suggests that there are differences between the two measurements. We can see hints of heterogeneity in the observations as well. As can be seen from the descriptive statistics (just bellow) some firm-year observations have 0 book leverage (more specifically Det Norske Oljeselskap 2006-2008), while the maximum observed is 0,60. Further on, when looking at the same figures for the market leverage, we see an even more wide spread observation. Petrobras has in the last reported fiscal year a market leverage of 99,71% of reported enterprise value. The graph above gives us a visual interpretation of how the book- and market leverage move together.[8]

As can be seen, the industry experienced a significant dip in market leverage and a closing of the gap between book and market leverage at around 15% when the last financial crisis hit. In the time after the crisis, book leverage as evolved quite stable below 25%, whereas market leverage has steadily risen and the gap between market- and book has only become larger, with market leverage closing in on a average of above 40% in 2014. With a basis on the observed larger spread between max and min, also the higher volatility in market leverage (as can be seen both from the

[8] *For the curious reader, a graph showing all sample companies historical book leverage, can be found in the sub-chapter 8.4*

graph above and from the descriptive statistics table below). This confirms that book leverage ratio might be a more stable and better representation of the E&P industries target leverage for this regression analyse.

Table 7.1.1: Firm variable descriptive statistics

	Observat	Mean	SD	Minimum	Maximum
Book Leverage	353	0,189	0,103	0,000	0,607
Market Leverage	321	0,243	0,192	0,000	0,997
Tangibility	353	0,563	0,146	0,018	0,900
Market-to-Book	321	1,005	0,855	0,047	7,520
Size	353	10,366	1,978	3,657	12,861
Profitability	353	0,181	0,171	-0,421	1,333
Dividend Payer	353	0,832	0,373	0,000	1,000

The table displays the number of firm-year observations, the mean, the standard deviation and the minimum and maximum for each variable.

The sample of E&P companies in this thesis shows a considerable lower mean book leverage (18,96%) than that of the shipping industry in Drobetz et al. (2013) with 40,7%. Excluding the US companies mean leverage ratio (27,7%) one can observe mean book leverage similar to this sample in the G7 countries, shown by Bessler (18,2% and 22,3%). Dayanandan & Donker (2011) report a mean market leverage of 79% in their "US only" company sample. A reason for seeing higher ratios in the shipping industry could be that conventionally the shipping industry has operated with a higher financial and operating leverage, due to the cyclical nature of the shipping market (Drobetz et al. 2013). The findings from Dayanandan & Donker (2011) shows that US oil companies tend to, on average, to take on more leverage than other companies outside the US. This thesis sample consists of companies spread all around the world and with that, as with Bessler et al. (2013) we see a lower mean leverage ratio than in Dayanandan & Donker (2011).

The shipping industry has a high dependency on tangible (assets) ships to operate. The E&P industry is also an asset driven industry, as operations in oil production demands a high degree of tangible assets (platforms, oil pumps and productions equipment etc). Bessler et al. (2013) study of G7 countries includes industries less asset driven and therefore has results that, on average, has a lower tangibility (29,5%). In line with findings from Drobetz et al. (2013) one can in thesis observer a high degree of tangibility, 63% and 56,3% respectively.

I can see from the table above that the E&P industry is as other maritime industries, see Drobetz et al. (2013), have a mean market-to-book ratios are significantly lower than for the G7 average from Bessler at al. (2013). With the E&P companies market to book ratio mean of 1.005, the shipping industry (Drobetz et al, 2013) 1.165, compared to the G7 countries in general (Bessler et al, 2013) of 1.843, we see that E&P companies` valuation levels are relative low, indicating a substantial valuation discount in the offshore industry. This said, I see that the spread between min and max values are substantial (0.0478-7.520), indicating that there is heterogeneity in valuation of smaller companies, compared to a super-major with a well diversified production portfolio. An example here is Österreichische Mineralöverwaltung (OMV) compared to ExxonMobil. OMV is a smaller E&P company from Austria, while Exxon is the industries biggest competitor with operations multiple shelf's and production in both shale, gas as well as regular offshore and onshore oil production. Their respective market-to-book ratios in 2014 was, 43,62% and 120,3%.

As previously mentioned we naturally see a high level on book value of assets. Mean size-ratio is 10.36 which is substantially higher than both the shipping industry and the general average of the G7 countries, respectively 6.48 and 4.9. With a relative low volatility (1.97) compared to the G7 (2.175). This observation correlates with the conjecture that multiple industries assets are perceived too be more comprehensive to valuate and different in need of size and structure than that the E&P industry. And since the industry is costly and most operations demand somewhat the same assets to operate we see a relative high size-ratio, even when including minimum values we se high values with low volatility compared to Bessler et al. (2013) general G7 observations.

Historically the oil & gas market has since the beginning of the 1990s seen a increase in technological innovation that has outpaced field depletion and therefore increase productivity and profitability (Managi, Opaluch, Jin and Grigalunas, 2003). I observer that profitability in the E&P-industry is similar to other industries with offshore activities. The mean profitability ratio is 0.1813, which is slightly higher than that found in Drobetz et al. (2013) of 0.113 but significantly higher than the mean average from the G7 countries in Bessler et al. (2013) of -0.023. But it can also be observed some heterogeneity, as min and max observations are ranging from negative operations to highly profitable ones with a profitability ratio of 1.33. A more profitable company should be more attractive to investors, and therefore affect the company's ability to obtain capital, and with that a part of the arrangement that determines capital structure.

Empirical research has shown that high levels of free cash flows are related to unconstrained and constrained firms. High levels of free cash holdings has shown that financially constrained firms might take on value-increasing projects otherwise not possible, and that unconstrained firms might pay out dividends in a response to attract capital through a less costly manner (Denis & Sibilkov, 2010). One could then expect to see dividends having positive effect on companies becoming less financially constrained. As much as 83% of the data sample companies pay out dividens, higher than both merchant shipping 77.8% (Drobetz et al. 2013) and G7 countries sample 4.6% (Bessler et al. 2013).

7.1.2 Macro specific descriptive

Table 7.1.2: Macro variable descriptive statistics

	Years	Mean	SD	Min	Max
Industrial Production	18	0,008	0,023	-0,031	0,046
Industrial Capex	18	0,141	0,123	-0,116	0,377
US Recession	18	0,222	0,427	0,000	1,000
Term Spread	18	0,015	0,011	-0,001	0,029
GDP Growth	18	0,018	0,016	-0,037	0,037
Crude Oil Growth	18	0,146	0,534	-0,608	1,617
US Shale Production	18	0,444	0,511	0,000	1,000
MSCI	18	0,057	0,205	-0,425	0,418
Change Major currency Index	18	0,008	0,075	-0,145	0,117

The table contains macroeconomic variables with their means, standard deviation, minimum and maximum values.

As can be seen from the table above, reporting descriptive statistics on macroeconomic variables is not given in firm year observations, as in the section above. Since data on macro-trends in this thesis's time horizon is similar to all firms across all firm observations, the data is simply repeated for each individual firm timeframe of reported numbers. The macro variables are displayed in year observations instead, and with that one is able to avoid values being bias towards time periods containing abnormally large values (like economic recession). The reason behind this is to highlight and get a more holistic view of the major macroeconomic movements across the time period of this thesis. These movements will alter be used to analyse how and to what extent these variables affect a company's leverage ratio.

