Applying "Financing and takeovers" by Morellec and Zhdanov (2008) to a real-life case.

A thesis about capital structure in a merger context

Paper: Master thesis in MSc Finance and Investments

Authors:

Tuva Firing Sollid, student number: 107806

Louise Karete Bergh Heidal, student number: 107592

Programme: MSc in Finance and Investments

Supervisor: Kristian Miltersen - Department of Finance

Date: September 14th, 2018

Institution: Copenhagen Business School

Standard pages and Characters: 90 pages – 143 567 characters

Abstract

The purpose of this thesis was to create a model based on the article "Financing and takeovers" by Morellec and Zhdanov (2008) and explore whether this model could be applied to a real-life case. We have compared the theoretical equity value with the observed market value. The model of Morellec and Zhdanov (2008) considers the role of leverage in a takeover contest, jointly determining financing strategies and the timing and terms of the takeover. We developed our own model based on this framework, by changing it from a cash flow approach to a firm value approach, using simple linear regressions. We extended the model to include fixed costs and made a set of assumptions to answer our problem statement. Our results showed a 25% difference between the theoretical equity value and the observed market value. Based on these results it can seem that our model is applicable for the real-life case used in our thesis, although additional testing with other real-life cases is necessary to draw a final conclusion.

Preface

This thesis represents the final period of our master's degree in finance and Investment, which equals 30 ECT credits.

Based on studying the course Corporate Finance, both of us have got an increased interest for capital structure and mergers and acquisitions, and the field real options from the course Derivatives and Fixed Income. This combined with an interest in Norway's biggest income source, the petroleum industry, was the underlying motivation for the choice of topic. Moreover, we choose Aker BP as our case, since the merger happened recently, and it is a major company on the Norwegian Continental Shelf. We hope that our choice of problem not only will serve as a dive in our own interests in this area, but also as a constructive contribution to the corporate finance literature.

Further we would like to thank our supervisor, Kristian Milters, for a good and constructive cooperation throughout the semester.

Overview of figures

Overview of tables

Table of Contents

1. Introduction

The research on mergers and acquisitions (M&A's) and the motivations behind takeovers is extensive. Firms pay huge amounts to acquiring other firms in order to create additional value through synergies, the so-called 2+2=5 effect (Damodaran, 2005). Synergies can be created in many ways, for instance, higher debt capacity and diversification (Berk and DeMarzo, 2014). There is often potential for synergies in M&A's, however, acquirers often fail to create synergies in practice and it is not seldom that shareholders overpay for synergies (Damodaran, 2005). According to a report by Harvard Business Review, the failure rate of mergers and acquisitions are found to be between 70% and 90% in many studies (C. M. Christensen, Alton, Rising, & Waldeck, 2011).

The role of capital structure in a takeover contest is a research area within M&A literature that is not extensive to this date. Literature suggests that the bidder with the lowest leverage wins the takeover contest and tends to lever up after takeover is accomplished (Bruner, 1988; Morellec & Zhdanov, 2008). The bidder who wins the takeover contest becomes a growth firm and invests, while the losing bidder becomes a value firm and does not invest. In this way debt plays a strategic role in the takeover contest. Real option theory is relevant in terms of takeover activity, because takeover is often uncertain due to the optimal timing of the takeover. The firm has options related to delay and wait for the optimal time to acquire, and options to default, both before and after takeover (Morellec & Zhdanov, 2008). Morellec and Zhdanov (2008) analysed the impact of a firm's capital structure in relation to the outcome of a takeover competition between two potential bidders. They are isolated looking at the linkage between leverage and the takeover contest. Their research paper "Financing and Takeovers" presents the ground of our thesis, which is further supplemented with our own adjustments to answer our problem statement.

1.1 Purpose of the thesis

Our model builds on the model framework of Morellec and Zhdanov (2008) and partly by Leland (1994). The model of Morellec and Zhdanov gives the theoretical optimal leverage in a takeover situation and we want to investigate if the model can be applied to a real case. We are going to explore this by finding the theoretical equity value and compare it with the observed market value. The value should be as similar as possible for the model to fit with real case. To our knowledge, this has not been done previously using the framework of Morellec and Zhdanov (2008). The problem formulation is presented below:

Can we apply the model of Morellec and Zhdanov to a real-life case?

The model of Morellec and Zhdanov (2008) is based on a cash flow approach, however, we will use a total firm value approach. We are only using data and information that are available to the public and we are mainly using academic books, relevant research papers and annual reports.

1.2 Structure

Chapter 2 consists of an introduction of the petroleum industry and the development of the oil price. The chapter begins with a presentation of the Norwegian petroleum industry, followed by the global petroleum industry. We will also present basic theory regarding modelling the oil price.

Chapter 3-4 aims to provide the reader with some general theoretical background about mergers and acquisitions, and theories about optimal capital structure.

Chapter 5 explains the model of Morellec and Zhdanov (2008), followed by an outlining of our model.

Chapter 6 present the case of Aker BP and describes all the firms involved in the merger.

Chapter 7 is the main analysis. The chapter starts with an explanation of our regressions, which is followed by finding the bankruptcy level and lastly, calculating the theoretical equity value.

Chapter 8 represents the comparative analysis. In this analysis we will perform a comparative analysis of the equity value, synergies and bankruptcy level.

In **Chapter 9-10** we will limitations of the thesis, as well as a final conclusion and further perspectives.

2. The petroleum industry

In this chapter we will present the petroleum industry, both the Norwegian petroleum industry and the global industry. Then we will describe the oil price development and the modeling of the oil price.

2.1 The Norwegian petroleum industry

The Norwegian petroleum industry started up for more than 50 years and plays a key role of the development of the welfare state in Norway. The industry has become the most important industry regarding the revenues, investments and share of total value creation in Norway (Norwegian petroleum, 2018c). Since the beginning, the Norwegian petroleum activities have generated a value creation of about 14.000 billion kroners measured in today's kroner value (Olje- og energidepartmentet, 2018). There are still large resources on the continental shelf and major development projects such as Johan Sverdrup, which is in process up to date (Norwegian petroleum, 2018c).

2.1.1 The history of the Norwegian petroleum industry

A gas discovery in Groningen in the Netherlands in 1959 was decisive for starting to look for opportunities for oil and gas extraction in the North Sea. This led to people getting the prospect of the possibility of discovering hydrocarbons under the North Sea. In 1962, the American company Philips Petroleum wanted to start an explorative search in the North Sea. However, the Norwegian authorities was not interested in having only one company with exclusive rights for exploration on the NCS (Norwegian continental shelf). More companies needed to be involved and later in the 1960s, 22 production licenses were awarded. The first exploration well was drilled in the summer of 1966 by Esso, but it was dry. As a result, first discovery of oil on the Norwegian Shelf was done in 1967, called Balder, but as it was not profitable at that point in time it took 30 years before the field was finally developed. In 1969, Phillips Petroleum discovered the oil field Ekofisk, which is among the largest oil fields discovered. In the years following, a number of major discoveries were made, for example Statfjord, Oseberg, Gullfaks and Troll. These oil fields are still operating and are of major importance for the Norwegian petroleum industry. In the early 1980s exploration also started in the Norwegian Sea

and Barents Sea. The production started in the Norwegian Sea and in the Barents Sea, in 993 and 2007 respectively (Norwegian petroleum, 2018c).

2.1.2 The Norwegian petroleum industry today

Norway is the eight largest oil producer and the third largest gas producer in the world (Ministry of Petroleum and Energy, n.d.). Norway's crude oil production covers about 2% of the global demand. However, Norway supplies about 25% of EU demand, which makes oil and gas two of Norway's most important export commodities. Most of the oil and gas deriving from Norway is exported and the value of the oil export was only marginally above the gas export in 2017 (Norwegian petroleum, 2018b).

Due to consolidations on the NCS, the numbers of companies have decreased and there are currently 43 active companies here. These are large international global consolidations, large Norwegian companies and many small companies, both national and international. The diversity and competition among the players are important to ensure effective exploration and resource utilization in the fields. Statoil is the company with the highest expertise and knowledge regarding the NCS and is the operator of several of the larger and older fields on the continental shelf. This makes the company crucial for the overall value creation (Norwegian petroleum, 2018a).

It is estimated that about 45 % of total recoverable resources on the NCS have been produced and sold. Hence, there are considerable amounts of resources left, and the level of production activity on the NCS is expected to continue to be high for the next 50 years. More precisely, it is expected to remain stable for the next few years and then increase from the early 2020s. In the longer term, the level of production will depend on new discoveries, the development of these, and an improved utilization of already existing fields (Norwegian petroleum, 2018d).

2.2 The global petroleum industry

The world is heavily dependent on fossil energy and as much as 81% of the world's energy comes from fossil energy (Energi og klima, 2018). Oil covers about 33% of the world's energy demand and the largest oil producers in 2016 was the United States, followed by Saudi Arabia and Russia. In 2016, The

Organization of the Petroleum Exporting Countries (OPEC) accounted for about 30% of global oil production (Norwegian petroleum, 2018b). There are 14 member countries of OPEC, and the purpose of the organization is to align the petroleum politics of the member countries and secure stable oil prices. The organization was founded by Iraq, Iran, Kuwait, Saudi Arabia and Venezuela (Gundersen, L., Lundeberg, 2018). The petroleum industry is consisting of different companies, mainly international companies such as Amoco and ExxonMobil, and governmental companies, such as Equinor and National Iranian Oil Co. The petroleum industry is known for cooperation between large oil companies which are dominating the marked through cartels and cooperation agreements. These companies still represent a strong position, although in later years, the OPEC countries have attained a stronger influence on the production (Gundersen, L., Lundeberg, 2018).

2.3 The oil price

Oil has been the dominant source of energy for around 60 years, and the commodity that had the greatest impact on politics and economic strategies on a global level (Deutsche Bank, 2013). The oil price is also assumed to be the most crucial value driver in an oil project, and hence, important when valuing an oil firm (Lund, 1997). In the following we will look into the oil price and its risk factors.

2.3.1 Oil price exchanges

Oil can be exchanged at the spot rate and through futures contracts. There are several different variations of oil traded, but the two most common proxies used for the oil price is Brent crude or West Texas intermediate (WTI) (Deutsche Bank, 2013). Brent crude oil originates from the North Sea, while the WTI oil originates from the United States (Investopedia, n.d.-e). In the thesis we will use the Brent crude oil as a benchmark for the oil price.

2.3.2 The history of the oil price

When looking at the oil price development, it includes both long and short term fluctuations, as can be observed from the graph:

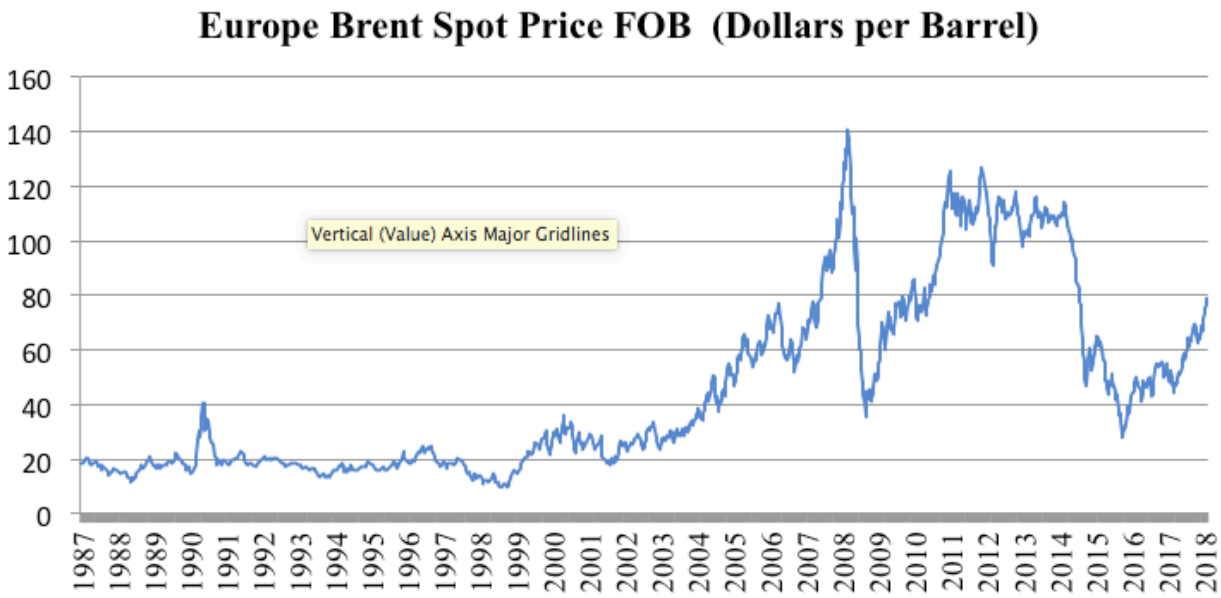


FIGURE 1 – THE HISTORICAL DEVELOPMENT OF THE OIL PRICE, OWN PRODUCTION BASED ON U.S ENERGY INFORMATION ADMINISTRATION (EIA, N.D.)

During the period from 1987 to 2000, there were some fluctuations in the oil price because of the conflicts in the Middle East. From 2000, emerging economies such as India and China experienced increased demand for oil. OPEC also decided to implement production cuts. Both factors contributed to a tremendous rise in the oil price, and it reached record heights of USD 150 per barrel in 2008. In the following period the financial crises led to a global recession that hit the demand hard. The oil price decreased until it hit the bottom of USD 35 per barrel. As the recovery of the economy started in the following years, the oil price started to rise again. It experienced some fluctuations until the shock hit in 2014 (DePersio, 2018).

The oil price shock in 2014 was primarily a result of the production of shale oil in the United States. By producing this oil, the United States became almost self-sufficient with oil, thereby decreasing the oil-demand worldwide. In addition, demand in general had been declining due to expected economic

slowdown (Richard Anderson, 2015). The result of this was a rapid increase in the oil price from the middle of 2014 and until the start of 2015, ending at a price of USD 46 per barrel. Then the oil price increased slightly until May 2015, followed by a decrease and it hit the bottom of USD 27 per barrel in January 2016. In the following years, there have been some fluctuations in the oil price, although it has mainly increased overall.

2.3.3 Risk factors

As described in the previous section, the oil price is a type of commodity with large fluctuations and is thus associated with great risk. There are primarily two sources of oil price fluctuations; the balances between supply and demand in the market and market sentiment (Kosakowski, 2018).

Regarding supply and demand, the oil price typically increases if demand increases relatively to supply, or supply decreases relatively to demand. When the opposite occurs, the oil price will typically fall. Such a change in the market balance is mainly a result of global trends in the oil production and in the consumer base. Two examples of this are when China attained a more significant role in the world economy, and when the production of the shale oil from the United States increased. Another factor that may influence the oil price is long-term issues, for instance that oil is a non-renewable resource that eventually will run out. This could result in a change of the market balance leading to higher future oil prices. However, other sources of energy have emerged, as well as an improved utilization of existing energy sources, supporting falling oil prices in the future (Windheim, 2016).

Since oil is most commonly traded through futures contracts, the mechanism of the futures market is important. An *oil futures contract* is a contract between two parts with the agreement of buying or selling a barrel of oil at a certain price at a certain time (Kosakowski, 2018). As the futures market allow the participant to make gain or losses throughout the life of the contract, most contracts in the futures market are closed out by the trader taking the other part of the futures before the maturity of the contract (Hull, 2012). In fact, more than 90% of the trading within oil future contracts involves speculators trading “paper” barrels with each other (Kennedy II, 2012). Thus, the oil price markets are highly exposed to speculations from traders who only participate to bet on the oil price movements. Speculators, and some hedgers, will buy oil futures if they anticipate an increase in the market, and

they will try to sell oil futures if they expect a decrease. These predictions among speculators could be a result of short horizon events, such as war or other political issues in the oil exporting countries, cyclical trends, news within big international organizations, currency developments and extreme weather conditions (Windheim, 2016). Therefore, the oil price is highly influenced by market sentiment or market psychology, as well as supply and demand (Kosakowski, 2018).

In addition to the factors mentioned above, national and globally political events and agreements can have an impact on the oil price. An example is the war in the Middle East, which has played an important role. International agreements such as the Paris agreement have also been important. The purpose with the Paris agreement is to keep the average temperature increase on earth below 2 degrees, thus encouraging a global decrease in high-emission activities, such as oil production and usage (Windheim, 2016). OPEC has also played an important role in the development of the oil price, as the organization's cut in the oil supply was possibly one of the most important factors to raise the oil price records in 2008. However, some members produce more than their quota. Large oil exporting nations such as the United States, Canada, China and Russia are outside of the organization, gaining from the organization's supply cuts. As a result, it is not necessarily beneficial for an individual member to do the encouraged supply cuts. This could explain why members, despite the organization's "goal" to keep the oil price above USD 100 per barrel in the future, refused to cut production in 2014, leading to a dramatic decrease in the oil price at the end of 2014 (Kosakowski, 2018).

2.4 Modelling the oil price

As we have explained in the previous section, various factors make it difficult to predict future oil prices. Some argue that the oil price is following a stochastic process. Dixit and Pindyck (1994) define a stochastic process as "a variable that evolves over time in a way that is at least in part random" (Dixit & Pindyck, 1994, p. 60). In other words, any variable that changes over time in an uncertain way is said to follow a stochastic process. A Markov process is a specific type of a stochastic process, assuming that only the value today is relevant when forecasting the future expected prices. That means that the probability of a rise or fall in the oil price tomorrow is only dependent on the current price of oil, and the past history of the oil price are irrelevant (Hull, 2012).

2.4.1 Brownian Motion

A Brownian motion, also known as Wiener process, is a certain type of a Markov stochastic process, having a mean change equal to zero and a variance rate equal to one. The mean change per unit time for a stochastic process is referred to as the drift rate and the variance change is denoted the variance rate (Hull, 2012). Thus, the basic Brownian motion has two characteristics:

- The change in z during a small period of time Δ t can be written as:

  $$\Delta z = \varepsilon \sqrt{\Delta t}$$

  Where ε has a normal distribution with mean equal to 0 and variance equal to 1.
- The values for the change in z, for any to different short periods of time, Δt, are independent

The second characteristic indicates that the change in z follow s a Markov process (Hull). The generalized Brownian Motion for a variable x can be written as (Hull, 2012, p. 281):

$$dX = a\,dt + b\,dz$$

Where a and b are constants and the term $a\,dt$ means that X has an expected drift rate of a per time interval dt. $dX = a\,dt$ means that $\Delta X = a\,\Delta t$ in the limit in which Δt approaches zero. The other term can be understood as the nose or variability that are affecting the path of X. The noise can be measured as b times a wiener process and dz has the characteristics of Δz given above in the limit where Δt approaches zero (Hull, 2012). Within the real option pricing theory there is a common assumption that the oil price can be modeled as a Brownian motion (Brennan & Schwartz, 1985; Gibson, R.; Schwartz, 2016).

2.4.2 Geometric Brownian motion

A Geometric Brownian motion is assumed to describe the processes of raw commodities, including oil (Dixit & Pindyck, 1994). A Geometric Brownian motion is a process typically assumed for stock behavior but is also commonly used for modeling the oil price (Hull, 2012; Lund, 1997). The assumption behind the general Brownian motion process regarding constant drift does not fit in the

estimation of stock price developments, as investors required percentage return from a stock is not dependent on the stock's price. Instead, the assumption is changed into constant expected return. Consequently, if S is the stock price at time t, we have that the expected drift rate in S is assumed to be equal S*μ, where μ is a constant parameter. Further, regarding the variability, the assumptions underlying the path of the stock price has to be changed from the one underlying the general Brownian Motion. The variability of a stock is independent of the stock price, as an investor is not less concerned about the return of a stock if the price if it is 10 compared to if it is 100. The standard deviation of the change in a short time interval is assumed to be proportional to the stock price. The most commonly used model for stock price development is s therefore the following (Hull, 2012, p.287):

$$dS = \mu S\, dt + \sigma S\, dz$$

or

$$\frac{dS}{S} = \mu\, dt + \sigma\, dz$$

Where S is the stock price, t is the time, σ is the volatility of the stock price and dz is an increment of a Wiener process. μ is the stock's expected rate of return in the real word, while, in the so called "risk neutral world", μ is equal to the risk-free rate. The risk neutral world assumption is commonly used within finance, meaning that the risk preferences by investors are assumed to be neutral. In other words, the investors do not need compensation to take on a risky project. A result of this is that the expected return and the discount rate used for expected payoffs equals the risk-free rate (Hull, 2012). This issue we will discuss later.

In addition to a geometric Brownian motion process, some (Hull, 2012) assume that most commodity prices can be best modeled as a mean reversion process. A mean reversion process refers to the process when the commodity price tends to return back to a long-run average (Hull, 2012). However, the mean reversion process is complicated and using this method is not within the scope of this thesis. Thus, the geometric Brownian motion assumption will be used for the calculations later.

3. Mergers and acquisitions

The purpose of this chapter is to define mergers and acquisitions, why they occur and so-called merger waves. In this chapter, we will also explore synergies as an outcome of mergers and acquisitions.

The global market for mergers and acquisitions is very active and the average transaction value per year equals to one trillion per year. Due to the large amount of money involved, as well as the complexity, some of the most critical decisions a financial manager makes are related to mergers and acquisitions (Berk & DeMarzo, 2014).

3.1 Characteristics of merger and acquisitions

Mergers and acquisitions is a part of what is known as "the market for corporate control". A firm that is buying another firm is typically called the *acquirer*, while the company that is bought is called the *target*. The term "merger" includes different types of transactions depending on the relation between the target and the acquirer, as well as the payment method used in the transaction, i.e. cash, stock or a mix of these two. The purchase can also be done with debt instruments, options, and mixes of these two with stocks and/or cash. A *horizontal merger* is when the target and acquirer operate in the same industry. It is called a *vertical merger* when the target's industry buys or sells to the acquirer. The last type of merger is a *conglomerate merger*, which occurs when two firms that have unrelated businesses merge (Berk & DeMarzo, 2014). We will use the general term "merger" to cover all of the takeover transactions leading to the change of ownership and control in a firm.

An investment in the stock market is often a zero-NPV investment for most investors. However, for an acquirer it might be possible to add economic value as an outcome of the acquisition, and thus get a positive NPV-investment, which will not be possible for an individual investor to add alone (Berk & DeMarzo, 2014). There are numerous motives for why M&As occurs and they vary over time (DePamphilis, 2015). The most common motive is large synergies (Berk & DeMarzo, 2014) which can be either operating synergies or financial synergies (DePamphilis, 2015). This will describe more in

depth in section 3.2. Other reasons for mergers are diversification, strategic realignment, hubris (managerial pride), buying undervalued assets, mismanagement (agency problems), tax considerations, market power, misevaluation and industry shocks (Bruner, 2004; DePamphilis, 2015).

The expected synergies of a merger make the acquirer willing to pay an amount on top of the market value of the target firm, called the premium. The premium paid could indicate an expected equivalent price increase in the share price of the acquiring firm, although, this is not what happens. The premium paid to the target firm is almost the same as the value added by implementing the merger. Consequently, it is often the target's shareholders that collect the value added by the acquirer (Berk & DeMarzo, 2014).

3.1.1 Merger waves

Literature suggests that mergers occur in waves (Berk & DeMarzo, 2014; Mitchell & Mulherin, 1996) and since the end of 1980s there have been six waves of merger activity in the United States (DePamphilis, 2015). All waves reflected common features as they occurred during periods of sustained high rates of economic growth, low or decreasing interest rates, and with a rise in the stock market. The first wave occurred from 1987-1904 and the second from 1916-1929, where the first was characterized by horizontal consolidations and the second mostly by vertical consolidations. There were particularly large consolidations in the latter wave. The next wave occurred from 1965-1969 with a growth of conglomerates. From 1981-1989, the fourth wave took place and some of the main merger activities that happened were corporate raiders and hostile takeovers, i.e. breakup of conglomerates (DePamphilis, 2015). The 1980s was the most active takeover period in the past century (Mitchell & Mulherin, 1996). From 1992-1999, the fifth wave occurred and was characterized of strategic megamergers. The last wave took place from 2003-2008, and was characterized by global M&A transactions, horizontal megamergers and increased influence of private equity owners (DePamphilis, 2015).

