Valuation of Det Norske Oljeselskap ASA

A comparison between the traditional Discounted Cash Flow method and a resource-based Real Option valuation

Rikke Welle-Watne Jordbræk

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Supervisor: Leonhardt Pihl
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Rikke Welle-Watne Jordbræk

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0. Abstrakt

Oljeindustrien er en utradisjonell industri som kjennetegnes av mye usikkerhet og høy risiko, samtidig som den historisk har gitt svært god avkastning. Prosjektene er store og har høye kapitalkrav, tidsperiodene er lange, og prisen settes i et globalt marked som selskapene ikke har noen kontroll over. Det har derfor vært forbundet med vanskeligheter å verdsette bedrifter innenfor denne industrien da verdiskapelsen er utradisjonell. Målet med denne oppgaven har vært å prøve å finne verdien av Det Norske Oljeselskap ved å bruke flere forskjellige verdsettelsesverktøy, og analysere hvilken metode som estimerer selskapsverdien best gjennom å sammenligne den med aksjekursen. Verdsettelsen har blitt gjennomført ved å bruke en tradisjonell regnskapsanalyse med diskonterte pengestrømmer og en ressurs-basert realopsjonsmodell.

En av de største utfordringene ved å verdsette et oppstrøms oljeselskap er at inntektene er fullstendig avhengige av oljeprisen. Oljeprisen er veldig volatil og settes i et globalt marked. Den bestemmes primært gjennom tilbud og etterspørsel av olje. I forhold til etterspørselen er det tilstanden i verdensøkonomien, og spesielt vekst i utviklingsland som er avgjørende. På tilbudssiden er det primært OPEC, den politiske situasjonen i Midtøsten og utviklingen av skiferolje som er utslagsgivende. Oljeprisen er den viktigste driveren av et oljeselskaps inntekter, og for å verdsette et oljeselskap var det viktig å estimere den framtidige prisen. To metoder ble brukt til å estimere den fremtidige oljeprisen: scenario og stokastisk modellering. Det ble utviklet en scenariomodell, som predikerte oljeprisen gjennom å lage et lavt, base og høyt utfall basert på tilbud og etterspørsel av olje. I stokastisk modellering ble det brukt en geometrisk brownian bevegelse med fastsatte rammer. Begge metodene estimerte at oljeprisen er undervurdert og har predikert en vekst.

Det norske oljeselskap ASA er en av de største aktørene på norsk sokkel ved at de er partner i 79 lisenser. Selskapet er relativt ungt og har kun et felt med høy produksjon. Mye av verdien i selskapet vil derfor ligge i de planlagte og mulige prosjektene som tilhører selskapet gjennom deres lisenser. Dette fører til vanskeligheter med regnskapsbaserte verdsettelsesverktøy da fremtiden estimeres gjennom en konstant vekstmodell. Det er også vanskeligheter i forbindelse med å verdsette selskapet i et helhetlig perspektiv, og ikke se på hvert enkelt oljefelt. Ujevne produksjonsprofiler, lange investeringshorisonter og usikkerhet i petroleumsreservene fører til at selskapet ikke vil følge en jevn trend, gjennom at både inntekter og innvesteringer kan svinge voldsomt fra år til år.

Da oljeindustrien er preget av høy usikkerhet har flere forskere foreslått at realopsjoner bedre fanger verdiskapelsen. Dette gjelder primært innenfor oljeprosjekter da realopsjoner inkluderer verdien av ledelses fleksibilitet. Basert på de dårlige resultatene fra regnskapsanalysen, ble selskapsverdien estimert ved å verdsette selskapets lisenser, som betyr deres nåværende og fremtidige ressurser. Det var i primært fleksibiliteten til å vente hvor det ble funnet høye verdier for selskapet.

I regnskapsanalysen ble aksjekursen beregnet til å være 7,89 NOK, mens ved hjelp av ressurs-baserte realopsjoner ble den 49,89 NOK. Til sammenligning var aksjekursen på verdsettelsestidspunktet 38,89 NOK, men den har i løpet av de neste månedene steget til rundt 55 NOK. Det er tydelig at realopsjonsanalysen bedre estimerte verdien av Det Norske Oljeselskap, og ga mye bedre innblikk i den fremtidige forventede inntjening og muligheter. Derimot er det også svakheter i analysen, og da særlig i forhold til at det er mange parametere som må estimeres. Det fører til at den beregnede selskapsverdien er mer usikker. Realopsjonsanalysen er teknisk komplisert og krever tilgang til mer informasjon enn regnskapsanalysen. Dette betyr at selv om realopsjoner er et mer egnet verdsettelsesverktøy enn regnskapsanalyse, er det flere negative sider som antyder at det finnes mer velegnede verdsettelsesmetoder.