Industrial production (or net oil output) shows us the growth rate of total oil volume output per year. Industrial Capex is showing total industrial capital expenditures growth rate. Drobetz et al. (2013) sample defines 1998-2002 and 2009-2013 to be shipping regressions with a mean of 0.051. One can observe a lower mean on Industrial Production, but a more prolonged effect in the same periods (see appendix on historical change on macro factors). As for Industrial Capex one can observe a higher mean accompanied by a standard deviation. From the beginning to present time both industry- output and capex rates have increase, with the latter significantly more than the former, 15,85% and 255.21% respectively. The reason behind this is though to be the increased difficultly and costly endeavours to find/locate and develop cost-efficient/profitable oil fields (Forbes, *Capital Expenditures*, 2014).

In order to capture effects of major economical events that have happened during my time of study, a dummy for US recessions is included. A variable on the American economy has proven from previous research (see, Dayanandan & Donker 2011, Drobetz et al 2013) to be a good indicator on which economic state (growth/decline) we`re in.

Empirical evidence support the claim that there is an invers relationship in the term spread structure which again is associated with future recessions. In times of economic downturn short-term interest rates declines, and the lagged term spread increases. So a smaller term spread might be a good estimator for future recessions (Dahlquist & Harvey, 2001). This statement also seems true for the data collected in this thesis. Term spread is relative low on average, with low levels of volatility and increased spreads during times of recession.

In this thesis timeframe, GDP growth from the G7 countries is historically inline just bellow world´s average real GDP growth historical long-term growth trend (World Bank, *Historical GDP growth*, 2015). One can observed that both maximum and minimum observations in our timeline are close to rest of the world GDP growth rates. Maximum growth comes just before the crisis hit in 2001 (9/11), and the minimum came after the financial crash in 2008-09, with a negative growth rate of -3.76%.

Looking at the Crude Brent Oil price, we see signs of extreme volatility through my sample period. From 1997 price of $17.1 up until Jun 01 2008 price of $139.8 down again to Des 01 2008 price of $45.59, with high levels of change through the last years closing-in with a average of 60% decline in 2014 with a price at Des 01 2014 at $57.33. One can observe a clear connection between MSCI Index movements, economic recessions and declines in Brent Crude prices, as

well the general GDP growth rate. US Shale Oil is included as a dummy. This to catch the potential effect from this source of energy becoming of significance in the energy market as off 2007 (*Shale Oil: the next energy revolution*, PWC. 2013).

MSCI follow the G7 GDP growth rate quite closely, but with some degree of volatility, through this thesis time period. But one has to acknowledge that this sample includes two major financial crisis, these being 2001 (9/11) and 2008 (housing crisis), which do create large deviation from between the two measurements. The changes in dollar value to the other major currencies displays a rather low mean average over my sample period. All time low observation being -14.5% and all time high being recently achieved in 2014, being 11.7%. One might expect the volatility in dollar price to be of great importance, if E&P-industry was unstable and volatile, like shipping (see Drobetz et al 2013) or earlier in the "oil-life cycle", like seismic activity. Being non-off these and actually quite stable, one would at best expect a mild significance when looking at the impact on capital structure.

7.2 Correlation Matrix and Potential Outliers

If one ignores the correlation between market and book leverage, the values remain low and there is no reason to be concerned with the other variables, how they correlate, and if they would possibly have a negative effect on the later performance of the regression. But just to be sure, the certain variables in question will shortly be highlighted and explained. [9]

[9] In econometrics, multicollinarity may occur when two or more independent variables in a regression are highly correlated, meaning that one variable can be predicted from the other (Stock & Watson, 2012).

Table 7.2: Correlation Matrix on Firm variables

	Book Leverage	Market Leverage	Tangibility	Market to Book	Size	Profitability	Dividend Payer
Book Leverage	1.000						
Market Leverage	0.590	1.000					
Tangibility	-0.037	0.023	1.000				
Market to Book	0.095	-0.424	-0.026	1.000			
Size	-0.233	0.181	0.181	-0.345	1.000		
Profitability	-0.150	-0.139	0.120	0.181	0.084	1.000	
Dividend Payer	-0.251	0.035	0.089	-0.310	0.725	0.147	1.000

The table matrix reports the correlation coefficients for both topical dependant variables and how they interact with firm-specific variables. The sample is as always, 1997-2014.

The first one we see, that could cause trouble is the correlation between book leverage and size of -0.233. As is to be expected in a asset driven industry like the E&P industry is, this was to be expected, plus the overall all size of the coefficient is not so large that it might be of a concern. The same rational thinking goes for the correlation between market to book and size, -0.345, as the former is a used as a financial performance ratio, comparing market value to book value. At last one can see a high coefficient value on the correlation between size and dividend pay out of 0.725. This is natural as expected as larger firms often operate on a larger scale and there have the capacity to take on dividend pay out policies to attract and make their company more appreciated by their shareholders.

When considering potential outliers causing problems in practical empirical research, I follow the works of Woolridge (2009). He states that observed outliers could cause problems, if one detected two situations. First situation, errors when entering data. If the person how entered the data added an extra zero to a number, it could potentially throw off the OLS estimates. This has been manually checked for, through review and cross-referencing all data gathered from ThomsonOne with the Orbis database. No potential outliers were found in the thesis database. The second potential problem is if one of the companies in the sample varies widely from the rest of the sample. This is only the case if the variation is extreme, and could be check for by analysing the summary statistics for the sample (Woolridge, 2009). This has been done in the above-discussed descriptive statistics. Compared with other empirical research on the matter Drobetz et al. (2013) and Bessler et al. (2013), I find no values were the variation is of concern, and therefore following Woolridge (2009) see no potential problems from outliers creating problems for my regression results.

7.3 Fixed Effects Model or Random Effects Model

Preforming the random effects model we see that the Ho (null hypothesis) for the Hausman Test for random effects is strongly rejected, having a p-value of 0.0076. As explained in *Methodology* chapter, this means that the unobserved effect of u_{it} has some degree of correlation with one or multiple of the independent variables. The data sample in this thesis is to some degree unbalanced, and consists of unobserved values that vary across entities and/or time. As mentioned earlier, a random effects model demands a balanced data sample, and will therefore not be applicable in this thesis. A fixed effects model is the chosen analytical appliance.

Hausman Test for Random Effects

DF	m Value	Pr > m
5	15.74	0.0076

Parameter Estimates

Variable	DF	Estimate	Standard Error	t Value	Pr > |t|	Label
Intercept	1	0.085434	0.0602	1.42	0.1567	Intercept
Tangibility	1	0.214665	0.0464	4.63	<.0001	Tangibility
Market_to_Book	1	0.016214	0.00661	2.45	0.0147	Market-to-Book
Size	1	0.001218	0.00595	0.20	0.8380	Size
Profitability	1	-0.08751	0.0337	-2.60	0.0098	Profitability
Dividend_Payer	1	-0.03428	0.0244	-1.41	0.1609	Dividend Payer

Figure 10. Panel data regression with Hausman test for random effects model.