3.1.2 Mergers in the petroleum industry

The period 1998-2001 was characterized by mega-mergers creating some large multinational companies in the petroleum industry, such as BP Amocco, Exxon- Mobile and Conoco Philips. BP was the first with its acquisitions and the other majors realized that there were huge synergies for BP to benefit from. Therefore, they followed acquiring to also exploit synergy benefits by acquiring. In 2007, Statoil and Norsk Hydro's oil and gas operations merged, creating a major upstream player on the Norwegian shelf, which made them able to compete for the most extensive projects worldwide (Deutsche bank, 2013). The decline in the oil price affected the merger and acquisitions in the gas and oil industry in 2015 (Deloitte, 2016). The increase in the oil price together with lower costs creates good conditions for consolidations in the oil sector. Lastly, several companies have reduced their shareholdings in order to reduce the debt that had risen during the downturn (J. Christensen, 2017).

3.2 Synergies

Synergies are often used as an argument for why two companies should merge. The concept refers to the opportunities that arise as a result of the combined entity, which would not exist for the two companies if they were operating separately. This is also called the 2+2=5 effect, which means that the combined entity is greater than the sum of the two companies separately. How a firm exploits the opportunity of synergy benefits differs among industries (Damodaran, 2005).

3.2.1 The importance of estimating synergies

The forecasted synergies can justify the vast amount of money that is often being paid as a premium for the acquisition. The buyers share price is reflecting whether the synergies received through the acquisition can justify the acquisition premium. If the amount paid is larger than the stand-alone target value plus the perceived value of the synergies, the share price will fall at the announcement of the deal. Correspondingly, if the price paid is lower, the buyers share price will rise. This is one of the reasons why the determination of synergies is crucial in the decision process before an acquisition. Moreover, value creation should be the main goal of M&As (Bruner, 2004).

3.2.2 Financial and operational synergies

Synergies are usually divided into two categories; operating and financial synergies. Operating synergies are important for the firms' growth, margins and returns, and therefore essential for value creation. This type of synergy can further be divided into four groups. The first includes economies of scale synergies, which means that two firms can become more profitable and cost-efficient as one entity. This is typical in a horizontal merger. The second group is the greater pricing power of a combined firm, resulting in less competition and higher market share. This could be beneficial if two competitors merge. The third group describes cases where two firms merge, and their combination of different functional strengths makes the merged firm more profitable (Damodaran, 2005). Within the oil industry, a typical example would be the merger of a company that has the "right" equipment or licenses to operate within an area, and another company that has a highly qualified workforce and a lot of experience within the oil sector. If these companies merge they can use the highly qualified workforce to fully take advantage of the licenses and the equipment (Bruner, 2004). The fourth group of operating synergies is higher growth in new or existing markets. An example of this is when the acquirer has a product line that it would want to sell in a new market, and the target has already been operating in this market for a while and with a well-known brand name (Damodaran, 2005).

Financial synergies can result in higher cash flows or a lower cost of capital (discount rate). There are mainly four types of these synergies. The first is typical in mergers where one firm has excess cash, but not equivalent profitable business opportunities, and the other firm has profitable business projects available, but lack the financial strengths to exploit them. The second group of financial synergies is increased debt capacity. By combining two firms the cash flows and earnings often become more predictable and stable, which makes it easier to borrow and take on more debt than if the firms had been operating separately. This in return can provide the combined firm with higher tax benefits, which most likely will lead to a lower cost of capital. Third, synergies can arise in terms of tax benefits through higher depreciation cost or by a reduction in the taxable income. Tax benefits can be achieved if the firm writes up more assets due to the merger, and thus will exploit their tax benefits from the higher depreciation charges. A reduction in the taxable income can be accomplished if the profit from one of the firms can be offset by the loss of another firm. Diversification synergies are the fourth main

type of financial synergies. This synergy arises in cases where two firms are exposed to different types of risk that at least partly offset each other if they merge. Diversification synergies can be valuable for small firms with shareholders that are not diversifying on their own. If the investors are diversifying on their own, this is often far more easy and cheaper for the individual investor (Damodaran, 2005).

3.2.3 In place and real option synergies

Bruner (2004) distinguish between what is called "in place synergies" and "real option synergies". A valuation of synergies should reflect both of these and adding them together in order to reach the total synergies. According to Bruner (2004) the two types of synergies should be valued differently. If they can be characterized as "in place synergies" their payoffs are relatively predictable, and they should be calculated through a discounted cash flow valuation. However, if they are not reasonable predictable and the payoffs are dependent on a triggering event to be realized, they can be characterized as real option synergies. They should thus be calculated with a real option approach. Examples of this can be growth option synergies, exit option synergies, option to defer, options to alter operating scale and options to switch (Bruner, 2004).

When two firms merge their resources, they create an opportunity to grow as a combined entity. This is called *growth option synergy* (Bruner, 2004). The opportunity to grow is not an obligation; it is a right that the combined entity can exploit if it is predicted to be profitable. The right to sell parts of the merged firm, gives the firm flexibility to correspond to market conditions, referred to as *exit option synergies*. Consequently, the firm can shift resources from the least profitable parts of the firm by selling it and use the resources on the more profitable parts (Bruner, 2004). The *option to defer* gives the holder an option to postpone an investment until later, without losing the opportunity to invest. This gives the holder the flexibility to wait and see without the potential threat of competitors taking the opportunity instead (Kaplan, n.d.). The *option to adjust the operating scale* means the option to expand, contract, restart or shut down (Benninga, 2000). If market conditions change, the option to switch becomes useful. An example of a market condition change is when more efficient assets can replace traditional production assets, and the option to switch gives the option holder an opportunity to change assets, in order to be more cost efficient (Kaplan, n.d.).

4. Optimal Capital Structure

In this chapter we will present and discuss theories related to the choice of equity and debt of a firm and determinants of capital structure mentioned in Morellec and Zhdanov (2008). In the end, we focus more on the optimal capital structure in the oil industry.

4.1 Debt-equity choice of a firm

A firm can use debt, equity or a combination of these as financing. The choice of financing is what we call a firm's *capital structure*. Given that a firm's value is a function of all future cash flows, a tax minimizing capital structure will improve the firm value. The capital structure that results in the lowest possible marginal tax burden is therefore the optimal capital structure. Firms spend a lot of time and resources finding the optimal capital structure, since the optimal capital structure can have a huge impact on the firm value. Consequently, this area has been a research area of high interest among researchers for a long time. Merton Miller and Franco Modigliani are among the most prominent researchers within this area and in 1958, they presented two theorems related to capital structure. The theorems have played a key role for research in this field and have made ground for later research as well ((Berk & DeMarzo, 2014).

According to the two theorems developed by Miller and Modigliani (1958), the value of a firm is determined by the cash flows produced by the firm's assets, under the assumption of perfect capital markets. Miller and Modigliani defined perfect markets as closed, free of tax and efficient markets without asymmetric information. Initially, Miller and Modigliani believed that capital structure was irrelevant to the firm value and it was not before the assumption of perfect markets was abandoned that capital structure became relevant. Miller and Modigliani (1963) revised the theorems in 1963, taking into account tax and tax-deductible interest (Berk & DeMarzo, 2014). Later literature has taken market imperfections, such as tax and agency costs, into consideration as well and built further research on the ground of Miller and Modigliani. Despite that Miller and Modigliani did not take into consideration the market imperfections, they are arguably one of the most influential in their area of research.

4.1.2 Agency Costs and the Trade-Off Theory

Theories developed on the ground of Miller and Modigliani, have attempted to explain a firm's choice of capital structure in imperfect markets. One of the most important contributions concerns how a firm weights advantages and disadvantages of external debt, by entering into new loans with creditors outside the firm. These contributions are often referred to as the "trade-off theory".

The trade-off theory emphasize that a firm will choose a debt level that fully exploit the *tax shield* (Miller & Modigliani, 1963), referring to the deductibility form the firm's taxable income due to expenses such as depreciation, amortization and interest expenses (CFI, n.d.). Considering only the tax shield, the firm will benefit from taking on as much debt as possible. However, the firm will need to balance the benefits of the tax shield with the increased agency costs and financial distress costs. As a result of this, firms will not choose to finance themselves exclusively with external debt, since the cost of debt will ultimately weight heavier than the benefits of debt, when the debt level increases (Miller & Modigliani, 1963). The total firm value of a levered firm is defined by (Berk & DeMarzo, 2014, p.563):

$$V^L = V^U + PV(Interest\ Tax\ Shield) - PV(Financial\ Distress\ Costs) \\ - PV(Agency\ Costs\ of\ Debt) + PV(Agency\ Benefits\ of\ Debt)$$

EQUATION 1

The financial distress costs are the directly and indirectly costs related to bankruptcy and insolvency. These costs often vary by industry and are higher for firms that have few tangible assets that can easily be liquidated (Berk & DeMarzo, 2014). The financial distress costs will increase with higher leverage ratio, since higher leverage ratios results in increased debt commitments, and therefore a higher risk for financial distress and bankruptcy. This will result in lower present values and impaired firm value. Since firms are not obligated to provide equity holders with dividend payments, equity financing does not imply bankruptcy risk in the same way as with debt. During difficult times a firm solely financed by equity will have less severe payment commitments.

Agency costs do not arise from bankruptcy risk, but from conflict of interest between the management and the shareholders. Since agency costs also depends on the external debt level, it is important to take

agency costs into consideration when evaluating the advantages and disadvantages of increased use of external debt. However, an increase in external debt will not always result in a corresponding increase in agency costs. For instance, a firm with an initially low amount of external debt will not only take advantage of the increased tax shield. A higher debt ratio can also result in reduced agency costs, because a larger fraction of the firm's free cash flows will be bound to repay the debt, and thus less likely to be overinvested for management's own profit. For a firm that initially has low external debt, the use of more external debt could therefore have a disciplinary effect and could contribute to lower opportunism among the firm's managers. As a result, a moderate increase in external debt can give reduced agency costs and increase firm value (Berk & DeMarzo, 2014).

However, if the firm's debt ratio is already high, a further increase in debt will both lead to increased bankruptcy risk and financial distress costs, and increased agency costs. A common problem that arises under these circumstances is the *under-investment problem*. This is when the firm's management will not finance NPV-positive projects, because of loyalty to shareholders. Shareholders will not want to carry out the projects because they carry financial risk, and all returns will cover the creditors' outstanding claims. The shareholders will therefore not gain anything from the project. In cases like this with high debt levels, the management will often not be able to complete projects despite the positive NPV (Berk & DeMarzo, 2014).

Another agency costs that may arise because of high external debt is excessive risk taking, which implies that the management conducts negative NPV projects, referred to as *the asset substitution problem*. This is because, in rare cases, negative NPV projects can produce extremely good results, resulting in positive NPV projects for the shareholders. If the project on the other hand results in negative value added, the worst that can happen to the shareholders is that the firm goes bankrupt and lose their invested share capital. In other words, the upside risk is much larger than the downside risk to the equity holders. As a result, due to the too high level of external debt, the shareholders will gain from taking on high-risk investments. If the management executes the project of loyalty to the shareholders, the project will most probably turn out negative for the creditors, as the firm value is most likely to decrease due to the project overall being NPV negative (Berk & DeMarzo, 2014).

4.2 Determinants of capital structure

Morellec and Zhdanov (2008) mention a number of potential determinants of capital structure, which are used in earlier research. These are size, regulation, cost of financial distress, tangibility and profitability.

4.2.1 Size

A large sample of earlier studies have suggested that leverage ratio is positively related to firm size (Harris & Raviv, 1991; Murray & Goyal, 2003; Rajan & Zingales, 1995). Size can be seen as an inverse proxy of probability of bankruptcy since larger firms often have a lower default risk, and a result of this is that larger firms are able to take on more debt (Rajan & Zingales, 1995). According to Titman and Wessels (1988) the low bankruptcy levels can be explained by the fact that large firms tend to be more diversified. These arguments imply that larger firms should have higher leverage, in accordance with the trade-off theory (Murray & Goyal, 2003).

4.2.2 Regulation

Firms operating in regulated industries are less affected by conflicts of interests between shareholders and debt holders than in unregulated industries (Morellec & Zhdanov, 2008). Regulated firms have more stable cash flows and expected bankruptcy costs are lower. Therefore, regulated industries can take on more debt and have higher leverage ratios. However, there is less discretion in a regulated firm, making the principal-agency conflicts decreasing and debt less preferable from a control perspective (Murray & Goyal, 2003).

4.2.3 Cost of financial distress

Titman and Wessels (1988) find a negative relationship between leverage and probability of financial distress. This is in accordance with the trade-off theory that predicts that the expected bankruptcy costs increase with probability of bankruptcy, as mentioned earlier.

4.2.4 Tangibility

Most previous research supports a positive relationship between tangible assets and the leverage ratio (Murray & Goyal, 2003; Rajan & Zingales, 1995). Morellec and Zhdanov (2008) argue that the principal-agency conflicts can be assumed to be lower when there are more tangible assets, as they are easy to collateralize. Tangible assets, such as property, are easier to value than intangible assets such as goodwill. Hence, tangibility lowers the expected bankruptcy costs. Lower expected bankruptcy costs and debt-related agency conflicts imply a positive relation between tangibility and leverage (Murray & Goyal, 2003).

4.2.5 Profitability

Rajan and Zingales (1995) studied determinants of capital structures in the G-7 countries and found a negative relationship between profitability and leverage in most countries. Harris & Raviv (1991)and Titman and Wessels (1988) also found a similar relationship. However, there are conflicting findings on how leverage is affected by profitability. According to Murray and Goyal (2009), expected cost of financial distress is lower for profitable firms, which support a higher leverage ratio. In addition to this, the company is able to lend more due to lower probability of going bankrupt. Hence, according Murray and Goyal (2009), there is a positive relationship between profitability and leverage. As mentioned earlier, debt is favorable for profitable firms as it lowers free cash flows and then decreases agency costs (Jensen, 1986).

4.3 Optimal capital structure in the petroleum industry

Taxes play an important role in determining optimal capital structures, as mentioned earlier. Hence, the differences in tax provisions among countries and industries contribute to the determination of the optimal capital structures as well. We are using the Norwegian taxation rules for petroleum companies, since the firms considered in our thesis are paying takes in Norway. The ordinary tax rate in Norway is around 23%, but petroleum companies must pay a special tax (i.e. petroleum tax) on top of this, making their marginal tax rate 78% (Norwegian Petroleum, 2018).

According to the tradeoff theory and everything else equal, higher tax rates give companies an incentive to take on more debt (Berk & DeMarzo, 2014). The marginal cost of debt is lower for petroleum companies as they have higher interest deductions in the financial statements due to the special petroleum tax. However, it is important to emphasize that this is under the assumption of everything else equal; the companies should be equal, the risk should be the same etc. As described earlier, the oil price is volatile of nature due to the variation in oil- and gas prices. This in turn makes the petroleum business risky. Risky business leads to creditors demanding higher interest rates on loans, and higher interest rates correspond to higher costs making the use of debt less (Berk & DeMarzo, 2014).

5. The case of Aker BP

In this chapter we will first present the individual companies that created Aker BP, then followed by a presentation of the merger and Aker BP today. Below we present a time line with some of the main events during the history of Aker BP.

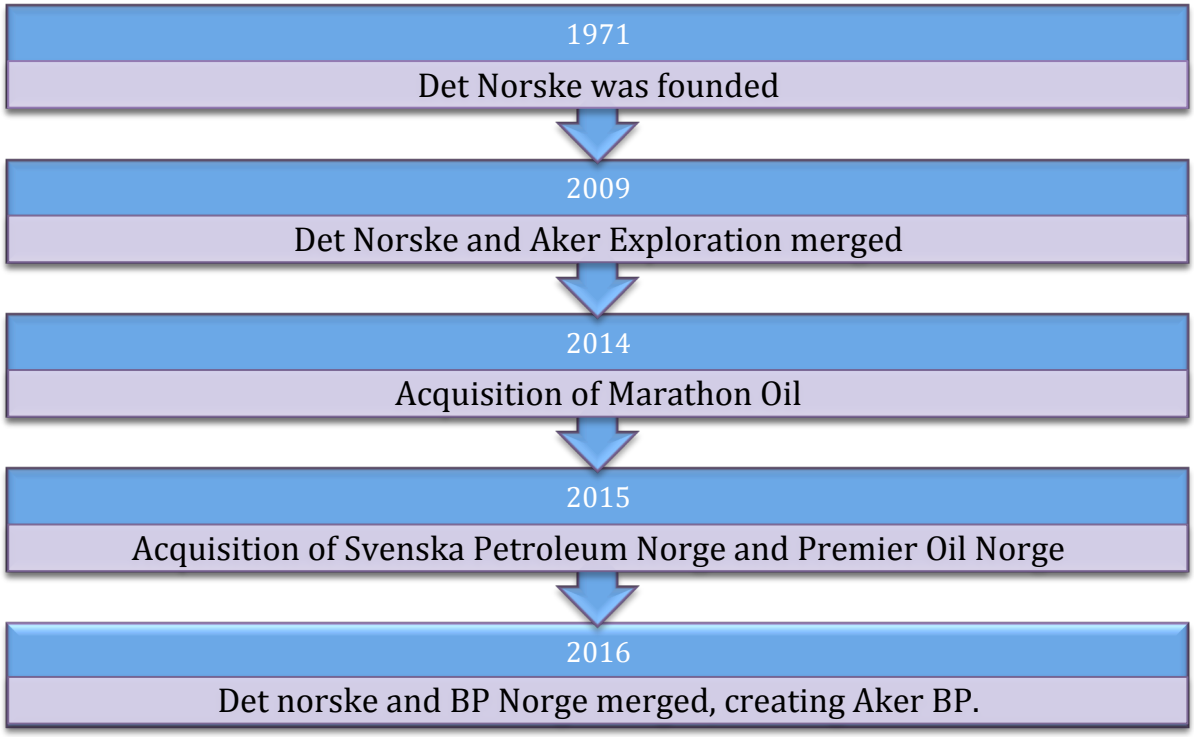


FIGURE 2 - THE TIMELINE OF AKER BP, OWN PRODUCTION BASED ON (Aker BP ASA, n.d.)

5.1 Det Norske

Det Norske Oljeselskap ASA (hereby referred to as Det norske) was the first national petroleum company in Norway founded in 1971 and was the first Norwegian oil company on Oslo Stock Exchange. Later the company changed its name to DNO. Due to restrictions from the government, allowing only three Norwegian oil companies on the NCS, DNO was prevented from further activity on

the NCS. Therefore, the company had to put their efforts outside Norway. The company's strategy was to focus on small oil fields and to expand the production from mature oil fields. In 2004, they sold licenses to the Swedish company Lundin. The same year NCS opened for new companies, leading DNO to acquire licenses here.

Petra and DNO decided to merge Petra and the Norwegian interests of DNO in October 2007, organized through the company NOIL Energy. Later that year the merged firm Petra changed its name to "Det norske oljeselskap ASA". In the following years, the company expanded through increasing the workforce, licenses, operator ships and exploration activity. In 2009, Det norske merged with Aker Exploration ASA, a company concentrated around exploration and production at the Norwegian shelf. The merged company kept the name "Det norske". In 2014, Det norske bought Marathon Oil Norway and became a larger and stronger company with a significantly increase in production (Aker BP ASA, n.d.). The acquisition of Marathon Oil Norge was an important milestone as it made Det norske a fully integrated E&P (exploration and production) company. This was also the first time a Norwegian oil company bought out an American company on the Norwegian shelf. Since this, Det norske have further developed as one of the leading oil companies on the Norwegian shelf. In 2015, Det Norske strengthened its position further on the Norwegian shelf, by first acquiring Svenska Petroleum Norge and Premier Oil Norge AS. Det norske have shown that they manage their growth strategy, through effective acquisitions and integrations (Aker BP ASA, 2015). The merger with BP Norge took place in 2016, which will be further explained below.

5.2 Aker

Aker ASA (herby referred to as Aker) is a Norwegian industrial company that combines industrial expertise with knowledge about the capital markets and financial strength. Their portfolio consists of ownership in several companies, among them Det norske. The ownership interests are mainly in the oil and gas industry, maritime assets and marine biotechnology sectors. The company have existed for 175 years and gone through several mergers, acquisitions and restructurings. From 2004 the company was listed on the Oslo Stock Exchange. In the year following the company was followed by a large number of transactions, i.e. establishing companies, among one of them Aker Exploration ASA in 2006. Aker

Exploration was concentrated on exploration activities and production on the Norwegian shelf, and got licenses and was pre-qualified as operator in 2007 (Aker ASA, n.d.)

Aker's presence on the NCS was strengthened through the merger of Aker Exploration and Det norske in 2009, where Aker played a key role in the merger (Aker ASA, 2009). The merger created the second biggest company on the NCS measured in the terms of licenses and operatorship (Aker BP ASA, 2009). Aker was already a large shareholder in both of the companies before the deal. Aker owned 18% of the shares in Det norske and 76% in Aker Exploration (Schultz, 2009). Aker became the major shareholder in the merged oil company with about 30 % of the shares based on Aker's ownership in the two companies separately (Aker BP ASA, 2009). Aker strengthened its ownership through Aker Capital AS (fully owned by Aker) in 2011 corresponding to an ownership interest of 55,11% (Aker ASA, 2011). In 2012, Aker Capital AS sold shares in Det norske and reduced their ownership from 50,81% to 49,9%, due to restrictions from The Oil and Energy Department stating that Aker had to place a parent company guarantee at Det norske in order to have an ownership of above 50%. Aker concluded that this was not beneficial to fulfill and they sold shares (Aker ASA, 2012).

5.3 BP

BP p.l.c. (hereby referred to as BP) started when the British investor William D'Arcy discovered oil in Persia in 1908. Within a year the company called Anglo-Persian Oil Company was established (BP, n.d.-b). The company was later renamed The Anglo Iranian Oil company in 1935 (BP, n.d.-e) and the British Petrolium Company. In 1914, the Great Britain became the main shareholder in the company. Over the next decades, the company disposed large oil discoveries in Persia, before the Iranian Sate nationalized the oil industry in 1951. After the second world war, the company rebuilt together with the rest of Europe. They invested in refineries in France, Germany and Italy, and for the first time, their products was sold in New Zeeland and Europe (BP, n.d.-d). In addition to this, The Anglo Iranian Oil company signed a cooperation with other oil companies and also got licenses in other areas in the Middle East. In 1969, BP discovered oil in Alaska and in the British section of the North Sea. In the North Sea, they were the first company that made profitable discoveries of gas and oil. BP was operating in the US market for the first time in 1969 and acquired the US company Standard Oil

Company of Ohio. The Great Britain ownership of BP was first reduced until it was liquidated completely in 1987. In 2000 the company acquired Atlantic Richfield Company and Burmal Casterol, and continued with its takeover activity with the acquisition of Veba Oel inn 2001 and the half of TNK-BP in 2003 (Hagland, 2015). The company was named BP Amoco after the merger of British Petroleum Company (BP) and the American Amoco in 1998. The name of BP today originates from 2001 (Hagland, 2015). BP had an ownership of 50% in Norsk Brændseselolje from 1920-1976, which was a distributor of petrol and other petroleum products. Statoil took over the business in 1976, and BP's gas station chain was named Norol, and later named Statoil (Hagland, 2015).

Today, BP is one of the top three largest oil companies in the world, together with Exxon Mobil and Shell. The company is a global energy company that operates within the exploration and production sector of petroleum in 25 countries. Among these are the United States, Canada, the Mexican Gulf, Trinidad and Angola. They also operate in the Norwegian and British sectors of the North Sea (Hagland, 2015). BP has moved from only operating within the petroleum sector to also operating within other energy sources as the world heads towards a future with lower carbon use. These energy sources include petrochemicals, solar energy, wind power and hydrogen (BP, n.d.-c).

5.3.1 BP Norge

BP Norge is a Norwegian subsidiary of BP, and has been active with oil extraction and exploration on the NCS since 1965 through Amoco, and from 1974 through BP. In 2004, the company was operating on five fields; Valhall, Hod, Skarv, Ula and Tambar (Aker BP, 2016a). They partly owned the Ormen Lange field and they were also operating within the Skrav field in the Norwegian sea (Hagland, 2015). In 2015, BP Norge had 13 licenses, proven and most likely 224 million barrels of oil equivalent, an average net production of 62 100 barrels of oil equivalent per day and 870 employees (Aker BP ASA, 2016).

5.4 The merger creating Aker BP

Aker BP ASA emerged in June 2016 because of the merger between Det norske and BP Norge, creating the leading independent offshore E&P company on the NCS, holding a portfolio of 97 licenses (84 from Det norske and 13 from BP Norge). Aker, BP and Det norske holds shares in the company equivalently to 40%, 30% and 30% (Aker BP ASA, 2016).