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1. Introduction

The petroleum Industry includes companies that explore, extract and produce petroleum products. The industry is identified by high risks and uncertainties, as it is characterized by long time frames for new investments, large capital requirements, high taxes and a globally set oil price. The global industry is dominated by national petroleum companies, which in turn means that governments, and not firms, control a large proportion of the industry (Deutsche Bank, 2013). The industry has given high profits traditionally, as a result of the high risk. However, in the last six months of 2014, the oil price fell by more than 50%. This has been the result of an oversupply in the market, mainly due to an increase in the production of shale petroleum. Many experts in the area believe that the oil price will stay at a lower level in the future (Anderson, 2015). This question is now how this will affect the future prospects and thus the value of a petroleum firm.

In Norway, oil was discovered in 1969, and has had a large impact on the economy of the country. The petroleum industry is the largest industry in terms of value creation, government income and export value (Norwegian Petroleum directorate, 2014). The petroleum is located offshore, mainly the in the Norwegian Sea and the North Sea. Det Norske Oljeselskap ASA, hereafter DETNOR, is one of the largest independent, upstream petroleum companies in Europe. It is only operating on the Norwegian Continental Shelf (NCS). The company is quite young, but are part owner of many large petroleum developments, including the Johan Sverdrup project. In the recent oil price crisis, the share price of the company was reduced by more than 50%. Was the drop a consequence of the value of the firm being reduced by that much or was it enlarged due to the role of speculators in the stock market? The objective of this thesis is to estimate the value of DETNOR, based on the challenging economic conditions that the petroleum industry entails.

The most common tool used to value companies is the discounted cash flow model in combination with financial statement analysis. The petroleum industry is known to be difficult to value due to the special characteristics of the industry. Many researchers have suggested that the traditional valuation models do not work well on companies operating in this industry. This is a result of the long time periods, uneven income inflow due to the production profile of oil fields, the high taxes and high uncertainties in terms of both the oil price and the size of the reserve. The aim of this thesis is thus to find the value of DETNOR using both traditional and non-traditional valuation methods. The motivation is to analyse which method that better captures the value creation potential of DETNOR.

2. Problem statement

As mentioned, the purpose of this thesis is to value DETNOR using different valuation methods. The value of a company can be many different things, but in terms of this thesis the definition of fair market value is used. Fair market value is the cash equivalent value which a willing and unrelated buyer and seller would agree to buy and sell the company respectively. Neither party should be compelled to act and both should have reasonable knowledge of the relevant information (Holthausen, 2012).

The valuation is executed from an outside analyst's perspective, and the goal is to capture the value of the firm based on the current and future cash flows. Two different valuation approaches is examined, financial statement analysis and real option analysis. As a result, the overall problem statement is as follows:

Which valuation method is most suitable to estimate the value of Det Norske Oljeselskap ASA and what is the value of a share as of 31st of December 2014?

In order to answer the main problem statement the following three sub-questions have been identified:

- *What is the value of Det Norske Oljeselskap ASA as of 31st of December 2014 using a Financial Statement Analysis?*
- *How can Real Options be included in a valuation framework?*
- *What is the value of Det Norske Oljeselskap ASA as of 31st of December 2014 using a Real Option Analysis?*

As the real option analysis and the financial statement analysis are build on two different theoretical foundations and are thus not directly comparable. However, the strengths and weaknesses of both models are compared.

3. Methodology and scientific knowledge

The purpose of this section is to make it easier for the reader to comprehend the outline of the thesis. In order to answer the problem statement, it is important to understand the design and methodology. This section will start with an overview of different valuation approaches, and the theoretical foundation of these. The data collection process will be discussed thereafter. As all information is not available and this thesis has a maximum page limit, an overview over

delimitations and assumptions is included. Finally, there will be an overview of the structure of the thesis.

3.1 Valuation methods

There are many different methods that can be used to estimate the fair value of a firm. Equity-oriented stakeholders attempt to estimate the "true" value of a company, when deciding to invest or not (Petersen and Plenborg, 2013). The purpose of the thesis is to identify a valuation method that is well suited for the Norwegian petroleum industry. There are two major approached to valuation of a firm´s enterprise value (EV); present value models and relative valuation (Petersen and Plenborg, 2012).