7.4 Regression Conditions

Assessing the results from my regression analyses, one could deduct a degree of statistical significance in the numbers presented. The results seem normally distributed and valid enough, with histograms showing a picture resembling the bell curve. And there seems to be no observed problems regarding multicollinearity. When *n,* the number of observations is large enough, the central limit theorem states that results should be approximately true, even if some of Y1,…..,Yn are not always normally distributed (Stock & Watson, 2012). If the regression errors are autocorrelated, the usual heteroskedasticity-robust standard errors form for cross-section data is not valid. Since this is a panel data test, I have used clustered robust standard errors to make the results valid (Stock & Watson, 2012). To obtain the clustered standard errors, I first perform both firm fixed and time fixed effects with white standard errors (*acov*), to produce robust results within a clustered correlation, like my data set. By creating a cluster variable for both firm and year fixed effects, I am allowing for observations in the industry/year to be correlated (that there are interaction across firms/time), but observations in the same firm, but different years, are to be uncorrelated. Then I run regressions with both firm and time-fixed effects clustered by firm ID and using *noint* to suppress the intercept and to handle possible threats of heteroskedasticity and autocorrelation (*Programming Advice*, Kellogg Northwestern University, 2015).

7.5 Regression Results

7.5.1 Results and Discussion of Firm Specific Variables

The regressions are broken done, and run step by step, building onto the model to increase the scope and get a more holistic view of how each independent variable affect book leverage ratio. First the coefficient results is presented, then in the shaded column each respected variables standard error is present, with a star to represent the degree of statistical significance the variable has. To differentiate between time varying and time-invaring effects we also add on time- and firm fixed effects step by step. So, the first model is a standard regression with no firm- or time fixed effects, but with White Standard Errors. The second- and third model is run with firm- and

time fixed effects separately, ending with the fourth including all but clustered by firm. The same procedure is done with the fifth model throughout to the eight, only here we cluster by firm instead of White Standard Error to allow for observation to be clustered within the industry, but there are different observations in different years that are uncorrelated.

Table 7.5.1: Standard leverage regression on firm variables

Dep: Book Leverage

		1	2	3	4	5	6	7	8
Tangibility	0,079	0,0292***	0,074*	0,221***	0,007	0,292***	0,074	0,221**	
	(0,051)	(0,068)	(0,039)	(0,068)	(0,103)	(0,092)	(0,082)	(0,096)	
Market-to-Book	0,004	0,010	0,024**	0,017	0,004	0,010	0,024	0,017	
	(0,009)	(0,012)	(0,010)	(0,012)	(0,016)	(0,018)	(0,019)	(0,018)	
Size	-0,005	-0,003	0,019***	0,025**	-0,005	-0,003	0,019***	0,025*	
	(0,004)	(0,007)	(0,003)	(0,012)	(0,010)	(0,008)	(0,006)	(0,012)	
Profitability	-0,074***	-0,099**	-0,083***	-0,091**	-0,074	-0,099*	-0,083*	-0,091	
	(0,023)	(0,044)	(0,027)	(0,044)	(0,045)	(0,048)	(0,043)	(0,063)	
Dividend Payer	-0,041	-0,024	-0,097***	-0,031	-0,041	-0,024	0,097*	-0,031	
	(0,028)	(0,043)	(0,028)	(0,041)	(0,044)	(0,020)	(0,049)	(0,022)	
Firm Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes	
Time Fixed Effects	No	No	Yes	Yes	No	No	Yes	Yes	
White Standard Error Model	Yes	Yes	Yes	Yes	No	No	No	No	
Cluster by firm	No	No	No	No	Yes	Yes	Yes	Yes	
Observations	321	321	321	321	321	321	321	321	
Adjusted R-squared	0,0689	0,8952	0,7624	0,9003	0,08347	0,9037	0,7764	0,9127	

The table displays the standard leverage regression results with sample of 21 publicly listed E&P companies, in the timeframe 1997-2014.
Standard Errors at firm level are given in parentheses, just below the regression coefficient.
Firm and time fixed effects indicates what fixed effects are included in the given regression.
* Statistical significant at the 10% level. 0,05<p-value<0,10
** Statistical significant at the 5% level. 0,01<p-value<0,05
*** Statistical significant at the 1% level. 0,00<p-value<0,01

In the first regression one can observe results where the coefficients for tangibility, profitability and dividend payer are inline with what our benchmark earlier empirical studies have found (Frank & Goyal, 2009; Drobetz et al., 2013). At the 1% significance level profitability has a negative effect on book leverage ratio with -0,0743. As stated by the pecking order theory, increased profitability make the company more prone towards using internal financing instead of external. The company perceives internal financing, here through equity deposit from profits, as cheaper and less risky. Cheaper because of cost of obtaining external financing, and less risky because increase free cash flows would give the company a buffer for unexpected events and more legroom if sudden possible investment opportunities should occur. The results are also, to a certain degree, inline with the theory that there is an active trade-off between leverage and profits (Frank & Goyal, 2009). The R-Squared of this regression is 6,89%, which gives this first model quite the low explanatory power on what effects book leverage. I therefore continue to add on to

this first model, to try to see if I can increase the explanatory power, and get more significant results to the extent on how each independent variable effect book leverage.

In the second- and third regression model the same variables are included, but here it is also included a fixed effects to the OLS-regression. According to Peterson (2009) and Drobetz et al. (2013), by adding fixed effects one tries to account for the unobserved heterogeneity at the firm and/or time level, and with that increase the explanatory power of the model. Lemmon et al. (2008) has shown that adding a firm fixed- or time-fixed effects significantly increases the R-Squared in the model. In model 2 a firm-fixed effect is added. This entails that capital structure is significantly driven by unobserved time-invariant firm effects. And visa versa for the third model, where time-fixed effect is added. The meaning behind this is that the reasoning behind a certain capital structure is based on an individual difference on a firm-level, time-level or both. A results of this in the second model is that perhaps some of the independent variables included may become less or more significant in their impact on book leverage as the regression now accounts for time-invariant effects (Drobetz et al. 2013). The explanatory power of the model is significantly increased, with R-Squared values of 89.52%. With the third model having an explanatory power of 76.24%. The reader is asked to notice the increase in explanatory power from model 1 till 2 and to 3, as this will be relevant when I further expand the regression.

Examining the second model one can see that both tangibility and profitability display some degree of significant impact on book leverage. Tangibility with a significant positive impact at the 1% level and profitability with a significant negative impact at the 5% level. So, firms with a higher degree of tangible assets are more prone to take on debt. This is in correlation with trade-off theory, as tangible assets are easier to comprehend, the more conceivable it is the more one can reduced adverse selection and agency cost, which finally gives the company a higher degree of leverage capacity (Drobetz et al. 2013). Profitability shows a negative relationship with book leverage, which correlates with the pecking-order theory, somewhat the trade-off- theory and correlates with what was expected for the E&P-industry (read earlier in the thesis). As most often found, internal- to external financing is most often preferred. As described by both Frank & Goyal, (2009) and Drobetz et al (2013), with increased profitability one can observe an inverse relationship with book leverage. This can also be seen as the case for the E&P-industry.