The merger was finally done in September 2016 (Aker BP, 2016). "The merger created a company with a diversified production base, strong balance sheet and cash flow outlook, coupled with organic and inorganic growth ambitions "(Aker BP, 2016b). It was done through a share purchase transaction, where Det norske issued 135.1 million shares based on NOK 80 per share to BP as compensation for all shares in BP Norge. Additional to the shares, BP's assets, a tax loss carry forward of $267 million and a net cash position of $178 million were achieved through the merger. In order to get the achieved agreed-upon ownership structure, Aker (Det norske's major shareholder) acquired 33.8 millions of these shares from BP at the same share price. An illustration of the merger deal can be found below. The merger transaction was expected to significantly strengthen the merged company's operations, cost efficiency and growth potential on the NCS, leveraging on Det norske's efficient operations, BP's capabilities and Aker's industrial experience through 175 years. The companies expected to build on capacity and competence from both BP Norge and Det norske to realize major cost cuts and synergies, through a lean and nimble business model. By a reduction of 35% in net-interest bearing debt per barrel of oil equivalent of reserves, the transaction was expected to strengthen Det Norske's balance sheet and credit accretive. Moreover, the companies also expected to introduce a dividend policy with quarterly dividends (Aker BP, 2016). Statoil produces around two-thirds of oil and gas in Norway, and therefore industry executives and politicians have for a long time hoped for some strong competition for Statoil (Milne & Stacey, 2016).

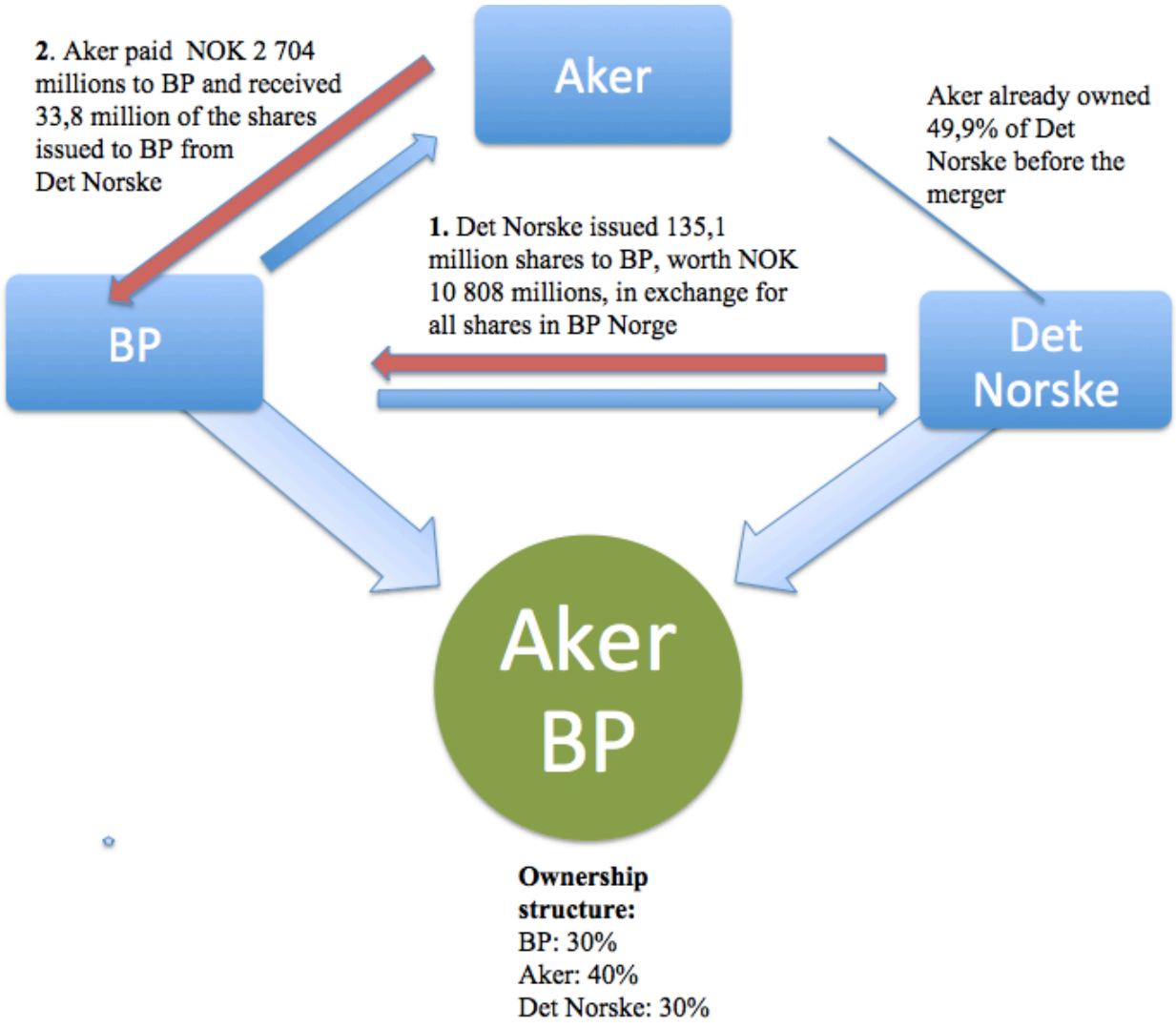


FIGURE 3 - THE MERGER PROCESS, OWN PRODUCTION BASED ON (AKER BP, 2016)

The Aker BP known today is an exploration and production (E&P) company with exploration, development and production activities in all the three main petroleum provinces on the NCS and are among the largest independent European oil companies (measured in production), with a workforce of about 1,300 employees. In 2017 Aker BP had a production of 138,800 barrels of oil equivalent per day. Aker BP is listed on Oslo Stock Exchange and is headquartered at Fornebu outside Oslo (Aker BP, n.d.-a).

6. The model

This chapter will first introduce the model by Morellec and Zhdanov (2008) and the model by Leland (1994), which is the ground of our thesis. Subsequently, we will outline our model.

6.1 The model of Morellec and Zhdanov (2008)

The article "Financing and Takeovers" by Morellec and Zhdanov (2008) presents a framework for analyzing financial leverage in takeover activity. It considers a takeover competition between two potential acquiring firms for a potential target. It is assumed that all of the firms are risk-neutral and that they have rational expectations regarding the underlying stochastic processes and the decision-making of the other firms. The framework is jointly financial strategies of the bidding firms and the timing and terms of takeovers. Their analysis is built on a contingent claims model by ÖBJÖBJMello and Parsons (1992)is influenced by the financing strategy, through its effect on bankruptcy cost, taxes and investment decisions. However, instead of focusing on internal investment, Morellec and Zhdanov (2008) consider a growth-opportunity through acquisition in a competitive environment.

The competition among bidders is important for shaping equilibrium financing strategies, meaning that the bidders have different leverage ratios. The model demonstrates that two otherwise identical firms can have different capital structures before the takeover. The winning bidder is the firm that becomes a growth firm, with a low leverage ratio and invests in the takeover. The losing bidder is the firm that becomes a value firm, with a higher leverage ratio and does not invest in the takeover. The model predicts that the bidder with the lowest leverage is most likely to win the takeover contest and that the winner should adjust leverage after the takeover. It also predicts that the premium paid to the target firm decreases with the leverage of the winning bidder. Consequently, the capital structure of the firm determines the outcome of the takeover contest. Since the losing bidder foregoes a growth opportunity of not acquiring the target company, it compensates for this by issuing more debt and hence receives greater tax benefits (Morellec & Zhdanov, 2008).

6.1.1 Lever up/down

Before the takeover, the leverage of the winning bidder is below the industry average. After the takeover, Morellec and Zhdanov predicts that the winning firm should lever up again. This is under the assumption that there are no more takeovers following the takeover. Before the takeover, the bidder with the lowest coupon payments is the winning bidder, but after the acquisition debt loses its strategic role. The merged firm has an incentive to increase leverage, by adjusting its leverage ratio to take advantage of tax benefits and at the same time take into consideration expected default costs (Morellec and Zhdanov, 2008). This pattern has also been proven empirically by Bruner (1988), who demonstrates that bidders have a higher financial slack and are significantly less levered than a general sample of firms before a merger. Moreover, in the first year after the merger the financial slack decreases and leverage increases significantly compared with a control sample. These changes are closely related with the merger (Bruner, 1988). These findings are consistent with Myers and Majluf (1984), who found that bidders are slack rich ex ante merger and Ghosh and Jain (2000) and Clayton and Ravid (2002) provided similar results. Clayton and Ravid (2002) investigate how bidding behavior is affected by capital structure in various auctions. They found that firms seem to reduce their bids, when the leverage increases and that firms with lower leverage tends to win the bidding contests. Ghosh and Jain (2000) found strong evidence of significant increase in leverage in a merged firm following the takeover. This increase in leverage is related to an increase in debt capacity, however, there is weak evidence that this increase in debt is an outcome of earlier unexploited debt capacity (Ghosh & Jain, 2000).

6.1.2 Determinants of the leverage rate

According to Morellec and Zhdanov (2008), several factors influence the optimal capital structure of the bidding firm, among them synergy benefits, volatility, bankruptcy cost, tax rate and the industry shock.

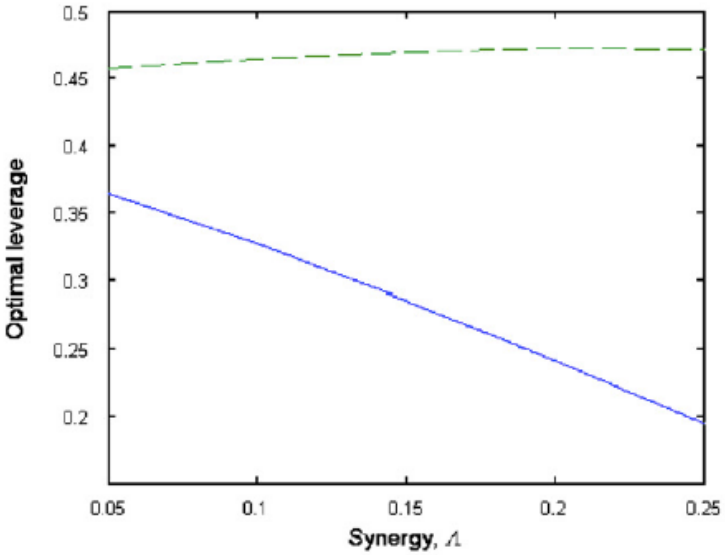
The leverage of the winning bidder decreases with synergy effects because of the anticipated extra value achieved when acquiring the target. The extra takeover surplus is more than weighing up for not fully exploiting the tax benefits related to debt. Thus, the winning bidder would want to decrease its

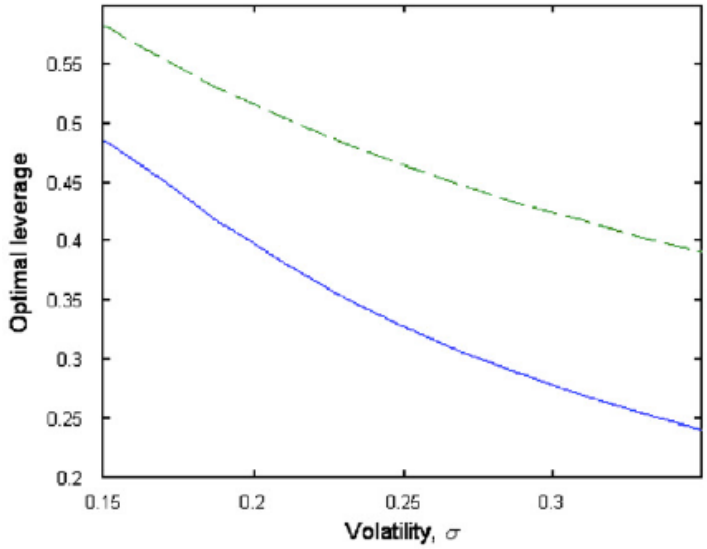
leverage ratio, to be sure to undercut the leverage of the other bidder, when the synergy effects are high. Also, since the acquisition is more profitable with higher synergies, the takeover process will happen at a faster rate. For the losing bidder, the leverage ratio increases marginally with increasing synergies. The winning bidder is compensating for the more profitable acquisition by lowering its leverage ratio, and therefore letting go of some of the tax shield. As a result, the losing bidder only needs to be compensated on a low scale for the loss of the profitable acquisition and as a consequence, their leverage ratio is increased slightly to reap the associated tax benefits. On the contrary, if the profit of the losing bidder is high, the strategic role of leverage becomes less important. Hence, since the winning bidder is not willing to lose as much tax benefits by lowering the leverage, its leverage ratio increases. The leverage ratio of the losing bidder also decreases, but at a lower rate (Morellec and Zhdanov, 2008).

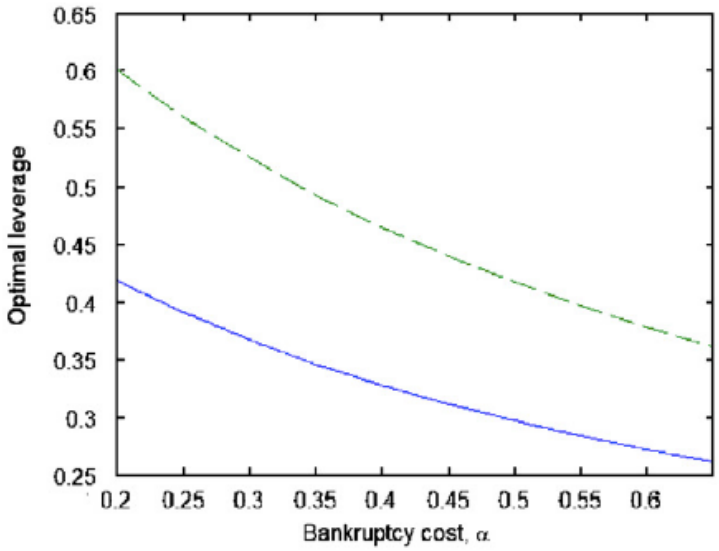
Higher volatility decreases the leverage ratios of both of the bidding firms. Since high volatility causes higher uncertainty related to the income to the firm, the bankruptcy risk increases. Consequently, the cost of debts become higher and debt is considered as less attractive for both bidders. In addition to this, as acquiring the target firm be seen as a real option, and options are more valuable with high volatility (Hull, 2012), the takeover will be more beneficial for the winning bidder if the volatility is high. Since this option is not given to the losing bidder, higher volatility decreases the leverage of the winning bidder more than that of the losing bidder. Bankruptcy costs also plays an important role in determining the optimal capital structure. Relatively low bankruptcy costs give an incentive to increase leverage, due to the tax benefits of debt. However, as low bankruptcy cost also makes the takeover more profitable, the winning bidder is not increasing its leverage ratio as much as the losing bidder, as it has an incentive to keep the leverage low due to strategic reasons (Morellec and Zhdanov, 2008).

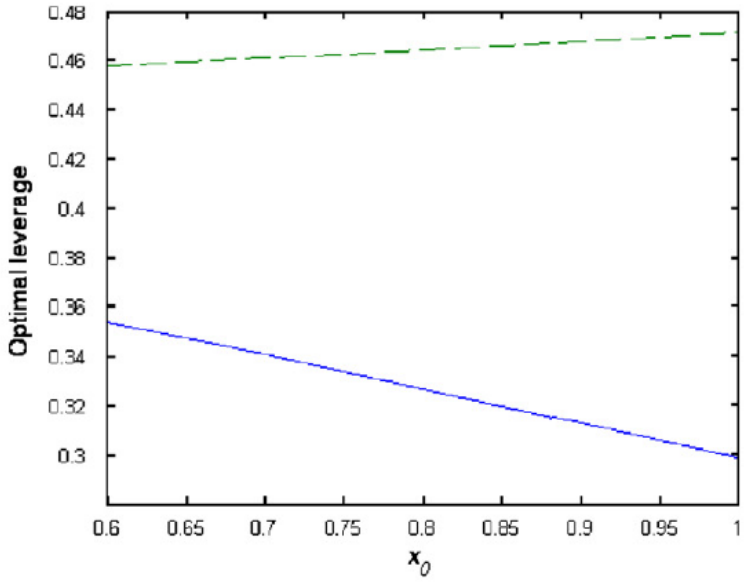
The spread in leverage ratios of the two bidders also increases with the industry shock. As higher industry shock will affect the profits of the target firm positively, the takeover becomes more attractive. The strategic role of debt is therefore becoming more valuable and winning bidder would prefer to decrease its leverage to be sure to undercut the other bidder. A higher industry shock will also increase the profits of the two bidder firms, giving higher equity values and thus higher debt capacity. This is why the curve of the losing bidder is slightly moving upwards with a higher industry shock. Finally, the leverage ratios of both firms increase with the tax rate, because of the higher tax shield (Morellec and

Zhdanov, 2008). The total effect of synergy, volatility, bankruptcy cost, the industry shock and the tax rate on optimal leverage is illustrated in the graphs below.






Optimal leverage
0.65
0.6
0.55
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.25
0.3
0.35
0.4
0.45
0.5
0.55
0.6
Bankruptcy cost, α


Optimal leverage
0.48
0.46
0.44
0.42
0.4
0.38
0.36
0.34
0.32
0.3
0.6
0.65
0.7
0.75
0.8
0.85
0.9
0.95
1
x_0

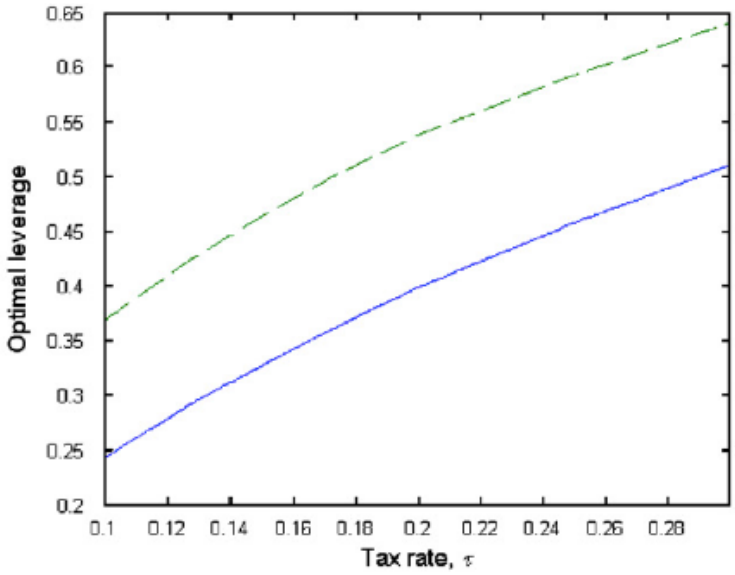


FIGURE 4, 5, 6, 7 AND 8 - THE TOTAL EFFECT OF SYNERGY, VOLATILITY, BANKRUPTCY COST, THE INDUSTRY SHOCK AND THE TAX RATE ON OPTIMAL LEVERAGE. The blue and the green (dashed) lines represent the leverage ratio of bidder 2 and 1, respectively. Adapted from "Financing and takeover" by E. Morellec, A. Zhdanov, 2007, 2008, Journal of Financial Economics 87, 556-581

6.1.3 Imperfect information

In the base case of the model by Morellec and Zhdanov (2008) it is assumed to be perfect information, meaning there are no uncertainties about the synergy benefits Λ_i. Moreover, both firms know that they will achieve the same synergies after the takeover. However, Morellec and Zhdanov are taking the model further by incorporating imperfect information. More precisely, they assume that the synergy benefits of the two bidders are not identical and that they only know their own synergy parameter Λ_i. In this case, both bidders believe that the synergy benefit of the competitive bidder is uniformly distributed on the interval $[\Lambda_i - \varepsilon, \Lambda_i + \varepsilon]$ with $i = 1,2$ and $\varepsilon > 0$.

Under the assumption of imperfect information, the market's estimate of the synergy parameter equals its true value. The information about synergy benefits is revealed through the bidding contest as a bidder leaves the contest, hence resolving the uncertainty. Unlike the case with perfect information, choosing a coupon payment marginally below a rival does not guarantee that the bidder wins the

takeover contest. It is only increasing its probability (as it is still not beneficial to raise the bid of a bidder above the reservation value). There is a tradeoff between the marginal benefits of debt and marginal costs of debt, depending on the uncertainty of the synergy parameter. When there is low uncertainty, the benefits from a higher probability of becoming the winning bidder exceed the correspondingly reduction in tax benefits. The asymmetric equilibrium falls apart when the uncertainty is high, and it is more difficult for the bidders to predict the outcome of the takeover. Hence, the strategic role of debt loses its key role and leverage choices are mainly based on the trade-off between tax benefits and bankruptcy costs. In other words, the strategic role of debt depends on the degree of uncertainty of the synergies. A bidder should try to get specific information about the synergy value of its competitor, without revealing its own synergy parameter (Morellec & Zhdanov, 2008).

6.1.4 Cash offer versus stock merger

A bidder can pay for the target in two ways, either by paying in cash or by a stock-swap, or a combination. A stock-swap is when the bidder issues new stock and gives it to the target shareholders in exchange for the target shareholders' old shares (Berk & DeMarzo, 2014). In case of a cash payment the target shareholders do not have an ownership control anymore, but in a stock-swap they still have some control by receiving a share in the merged entity.

In the base case of the model by Morellec and Zhdanov (2008) the winning bidder is paying with cash, which is financed by issuing equity to pay the target shareholders. However, Morellec and Zhdanov are also examining the case where the winning bidder gets the target shareholders' shares and in return the target's shareholders gets a fraction of equity (i.e. shares) of the merged entity. The main results in the article are also applicable for these stock offers. The winner of the takeover competition is the bidder with the highest bid. The target shareholders strive to maximize the amount they get from the takeover, and this amount is the same independent of payment method used. The target shareholders get a fraction of $1 - f_i$ of equity of the merged entity and the bidder's shareholders gets a fraction of f_i.

Payment method and choice of financing is often used interchangeable; however, it does not necessarily need to be the same. For example, a company that pays in cash can for instance finance the takeover by taking on more debt, using internal resources or issue equity to pay (Fischer, 2017). Masulis and Faccio (2005) show a linear relationship between the probability of paying with cash and

the control rights. A stock issuance will weaken a dominant's shareholders voting power. In the case where the bidder wants to remain in control, they often have an incentive to choose cash financing instead of stock financing. However, if the bidder has a major shareholder there is more unlikely that the shareholder's control will be threatened (Masulis & Faccio, 2005). Myers and Majluf (1984) show that managers preferably use stock payments instead of cash in merger deals when the stocks are overvalued in the capital markets. This is to take advantage of the temporarily market inefficiencies. Hence, as the firm announces the equity financing of the merger, it will lead to a decrease in the share price as the market will have a perception of the shares to be overvalued (Myers & Majluf, 1984).

6.1.5 The model of Leland (1994)

The model of Leland (1994) investigates corporate debt values and optimal capital structures of a firm in a combined framework. It develops closed-form results by linking the debt and optimal capital structure to various variables affecting the capital structure, such as firm risk and bankruptcy costs. An underlying assumption is that the asset value of the firm follows a diffusion process with constant volatility. It is also assumed that optimal capital structure is affected by taxes, as explained earlier in the thesis. The model classifies debt as protected or unprotected. Protected debt is typically short-term debt with positive net worth covenants, while unprotected debt most often does not have net-worth covenants. If the firm has issued unprotected debt, bankruptcy will only occur when the firm cannot pay the demanded coupon payment by issuing extra equity hence, if the shareholders issue new equity capital, the default can be delayed. Any asset value making the firm go bankrupt implies an equity value equal to zero, meaning that no more equity can be issued. This type of debt financing can therefore be characterized as shareholders holding a put option on the firm, meaning that they have the right to "sell" the company to the debt holders. They can do this by not paying the demanded coupon payments so that the company defaults, in other words exercising the option. Protected debt on the other hand, defaults when the assets of the firm become lower than the principal value of debt (Leland, 1994). Since the type of debt is determining whenn bankruptcy is triggered, it is important to know which type of debt that is used for determining the optimal leverage and debt values.

6.2 Our Model

In the following we will present our own model based on the model of Morellec and Zhdanov (2008), but with certain distinctions as our model extends this model.

A set of assumptions is made in accordance with Morellec and Zhdanov. First of all, there is a competition between two bidders for a potential target. Second, the bidding and target firms are levered and are consequently taking advantage of the tax benefits of debt and at the same time balancing expected bankruptcy costs. Third, the bidders have the same operational technologies and are exposed to the same industry shock *X*, which in our case represent the oil price. This shock is governed by the stochastic process:

$$\frac{dX}{X} = \mu\, dt + \sigma\, dW_t$$

EQUATION 2

where $W_t$is a Brownian motion. μ and σ are constant parameters and $(W_t)_{t\geq 0}$ is a standard Brownian. Fourth, an investor can lend and borrow at the instantaneous risk-free rate $r > \mu$. The fifth assumption states that the model abstracts from potential agency conflicts between managers and shareholders. When we mention "the bidder" in the following, we refer to the winning bidder.