The most common model of the present value models is the discounted cash flow model (DCF) and the economic value added model (EVA). As both models are derived from the dividend discount model, they produce the same result. Consequently, only the DCF-model will be used in this thesis. The DCF model, the EV is calculated based on forecasts of the free cash flows to the firm (FCFF). The terminal value is captured using Gordon´s growth model. In terms of valuing a company the DCF model is used in combination with financial statement analysis. This means that the forecasts of FCFF are based on selected budgeted items of a firm´s financial statement. This model is used to estimate the fair value of DETNOR in part 9.

A relative valuation, is a valuation method where the value is estimated by multiplying the firm´s value driver by the market multiples of comparable companies (Holthausen, 2012). The value driver should be an indicator of the long-run performance of the company. A comparable company is a firm within the same industry with similar size. The method is based on the assumption that comparable companies have the same valuation multiples. The valuation itself is simple, but the technique is challenging in terms of identifying comparable companies and in terms of choosing a value driver. Due to the lack of comparable companies on the NCS and constraints in the length of this thesis, relative valuation is not evaluated in the thesis.

Valuing petroleum companies using traditional tools have been associated to great difficulty as the industry characterised by unstable profits and long-time periods. Researchers such as Smit (1997), Bjersund and Ekern (1990), and Smith and McCardle (1988) have identified Real Options as an appropriate tool to value petroleum resources. According to Kaiser and Yu (2012), the value of a petroleum company is determined by its reserves, the level of production and the price of the commodity. Bearing this in mind, a valuation method has been formed that reflects these three factors. The framework estimates EV by valuing its resources with a DCF, but also adding the value of the available real options. The model is presented in more detail in part 11.

3.2 Data collection

This thesis is written from the perspective of an outside analysis. To estimate the true value of DETNOR, the internal information regarding the state and prospects of the company must be included. This analysis is based on public information only. As the Norwegian government owns the resources on the NCS, there are strict requirement on publication of data. All information regarding exploration activity, drilling and development of production facilities of petroleum fields is public. The government site, fact page of the Norwegian Petroleum Directorate, has been used as the primary sources of data regarding the current and future petroleum resources of DETNOR. The thesis will only use secondary data sources. The reasoning for this is that the analysis should be independent and objective, to ensure the validity of the findings. By including primary data sources in form of interview etc. it is easy to be affected by the subjective opinion of the interview object.

3.3 Assumptions and delimitations

To answer the problem statement it is important to focus on the key issues, and to do this some limitations are necessary. The limitations are essential to create a purposeful analysis. Throughout the thesis, it is expected that the reader has general knowledge of economic theory, and thus will the description of the theory and models be limited. The following limitations and assumptions has been made:

- Five years of historical data has been included in the financial statement analysis. The argument for such a short period is that in the years prior to this the company was so young that they barely had any production. The firm transformed completely after the acquisition of Marathon Oil in 2014, and consequently only the financial data after this point should be analysed (Petersen and Plenborg, 2012). However, as this would limit the analysis to only one quarter of financial data, the five-year period has been used.
- Petroleum research is a subject with a very high degree of technical information. The process of producing petroleum has many aspects that may not be fully captured, as the author is a business student and not an engineer. This may limit the realism of the valuation. This thesis is meant as a useful tool in the valuation of petroleum companies, but it does in no way try to capture all the engineering aspects that are central to this industry.
- In this thesis, petroleum will be treated as a homogenous product. There will be no difference between oil, gas, NGL or condensate, nor include any quality differences. The petroleum will be measured in barrels of oil equivalents (boe) and sold at the oil price. There are some differences between the prices of the different types of petroleum, but they mostly follow the same pricing pattern (Seth, 2015). The crude oil price used is the Brent crude, which is the type of most NCS oil.

- The cut-off date is the 24th of April, which is the date the audited annual report for 2014 was released. The valuation is set to be the 31st of December, which is the last date of financial information. However, information regarding the development of the oil price has been included from the entire period.
- Exchange rate is assumed to be static at the rate of 7,4163, which is the USD/NOK rate at December 31st. A forecasted exchange rate should be estimated to value the future resources correctly, but this was excluded to keep the model as simple as possible.
- Inflation is not included in the model. This is as a result that the timing of the different investments in unknown and the correlation between the inflation and oil price is unclear.
- The financial statement analysis is executed to illustrate how this method is generally used. It could have been adjusted more to fit the industry better. An example of this is by forecasting using Net Asset Value (NAV) and widening the budgeting period. As the firm operates in an industry with limited reserves, DETNOR will not have terminal growth. By including these two measures, the estimated share price would perhaps be more indicative of firm value.