Then examining model three. With only a time-fixed effect added, we see some changes to which of the firm specific variables being of significance. Here size, profitability and dividend payer are

significant at the 1% level. Market to book and tangibility are both of lower significance in their impact with 5% and 10%, respectively. Both firm size and profitability are inline with former empirical research and the predictions done for this thesis on how they affect book leverage. Hall & Weiss (1967) has observed that in real life there are clear signs of a relationship between firm size and the durability of profits. So, the significantly positive impact from firm size can to some degree be explained as a feature in explaining a company's leverage ratio. With dividend payer being significantly negative on its impact on book leverage, I see a correlation with what being stated in the trade-off theory and my own predictions. With its high levels of transparency, dividend payout acts as an attractive way of financing. With low free cash flow for firms' managers come lower levels of agency problems, as the need for increased debt to "control" managers is less prone (Frank & Goyal 2009, Drobetz et al. 2013). Looking at market-to-book ratio I see a positive relationship with book leverage. This is differing from the predictions. As explained by Leary & Roberts (2013) industries with high expectancy of growth being exude a positive impact on book leverage. In my time frame one can see the Brent Crude price grow by close to 265%. This might be a good indicator to explain the expected growth the industry has faced, and with that give a reasoning as to why the impact in positive.

The forth model, is the final model for regressions done with White Standard Errors. Here I have included both time- and firm-fixed effects in hope of increasing the explanatory power and get a more holistic picture of the variables in question. Tangibility becomes again significant at the 1% level, while both size and profitability is significant at the 5% level. All three variables are in correlation with how I predicted them to affect book leverage (tangibility and size being positive, while profitability being negative in its effect). This analysis supports the findings from model two, with an added effect from size also having an impact, as discussed under model three The explanatory power of the model is an R-Squared of 90.03%. Here the reader is asked to remember the stated explanatory power when going from model one to model two and three. What is worth observing is the added effect from going from model one to model two, in comparison with going from model two and three to model four. The increase in explanatory power is much less in the latter than in the former, which might be interpreted in a way that some of the determinants, which act as a foundation for an E&P company´s capital structure decision, might be some degree of unobserved company specific effects, instead of observable effects.

Model five is a repetition of model one, it acts as a starting point for the last three regression models. Here I cluster by firm ID and allow for correlation within a year between firms, but no autocorrelation across years (as described under *7.4 Regression Conditions*).

In model six and seven I see trends on results similar to the ones in model two and three. Adding firm-fixed effects to model six and time-fixed effects to model seven, gives R-squared values of 90.37% and 77.64% respectively. These values are quite close to the ones in model two and three, where adding a time-variant effect gives lower explanatory power to the model. This might make us perceive that the E&P-industry is more prone to be affected by time invariant factors (like firm specific factors) when determining a capital structure then by time variant factors. Either way when clustering by firms I can see that the coefficient results generated can draw similarities to the one in model two and three. Once again I see tangibility being of significance. Model six generates tangibility as having a positive effect on the 1% level. Profitability also exhibits the same trends as in model two, with a negative significant effect on book leverage, at the 10% level. Supporting the claim of size being of significance in model three, model seven exhibits size with a significant positive impact at the 1% level. Also, both profitability and dividend payout have similar impacts as in model three, only here with a slightly weaker significance level.

In the last step of the firm specific analysis I add both firm- and time-fixed effects to the cluster model. The explanatory power reach the highest level detected so far in this analysis with an R-Squared of 91.27% fairly close to model four (just above 1% higher). Looking closer at the results from model eight in comparison with model four, one can draw some lines as to what is the general trends on firm-specific variables having an effect on book leverage. Model eight displays both tangibility and size still having a significant effect, respectively at the 5% and 10% level. With both profitability and dividend payout being fairly close to significant, with quite low p-values. So the economic logic drawn from this is that all through the analysis tangibility as shown to be of great importance to book leverage. Size of the firm also has shown similar signs, although not as strongly. And at last, profitability and dividend payout has through the analysis shown a tendency to have a significant effect on book leverage ratio.

As already touched upon, I see a trend where determinants not dependent on time are of more importance than time-variant factors. Another factor to take away from this analysis is that the larger the size and the "scope" of the company is, the more leverage it seems to take on. So, a

large company, like Exxon, BP or Shell, have a lot off assets where a considerable amount is tangible, this seems to create transparency and reduce adverse selection and make external financing through debt markets more attractive than for a smaller and less tangible company. Since this is an industry dependent on quite large capital expenditures, it makes sense that we therefore observe that larger companies (takes on more debt), when running out of internal financing, turn towards debt capital markets to fund their investments in a industry where income may vary, based on a volatile oil price. In general I mostly observe support for the logic from the trade-off theory, then pecking-order theory when looking at reasoning behind the choice of capital structure in these globally listed companies. This seems quite natural, as they are all, on an average market scale, quite large companies and all are publicly listed. Here the advantages from a trade-off from the bankruptcy perspective and the agency perceptive could be of significance. Trying to optimize the capital structure in these companies are of great importance in the sense that tax-savings/losses could be huge, and a potential bankruptcy could also have large ramifications. As these companies are operating on such a large scale, the need to "keep managers in check" and decrease manager-shareholder conflicts are of great importance. So, as mentioned earlier in this thesis, leverage might here act as disciplinary tool, keeping managers "on a straight line". Except for the market to book ratio, the results from this analysis are inline with the relevant comparables from earlier empirical research (see *table 3.2*). Also, when looking at the coefficients and in what directions they affect book leverage; their behaviour corresponds with the general trends from the G7 research by Frank & Goyal (2009) and from the merchant shipping research done by Drobetz et al. (2013).

7.5.2 Results and Discussion of Macroeconomic Variables

In this second analysis I will present the regression coefficient results when including macroeconomic variables. By dividing the macroeconomic variables into different groups I am trying to avoid the leverage-ratios cyclicality. Attempting to separately create an image of how each "macro-group" affect book leverage. The assumption is that macroeconomic variables will affect the company´s ability to raise capital is perceived to be of importance, as the E&P industry is the main supplier of the energy source which pt. is still the most demand through this world (EIA, *World Energy Consumption*, 2013). In general, demand for a good being significantly affected

by macroeconomic events is empirically proven in Drobetz et al. (2012) research. I would therefore presume that the same goes for E&P output of oil & gas.

The results of my regressions are shown in the table bellow. Model one is a repetition of model two in the firm-variable analysis above. By including firm fixed-effects I am trying to see if macroeconomic events might influence a company's capital raising and with that encourage them to choose different levels of leverage at different points in time Following the line of though from Drobetz et al. (2013) and Erel et al. (2012), time fixed-effects is excluded from the regression, as it might absorb the "business-cycle effect" and thereby create biasness in the regression results. The results in model two, three and five are from regressions, where each "macro-group" was been individually added to see how they affect my dependent variable. Respectively industrial growth parameters, industrial price drivers and lastly general macro trends. Model four and six are summing up and showing, respectively, how "all" industry factors are affecting and a sum-up of "all" factors, and how they affect book leverage.