Our model can be compared to the model of unlevered firm asset value demonstrated by Leland (1994). The unlevered asset value of the firm can be modeled using a stochastic process with constant volatility of return, where W is a standard Brownian motion (Leland, 1994, p.1217):

$$\frac{dV}{V} = \mu(V,t)dt + \sigma dW$$

Where V is the asset value of the firm, μ is the drift rate and σ is the volatility. The financial structure of the firm is assumed to not have any effect on the stochastic process of V (Leland, 1994). The assets generate a continuous stream of cash flows (Morellec & Zhdanov, 2008).

In our model we will take into consideration that the markets are not likely to be characterized by perfect information as described earlier. Thus, this assumption regarding imperfect information in the model of Morellec and Zhdanov is not applied to our model. The main difference between our model

and the model of Morellec and Zhdanov is that we use firm values in our model, while the framework explained above uses cash flows. We will in the following sections transform the formula for cash flows into formulas for firm values, so that we can apply the framework of Morellec and Zhdanov. Including to this, we will also test if this can be done without compromising the underlying assumptions of the model.

6.2.1 Cash flows

The formula for cash flows in our model is based on the model of Morellec and Zhdanov (2008). According Morellec and Zhdanov, the cash flows to the firm without debt and tax can be expressed through the linear relationship:

$$CFF_{\text{beforetax}}(X) = ax - b$$

Where X is the oil price, a is a constant scaling factor and b represents the fixed costs. If the firm issue debt, the cash flow to the firm before tax can be expressed as:

$$CFF_{beforetax}(X) = aX - b - c$$

EQUATION 3

Here, c is the coupon payment on debt, i.e. the cash flows to the debt holders. When taking into account the taxes paid by the firm, we have to distinguish the cash flow to the equity holders from the cash to the debt holders. We assume that the equity holders are affected by two different tax rates. The first one is the corporate tax that the equity holders would have to pay on the profits of the firm. The cash flow after the corporate tax t_c, can be expressed as:

$$CFE_{aftertax} = aX\,(1 - t_c) - (b + c)(1 - t_c)$$

$$= (aX - b - c)(1 - T_c)$$

When dividends are paid out to the shareholders, the dividend tax rate t_d also affects the cash flow. The total cash flows to the equity holders after both corporate tax and dividend tax is paid, becomes:

$$CFE_{aftertax}(X) = (\mathrm{aX} - \mathrm{b} - \mathrm{c})(1 - t_c)(1 - \mathrm{t_d})$$

EQUATION 4

Debt holders receive the coupon paid on the loan by equity holders. In our model, a tax rate for interest income, t_i, affects this coupon payment and the cash flow to debt holders after tax becomes:

$$CFD_{aftertax}\,(X) = c(1 - t_i)$$

EQUATION 5

In accordance with the assumptions in our model, the tax rates t_c, t_d and t_i, affect the total cash flow of a levered firm, paying out dividends to its shareholders and a coupon of c to its debt holders. Combining the after-tax cash flows paid to the equity holders and to the debt holders, the cash flow to the firm after tax becomes:

$$CFF_{aftertax}(X) = (aX - b - c)(1 - \mathrm{t_c})(1 - \mathrm{t_d}) + \mathrm{c}(1 - \mathrm{t_i})$$

EQUATION 6

6.2.2 From cash flows to total firm value

Since we only have observations for the total firm values from the regressions, it is necessary to adjust the formulas based on cash flows to fit the total firm values in. However, whether cash flows or total firm value is used will not necessarily make any significant impact. As long as the cash flows are adjusted to perpetual values and the firm is outside of bankruptcy risk, the two measurements will give the same results. This is explained more thoroughly in the following sections.

6.2.4 Perpetual values of the cash flows

As the total firm values represent perpetual values, the cash flows need to be converted into perpetual values as well. The first term in the equation of the cash flows before debt and tax is equal to aX. The growth rate of this term can be understood as the rate μ of X. Since the growth rate is a constant, as explained earlier, Gordon's growth formula can be applied to this part of the equation. According to Gordon Growth model, the aX term should be divided with $r - \mu$ to get the perpetual value (Investopedia, n.d.-a). The rest of the equation, the fixed cost and the coupon, represent the constant in the model with a growth rate equal to zero. Hence, they are divided with just r. The perpetual value of the cash flows before tax becomes:

$$TFV(X) = \frac{aX}{r - \mu} - \frac{b + c}{r} + \frac{c}{r}$$

EQUATION 7

After tax, the value equals:

$$TFV_{aftertax}(X) = \frac{aX(1 - t_c)(1 - t_d)}{r - \mu} - \frac{(b + c)(1 - t_c)(1 - t_d)}{r} + \frac{c(1 - t_i)}{r}$$

EQUATION 8

Setting $\beta = \frac{a(1-t_c)(1-t_d)}{r-\mu}$ and $\alpha = \frac{(b+c)(1-t_c)(1-t_d)}{r} - \frac{c(1-t_i)}{r}$, the equation can be rewritten as:

$$TFV_{aftertax}(X) = \beta X - \alpha$$

EQUATION 9

Where β and α equals the perpetual after-tax values of the scaling factor of the model, i.e., the sensitivity to the oil price, and the fixed cost and coupon payment respectively.

Another difference from the model of Morellec and Zhdanov is that their model only considers the coupon payment, while our model also includes the fixed costs of the firms. The reason for this is that Morellec and Zhdanov are suitable for a more long-term use, while this model is more short-term. Whether the costs are fixed, or variable are determined by the time period considered. As it is harder to adjust costs in the short term, the costs are considered fixed in this time frame. Opposite, costs are in general, variable in the long term (Investopedia, n.d.-b). Further, there is a possibility of the firm going bankrupt without debt, if it has fixed costs. If the firm has no debt and no fixed costs, it cannot go bankrupt. Hence, by including the fixed costs in the model we make bankruptcy a possibility.

6.2.5 The option element

To this point, we have only included the cash flows paid when the firms are outside of bankruptcy risk in our estimation of the firm values. However, this is not necessarily the case in real life. When we estimate the firm values, an option element has to be taken into account, i.e. the option value of going bankrupt.

The option that the equity holders own has the value equal to $e_2 X^{\nu}$, where ν is the negative root of the quadratic equation $\frac{1}{2}\sigma^2(y-1)y + \mu y - r = 0$ (Morellec & Zhdanov, 2008). The cash flow to the equity holders is determined by the oil price, and when the oil takes on a certain value $\underline{X}$ (the default threshold), the shareholders decide to default on their debt obligations by exercising the option and go bankrupt. Hence, the value of the firm's assets is given to the debt holders. This choice has thus the characteristics of a put option, and its value is based on the assumption that shareholders not necessarily decide to go bankrupt when net cash flow reaches zero. This is because shareholders assume that there is a probability that the value of the cash flows can turn positive again. Hence, the option gives the shareholders an option to wait and see how the cash flows will evolve. The choice of not going bankrupt when the cash flows takes on negative values is valuable and make the option value positive.

The debt value is affected by the shareholders bankruptcy-option. The debt holders have sold a put option to the shareholders, allowing them to "sell" the firm to the debt holders, by going bankrupt. If the shareholders decide to exercise this option, the debt holders hold the other part of this agreement and are obligated to "buy" the firm. Thus, the value of debt can be thought of as the difference between the perpetual value of the coupon after tax and a put option. We define the debt after the definition of unprotected debt, as explained above, and the put option has therefore a strike price equal to the coupon value. Why the debt is characterized like this is explained in the section explaining debt value. Its value is equal to $d_2 X^{\nu}$. The option sold to the equity holders do not have the same value to debt holders as it does to equity holders, since, at bankruptcy, the firm value does not equal to the sum of the equity and debt anymore. This is due to the bankruptcy cost affecting the firm when it goes bankrupt or is close to bankruptcy, meaning that a third party is getting some of the firm value. Bankruptcy costs are incurred by creditors to ensure that their rights and interests are fulfilled, and this is done using legal and professional help. The payment reduces the value of assets that is finally shared among the investors. The bankruptcy cost is often around 3-4 % of the pre-bankruptcy value of total assets and are higher for more complicated firms with many creditors and also for small firms (Berk & DeMarzo, 2014). Since the debt holders are left with the remaining asset value at bankruptcy, they are the ones paying for the bankruptcy cost. Their option value is therefore affected negatively by these costs.

6.2.6 Equity value

The value of equity can be thought of as the perpetual cash flows to equity holders, plus the option value of going bankrupt. The option is equal to a put option on the firm's assets, where the debt holders hold the other part of the option contract. The value of equity is thus given by the formula:

$$Equity(X) = e_2 X^{\nu} + \frac{aX(1-t_c)(1-t_d)}{r-\mu} - \frac{b + c[(1-t_d)(1-t_c)]}{r}$$

EQUATION 10

The perpetual value of cash flows to shareholders and the value of equity are shown in the graph below. The red line illustrates the value of equity with the option to default, and the blue line illustrates the perpetual value of the cash flows to equity holders. The blue line is crossing the y-axis in $\frac{-(b+c)[(1-t_d)(1-t_c)]}{r}$ and its slope is defined by $\frac{a(1-t_c)(1-t_d)}{r-\mu}$.

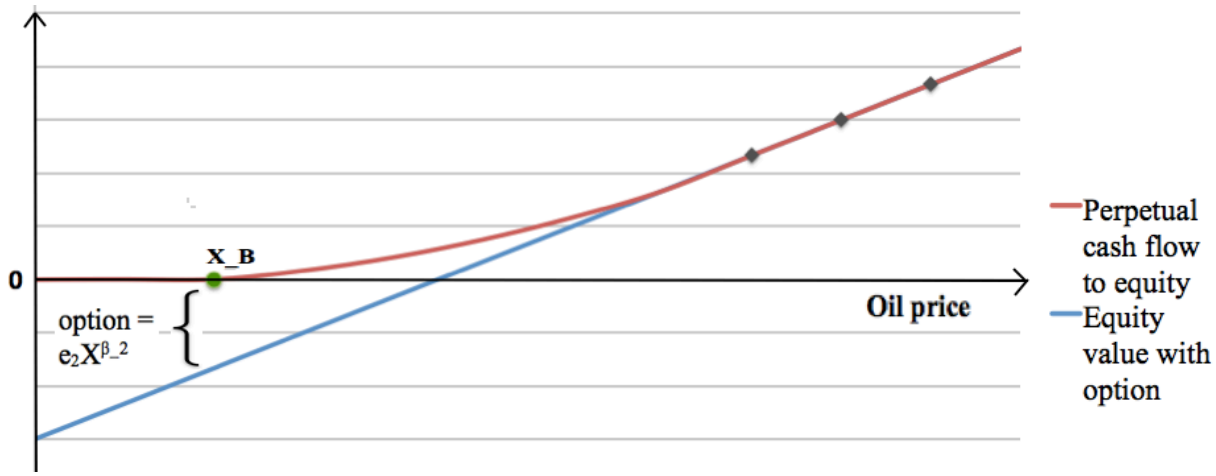


FIGURE 9 - THE EQUITY VALUE AND THE PERPETUAL CASH FLOW TO THE EQUITY HOLDERS FOR DIFFERENT OIL PRICES

As illustrated by the graph, the value of equity becomes linear and merges with the line for cash flows, as the oil price X takes on higher values. This is because of the loss of the option value. In other words, when operating with oil prices sufficiently high, far away from the bankruptcy level $\underline{X}$, an estimation of the equity value will give the same result as the estimation of the perpetual cash flows to equity. Thus, it is important to estimate $\underline{X}$. Assuming the absolute priority rule, the value of equity is zero in $\underline{X}$ (Leland, 1994). The optimal point for $\underline{X}$ is where the slope of the equity value is equal to zero, and this can be found by using smooth pasting. We thus have to identify the differentiation equation for $Equity(X)$ and set this equal to zero. Then, if we solve this equation for $\underline{X}$, we get the following approximation for the bankruptcy level:

$$\underline{X} \to \frac{(b+c)\,\nu\,(r-\mu)}{ar(-1+\nu)}$$

EQUATION 11

Where ξ and ν are the positive and negative roots of the quadratic equation $\frac{1}{2}\sigma^2 y(y-1)+\mu y-r=0$. The equations for the positive and negative roots are as following:

$$\xi \to \frac{-2\mu+\ \sigma^2+2\ \sqrt{2\,r\,\sigma^2+\left(\mu-\frac{\sigma^2}{2}\right)^2}}{2\sigma^2}$$

EQUATION 12

$$\nu \to \frac{-2\mu+\ \sigma^2-2\ \sqrt{2\,r\,\sigma^2+\left(\mu-\frac{\sigma^2}{2}\right)^2}}{2\sigma^2}$$

EQUATION 13

Equation 11 is used in the situation when the firm has debt. If the firm does not have any debt, almost the same equation is used. The only difference is that the coupon is removed from the equation, as the firms do not have any debt obligations. The equation is as follows:

$$\underline{X_0} = \frac{b\,\nu(r-\mu)}{ar\,(-1+\nu)}$$

EQUATION 14

6.2.7 Debt value

The debt in our thesis is assumed to have infinite maturity. If the debt has no explicit time dependency, the value of the claim at time *t* becomes equal to zero. This means that, with infinite maturity, the only payment to the debt holders is the coupon. In other words, the company will only go bankrupt if they cannot pay the coupon. This definition of debt is consistent with the definition of unprotected debt (Leland, 1994)

When estimating the debt, the option value sold to the equity holders has to be taken into account. The value of debt $D(X)$ can be thought of as the perpetual cash flows to debt holders, minus the option value of going bankrupt, described above. The value of debt is thus given by the formula:

$$Debt(X) = \frac{c(1-t_i)}{r} - d_2 X^{\nu}$$

EQUATION 15

For high values of the oil price X, far away from $\underline{X}$, the two curves of the perpetual cash flow to debt and debt value merge. Then, the option element disappears. This is illustrated in the graph below.

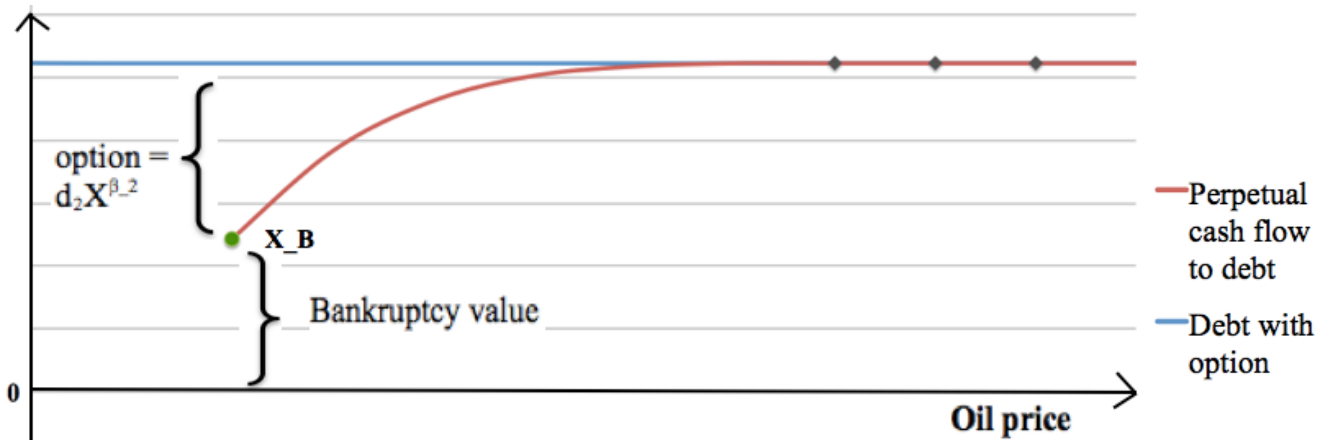


FIGURE 10 - THE DEBT VALUE AND THE PERPETUAL CASH FLOWS TO THE DEBT HOLDERS FOR DIFFERENT OIL PRICES

6.2.8 Total firm value

Total firm value equals the sum of equity value plus debt value, and can be written:

$$TFV(X) = \frac{\mathrm{aX}\,(1-\mathrm{t_c})(1-\mathrm{t_d})}{r-\mu} - \frac{(\mathrm{b}+\mathrm{c})(1-\mathrm{t_d})(1-\mathrm{t_c})}{r} + e_2X^{\nu} + \frac{(1-\mathrm{t_i})\mathrm{c})}{r} - d_2X^{\nu}$$

EQUATION 16

However, this is only the case when the firm is bankrupt, or very close to bankruptcy. If the oil price X is sufficiently high, far away from $\underline{X}$ the option is not valuable anymore since it is a very little chance of going bankrupt. Then, both e_2X^{ν} and d_2X^{ν} becomes equal to zero. The values of debt and equity is thus the same as the perpetual cash flow values to equity and debt:

$$Equity(X) = \frac{\mathrm{aX}\,(1-\mathrm{t_c})(1-\mathrm{t_d})}{r-\mu} - \frac{(\mathrm{b}+\mathrm{c})(1-\mathrm{t_d})(1-\mathrm{t_c})}{r}$$

$$Debt(X) = \frac{(1-\mathrm{t_i})\mathrm{c})}{r}$$

And the total firm value becomes:

$$TFV(X) = \frac{\mathrm{aX}\,(1-\mathrm{t_c})(1-\mathrm{t_d})}{r-\mu} - \frac{(\mathrm{b}+\mathrm{c})(1-\mathrm{t_d})(1-\mathrm{t_c})}{r} + \frac{(1-\mathrm{t_i})\mathrm{c})}{r}$$

EQUATION 17

The total firm value with the option and the perpetual cash flows to the firm is illustrated in the graph below:

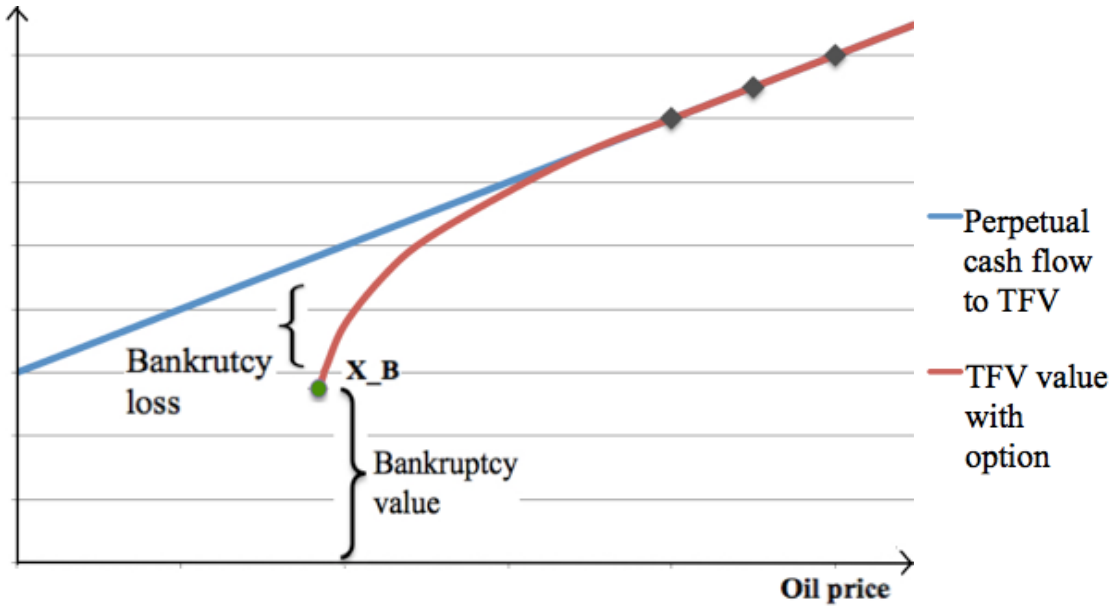


FIGURE 11 - THE TOTAL FIRM VALUE AND THE PERPETUAL CASH FLOWS TO THE FIRM FOR DIFFERENT OIL PRICES

As a result of this, it is important that the option value is equal to zero, so that the estimated firm values used in the model of our thesis can be compared to the cash flows used in the model of Morellec and Zhdanov. Further in the analysis, we will assume that this is the case. We are also going to test this assumption in the analysis, by comparing the value of $\underline{X}$ with the firm values used in our thesis, checking if the firm values are relatively far away form $\underline{X}$.

6.2.9 Synergies

Our model analyzes two types of synergies; cost savings and operational cash flows synergies. According to Damodaran (2005) the synergy effects are incorporated into the cash flows. There are cost savings synergies if the fixed costs before tax and debt of the merged entity are lower than the equivalent values of the bidder and target together. This could be a result of economies of scale effects, as described earlier, which is typical in merges between two firms operating in the same business. The synergy can be illustrated by the following inequality:

$$b_m < b_b + b_t$$

EQUATION 18

Hence,

$$b_b + b_t = b_m + \Lambda_{\mathrm{b}}$$

Where b_m, b_b and b_t illustrates the fixed cost before tax and debt of the merged entity, the bidder and the target respectively, and Λ_{b} represent the cost synergies. The other synergy is related to the productivity of the firm's operations. In our case, the productivity is captured in the scaling factor *a* in the equation for cash flows. The scaling factor reflects how the company manages to exploit the oil price effect on cash flows before tax and debt. If the scaling factor is high, an increase in the oil price will have considerable impact on the cash flows to the firm. Hence, this synergy is present if the scaling factor for the merged entity is larger than it is for the bidder and target together. The synergy effect is shown by the inequality:

$$a_m > a_b + a_t$$

EQUATION 19

Hence,

$$a_b + a_t + \Lambda_{\mathrm{a}} = a_m$$

Where a_b, a_t and a_m represent the scaling factor before tax and debt of the bidder, the target and the merged firm respectively, and Λ_{a} represent synergies related to productivity.

7. Analysis

The main analysis consists of four parts. First, we are going to calculate the firm values for target, bidder and merged based on publicly financial data. Secondly, we will do simple linear regressions on the data values to define the linear relationship between the oil price and the firm values. Thirdly, we are going to estimate the bankruptcy level for the three firms. Finally, and the main purpose of the analysis, we will calculate the theoretical equity value of the bidding firm using our model.

7.1 Firm values for target, bidder and merged and the oil price

The firm value of the merged entity (Aker BP) is based on quarterly data for 2017 from the annual accounting report of 2017. Quarter 4 in 2016 is not included in the data set, because the merger was finally being completed on December 1st i.e. this was the first day for the new firm Aker BP (Aker BP ASA, 2016). The data for target is retrieved from Proff Forvalt and for bidder from the annual accounting reports (Proff Forvalt, 2018). Preferably, we would use total firm values of target (BP Norge) and bidder (Det norske) from the period just before the merger, i.e. from around 2012 to quarter 3 in 2016. However, as BP Norge does not provide quarterly accounting data, the year of 2016 is omitted from the calculations of firm values. Another consideration is that Det Norske's firm value from the period from 2014-2015 may be highly impacted by all the takeover activity in this period. Therefore, we decided to exclude these years, to avoid having a leverage ratio that is influenced by takeover activity. We ended up with using the years 2010-2013 for Det norske. The period between 2012 and 2015 was not significantly affected by takeover activities for BP Norge, therefore, we use this period for BP Norge.

7.1.1 End-of-year numbers versus average numbers

It is arguable whether end-of-year or yearly average numbers should be used when estimating firm values and oil prices. Average numbers tend to even out fluctuations during the year. However, calculating values based on end of year numbers, provide more accurate values at the end of the year

(Petersen & Plenborg, 2012). Market values represent the value today, with the market's expectations of the future value already incorporated into the values. We want market values since we are comparing our theoretical equity value with the market values of equity. Hence, we are using the end-of-year values of the firm values, as these values represent the market value. The same argumentation holds for the oil price.

7.1.2 From NOK to USD

Aker BP's functional currency is USD (Aker BP ASA, 2017). Since Det norske changed their functional currency in 2014 from NOK to USD, the accounting data will be re-calculated in 2012 and 2013 from NOK to USD. This is also done for BP Norge for all years, as all of the accounting numbers is in NOK. The calculations for both are based on end of year exchange rates taken from Norges Bank (Norges Bank, n.d.-b).The firm values is in USD for bidder, target and merged can be found in Appendix A.

7.1.3 Calculating the firm values

The firm values are found adding debt and equity. Since we want to find the market values of the firms, the market value of equity and debt should be used. However, calculating the market value of debt is quite complicated and it is therefore common to use the book value of debt instead. This is a simplification that we are making in our thesis. All of the firm values can be found in Appendix A.