Table 7.5.2: Standard Leverage regression on macro variables

	1	2	3	4	5	6
Dependent Variable: Book Leverage						
Tangibility	0.29209***	0.2751***	0.2811***	0,2392***	0,2594***	0,2093***
	(0,06819)	(0.0675)	(0.0671)	(0,0662)	(0,0667)	(0,0651)
Market-to-Book	0,01029	0.0112	0.0102	0,01299	0,01876	0,0196
	(0,0125)	(0.0131)	(0.0120)	(0,0124)	(0,0126)	(0,0125)
Size	-0,00313	-0.0011	0.0108	0,0201*	0,0042	0,02346**
	(0,00725)	(0.0071)	(0.0101)	(0,0103)	(0,0097)	(0,0107)
Profitability	-0,09934**	-0.0832*	-0.1178**	-0,0922**	-0,1021**	-0,0823*
	(0,04459)	(0.0448)	(0.0469)	(0,0433)	(0,04477)	(0,0428)
Dividend Payer	-0,02408	-0.0212	-0.0282	-0,0231	-0,0311	-0,0303
	(0,04301)	(0.0425)	(0.0431)	(0,0430)	(0,0422)	(0,0418)
Industrial Production		0.1841		-0,0450		-0,2112
		(0.1618)		(0,1795)		(0,222)
Industrial Capex		-0.0839**		-0,1483***		-0,1455***
		(0.0335)		(0,0369)		(0,0366)
Crude Oil Growth			-0.0050	-0,0219**		-0,0088
			(0.0082)	(0,0102)		(0,0132)
Us Shale Production			-0.0293**	-0,0443***		-0,0393***
			(0.0112)	(0,0120)		(0,0131)
Us Recession					0,0274**	0,0288
					(0,0152)	(0,0181)
Term Spread					1,4356***	1,6232***
					(0,3987)	(0,4254)
GDP growth rate					1,743***	1,5924**
					(0,5753)	(0,7262)
MSCI					-0,0671**	-0,0489
					(0,0325)	(0,0371)
Change Major Currency Index					0,0397	0,0891
					(0,0582)	(0,0624)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	321	321	321	321	321	321
Adjusted R-Squared	0,8952	0.8966	0.8967	0.9006	0.8987	0.9038

The table presentet shows regressions run with book leverage as a dependent variable, focusing on macroeconomic independent variables. As the table on firm specific, the regression here is also based on the 21 E&P-companies chosen, in the time frame of 1997-2014. Each variable is shown with its attached coefficient results, with the the clustered robust standard error at firm level shown in parentheses under each variable. Firm-fixed effects are

* Statistical significant at 10%-level

** Statistical significant at 5%-level

*** Statistical significant at 1%level

Giving model two a closer look, I was startled to find that industrial production had no significant effect on book leverage. As industrial production is a measurement of total output (how much oil is pumped up and then sold forward), one could argue that the reason for it not being of significant on a companies capital structure is because, contrary to the merchant shipping industry (research by Drobetz et al. 2013), the E&P-industry operate without

orderbooks. Meaning that production and sales are much less volatile, revenue streams are steadier and more predictable, and therefore not that significant on the choice of capital structure. Industrial capex on the other hand shows a clear significant impact on book leverage ratio. With a negative impact on the 5%-level, how much is spent on capital investment follows the thoughts of both the pecking order- and the market timing theory, and how we earlier in the thesis predicted how it would impact our dependent variable. As shown in the descriptive analysis, industrial capex has through this thesis timeframe shown a growth rate with relative high levels of volatility. With increased difficulties in locating oil wells and harsh weather conditions oil productions has been through these last 17 years shown to be increasing with a counter-cyclical effect on book leverage.

At a first glance one can observe in model three a crude oil growth having insignificant effects on book leverage, just as surprising as industrial production in model two (more on this in model four). What we do see is that US discovery of major shale oil reserves (EIA, *U.S. energy imports and exports*, 2015), as the world's largest importer of oil related energy products (EIA, *China worlds largest energy consumer, 2015*), has had a significant negative impact on the 5%-level (PWC, *Shale Oil: the next energy revolution*, 2013). So, generally speaking an increase in oil prices and oil reserves are having a positive effect on the industries revenue-stream (Dayandaran & Donker, 2011). With increased cash flows, and following both the pecking order theory, where a company would choose internal over external financing, and the market timing theory where equity issuing is preferred over debt in a positive market we see a counter-cyclical effect from US Shale Production on book leverage.

In the model four we have included all industry specific macro variables. Up until now, this the model where wee see most variables having a significant impact on book leverage. Industrial capex continues to be of significance, now with a negative impact at the 1%-level. Growth in the crude oil price now shows a negative significant impact at the 5%-level confirming the argumentation from the model above on how a "boom" in the E&P industry affects a company's capital structure. As in the previous model Us Shale production have a significant negative impact, now at the 1%-level.

Now to model five, where industry variables are replaced by more general macro variables. Following earlier stated prediction, on how macro-variables affect book leverage, one can now observer a clear counter-cyclical relationship between capital structure in the E&P-industry and

the more general market conditions, here represented by a US recession dummy. So, when the market turns sour (has negative growth) on can observe an increase in the dependent variable. The US recession dummy variable has a positive impact at the 5%-level (since its a dummy, represented by a 1 for when the event occurs, this means a negative relationship). These results are in correlation with both the market timing- and the pecking order theory. First following market timing theory, Baker & Wurgler (2002) found companies tend to issue equity in good market conditions, where investors try to position themselves for future growth. The opposite has shown to happen, with leverage being preferred in economic downturns. Second, hard times in market might decrease spending and increase investor scepticism. In a recession most investors appear wary and bleaker market-outlooks increase risk aversion, which again limit the supply of equity available for companies. So, following the pecking order theory, a market in recession will most likely experience decreased earnings, making internal financing hard to obtain, leaving external financing as the second best capital funding solution. Equity has a significant degree of adverse selection and becomes more expensive as investors are observing companies possibly experiencing financial distress, and will therefore demand a higher return on what they perceives as a more risky investment. As the pecking order theory states, summing up these factors one would preferred debt as the choice of funding in times of economic downturn.

Adding the other world economy variables to the regression, as shown in model five, have almost the same explanatory power compared to the model four, with a explanatory power of 89.87% in model five to 90.06% in model four. One could interpret this to mean that these more "general" macro trends do in fact also have some degree of significant impact on book-leverage. This is confirmed by the degree of significant results we see from lagged term spread, GDP growth rate and MSCI.

The lagged term spread shows a strong significant effect at the 1% level. Against the earlier predictions, term spread draws on the trade-off theory and shows a pro-cyclical relationship with book-leverage. So, following Dahlquist & Harvey (2001) findings; when term spread increases, an indication of a economic downturn. Here we see increase in book leverage. Drawing on the trade-off theory it seems that most companies might use debt as a disciplinarian tool to reduce manager-shareholder conflicts in less prosperous times. Increased leverage might restrain managers' willingness to take on more risky projects. So as mentioned in the *chapter 2 Capital Structure Theory* and proven by Jensen (1986), one could interpret leverage, in these situations, as a way of decreasing agency problems associated with free cash flows.

The coefficient of GDP growth rate indicates a strong pro-cycle relationship with book leverage at the 1%-level. This is comes as a surprise and is contrary to predictions for this thesis. Results here follow the logic from the trade-off theory, which again, as with the lagged term spread, we can interpret this as Frank & Goyal (2009) explain, leverage as a tool to influence managers' control. Since GDP growth is a good indicator for a prosperous economic environment, one has observed company management in these times announcing dividend payout in all foreseeable future (Seadrill, 2015). As explained in the *chapter 2 Capital Structure Theory*, such claims have weak foundations, since no one can predict the future. So instead of issuing equity in situations with high levels of free cash flow, E&P-companies could take on more leverage, and thereby committing to there claims on dividend payout.

As one analyse the last variable of significance in model five some confusion might occur as to the indicator being the opposite of GDP growth rate. The MSCI coefficient can be observed as being counter-cyclical in its relationship with book leverage, at the 5%-level. As the coefficient is negative it supports the earlier predictions and are inline with both the pecking order theory and the clearest point in the thesis, a support for the market timing theory. As explained in the theory chapter (chapter 2), Baker & Wurgler (2002) has found evidence that companies adhere to stock market movements, and issue equity in a positive, rising market and vice versa in a declining market. Contrary to Drobetz et al (2013) findings on the merchant shipping industry, one can here observe an E&P industry taking into consideration stock market movements.

The last and final model is a combined model of all macro variables from the earlier regressions. Model six is added in the thesis to give a more holistic view of what variables displays a trend of reappearing as significant in explaining movements in book leverage. With the final model having am explanatory power of 90.38%, quite consistent with the previous macro regression, one could support the claim that macro specific events do play a significant role in explaining movements in companies book leverage. In general one could say that the results of significance are inline with the stated claim of a counter-cyclical relationship with E&P-companies book leverage. Nevertheless, the results are not 100% definite since results from term spread and GDP growth rate indicating opposite effects to first proclaimed in this thesis. Also one could observe something of interest, if you look at the fairly closely related shipping industry in Drobetz et al. (2013). When look it their models and finding the one with the highest level of explanatory power, which is model three or model five with 74.7%, one see a tendency of macroeconomic events being of more importance when determining capital structure in the E&P industry

compared to the shipping industry. One gets a slightly different impression of how differences in firm- and macro variables impact capital structure determinants when analysing this thesis results together with the shipping industry. Looking at the firm specific variables one could say that E&P companies mostly follow the reasoning from the trade-off theory, with some hints of pecking order theory, when determining a capital structure. When it comes to macro specific variables one sees mostly actions in coherence with the pecking order theory and also hints of market timing theory.

7.6 Further Research

In this sub-chapter there will be a summary of what I´ve found to be the strengths and weaknesses of this thesis. By pointing out limitations I will also give a notion to which areas potential further research might be needed and/or of interest.

With a rather small data sample size, only 353 firm-year observations taken from 21 E&P companies, critics could argue that the regression results would be biased towards what's called the major oil & gas companies. By including even more companies into the data sample one could hope to increase the statistical reliability of the thesis and get an even more general sense of what drives the E&P-industry.

On the other hand conducting regressions where one can observe variables of clear statistical significance with models having explanatory powers waking around high 80s low 90s, gives a contrary indications to the results where a critic being sceptical to the size of the data sample. The data sample includes companies ranging from DNO being a small-to-middle cap company with a narrow operating field (West-Africa and Middle East), 977 some employees, asset size around 1 billion USD (DNO, homepage, 2015) to ExxonMobil as a world operating "super-major", with 75 000 employees and asset size of 350 billion USD (ExxonMobil, homepage, 2015). As explained in chapter *7.2 Correlation Matrix* the thesis avoids winzordising so as to not cut of any potential outliers which might have been of interest, as the companies do not vary so much in firm parameters. So the sample includes all companies' size and would therefore, given the quite consistent high R-squared, give a clear insights into what are the driving factors when determining book leverage.

When it comes to further research on the topic at hand there are aspects that might increase our understanding and shed a new light on how capital structure is decided in E&P-companies. First, by adding new or more alternative determinants one might take this area of research forward. An example of this could be political cloud or taxes. In both cases I suggested that a more qualitative approach is employed political cloud in the sense that one might find companies getting unfair advantages based on their connection to the political powers in their operating areas. By conducting interviews of key personnel currently and previously in the company, one might be able to paint a clearer picture and see correlations between political power-switches and changes in a company capital structure. Tax, as already discussed, is a large part of the cost of running an E&P-company. Interviewing key company personnel will also here be of importance, and even more so local government officials to get an honest insight into what actually is paid and can be defined as tax both now and historically in the country in question. Second, a deeper and more accurate understanding of the reported book leverage. What is included and how is it structured. Analysing what kind of leverage do the companies take on, conventional bank loans, short and/or long-term bonds etc, and one might be able to see if there are different factors driving each type of leverage.

7.7 Conclusion

My thesis aimed to shed a light on the underlying factors determining an E&P company´s capital structure. All companies included in the data sample are publicly listed and in total has operations all around the world. The timeframe for this thesis was 1997-2014, with both booming and declining markets. Firm specific data was drawn from ThomsoneOne Worldscope, with inputs on missing data points from Orbis. Industry specific macro variables were gathered from Rystad Energy. The remaining macro trends were generated using data from Federal Reserve Bank of St.Louis (FRED – St.Louis).

The results generated from my regression has shown some variables having more of a significant impact on book leverage than others. With the firm specific variables the trade-off theory seems the most appropriate theoretical model to explain why E&P-companies takes on a certain level of leverage. Tangibility and size are the most influential variables following the trade-off theory. They have a positive significant impact on book leverage. After these two, the regression results have also shown profitability having a certain degree of negative significant impact on book leverage, inline with the pecking order theory. With high levels of R-Squared the models of this thesis can be said to have a important saying into what is explaining capital structure. Nevertheless, I have observed some changes when going through the regression steps. The data sample generates results of higher explanatory power when adding company-variant factors contrary to time-variant factors. So, unobserved company specific effects seem to play a role when deciding how to structure ones balance sheet.

When it comes to macroeconomic variables, the pecking order theory and market timing theory are best at explaining how international events affect an E&P-company´s capital structure. GDP growth rate and lagged term spread following the market timing theory meaning that when these to trends are positive you observe companies trying to "time" this and increase their leverage. All other variables of significance display a counter cyclical impact on book leverage. Simply said; when the market goes up, book leverage goes down.