7.1.4 Calculating the market value of equity

For the companies listed on the stock exchange, Aker BP and Det norske, the market cap is calculated as the share price multiplied with the total shares outstanding, both using end-of-year numbers. Shares outstanding are found in the annual reports, as well as the share prices. BP Norge, however, was not listed on the stock exchange before the merger and the share price of the company cannot be observed in the same way. The book value of equity is often considerably lower than the market value of equity hence, if we use the book value of equity the company will most likely be undervalued. Therefore, we will need an alternative approach to estimate the market value of equity. One solution is to use comparable companies, but in that case the companies should share some of the same characteristics as BP Norge. Such characteristics could for instance be that they are of equal size, operate in the same

industry and in the same geographic area (Petersen & Plenborg, 2012). Uunfortunately, we do not have any comparable in our case. We will therefore develop our own method where we assume that BP Norge has the same debt-equity ratio (D/E ratio) as their parent company BP Ltd. We are finding the market value of equity by dividing book value of debt with this ratio. The market value of BP Norge is given as:

$$Market\ value\ of\ equity\ BP\ Norge\ = \frac{Book\ value\ of\ debt\ BP\ Norge}{D/E\ ratio\ for\ BP\ Ltd}$$

EQUATION 20

The market value of BP Norge, the D/E ratios of BP Ltd. (BP, n.d.-a) and the market value of equity are provided in the table below.

TABLE 1– MARKET VALUE OF EQUITY BP NORGE AND D/E RATIO FOR BP

	2012	2013	2014	2015
Book value of debt	4 901 409 348,95	3 397 965 793,13	3 023 511 811,87	2 251 424 338,74
D/E ratio	39,3 %	36,6 %	46,5 %	54,4 %
Market value equity	12 471 779 513,87	9 284 059 544,07	6 502 175 939,51	4 138 647 681,52

7.1.5 The oil price

Aker BP operates within the oil and gas sector. The development of the gas prices is rather identical to the development of oil prices. We base our analysis on the assumption that the two commodities are priced equally, and therefore we will not distinguish between the oil price and gas prices. We will use end-of year oil prices for the bidder and target firm and end end-of quarter oil prices for the merged firm. The oil price is downloaded from U.S. Energy Information Administration (EIA, n.d.).

7.2 Simple linear regressions

The purpose of the regression is to find a best possible estimate of the unknown regression line, which is determined by the equation: $y = \alpha + \beta X$. The regression describes the relationship between two variables, the independent variable (X) and the dependent variable (y) (Løvås, 2013).The purpose of using simple linear regression in our thesis is to estimate the unknown values α and β.

In the following, we will use simple linear regressions on the data for total firm values for bidder, target and merged, and the oil prices. The total firm values are the dependent variables and the oil price is the independent variable. The purpose is to find the oil price coefficient and the constant for all of the firms. In Appendix B all of the regressions are provided. The results for the coefficients and constants are summarized in the table below:

TABLE 2 – SUMMARY OF STATA OUTPUT

	Target	Bidder	Merged
β	113 000 000	91 800 000	300 000 000
α	-2 700 000 000	7 630 000 000	2 980 000 000

Using the output from Table 2 the three equations are as follows:

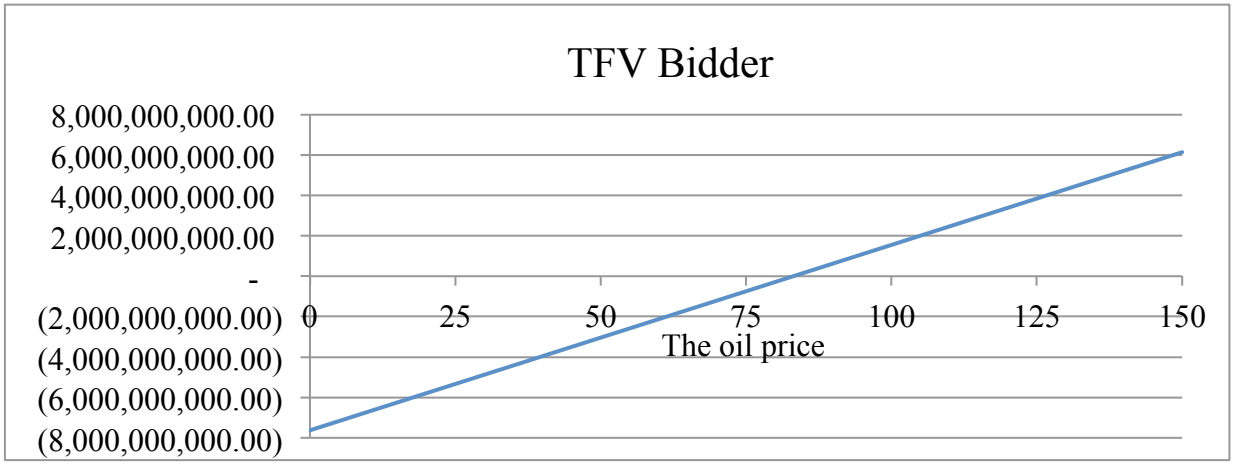
$$TFV_{Target} = 113\,000\,000X + 2\,700\,000\,000$$

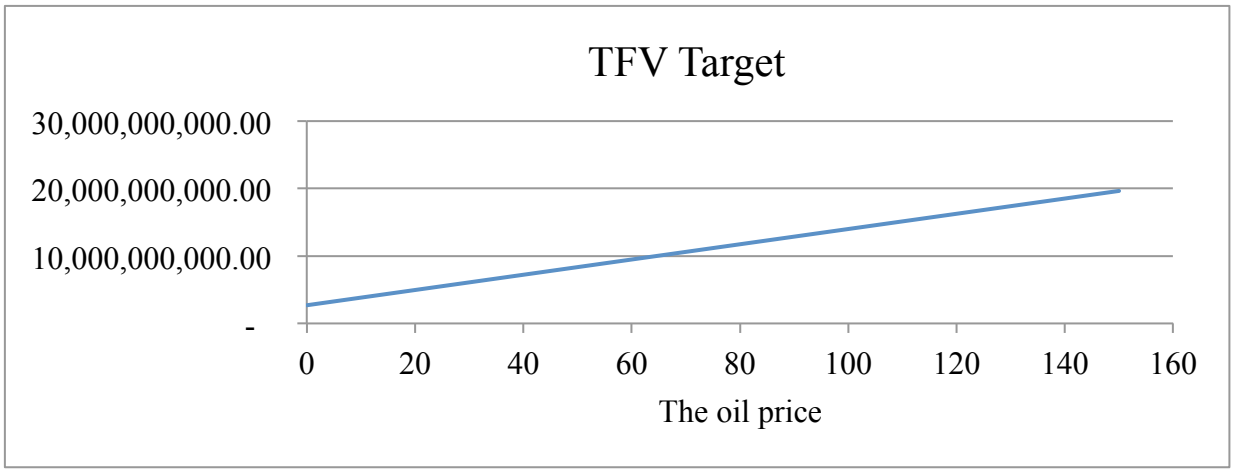
$$TFV_{Bidder} = 91\,800\,000X - 7\,630\,000\,000$$

$$TFV_{Merged} = 300\,000\,000X - 2\,980\,000\,000$$

The oil price is an important revenue driver of an oil company, therefore, an oil company is often highly affected by oil price fluctuations. Dayanandan and Donker (2011) show a positive and significantly relationship between crude oil prices and the performance of oil and gas companies in North America.

Moreover, their results also showed that the financial crisis of 2008 had a negative impact on the financial performance of oil and gas companies. As we can see from our data of total firm values, compared with the correspondently oil price form that year, total firm values are positively correlated with the oil price. The graphs below illustrates the firm values for bidder, target and merged with the correspondently oil prices:





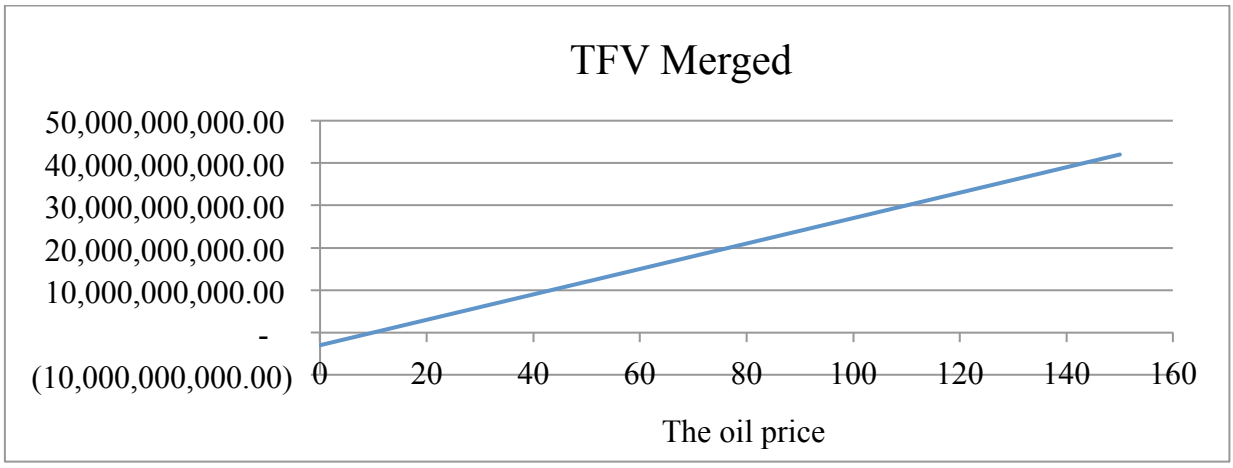


FIGURE 12, 13 AND 14 – TOTAL FIRM VALUE OF THE BIDDER, THE TARGET AND THE MERGED FIRM AS A FUNCTION OF THE OIL PRICE

We observe from the plots that the bidder and merged firm receive a negative total firm value if the oil price decreases to a specific level. Bidder gets a negative value at a significantly higher oil price than merged firm. However, for the target firm, there are no positive values of the oil price giving a negative firm value. We will emphasize this later in the analysis.

7.3 The development of the leverage ratio

The leverage of bidder both decreases and increases in the years before the takeover. From 2014 the leverage decreases until the merger and continues to decrease further. This we will discuss later in relation to theory. The graph below illustrates this development of the leverage ratio:

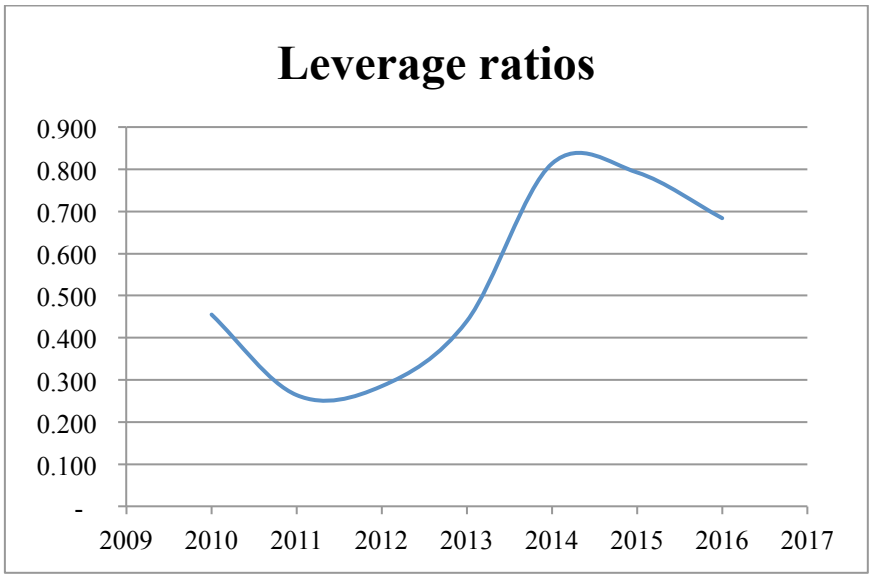


FIGURE 15 - THE DEVELOPMENT OF THE LEVERAGE RATIO OF THE BIDDER AND THE MERGED FIRM

7.4 Finding the bankruptcy levels

In this section we are going to calculate the bankruptcy levels for the three firms. The purpose of doing this is to test if the firm values are far away from the bankruptcy level, since this is a requirement for using the model of Morellec and Zhdanov (2008) with total firm values instead of cash flows. We will estimate two different bankruptcy levels for both firms; one where the firms have debt and one where they do not. The values of bankruptcy levels are inputs in the calculation of equity value.

7.4.1 Input parameters

The bankruptcy levels have several input parameters that need to be estimated. These are the risk-free rate, the volatility of the oil and three tax rates (corporate tax, dividend tax and interest income tax), the scaling factor, fixed cost and coupon. The parameters will be equal for the two situations described above, except for the coupon value, which will not be a part of the bankruptcy estimation for the firms without debt.

Risk-free rate

The risk-free rate is defined as the theoretical return of an investment with no risk (Investopedia, n.d.-c). Damodaran (2012) highlights that when the investment is risk-free, the investor knows exactly the returns. In other words, the actual return is always equal to the expected returns. According to a survey among the members of Finansanalytikerne in Norway, done by PWC in 2016, the 10-year government bond is the most used measure of risk-free rate in Norway. The purpose of this survey was to get an overview of the risk premium in Norway (PWC, 2016). According to Norges Bank, the 10 - year government bond in 2015, 2016 and 2017 was at 1,57%, 1,33% and 1,64% (Norges Bank, n.d.-a). We will only use the risk-free rate of 2015, to simply our analysis. However, in the comparative analysis of the thesis we will test for other risk- free rates.

The drift

It can be argued that the risk-free rate can be used instead of the expected return. This is the case if it the investors are risk neutral in their choice of investment strategies, meaning that they do not need to be compensated for taking on higher-risk investments. Using the risk-free rate is used instead of the expected return is called risk-neutral valuation, which is commonly used for pricing derivatives dependent on the underlying stock price. However, risk neutrality does not characterize the world we live in. In the real world, the investor would require a higher return from a higher risk investment. Nevertheless, assuming the world is risk neutral is giving us the right price of the derivative's price in the risk neutral word, as well as in the real world (Hull, 2012). Since the oil price considered in this thesis is affected by the derivatives market, i.e. future contracts on oil, we will make the same adjustment and use risk neutral valuation. According to Hull (2012, p.757) the drift for commodity prices can be assumed to be determined by the risk-free rate and the convenience yield as:

$$\mu = r - \delta$$

EQUATION 21

The convenience yield represents the benefits provided from holding the physical asset instead of a futures contract on the asset. Holding a physical asset give an opportunity to keep a production process active, and maybe even profit from short-term local shortages. This type of opportunity is not possible

for the holder of a future contract. In cases with oil, the convenience yield represents the benefits of holding crude oil as an asset. An example of such a benefit could be that crude oil can be used in the refining process if it is a part of the inventory, but this is not possible with a futures contract (Hull, 2012). In the oil industry, the estimates of the convenience yields have a remarkable spread and therefore, we have chosen to make an assumption for this input. As our risk free rate is 1,57%, we chose a rate lower than this, in order to get a positive value of μ. It is not necessary to have a positive value of μ, but we chose it for simplification. An approximation of the convenience yield is therefore 1%. Hence, μ become equal to 0,0157−0,01 = 0,0057 in the thesis.

Volatility

In the following, we will calculate the volatility based on the historical oil price development. Thus, a relevant time period and a number of observations have to be chosen for the oil price development. Regarding the time period, data that are too old may not be relevant for the estimation of volatility as volatility changes over time. However, more data indicates more accuracy (Hull, 2012).Therefore, we will use weekly historical Brent Crude oil prices from 1987- 2017 from EIA (2018) to get a large number of observations of the oil price development for a relevant time period.

There are mainly two methods for calculating volatility; implied volatility and historical volatility. Implied volatilities are based on option prices observed in the market, while historical volatilities are based on historical prices at fixed intervals of time. The historical volatilities are backward looking, while implied volatilities are forward looking (Hull, 2012). The implied volatility is not directly observable and requires a number of inputs, and we choose to simplify the calculations by using historical volatility. We will calculate the monthly standard deviation of the returns of the oil price, r, using the formula based on Hull (Hull, 2012, p.304):

$$s = \sqrt{\frac{1}{n-1}\sum_{i=1}^{n}(r_i - \bar{r})^2}$$

EQUATION 22

Where:

$$r_i = \ln \frac{S_i}{S_{i-1}} \text{ for } i = 1,2 \ldots, n$$

And:

$n + 1$= number of observations

S_i= stock price at end of ith interval, with $i = 0,1,\ldots,n$

$\bar{r}$: mean of the r_i

When applying this formula for the oil prices, the weekly standard deviation becomes equal to 4,21%. Since the standard deviation of $r_i = \sigma * \sqrt{\tau}$, where τ = length of the time interval, we will calculate the annualized volatility by multiplying the weekly volatility with the square root of 52 (Hull, 2012). The annualized volatility is 30.36%.

Taxes

The firms considered in our thesis are paying taxes to Norway, therefore we are going to apply Norwegian taxation rules in our calculations.

Corporate tax rate

The annual corporate tax rate was 27% in 2015 (Aker BP ASA, 2015) and it is assumed to be equal for both bidder and target in 2015. Correspondingly, the tax rate was 24% in 2017 (Aker BP ASA, 2017). Oil firms can have a marginal tax rate up to 78%. Actual marginal tax rate is often lower due to a deduction in the special tax rate, called uplift. This uplift is estimated on investments that are written off over 6 years, for pipelines and production facilities (Oljeskattekontoret, 2016). Despite that petroleum companies have to pay a special tax on top of the corporate tax, we decide to use only the corporate tax, to avoid any impact of a unnormal high tax rate on our estimations. We will therefore use the annual corporate tax rates of 27% and 24% and look at the impact of the special tax rate in our comparative analysis.

Dividend tax rate

Taxation on dividends are regulated by the shareholder model and concerns shareholders who have to pay taxes in Norway (Skatteetaten, n.d.). Firms do not need to pay taxes on dividends in Norway. The tax rates on dividends were 27% in 2015 and 29,76% in (Bjørnelykke, 2015; Nordstrøm & Lorentzen, 2017).

Interest income tax

The interest tax rate has fluctuated for several years, and for simplification we therefore assume a tax rate of 20% for all years. This is the interest tax rate paid by personal investors.

Scaling factor, fixed cost, coupon

The scaling factor, a, the fixed cost, b, and the coupon payment, c for the cash flows to the firms before tax and debt are found by using the regression output for the total firm value: α and β. We have already shown that α and β can be written as

$$\alpha = \frac{(1-t_c)(1-t_d)(b+c)}{r} - \frac{(1-t_i)c}{r}$$

$$\beta = \frac{(1-t_c)(1-t_d)a}{r-\mu}$$

The values for a, b and c can be found by rearranging the equations above:

$$b = \frac{\alpha r}{(1-t_c)(1-t_d)-(1-t\_i)} - c$$

EQUATION 23

$$c = \frac{\alpha r}{(1-t_c)(1-t_d)-(1-t\_i)} - b$$

EQUATION 24

$$a = \frac{\beta(r-\mu)}{(1-t_c)(1-t_d)}$$

EQUATION 25

Where α and β is the regression output shown in the analysis, r is the risk-free rate, t_c is the corporate tax rate, t_d is the dividend tax and t_i is the interest income tax.

The coupon payment in our thesis is defined as the total interest expense. It is arguable whether interest paid, or interest expense should be used as coupon payment. Interest expense is the interest payable on all borrowings, and it represents the interest accrued during the period of the financial statement. Interest paid, however, is what is actually paid during the period of the financial statement. It is the interest accrued, and not the interest actually paid during the accounting period, that are tax-deductible for companies (Investopedia, n.d.-d). As tax deductions are relevant for the calculations in the thesis, we are going to use total interest expense as the coupon payment. We will use the coupon payment of the target and bidder firm from the income statement of 2015. For the merged firm, we will use the equivalent value the income statement of 2017. The coupon values equal USD 103 677 000 for the merged firm, USD 109 125 000 for the bidder firm and USD 39 820 525 for the target firm. The values for the *a*, *b* and *c* are provided in the table below:

TABLE 3 – THE SCALING FACTOR, THE FIXED COST AND THE COUPON OF THE THREE FIRMS

	Merged	Bidder	Target
a	5 619 829,76	1 722 649,65	2 120 472,88
b	72 143 918,49	339 362 457,88	-198 525 129,48
c	103 627 000,00	109 125 000,00	39 820 524,46

7.4.3 Three scenarios for bankruptcy

The cash flows to the firms before tax can be written as: $aX - b - c$. Looking at the b – and c -values for the target firm, it becomes clear that the firm has cheap debt and a result of this, and they cannot go bankrupt. This is because the fixed value b, as well as the sum of b and the coupon c is below zero,

indicating that the firm always are able to serve its debt holders. Conversely, the merged firm and the bidder firm can go bankrupt even without debt. This happens if the aX-term is not large enough to even out the costs, meaning that $b > aX$. This can happen in periods with low prices leading to declining revenues, and the firm has a high amount of fixed cost, cannot cover the costs. Considering the firms in our thesis, the firms can go bankrupt if the oil price declines significantly.