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8. Appendix

8.1 Definition of Variables

Table 8.1: Definition of Variables

	Definition	Source	Formula
Company specific variables			
Book Leverage	Ratio of long- and short-term debt over total value of book assets	ThomsonOne	(LT Debt + ST Debt)/Total Book Assets
Market-to-Book	Ratio of the market value of assets to the book va	ThomsonOne	Enterprise Value/ Total Book Assets
Asset Tangibility	Ratio of fixed to total book assets	ThomsonOne	Net PP&E/Total Book Assets
Firm Size	Natural logarithm of total book assets	ThomsonOne	Ln(Total Book Assets)
Profitability	Ratio of EBITDA to total book assets	ThomsonOne	EBITDA/Total Book Assets
Dividend Status	Dummy variable for dividend payment	ThomsonOne	1 =dividend payment, 0=no dividend
Macroeconomic Variables			
Industry Output growth	Total Oil Barrel Production growth per year	Rystad Energy	
Industry Capex growth	Total Industry Capital Expenditures	Rystad Energy	
Brent Crude Oil Price growth	Annual change in the Brent Crude Oil Price	Rystad Energy	
US Shale Oil Pirce growth	Annual changes in the US Shale Oil Price	Rystad Energy	
US Recession	Indicator dummy variable. 1=two quarters of negative economic growth, otherwise 0.	Dayanandan & Donker (2011)	
Term Spread	One period lagged term spread between the 10 year- and the 1 year interest series of US tresuries	St.Louis Fed	
GDP growth rate	Aggregated growth rate in G7 countries	St.Louis Fed	
MSCI	Annual changes in world stock market returns by MSCI World Index	MSCI database	
Change in Major Currency Index	Annual change in the real-trade weight US dollar index	St.Louis Fed	

8.2 Requierments in a Regression Model

If a multiple OLS-regression is to show validity, four presumptions must be met.

Normality

The length between the single observation and its mean must be normally distributed with a mean $\mu = 0$ and variance $\sigma^2 = 1$, denoted $N(0,1)$. A test, shows the degree of skewness and the level of symmetrical distribution around the average. Kurtosis is a measurement of mass within the tail of the probability distribution. Looking at the null hypothesis, when the observations are

normally distributed and symmetric around the mean, both kurtosis and skewness are in line, then one can presume normality (Stock & Watson, 2012).

Linearity

For the results to be valid, one tries to make the model, the dependent variable *y*, linear with coefficients from the independent variables. When linearity is not obtainable, f.ex with firm size, one addresses this problem by changing the independent variable in question to logarithmic form. So a 1% change in X is associated with a change in Y of 0.01 (Stock & Watson, 2012).

Homoscedasticity

The error term μ is homoscedastic if the variance ($Var(e|x) = \sigma^2$) is constant for the conditional distribution of μ given $x\ i=1,\ldots,n.$ and does not depend on x. Otherwise, the error term is heteroskedastic. If the residual show signes of heteroskedasticity the regression analysis could become invalid, as the test for significance assumes that the modelling errors are uncorrelated and uniform- meaning that the variance do not vary/trend with the effects being modelled. The problem of heteroskedasticity can be overcome by using the **White Standard errors test** (Stock & Watson, 2012).

Multicollinearity

If two or more of the explanatory variables are correlated, it might become problematic to determine the causality of the relationship. Meaning, which explanatory variable is actually having an effect on the dependent variable. This is can be tested for by calculating and analysing a correlation matrix (Stock&Watson, 2012).

Autocorrelation

Autocorrelation is the correlation between a time series residual variable and its lagged value (it is correlated with itself, at different dates). For a fixed effects regression, the challenges of autocorrelation and heteroskedasticity can be overcome by using **clustered standrad errors**. Here, the standard errors allows the regression errors to correlated within a cluster or group, but assume that the regression erros are uncorrelated across clusters/groups (Stock & Watson, 2012).

8.3 Data and Representativness

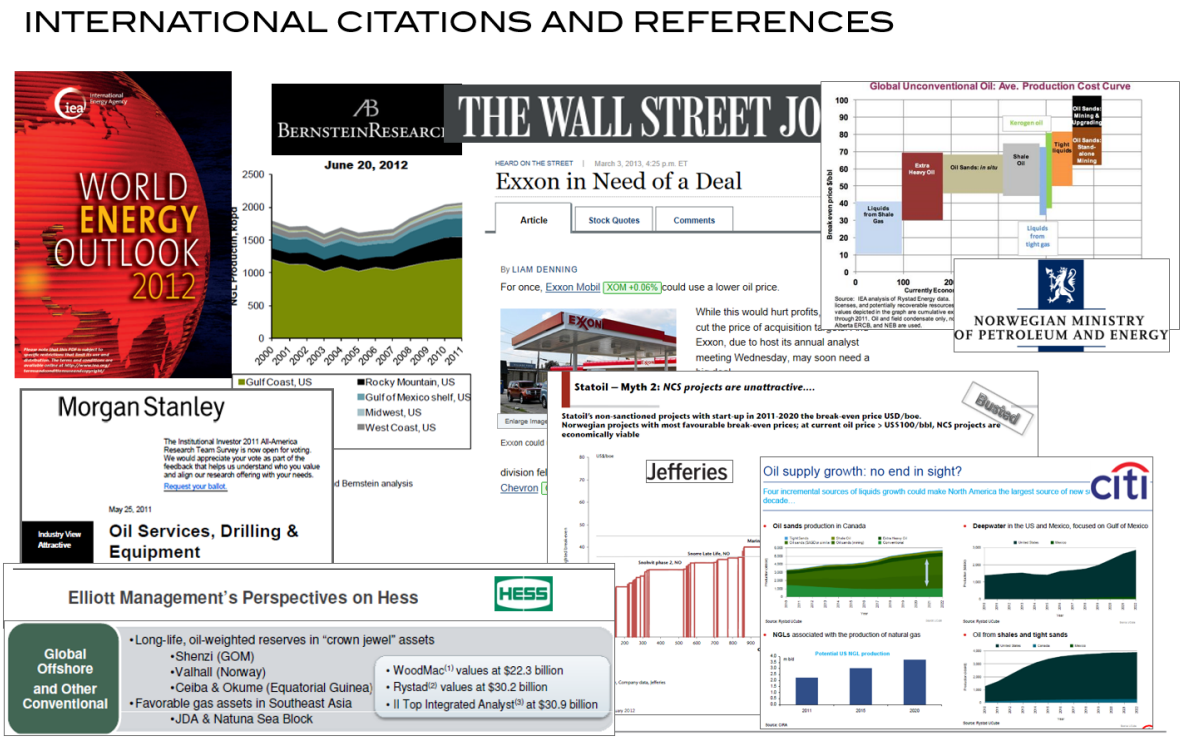


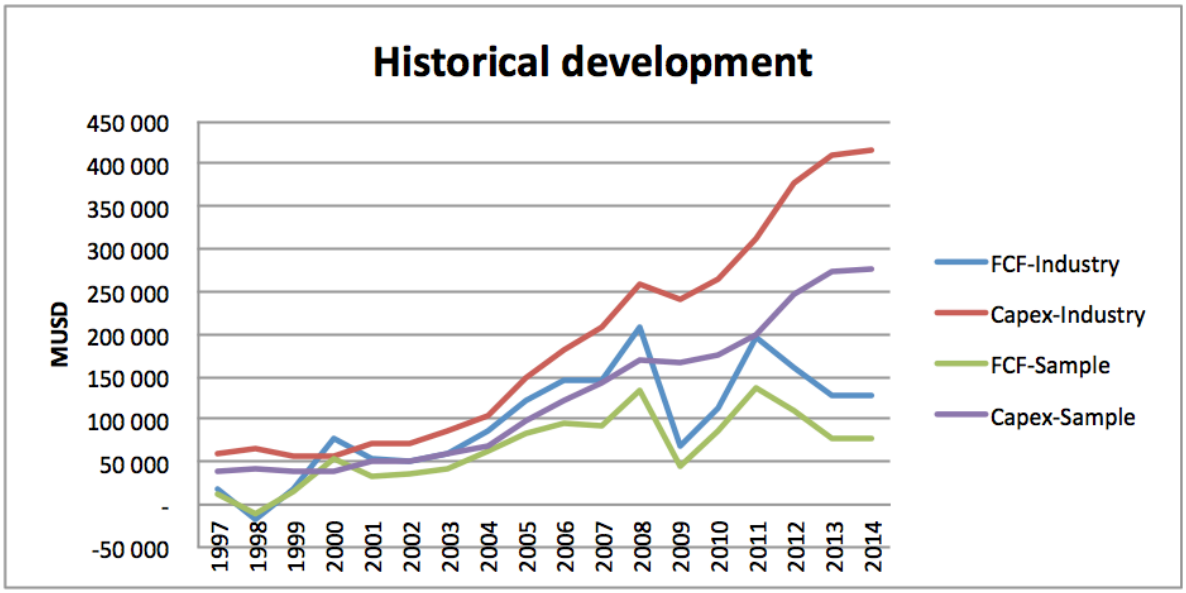
Figure 11: Credibility and usage of Rystad Energy database (2015)

Table 8.3.1: List of data sample with industry total.

2014	Company name	Production Output (kbbl/d)	Free Cashflow (MUSD)	Capex (MUSD)
	ExxonMobil	2 096,92	6 371,02	29 437,67
	BP	1 632,73	7 114,66	15 891,28
	Shell	1 498,78	8 134,10	25 583,05
	Chevron	2 021,56	8,57	32 668,77
	Total	1 061,72	-1 500,88	23 507,92
	ConocoPhillips	764,03	1 194,37	16 674,89
	Eni	923,18	5 593,18	11 915,85
	Petrobras	1 985,98	8 524,68	18 625,81
	Statoil	929,56	3 911,03	14 636,62
	Lukoil	1 880,06	3 561,34	11 938,82
	Imperial Oil	81,57	-160,07	1 367,83
	Tullow Oil	64,69	-242,74	975,18
	Lundin Petroleum	17,78	-836,75	1 323,57
	Rosneft	3 934,12	20 003,33	10 707,06
	Repsol	208,25	-149,00	4 746,57
	Sinopec	945,92	2 015,68	9 064,13
	CNOOC	1 011,52	6 718,00	12 291,90
	PetroChina	3 181,30	7 136,09	32 641,11
	DNO	60,19	89,48	260,47
	Det Norske	58,21	11,13	762,97
	OMW	150,00	928,96	2 258,88
	Thesis total	**24 508,07**	**78 426,18**	**277 280,35**
	Industry total	73 146,48	127 053,00	417 121,00
	%-of industry total	34 %	62 %	66 %

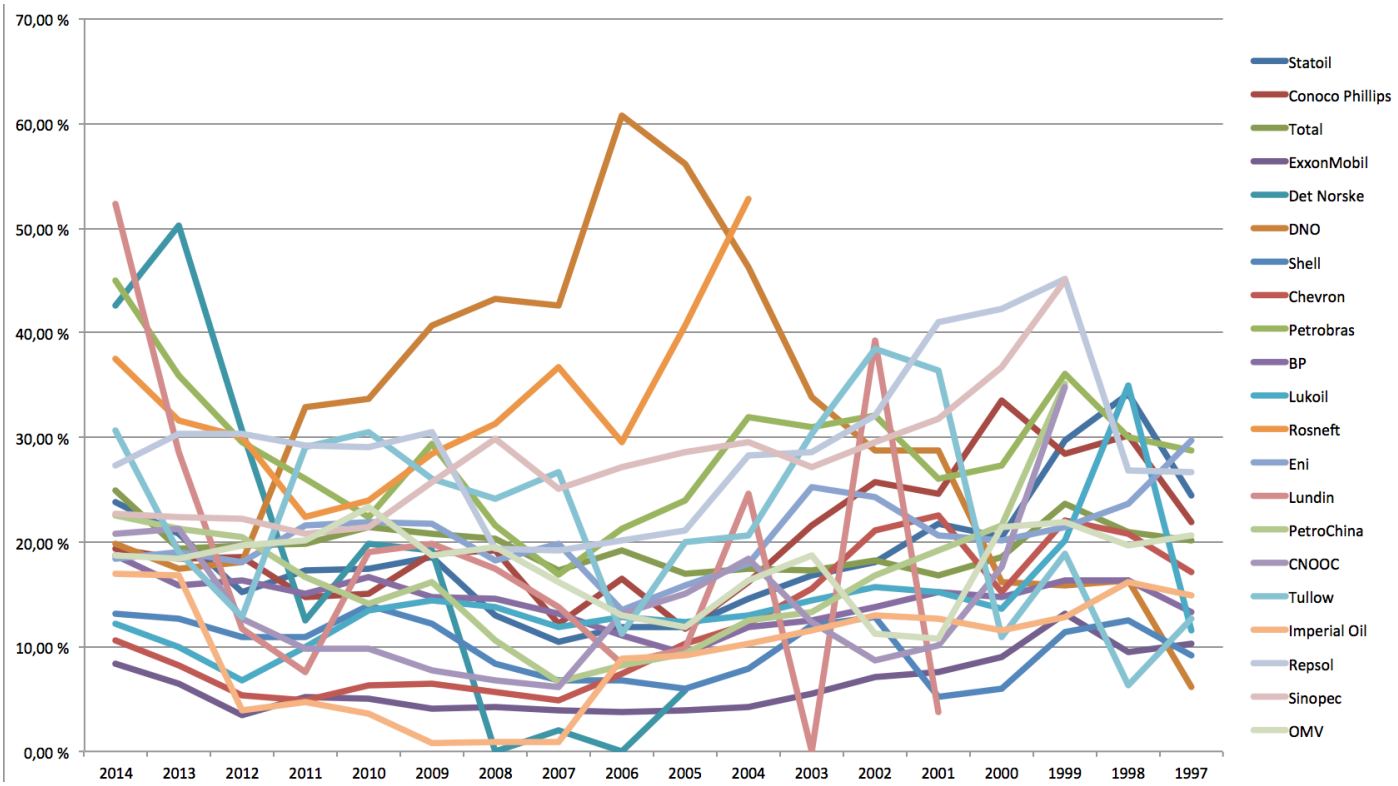
The table displays my sample of E&P companies, with FCF Capex and industry totals for 2014. Source: Rystad Energy

Table 8.3.2: Graph showing historical Free Cash flows and Capital Expenditures



8.4 Descriptive statistics

Table 8.4: Graph showing all data sample companies historical book leverage.



Source: Rystad Energy. A table displaying the entire sample og companies and their histroical book leverage. 2015.