We have three different scenarios considering bankruptcy, which are as follows:

1. If $b > 0$ and $c > 0$. The firm can go bankrupt even without debt. As in the case for the merged and the bidder firm.
2. If $b < 0$ and $b + c > 0$. The firm can go bankrupt with debt, but not without debt
3. If $b < 0$ and $b + c < 0$. The firm can never go bankrupt with or without debt. As in the case for the target firm

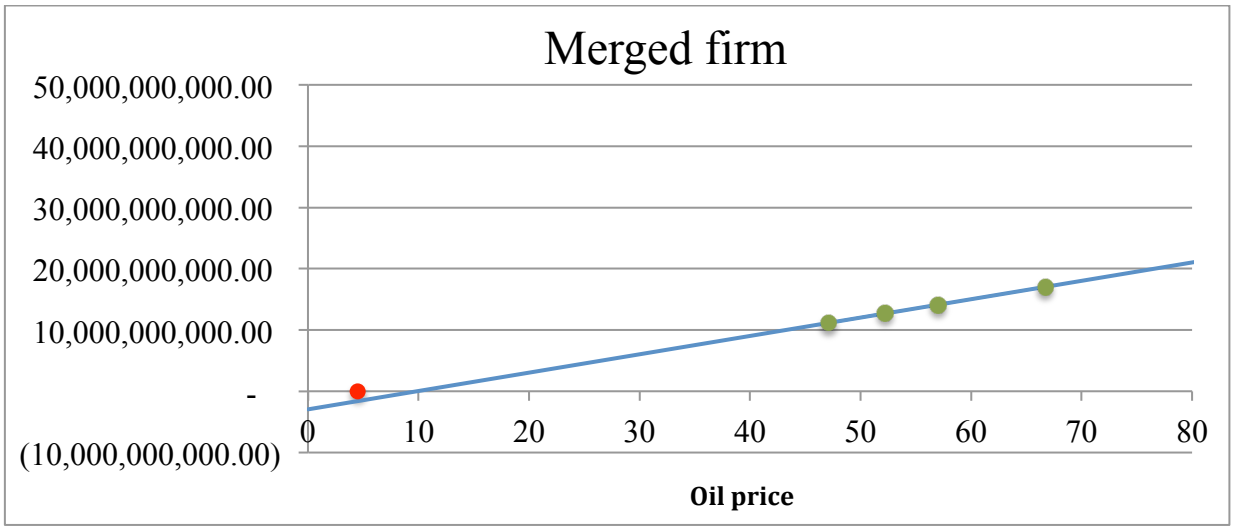
7.4.4 Bankruptcy levels for the merged, bidder and target firm with debt

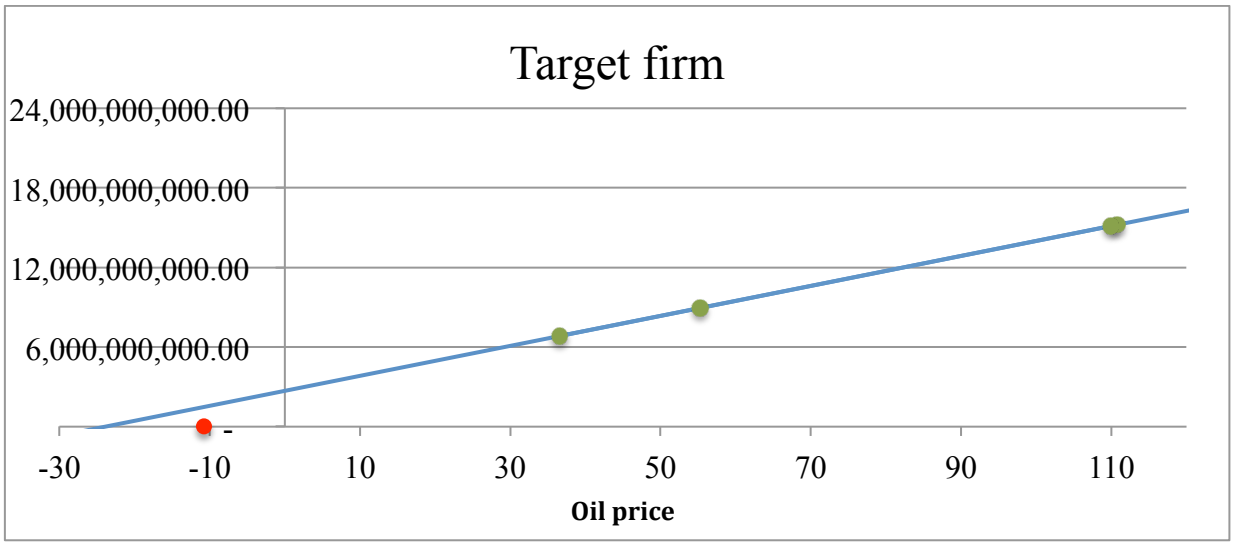
In the following we will estimate the oil price for which the firms go bankrupt with debt, as are all levered. Inserting the values into the equation 13, ν becomes equal to -0,2916. Then the estimate for ν is inserted into equation 11 for $\underline{X}$ for the three different firms. The values for $\underline{X}$ for the merged firm ($\underline{X}_m$), the target firm ($\underline{X}_t$), and the bidder firm ($\underline{X}_2$), are provided in the table below:

TABLE 4 – BANKRUPTCY LEVELS FOR THE MERGED, BIDDER AND TARGET FIRM WITH DEBT

	Merged	**Bidder**	**Target**
$\underline{X}$	4,497771892	37,43922972	-10,76292636

To get a better understanding of whether the firm values used in our thesis are far above the bankruptcy levels or not. The graphs below illustrate this, where the firm values and bankruptcy levels are plotted against the oil price:


Merged firm
50,000,000,000.00
40,000,000,000.00
30,000,000,000.00
20,000,000,000.00
10,000,000,000.00
-
(10,000,000,000.00)
0
10
20
30
40
50
60
70
80
Oil price


Target firm
24,000,000,000.00
18,000,000,000.00
12,000,000,000.00
6,000,000,000.00
-
-30
-10
10
30
50
70
90
110
Oil price

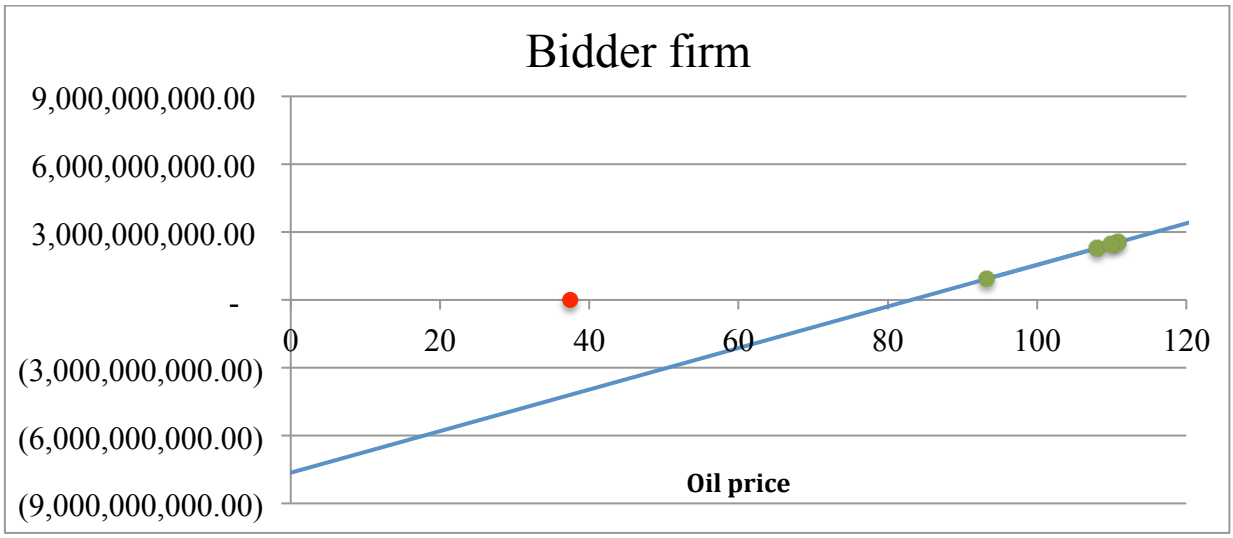


FIGURE 16, 17 AND 18 – ESTIMATED FIRM VALUES AND BANKRUPTCY LEVELS

The green spots represent the firm values for the firms in the different time periods and the blue lines represent the cash flows to the firms. The red spot represents the oil price at which the shareholders choose to go bankrupt with debt. We can conclude that the firm values are far above the levels of bankruptcy for all of the three firms. This implies that the options value of bankruptcy is in fact worthless, and the perpetual cash flows to the firms are equal to the total firm values. Therefore, we can continue to use our data further in the analysis. We can also observe from the graph that the bankruptcy level is below the value at which the cash flows reaches zero for both the merged firm and the bidder firm. The reason for this is that target firm cannot go bankrupt, as earlier explained.

7.4.5 Bankruptcy level for the losing bidder with debt

In the equity calculation, the bankruptcy level of the losing bidder is needed as well. There is no information about the losing bidder of the takeover contest in the Aker BP case. Hence, is necessary to make some assumptions in order to find the value of the bankruptcy level of the losing bidder. As described earlier, the only difference between the firms is their debt level, in other words their coupon

payment. The winning bidder is the firm with the lowest coupon. Therefore, the coupon for the losing bidder has to be higher than the coupon for the winning bidder. As a result, the bankruptcy level of the losing bidder, $\underline{X_1}$ has to be higher than the bankruptcy level of the winning bidder, $\underline{X_2}$ (Morellec & Zhdanov, 2008). As mentioned earlier, choosing a coupon payment marginally below a rival does not guarantee that the bidder wins the takeover contest, as it is only increasing its probability. Hence, there should be more than a marginally difference between the coupon payments of the winning bidder and the losing bidder. Therefore, we will assume that the coupon of the losing bidder, $c_{1,b}$, is 10% higher than the coupon of the losing bidder, $c_{2,b}$. Since the coupon of the winning bidder is equal to 109 125 000,00, the coupon of the losing bidder is set equal to $1{,}1 \cdot 109\ 125\ 000 = 120\ 037\ 500$. Since all of the other parameters in the cash flow estimation of the two bidders should be equal, $\underline{X_1}$ can now be calculated. Using the same formula as earlier for calculating the bankruptcy level (equation 11), the value of $\underline{X_1}$ becomes equal to 38,35.

7.4.6 Bankruptcy levels for the merged, winning bidder, target firm and losing bidder without debt

Now we will calculate the oil price for which the firms can go bankrupt with debt, denoted $\underline{X_0}$. Inserting the variables in equation 14 we get the following vales for the bankruptcy levels:

TABLE 5 – BANKRUPTCY LEVELS FOR THE MERGED, WINNING BIDDER TARGET AND LOSING BIDDER WITHOUT DEBT

	Merged	**Winning bidder**	**Target**	**Losing bidder**
X_0	1,846078359	28,32959717	0	28,32959717

As the target firm cannot go bankrupt, the X_0-value equals zero. The losing and winning bidder have now the same bankruptcy level, as the only factor differentiating them is the coupon payment.

7.5 Finding the fraction of asset value lost in bankruptcy

In this section we will explain the fraction of asset value lost in bankruptcy, denoted Ω. More precisely, we are going to investigate how the Ω-value should be found using the framework of Leland (1994) and how it fits with our data. However, we are not going to use the Ω-value in our calculations, as it is not a part of the equity calculation. The following will more serve as an explanation of how we could calculate the debt value, as Ω is an input in equation 15 for the debt value in Morellec and Zhdanov (2008).

We will use the framework of Leland (1994) to find Ω One limitation of using Leland (1994) is that we cannot find the optimal coupon by using the framework, because a persecution for this is to know the oil price at the exact time when the coupon is optimal. We cannot know this. However, if we assume that the target and the merged firm are not planning on participating in any merger activities in the nearest future, we can assume that the coupons we have from the accounting reports are the optimal for these firms. This is because the management of the firm, if not affected by a potential merger competition, will probably choose an optimal capital structure, balancing tax shields and bankruptcy risk. The management of the bidder firm on the other hand, is most likely going to select a capital structure that will increase the chances of winning the bidding competition. Their capital structure cannot be used in this framework, as it is not optimal in the framework of Leland (1994). Therefore, the data of the merged firm and the target firm will be used to find Ω.

The graphs plotted below shows the firm values for different values of Ω for target and merged firm. We can observe from the target's graph that the firm value remains at the same level for all of Ω-values reaching from 0 to 0,6. Hence, we can conclude that the bankruptcy cost does not have any impact at the firm value. As mentioned, this is because the firm cannot go bankrupt. For the merged firm the findings are almost the same, total firm value changes almost nothing with different Ω levels. Hence, Ω have little effect on firm value. We conclude, for both firms, that the firm values are very little sensitive to the bankruptcy cost.

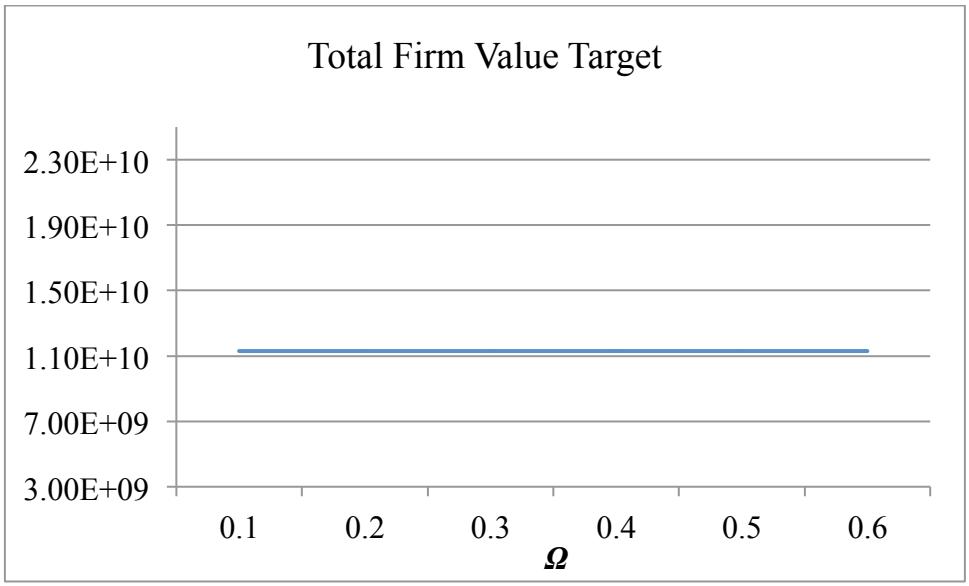


FIGURE 19 - *CHANGE IN TOTAL FIRM VALUE TARGET FOR DIFFERENT VALUES OF FRACTION LOST IN BANKRUPTCY*

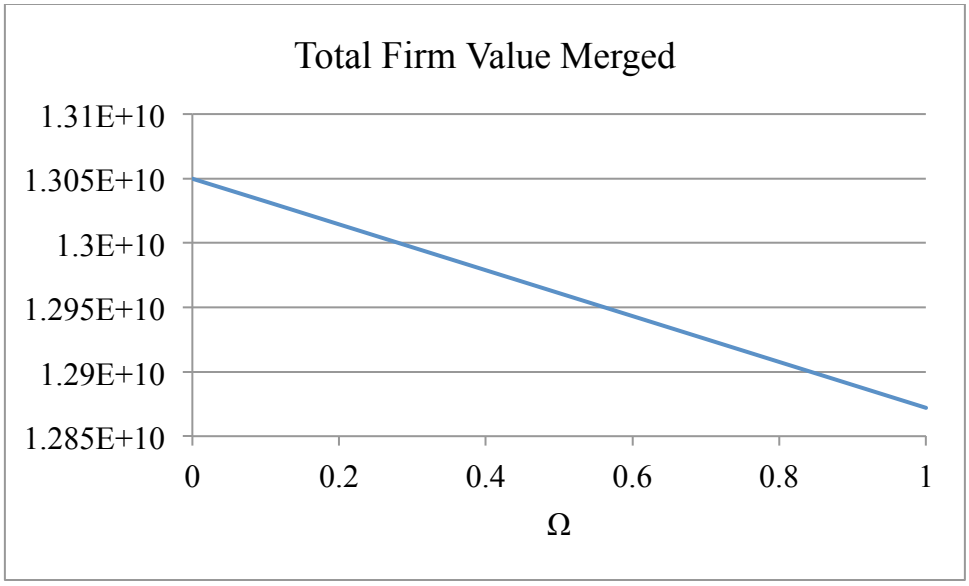


FIGURE 20 - CHANGE IN TOTAL FIRM VALUE BIDDER FOR DIFFERENT VALUES OF FRACTION LOST IN BANKRUPTCY

7.6 Finding the equity value

The purpose of this section of this thesis is to find the equity value of the bidder (Det norske) using the equations of Morellec and Zhdanov (2008). We will compare this value with the observed equity value in the market, to investigate whether our theoretical model can be applied to a real-life case. More precisely, we are going to use all the inputs found earlier in the analysis to find the equity value of the bidder before the merger using equation (16) in Morellec and Zhdanov (2008, p.564):

$$E_{2,b}(X) = (1-\tau)\left[\frac{\Pi_b X}{r-\mu} - \frac{c_b}{r} + \mathcal{L}\left(X, \underline{X}_1, \overline{X}\right)\frac{c_b}{r(1-\nu)}\left(\frac{\underline{X}_1}{\underline{X}_2}\right)^{\nu}\right]$$
$$+ \mathcal{H}\left(X, \underline{X}_1, \overline{X}\right)\left\{(1-\tau)\left[\frac{\Pi_{tar}+\Lambda}{r-\mu}\overline{X} - \frac{c_{tar}}{r} + \frac{c_{2,m}}{r(1-\nu)}\left(\frac{\overline{X}}{\underline{X}_m}\right)^{\nu}\right] - I\right\}$$

EQUATION 26

The variables are defined as earlier, with the exception of a few new variables that we will explain in the following. The equation represents all potential future cash flows received by shareholders in different cases; no default and no merger, default but no takeover, no default and takeover and last default after takeover. The first two terms in the first square bracket, represent the present value of the cash flows to shareholders after debt. The third term represents the present value of all future coupon payments when both of the bidding firms default. The last part of the equation represents the case where bidder 2 does not default before takeover, and acquires the target. Hence, the merged firm get the income and the expenses of both target and bidder, which is discounted to get the present value of cash flows at the time of the takeover. $\Pi_{2,b}$ equals the a-value described earlier of the bidder firm and Π_{tar} equals the a-value of the target firm. Λ_a represents the operating synergies and are related to the a-values. This effect is captured by the first two terms in the second square brackets. If the bidder defaults after the takeover, they do not need to pay any coupon payments and they retain the amount, denoted $c_{2,m}$. This value is discounted and multiplied with $\left(\frac{\overline{X}}{\underline{X}_m}\right)^{\nu}$, in order to get the present value if a default occurs. $c_{2,m}$ is, according to Morellec and Zhdanov (2008), calculated as $c_{2,b} + c_{tar}$. Where the two c-values is the coupon of the winning bidder and the target respectively. However, as our model is an extension of the model of Morellec and Zhdanov (2008), we are also including the b-value as well

as the cost savings synergies related to b. Therefore, we get that $c_{2,m} = (b+c)_b + (b+c)_t + \Lambda_b$. Lastly, I is subtracted, which is the price paid for the target firm. We will calculate this value by multiplying the number of shares paid to BP with the agreed upon share price for the acquisition. $\mathcal{L}(X, \underline{X}_1, \overline{X})$ and $\mathcal{H}(X, \underline{X}_1, \overline{X})$ can be found using the equations (10) and (11) from Morellec and Zhdanov (2008, p.562):

$$\mathcal{L}(X,z,y) = \left(y^{\xi}X^{\nu} - y^{\nu}X^{\xi}\right)\left(y^{\xi}z^{\nu} - y^{\nu}z^{\xi}\right)^{-1}$$

$$\mathcal{H}(X,z,y) = \left(X^{\xi}z^{\nu} - X^{\nu}z^{\xi}\right)\left(y^{\xi}z^{\nu} - y^{\nu}z^{\xi}\right)^{-1}$$

Adjusting these to calculate the values used in our case we get:

$$\mathcal{L}(X, \underline{X}_1, \overline{X}) = \left(\overline{X}^{\xi}X^{\nu} - \overline{X}^{\nu}X^{\xi}\right)\left(\overline{X}^{\xi}\underline{X}_1{}^{\nu} - \overline{X}^{\nu}\underline{X}_1{}^{\xi}\right)^{-1}$$

EQUATION 27

$$\mathcal{H}(X, \underline{X}_1, \overline{X}) = \left(X^{\xi}\underline{X}_1{}^{\nu} - X^{\nu}\underline{X}_1{}^{\xi}\right)\left(\overline{X}^{\xi}\underline{X}_1{}^{\nu} - \overline{X}^{\nu}\underline{X}_1{}^{\xi}\right)^{-1}$$

EQUATION 28

ξ and ν are the positive and negative roots of the quadratic equation $\frac{1}{2}\sigma^2 y(y-1) + \mu y - r = 0$, as explained earlier. The bankruptcy levels, $\underline{X}_1$, $\underline{X}_2$ and $\underline{X}_{tar}$ are the lowest trigger values for the oil price X, and $\overline{X}$ is the oil price at the time of the takeover. $\overline{X}$ equals the highest trigger point for the X-values. If X reaches the takeover threshold $\overline{X}$, before it reaches any of the bankruptcy levels, the takeover will occur. The takeover takes place immediately in this case. If the oil price falls below the bankruptcy level, the firm will go bankrupt. However, if the oil price lies between the bankruptcy level and the takeover threshold, the firm will not go bankrupt. We will use an oil price from right before the merger, at the 30th of June 2016, as we will use the market value of equity of this date EIA. (n.d.a). The chosen oil price is higher than the bankruptcy levels X_2 and below the takeover threshold $\overline{X}$. However, looking at the data for the oil prices, we observe that the oil price has been below the bankruptcy level in 2015

and the bidder should have gone bankruptcy according to our calculations. We will come back to this in the implication part of the thesis. Below we provide a graph illustrating the bankruptcy level and the oil price at the time of the merger, together with table 6 providing all the input variables for the equity calculation.

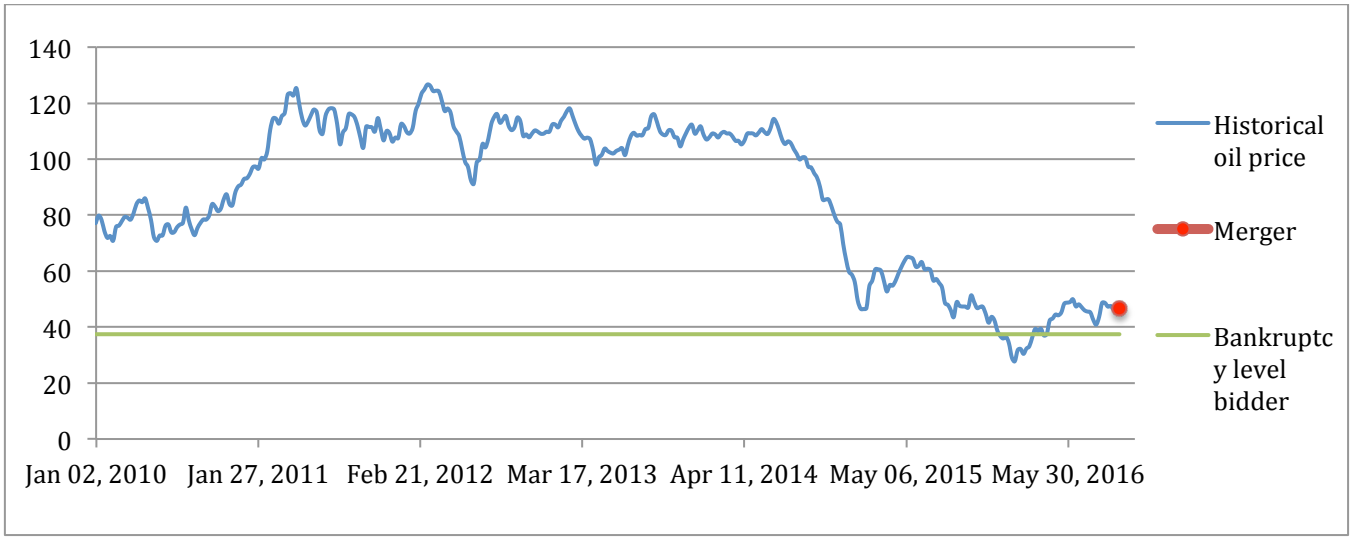


FIGURE 21 – THE BANKRUPTCY LEVEL AND THE OIL PRICE, OWN PRODUCTION BASED ON (EIA, n.d.)

TABLE 6 – THE INPUT VARIABLES USED FOR FINDING THE EQUITY VALUE OF THE BIDDER

r	*1,57%*
μ	*0,57%*
τ_c	*27%*
X	*48,05*
$\underline{X_1}$	*38,35*
$\underline{X_2}$	*37,44*
$\underline{X_m}$	*4,50*
$\overline{X}$	*48,24*
$c_{2,b}$	*448 487 457,88*

c_{tar}	*158 704 605,02*
$C_{2,m}$	*358 476 262,77*
$\Pi_{2,b}$	*1 722 649,65*
Π_{tar}	*2 120 472,88*
ν	*-0,2916*
Λ_a	*1 776 707,22*
I	*10 808 000 000,00*
$\mathcal{L}\,(X; \underline{X}_1; \overline{X})$	*0,02*
$\mathcal{H}\,(X; \underline{X}_1; \overline{X})$	*0,98*

Inserting all of the values into equation (16) we get a theoretical equity value of 1 928 763 512,68 NOK. The market value of equity is taken from the 2016 Q2 accounting report of Det norske and equals USD 2 418 913 576,27. Hence, there is a 25% difference between the equity value calculated with the framework of Morellec and Zhdanov and the market value of equity.

7.7 Finding the synergies

Two different synergies are estimated in our thesis, the operational cash flows synergies and the cost synergies. To identify these two synergies, as explained earlier in the thesis, we have to compare the $a-$ and $b-$values for bidder and target combined with the equivalent values for merged firm. If $a_{merged} > a_{target} + a_{bidder}$, the merger has created synergies through the productivity of the operations, by exploiting the effect of the oil price on the cash flows. If $a_{merged} \leq a_{target} + a_{bidder}$, the merged firm has not managed to exploit the oil price, or there is no change at all. If $b_{merged} < b_{target} + b_{bidder}$, the merged firm has lower fixed cost than the target and merged firm combined. Hence, the merger has created cost savings synergies. If, however $b_{merged} \geq b_{target} + b_{bidder}$, the

merger has led to the same fixed cost level, or even more costs. Then there are no cost synergies. In the table below, we have calculated the different values in order to investigate potential synergies:

TABLE 7 – ESTIMATION OF THE SYNERGIES

Calculating the synergies	
$a_{target} + a_{bidder}$	3 843 122,54
a_{merged}	5 619 829,76
$a_{merged} > a_{target} + a_{bidder}$ with:	1 776 707,22
Λ_*a*	**1 776 707,22**
$b_{target} + b_{bidder}$:	140 837 328,40
b_{merged}	72 143 918,49
$b_{target} + b_{bidder} > b_{merged}$ with:	68 693 409,91
Λ_*b*	**68 693 409,91**
Total	**70 470 117,13**

As can be seen from the table $a_{merged} > a_{target} + a_{bidder}$, indicating that the merger created synergies through the productivity of the operations. The merger also created cost savings synergy since $b_{merged} < b_{target} + b_{bidder}$.

8. Comparative statics

In this chapter, we will change the different input parameters in our calculations to look at the parameter's effect on the bankruptcy level, the equity value and the synergies. The input variables we will test for is the risk-free rate, the μ-rate /the convenience yield and the volatility and coupons. As the μ-rate rate is determined by the convenience yield and the risk-free rate, we can either chose to change the convenience yield or the μ-rate directly in the analysis and get the same results (if the risk-free rate is kept constant). We have chosen to change the μ-rate rate directly and keeping the risk-free rate constant. Therefore, we are actually changing the convenience yield. In addition to the input parameters mentioned above, we will also test for the changes in the synergies in the calculation of equity value and for the changes in the coupon payment for the synergies. We will also test for a tax rate of 78 % for the calculation of bankruptcy level and equity.

8.1 Bankruptcy level

Initially the bankruptcy level is at 4,49 for the merged firm and at 37,44 for the bidder firm. The target is left out of the calculations since they will never default, as explained earlier. The optimal bankruptcy level is positively related with the risk-free rate, in accordance with Morellec and Zhdanov (2008). This is because the risk-free rate is positively correlated with the discount rates. When the discount rate increases the present value of future profits decreases, leading to a lower equity value. This in turn gives a higher probability of default. Further, a higher probability of default leads to a higher bankruptcy level. Also, higher discount rates make the stockholders concerned about immediate losses rather than future losses. This makes the stockholders exercise their default option earlier (Morellec & Zhdanov, 2008). Since the option in our case is a put option, the option value decreases with a higher risk-free rate (Hull, 2012). The relationship between the risk-free rate and the calculated bankruptcy level for the bidder and the merged firm is shown below.

Opposite, the bankruptcy level is positively related to the drift rate of the oil price. The drift rate μ works the opposite way of the risk-free rate, since the discount rate $r - \mu$ decreases with an increasing

μ. Hence, an increased drift rate leads to a higher present value of future profits and thus a lower probability of default, which results in a lower bankruptcy level. However, this is not what we observe from our calculations, we get the opposite of theory, as shown in the graphs below. This we will elaborate more on in the implication.

The optimal bankruptcy level decreases with higher volatility, in accordance with Morellec and Zhdanov (2008). A reason for this could be that the real option of doing the takeover increases with volatility, as explained earlier. This makes the acquisition more profitable for the winning bidder, lowering the optimal bankruptcy level for the firm. This is in accordance with our data. Finally we have tested for the change in corporate tax for the two firms. We see that by changing the corporate tax rate from 24% and 27% for the merged and bidder firm respectively to 78% for both, the bankruptcy levels fall significantly for both of them. The graphs below illustrate our findings:

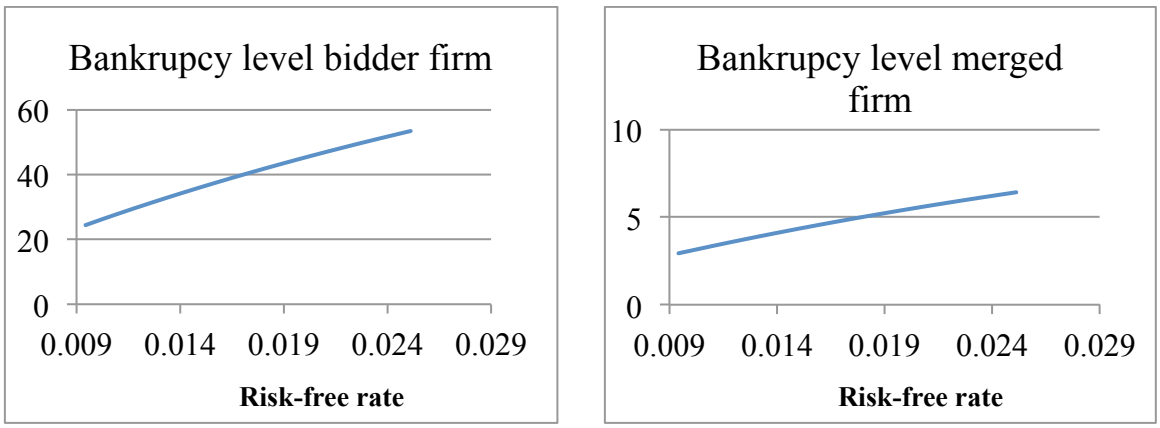
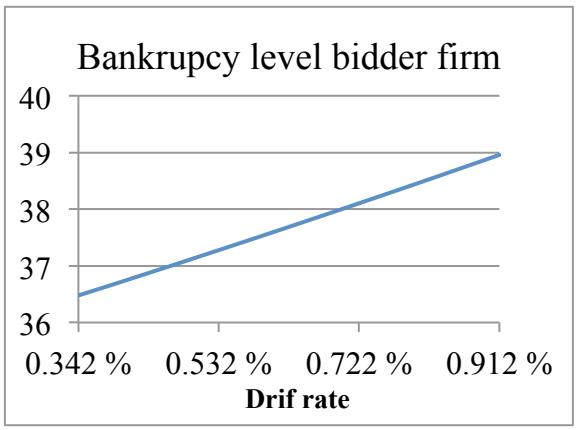


FIGURE 22 AND 23 - THE IMPACT OF THE RISK-FREE RATE ON THE BANKRUPCY LEVELS



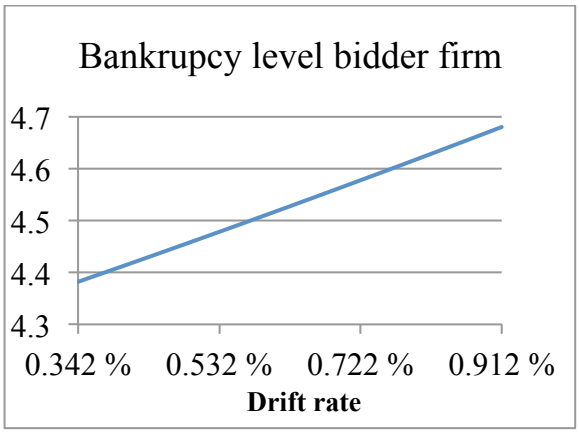
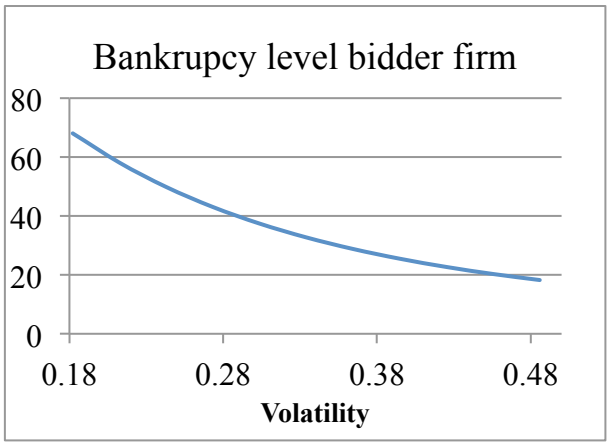


FIGURE 24 AND 25 - THE IMPACT OF THE DRIFT ON THE BANKRUPTCY LEVELS



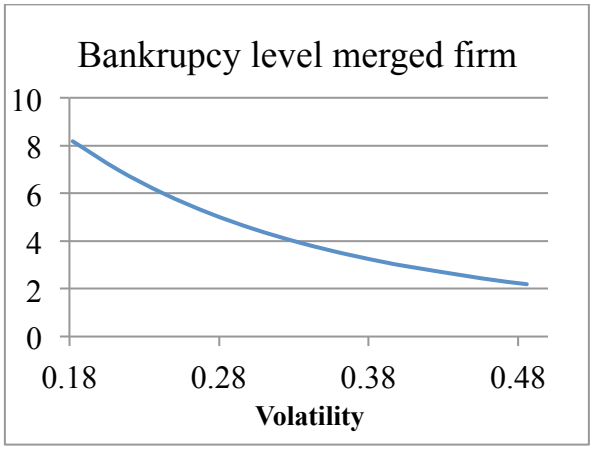
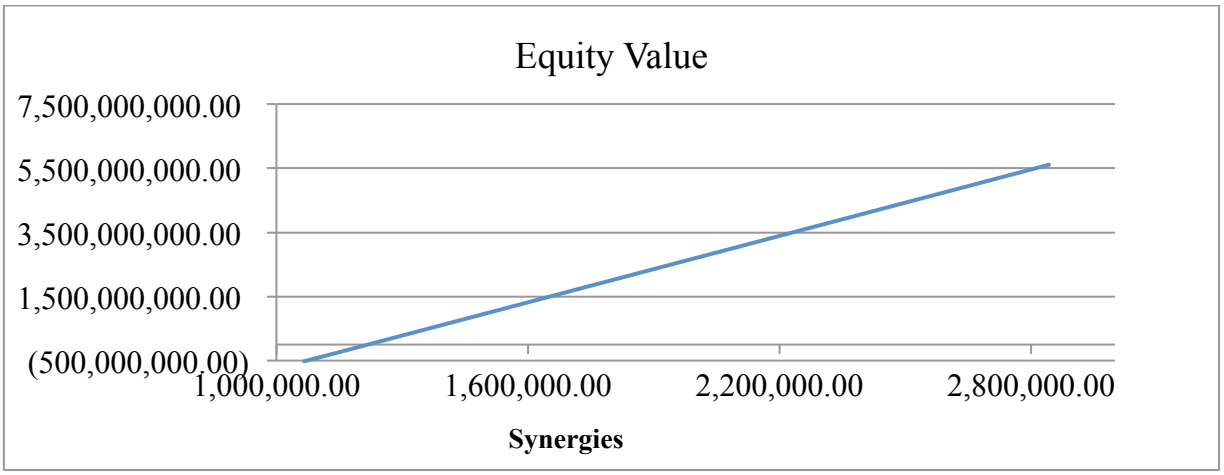


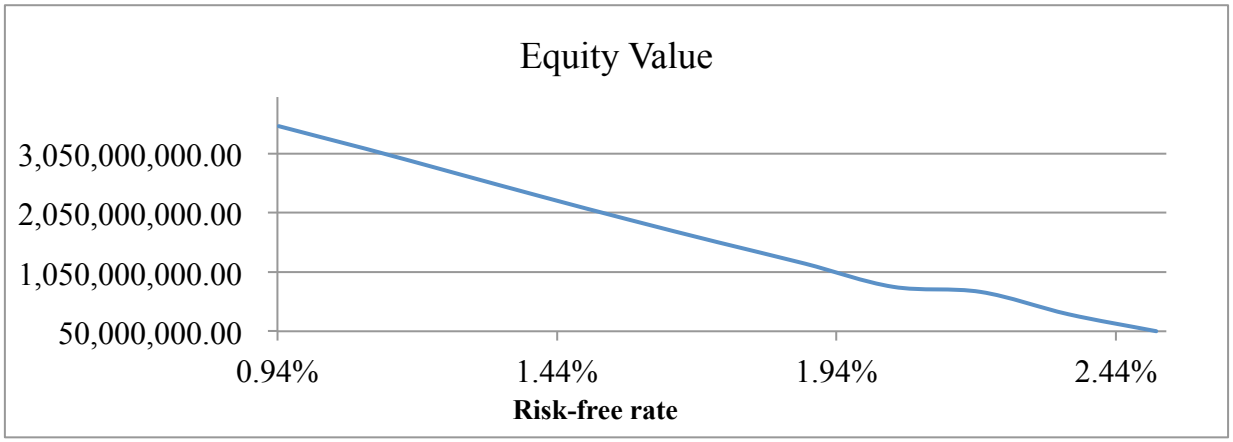
FIGURE 26 AND 27 - *THE IMPACT OF VOLATILITY ON THE BANKRUPTCY LEVELS*

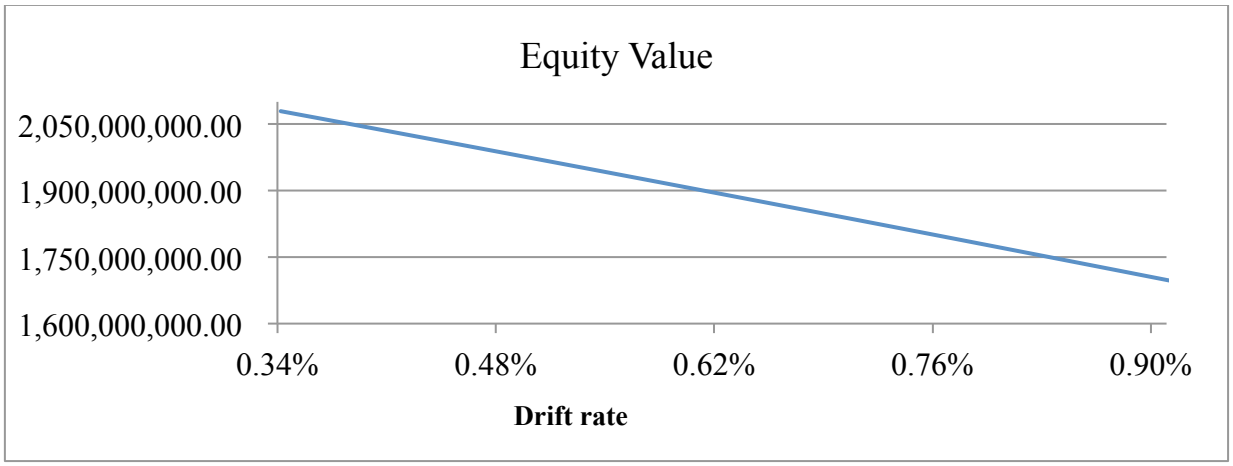
8.2 Equity value

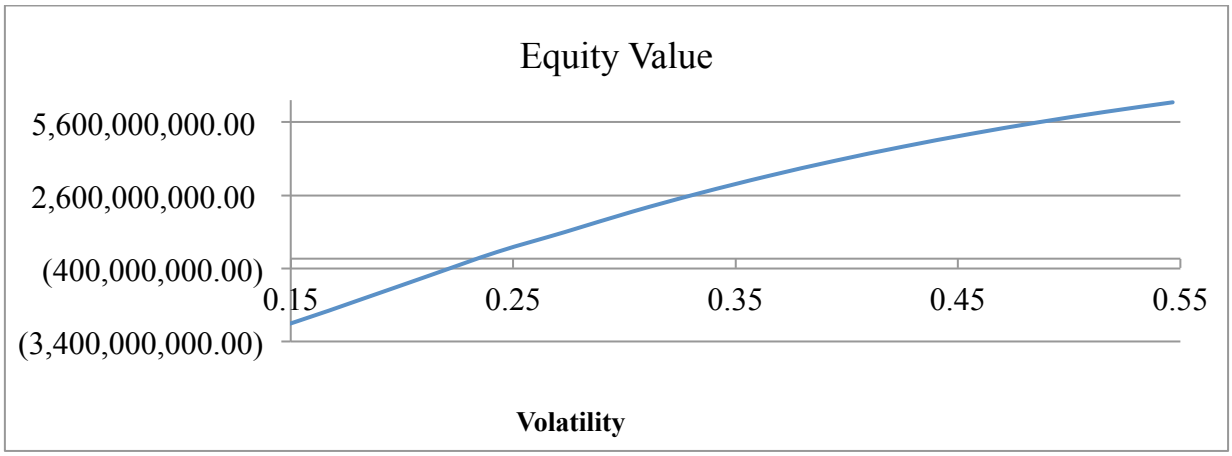
The equity value for the bidder estimated in the analysis equals 1 928 763 512,68. It is a -25% difference from the equity observed in the market. By changing the synergies, we observe that increased synergy effects give increased equity value. This is in accordance with Morellec and Zhdanov (2008) who finds that the leverage of the winning bidder decreases with increased synergies. When changing the risk-free rate equity value decreases. This is because the risk-free rate is positively correlated with the discount rates and an increased discount rate gives a lower value of equity. Hence, the risk-free rate is negatively correlated with the equity value. Also, as the risk-free rate is included in

the equation of the drift rate, the drift rate is positively correlated with risk-free rate. Therefore, an increase in the risk-free rate leads to a decrease in equity value. In general, the drift rate μ works the opposite way of the risk-free rate, since the discount rate $r - \mu$ gets smaller with larger μ. Thus, the larger the μ, the larger the equity value. However, this is not what we observe, as our equity value deceases with higher drift rates. The volatility parameter should have a positive correlation with equity value. This is because the equity of a firm can be understood as an option on the firm's assets (Berk & DeMarzo, 2014), and option values increases with higher volatility (both put and call options) (Hull, 2012). Our estimated equity value is in accordance with these arguments. In addition to this, we will look at what happens with the equity value when the corporate tax rate for the bidder is changed to 78%. If all of the other parameters are kept constant, we get a new equity value of -6 106 457 961,39. A higher tax rate should lead to a higher leverage ratio because of the tax shields, as explained earlier. Hence, the equity value should decrease, in accordance to what we observe with our data. Finally, we will look at how the equity value changes for other X- values. As the profit of the bidder firm increases with the oil prices, the equity value should be an increasing function of the oil price. Since the oil price has to be within the interval $37{,}44 < X < 48{,}24$, we only tested for values within this range. The findings are illustrated in the graphs below:


Equity Value
7,500,000,000.00
5,500,000,000.00
3,500,000,000.00
1,500,000,000.00
(500,000,000.00)
1,000,000.00
1,600,000.00
2,200,000.00
2,800,000.00
Synergies


Equity Value
3,050,000,000.00
2,050,000,000.00
1,050,000,000.00
50,000,000.00
0.94%
1.44%
1.94%
2.44%
Risk-free rate


Equity Value
2,050,000,000.00
1,900,000,000.00
1,750,000,000.00
1,600,000,000.00
0.34%
0.48%
0.62%
0.76%
0.90%
Drift rate



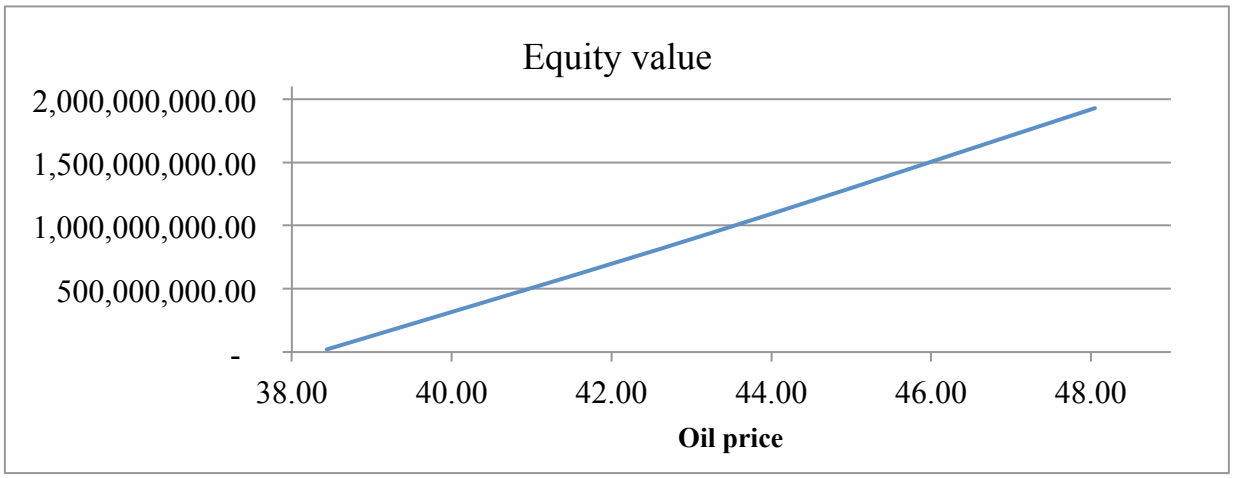


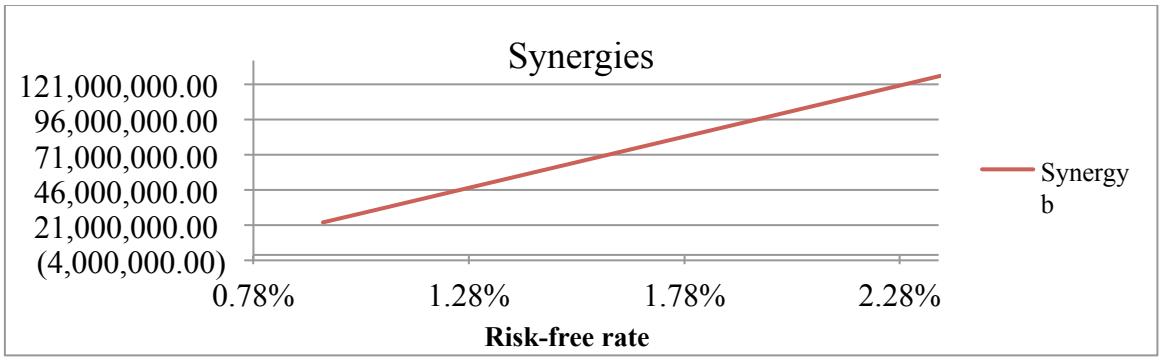
FIGURE 28, 29, 30, 31 AND 32 – THE IMPACT OF SYNERGIES, RISK-FREE RATE, DRIFT RATE, VOLATILITY AND THE OIL PRICE ON EQUITY VALUE

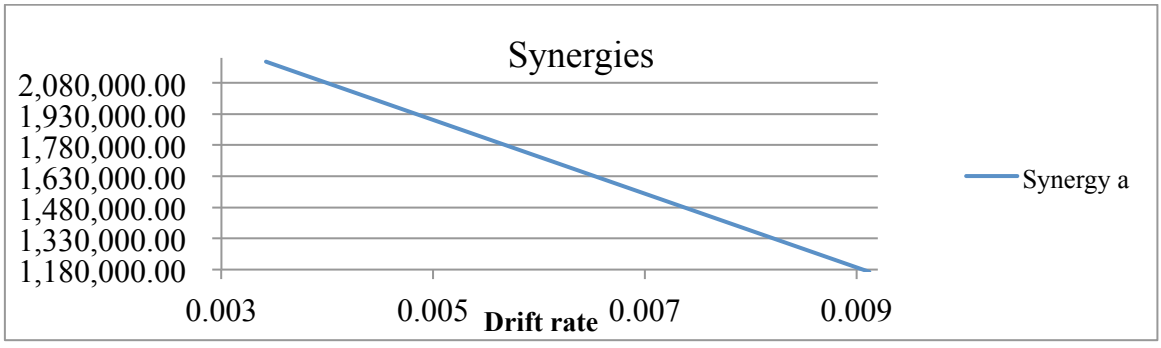
8.3 Synergies

We will now look at how changes in the different parameters influence the synergies calculated earlier. For the risk-free rate and the drift, the estimates are the same for all of the three firms. However, the coupon payment differs between the firms, and we will thus multiply all of the tree coupon payment with the same ratio to reach the total effect on the synergies.

Everything else equal, a positive change in the risk-free rate will have no effect on the a-synergies and a positive effect on the b-synergies. This means that that a higher risk-free rate is increasing the cost of the target and bidder together more that the cost of the merged firm alone.

The drift on the other hand, is positively related to the a-synergies, while it has no effect on the cost synergies. A lower drift is a result of a higher convenience yield, as the interest rate is kept constant, meaning that there is a positive relationship between the convenience yield and the b-synergies. The analysis of the coupon payment is done in a slightly different way, as mentioned. Since bidder, target and merged firm all have different coupon payments, we have decided to multiply all of them with the same ratio (0.6, 0.7, 0.8... 1.6) in order to investigate the effect on the synergies. This mean that we multiply all of the coupons with 0,6 to get the sum effect on the synergies, and then do this for all the other ratios as well. We observe that higher coupon payments are negatively affecting the b-synergies. We have illustrated all of the effect on synergies in the graphs below.





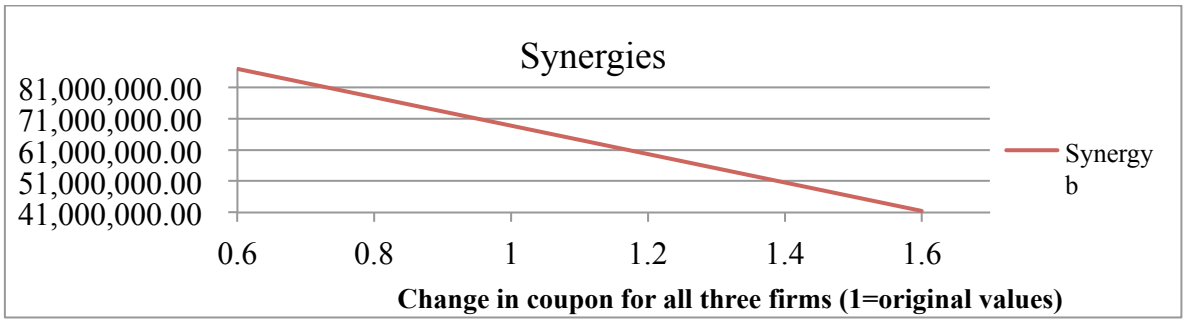


FIGURE 33, 34 AND 35 – THE IMPACT OF THE RISK-FREE RATE, THE DRIFT AND THE COUPON PAYMENT ON THE SYNERGIES

9. Implication

In this chapter we are going to describe the weaknesses about the analysis, discussing our results, concluding and provide suggestions for further research. We have investigated if our model based on Morellec and Zhdanov (2008) can be applied to a real case, by testing whether the theoretical equity value is equal to the observed market value.

9.1 Weaknesses in the analysis

There are several limitations to the data set and theoretical model used in this thesis, which are important to emphasize as these may influence the results. This sub-section will therefore address the most prominent of these weaknesses.

The first weakness we want to address is that the model of Morellec and Zhdanov (2008), and therefore also our model, is based on a simplification of the real world. A model cannot take into account all real-life scenarios and therefore have to make certain simplifications. Several factors that could impact the takeover are excluded, for instance the potential principal-agency conflicts that could occur between managers and shareholders in a firm. The models also assume that the firm should lever up after the takeover, however, whether this is beneficial or not could depend on whether they are thinking about acquiring another firm in the near future or not. The model neither considers whether the takeover is a hostile or friendly takeover. In a hostile takeover the acquirer needs enough shares to be in control over the target firm, hence making the target costlier to acquire (Berk & DeMarzo, 2014).

There are also some limitations related to our data set. First of all, our model is based on simple regressions applying a very limited amount of data. If we had more data for the equity and debt values we would probably have got more correct estimations. We have used annually data, and quarterly would probably be more correctly, but these data where not accessible for target firm. Moreover, we did not have the market value of equity for target firm (BP Norge) because it was not a listed firm. As a consequence, we made an assumption concerning leverage ratio and used our own method to reach the market value. This method has not been done before (as to our knowledge). This could be a wrong

way to solve the problem and may have affected our results negatively. Also, when we calculated the equity value for the bidder firm, we needed the bankruptcy level for the losing bidder as an input. Since we did not know anything about the other bidder(s) in our case, we had to make an assumption here as well. First, we assumed that there was only one other bidder. Further, the oil price has been below our calculated bankruptcy levels, indicating that the bidding firm should have gone bankrupt before takeover. However, this has not happened in real life, therefore we may have done some miscalculations when finding our bankruptcy levels. Another weakness about our trigger points is that the oil price has also been above the trigger point for merger in the past, hence the merger could have occurred earlier.

9.2 Implication

After presenting our main analysis and weaknesses, it is useful to summarize our results and their implications. We will discuss the equity value, the leverage ratio, the bankruptcy level and finally we the will examine the synergies.

Regarding the equity value, we would assume that a difference of 100% between the market value of equity and the theoretical equity value would imply that the model does not fit with the real world. However, if the difference is within an 0-10% interval it would fit optimally. Our results from the main results shows a difference of 25% between the theoretical value of equity and the market value. We would assume that this difference could be significant when valuing a company. However, the difference is not extreme either. Therefore, it is difficult to conclude whether our model can be applied to a real case or not, hence, it would be necessary to test it further on more real-life cases.

Because of our simplifications and the fact that we could have done some wrong estimations, the outcomes can be biased. The calculations may have affected our results both positively and negatively. The difference between the theoretical value of equity and the market value of equity could in addition to the lack of data and the possible miscalculations, arise because our case was a stock transaction. Consequently, the equity might have been overvalued at the time of the merger, as bidders often use a stock transaction when they assume that their stocks are overvalued (Berk & DeMarzo, 2014). An

example of an overvalued stock is when the market value the stock to NOK 100, but it is actually worth NOK 80. Then the market value of equity is higher than the theoretical value of equity. This could provide some explanation for why the market value of equity is 25% higher than the theoretical value of equity in our case.

Further we have a leverage ratio for bidder that decreases before the merger, in accordance with theory (Morellec & Zhdanov, 2008; Bruner, 1988), due to the strategic role of debt in a takeover context. In contrast, the analysis is not consistent with theory regarding the leverage ratio after merger. The leverage ratio continues to decrease for the merged firm after the takeover, but according to theory this should increase to exploit tax advantage of debt. A reason for this could be that the firm plan further acquisitions. Then they would benefit from having a lover leverage ratio, as explained earlier. As mentioned under determinants of capital structure, size, tangibility and regulation have a positive relationship with leverage. For example, large firms should tend to have higher leverage, which speaks in favour of high leverage ratio for both Det norske and Aker BP. However, high volatility indicates that the firm should have lower levels of debt, since the probability of default increases with volatility. The oil industry is, as we know, characterized of having a volatile oil price, making the business risky and therefore it is often preferably to have lower levels of debt. This implies that the firm should have a lower leverage ratio. Hence, it is difficult to conclude whether the leverage ratio after takeover is optimal or not in relation to exploiting tax benefits and at the same time minimizing bankruptcy risk.

Regarding the bankruptcy levels, we calculate that these values were 4,50 for the merged firm, 37,44 for the bidder firm and 0 for the target firm (as the target firm can never go bankrupt). These values indicate that the oil price only needs to fall to the level of 37,44 before bankruptcy occurs. As shown earlier, the oil price has reached levels below 37,44 several times during the first quarters of 2016 (before the merger). Hence, according to our model, the bidder firm should have gone bankrupt in the past. However, we see that the oil price is never lower than the bankruptcy levels in the periods used for the regression data. In regards to the takeover trigger for the merger, at $X = 48{,}24$, the merger should happen the first time the oil price reached this level. The comparative analysis for bankruptcy level and equity levels gives results in accordance with theory. However, the effect of the drift rate on bankruptcy level and equity value gives the opposite of what we would expect. We do not know why, but assumingly this is related to any wrong estimations or miscalculations.

In the analysis we provided an overview of the synergies related to the merger. We concluded that the merger creates both operating synergies and cost saving synergies, meaning that AkerBP exploit the oil price better and have lower total cost than Det Norske and BP Norge combined. Regarding the comparative analysis we observed that higher risk-free rates where increasing the cost of the target and bidder together more than the cost of the merged firm alone. Thus, the merged firm is probably running the firm more cost efficient than the target and the bidding firm. The drift on the other hand, is negatively related to the a-synergies, implying that the merged firm is more capable of utilizing higher oil prices than the target and bidder firm, if the drift rate is high. Since we kept the interest rate constant in the calculation of the μ, a higher μ implies lower convenience yield, since $\mu = rf - \delta$. Somehow the merged firm is more capable of utilizing higher oil prices, and this is above all noticeable when the convenience yield is high. In regard to the coupon payments, we found a negative relationship between coupon payments and b-synergies. As higher coupon payments indicate more debt, it can seem like debt is destroying cost synergies. This can imply that the bankruptcy cost of debt is more than weighing up for the tax shields.

9.3 Conclusion

The purpose of this thesis was to develop a model based on Morellec and Zhdanov (2008) and explore whether our model can be applied to a real-life case. The analysis resulted in a 25% difference between the theoretical equity value and the market value of bidder before takeover, implying that the model seems to fit the real-life case to some degree, although presenting some major weaknesses. These weaknesses considered may reduce the applicability to other real-life cases. We also found that the leverage was similar to what Morellec and Zhdanov suggested before takeover, i.e. decreasing leverage before takeover. Although contradicting results compared to previous literature regarding leverage after takeover, where the leverage of the merged firm decreases after takeover, however, this may be because they plan further acquisitions. We also found positive operating and cost saving synergies, indicating a profitable merger. In conclusion, the model seems to be applicable to the real-life case used in our thesis, however, additional analyses should be carried out to explore whether the model can be generalized to other real-life cases.

9.4 Perspectives

First, an extensive approach to our analysis could be to include actual numbers of the losing bidders. To our knowledge, there were other firms in Norway that were interested in acquiring BP Norge, although we could not access any information regarding this. This could potentially have strengthened our analysis, as the bankruptcy level for the losing bidder would be more valid. In this case it would also be possible to test whether the winning bidder would have a lower leverage ratio than the losing bidder as stated by Morellec and Zhdanov, and other researchers. Moreover, it could be interesting to calculate the debt-value of the bidder before takeover, using the Ω- value explained earlier. Lastly, it could also be interesting to test our model on data from other firms involved in takeovers, to explore applicability of our model to other real-life cases. (Aker BP ASA, 2010) (Aker BP ASA, 2011)(Aker BP ASA, 2012) (Aker BP ASA, 2013) (Aker BP ASA, 2014)

10. Bibliography

Aker ASA. (n.d.). This is Aker. Retrieved March 5, 2018, from https://eng.akerasa.com/About-Aker

Aker ASA. (2009). Annual report 2009. Retrieved from https://eng.akerasa.com/content/download/10151/127292/version/6/file/Annual_report_2009.pdf

Aker ASA. (2011). Aker Capital strengthens ownership in Det norske oljeselskap. Retrieved May 3, 2018, from https://eng.akerasa.com/Media/Stock-exchange-releases/Mandatory-Notification-of-Trade/Aker-Capital-strengthens-ownership-in-Det-norske-oljeselskap/(language)/eng-GB

Aker ASA. (2012). Aker ASA: Aker Capital - Salg av aksjer i Det norske oljeselskap. Retrieved March 5, 2018, from https://eng.akerasa.com/Media/Boersmeldinger/Mandatory-Notification-of-Trade/Aker-ASA-Aker-Capital-Salg-av-aksjer-i-Det-norske-oljeselskap

Aker BP ASA. (n.d.). Historien om Aker BP. Retrieved May 16, 2018, from https://www.akerbp.com/historien-om-aker-bp/

Aker BP ASA. (2009). Det norske and Aker Exploration to merge. Retrieved March 5, 2018, from https://www.akerbp.com/en/det-norske-and-aker-exploration-to-merge/

Aker BP ASA. (2010). Annual report 2010. Retrieved from https://www.akerbp.com/wp-content/uploads/2013/06/detnor_annual_report_2010.pdf

Aker BP ASA. (2011). Annual report 2011. Retrieved from https://www.akerbp.com/wp-content/uploads/2013/06/Annual_Report_2011.pdf

Aker BP ASA. (2012). Annual report 2012. Retrieved from https://www.akerbp.com/wp-content/uploads/2013/06/Annual_Report_2012_v8.pdf

Aker BP ASA. (2013). Annual report 2013. Retrieved from https://www.akerbp.com/wp-content/uploads/2014/03/Annual-Report-2013.pdf

Aker BP ASA. (2014). Annual report 2014. Retrieved from https://www.akerbp.com/wp-content/uploads/2015/03/DETNOR-Annual-Report-2014.pdf

Aker BP ASA. (2015). Annual report 2015. Retrieved from https://www.akerbp.com/wp-content/uploads/2016/03/PERT_0181_Aarsrapport_2015_engelsk_web.pdf

Aker BP ASA. (2016a). Annual report 2016. Retrieved from https://www.akerbp.com/wp-content/uploads/2017/03/AKERBP-Annual-Report-2016.pdf

Aker BP ASA. (2016b). Det norske oljeselskap og BP Norge fusjonerer og skaper et ledende uavhengig E&P-selskap på norsk kontinentalsokkel | Aker BP ASA. Retrieved June 10, 2018, from https://www.akerbp.com/det-norske-oljeselskap-og-bp-norge-fusjonerer-og-skaper-et-ledende-uavhengig-ep-selskap-pa-norsk-kontinentalsokkel/

Aker BP ASA. (2016c). Det norske oljeselskap and BP Norge merge to create a leading independent E&P company on the NCS.

Aker BP ASA. (2016d). First quarter-2016. Retrieved from https://www.akerbp.com/wp-content/uploads/2016/04/Q1-2016-ENG.pdf

Aker BP ASA. (2016e). Second quarter-2016. Retrieved from https://www.akerbp.com/wp-content/uploads/2016/07/Q2-2016-ENG.pdf

Aker BP ASA. (2017). Annual report 2017. Retrieved from https://www.akerbp.com/wp-content/uploads/2018/03/AKERBP-Annual-Report-2017.pdf

Aker BP ASA. (2017b). First quarter-2017. Retrieved from https://www.akerbp.com/wp-content/uploads/2017/06/Q1-17-Restated-FINAL.pdf

Aker BP ASA. (2017c). Second quarter-2017. Retrieved from https://www.akerbp.com/wp-content/uploads/2017/07/Aker-BP-Q2-17-Report.pdf

Aker BP ASA. (2017d). Third quarter-2017. Retrieved from https://www.akerbp.com/wp-content/uploads/2017/10/Aker-BP-Q3-17-Report.pdf

Aker BP ASA. (2017e). Fourth quarter-2017. Retrieved from https://www.akerbp.com/wp-content/uploads/2018/02/Aker-BP-Q4-17-Report.pdf

Benninga, S. (2000). Financial Modeling (2nd ed). MIT Press.

Berk, J., & DeMarzo, P. (2014). Corporate Finance (3rd ed.). Pearson Education Limited.

Bjørnelykke, K. (2015). Slik blir aksjonærbeskatningen for 2016. Retrieved April 14, 2018, from https://www.regnskapnorge.no/artikler/skatt/slik-blir-aksjonarbeskatningen-for-2016/

BP. (n.d.). Annual F&OI | Results and reporting | Investors | BP. Retrieved September 1, 2018, from https://www.bp.com/en/global/corporate/investors/results-and-reporting/annual-f-oi.html#Ratios/Debt_to_equity_ratio)

BP. (n.d.). First oil – 1901-1908 | Our history | Who we are | BP. Retrieved August 31, 2018, from https://www.bp.com/en/global/corporate/who-we-are/our-history/first-oil.html

BP. (n.d.). Our history. Retrieved March 10, 2018, from https://www.bp.com/en/global/corporate/who-we-are/our-history.html

BP. (n.d.). Post war – 1946-1970 | Our history | Who we are | BP. Retrieved August 31, 2018, from https://www.bp.com/en/global/corporate/who-we-are/our-history/post-war.html

BP. (n.d.). Through World War II – 1925-1945 | Our history | Who we are | BP. Retrieved August 31, 2018, from https://www.bp.com/en/global/corporate/who-we-are/our-history/through-world-war-two.html

Brennan, M. J., & Schwartz, E. S. (1985). Evaluating Natural Resource Investments. Journal of Business, 58(2), 135-157.

Bruner, R. F. (1988). The Use of Excess Cash and Debt Capacity as a Motive for Merger. Journal of Financial and Quantitative Analysis, 23(2), 199–217.

Bruner, R. F. (2004). Applied Mergers and Aquisitions. John Wiley & Sons, Inc., Hoboken, New Jersey.

CFI. (n.d.). Tax Shield - Formula, Examples, Interest & Depreciation Tax Deductible. Retrieved September 11, 2018, from https://corporatefinanceinstitute.com/resources/knowledge/valuation/tax-shield/

Christensen, C. M., Alton, R., Rising, C., & Waldeck, A. (2011). The Big Idea: The New M&A Playbook. Retrieved from https://hbr.org/2011/03/the-big-idea-the-new-ma-playbook

Christensen, J. (2017). Oppkjøpene tar seg opp i oljesektoren. Retrieved from https://www.dn.no/nyheter/2017/09/27/0954/Olje/oppkjopene-tar-seg-opp-i-oljesektoren

Clayton, M. ., & Ravid, S. (2002). The Effect of Leverage on Bidding Behavior: Theory and Evidence from the FCC Auctions. The Review of Financial Studies, 15(3), 723-750.

Damodaran, A. (2005). The Value of Synergy. Stern School of Business.

Dayanandan, A. ., & Donker, H. (2011). Oil prices and accounting profits of oil and gas companies. International Review of Financial Analysis, 20(5), 252-257.

Deloitte. (2016). M&A-rapport for olje og gass 2015. Retrieved from https://www2.deloitte.com/no/no/pages/energy-and-resources/articles/ma-rapport-olje-gass.html#

DePamphilis. (2015). Mergers, Acquisitions, and Other Restructuring Activities (8th ed.). Academic Press, Inc.

DePersio, G. (2018). Why did oil prices drop so much in 2014? Retrieved June 10, 2018, from https://www.investopedia.com/ask/answers/030315/why-did-oil-prices-drop-so-much-2014.asp

Deutsche Bank. (2013). A guide to the oil & gas industry. Retrieved from, https://www.wallstreetoasis.com/files/DEUTSCHEBANK-AGUIDETOTHEOIL%EF%BC%86GASINDUSTRY-130125.pdf

Dixit, A. . and, & Pindyck, R. . (1994). Investment under Uncertainty. Princeton University Press.

EIA. (n.d.). Weekly Europe Brent Spot Price FOB (Dollars per Barrel). Retrieved June 10, 2018, from https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=RBRTE&f=W

EIA. (n.d.a). Daily Europe Brent Spot Price FOB (Dollars per Barrel). Retrieved March 15, 2018, from https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=RBRTE&f=D

Energi og klima. (2018). Verdens avhengighet av fossil energi. Retrieved May 16, 2018, from http://energiogklima.no/klimavakten/fossilavhengigheten/

Fischer, M. (2017). The source of financing in mergers and acquisitions. The Quarterly Review of Economics and Finance, 65, 227-239.

Ghosh, A., & Jain, P. (2000). Financial leverage changes associated with corporate mergers. Journal of Corporate Finance, 6(4), 377-402.

Gibson, R.; Schwartz, E. S. (2016). Stochastic Convenience Yield and the Pricing of Oil Contingent Claims. American Finance Association: Journal of Finance, 45(3), 959-976.

Gundersen, L., Lundeberg, N. (2018). Petroleum. Retrieved from https://snl.no/petroleum

Hagland, J. (2015). BP p.l.c. Retrieved May 3, 2018, from https://snl.no/BP_p.l.c.

Harris, M., & Raviv, A. (1991). The Theory of Capital Structure. Journal of Finance, 46(1), 297-355.

Hull, J. C. (2012). Options, futures, and other derivatives (8th ed.). Harlow, United Kingdom: Pearson Education Limited.

Investopedia. (n.d.-a). Gordon Growth Model. Retrieved August 11, 2018, from https://www.investopedia.com/terms/g/gordongrowthmodel.asp

Investopedia. (n.d.-b). Long Run. Retrieved September 13, 2018, from https://www.investopedia.com/terms/l/longrun.asp

Investopedia. (n.d.-c). Risk-Free Rate Of Return. Retrieved September 2, 2018, from https://www.investopedia.com/terms/r/risk-freerate.asp

Investopedia. (n.d.-d). Tax Deductible Interest. Retrieved April 10, 2018, from https://www.investopedia.com/terms/t/tax-deductible-interest.asp

Investopedia. (n.d.-e). What is the difference between Brent Crude and West Texas Intermediate? Retrieved June 10, 2018, from https://www.investopedia.com/ask/answers/052615/what-difference-between-brent-crude-and-west-texas-intermediate.asp

Jensen, M. C. (1986). Agency Costs of Free Cash Flow, Coporate Finance, and Takeovers. The American Economic Review, 76, 323-39.

Kaplan. (n.d.). Real options. Retrieved July 29, 2018, from http://kfknowledgebank.kaplan.co.uk/KFKB/Wiki Pages/Real Options.aspx

Kennedy II, J. P. (2012). The High Cost of Gambling on Oil. Retrieved June 10, 2018, from https://www.nytimes.com/2012/04/11/opinion/ban-pure-speculators-of-oil-futures.html

Kosakowski, P. (2018a). What Determines Oil Prices? | Investopedia.

Kosakowski, P. (2018b). What Determines Oil Prices? | Investopedia. Retrieved June 10, 2018, from https://www.investopedia.com/articles/economics/08/determining-oil-prices.asp

Leland, H. E. . (1994). Corporate Debt Value, Bond Convenants, and Optimal Capital Structure. The Journal of Finance, 49(4), 1213–1252.

Lund, M. . (1997). The value of flexibility in offshore oil field development projects. The Norwegian University of Science and Technology.

Løvås, G. . (2013). Statistikk (3rd ed.). Oslo: Universitetsforlaget.

Masulis, R. ., & Faccio, M. (2005). The Choice of Payment Method in European Mergers and Acquisitions. The Journal of Finance, 60(3), 1345-1388.

Mello, A. S., & Parsons, J. E. (1992). Measuring the Agency Cost of Debt. Journal of Finance, 47(5), 1887-1904.

Miller, M., & Modigliani, F. (1958). The Cost of Capital, Corporation Finance and the Theory of Investment. The American Economic Review, 48(4), 261-297.

Miller, M., & Modigliani, F. (1963). Corporate Income Taxes and the Cost of Capital: A Correction. The American Economic Review, 53(3), 433-443.

Milne, R., & Stacey, K. (2016). Det norske acquires BP's Norway unit in cash and stock deal | Financial Times. Retrieved September 13, 2018, from https://www.ft.com/content/ab2c625c-2eda-11e6-bf8d-26294ad519fc

Ministry of Petroleum and Energy. (n.d.). Oil and Gas. Retrieved May 15, 2018, from https://www.regjeringen.no/en/topics/energy/oil-and-gas/id1003/

Mitchell, M. L., & Mulherin, J. H. (1996). The impact of industry shocks on takeover and restructuring activity. Journal of Financial Economics, 41(2), 193–229.

Morellec, E., & Zhdanov, A. (2008). Financing and takeovers. Journal of Financial Economics, 87(3), 556-581.

Murray, F. Z., & Goyal, V. K. (2003). Testing the pecking order theory of capital structure. Journal of Financial Economics, 67, 217-248.

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

Nordstrøm, J., & Lorentzen, M. (2017). Slik blir skatten din i 2017. Retrieved from https://e24.no/privat/skatt/slik-blir-skatten-din-i-2017/23887309

Norges Bank. (n.d.-a). Statsobligasjoner årsgjennomsnitt. Retrieved May 20, 2018, from https://www.norges-bank.no/Statistikk/Rentestatistikk/Statsobligasjoner-Rente-Arsgjennomsnitt-av-daglige-noteringer/

Norges Bank. (n.d.-b). Valutakurser. Retrieved September 13, 2018, from https://www.norges-bank.no/Statistikk/Valutakurser/

Norwegian petroleum. (2018a). Diversity and competition. Retrieved May 15, 2018, from https://www.norskpetroleum.no/en/developments-and-operations/number-and-diversity-of-companies/

Norwegian petroleum. (2018b). Exports of Norwegian oil and gas. Retrieved May 15, 2018, from https://www.norskpetroleum.no/en/production-and-exports/exports-of-oil-and-gas/

Norwegian petroleum. (2018c). Norway's petroleum history. Retrieved May 15, 2018, from https://www.norskpetroleum.no/en/framework/norways-petroleum-history/

Norwegian petroleum. (2018d). Oil and gas production. Retrieved September 13, 2018, from https://www.norskpetroleum.no/en/production-and-exports/oil-and-gas-production/

Norwegian Petroleum. (2018). The petroleum tax system. Retrieved from https://www.norskpetroleum.no/en/economy/petroleum-tax/

Olje- og energidepartmentet. (2018, May 8). Olje og gass. Retrieved May 15, 2018, from https://www.regjeringen.no/no/tema/energi/olje-og-gass/id1003/

Oljeskattekontoret. (2016). Petroleumssektoren og petroleumsskatten i tall og trender. Retrieved from http://www.skatteetaten.no/globalassets/pdfer/osk---oljeskattkontoret/petroleumssektoren-2016.pdf

Petersen, C. V., & Plenborg, T. (2012). Financial Statement Analysis. Pearson Education.

Proff Forvalt (2018). Årsregnskap BP Norge. Proff forvalt. (Online). Retrieved February 20, 2018, from https://www.forvalt.no/regnskap/regnskap/regnskapsinformasjon.aspx

PWC. (2016). Risikopremien i det norske markedet. Retrieved May 20, 2018, from https://www.pwc.no/no/publikasjoner/risikopremien-i-det-norske-markedet-2016.html

Rajan, R. G., & Zingales, L. (1995). What do we know about capital structure? Some evidence from international data. Journal of Finance, 50 (5), 1421-1460.

Richard Anderson. (2015). Are low oil prices here to stay? - BBC News. Retrieved June 10, 2018, from https://www.bbc.com/news/business-30814122

Schultz, J. (2009). Røkke sluker Det norske. Retrieved from https://e24.no/makro-og-politikk/aker-bp/det-norske-og-aker-exploration-fusjonerer/3232536

Skatteetaten. (n.d.). The shareholder model. Retrieved from https://www.skatteetaten.no/en/person/taxes/get-the-taxes-right/shares-and-securities/about-shares-and-securities/the-shareholder-model/

Titman, S., & Wessels, R. (1988). The determinants of capital structure choice. Journal of Finance, 43(1), 1-19.

Windheim, I. (2016). Hva bestemmer oljeprisen? Retrieved June 10, 2018, from http://www.nupi.no/Skole/HHD-Artikler/2016/Hva-bestemmer-oljeprisen