In general, the model has been created to be as simple as possible. This is based on the assumption that complexity does not necessarily lead to higher accuracy, as the margin of error increases.

3.4 Structure of the thesis

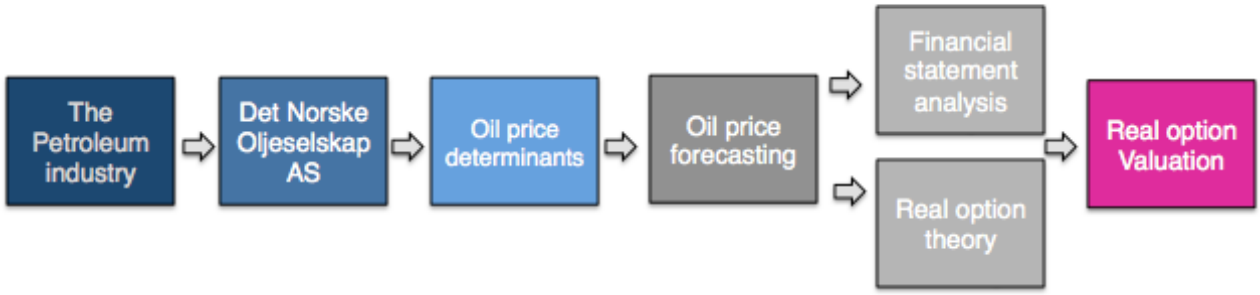

Figure 3.4.1: Illustration of the thesis structure.
Source: Own contribution

The first part of the thesis is an introduction of the petroleum industry. This gives an overview of the industry internationally and on the NCS. To do a reliable valuation, the analyst must know both the industry and the company in question. As a result, there is a section on DETNOR. The oil price is the most important economic variable in the industry, and a presentation of how this is determined follows. Based on this analysis and appropriate statistical models, the oil price is

forecasted. This is done before the valuations, as it is the main revenue driver in both methods. Thereafter, a traditional financial statement analysis is preformed, and the value of DETNOR is determined using a DCF-valuation. This model is subsequently evaluated, and based on the results of this and the available real option theory, a real option valuation framework is build. In order to answer the problem statement, a share price is estimated using both models.

4. Industry overview

The next section of this thesis will be an overview of the petroleum industry. This part will contain a brief introduction to the industry in general and on the NCS in particular, and an overview of the historical development. Thereafter there will be an overview of the value chain of a petroleum company to understand the activities performed by a firm in this industry. This section is included to give an understanding of the most important aspects of the industry.

4.1 Introduction to the petroleum industry

The petroleum industry is defined as companies working with the exploration, extraction, refining, transporting and marketing of petroleum products (Store norske leksikon, 2014a). The Norwegian petroleum directorate (NPD) defines petroleum products as " all liquid and gaseous hydrocarbon that exists naturally in the subsoil and other substances that is extracted associated with such hydrocarbons" (Norwegian Petroleum directorate, 2014). The most common petroleum products are oil and gas. The petroleum industry is the world´s largest industry in terms of dollar value (The economist, 2013). The largest producer is the US, with Saudi-Arabia and the Russia following behind (Doman, 2015). Petroleum can be found both onshore, which means that petroleum is found under the subsoil, and offshore, where the wells are drilled below the seabed.

The petroleum industry is often split into three major components; upstream, midstream and downstream. The upstream part of the industry includes companies that explore and produce petroleum, also known as E&P-companies. This means that upstream companies need to first locate potential fields, perform seismic tests and then drill exploration wells. When petroleum is discovered, the upstream firms will extract the petroleum from the reserve. The midstream part of the industry includes companies that process, store, transport and market petroleum products. The downstream companies operate by refining crude oil and distributing the different products down to the retail level. Products that can be created by crude oil include gasoline, diesel, natural gas liquids and other energy sources (PSG dover, 2015). Most petroleum companies operate at one of the three levels. However, the largest global firms in the industry are integrated and operate at all

three levels (The economist, 2013). As DETNOR is merely operating in the upstream section of the industry, just this part will be analysed further.

4.2 Historical development of the industry

The modern oil area started in 1859 in the small town of Tutusville, Pennsylvania. Oil was found 69 feet underground, during a rock "oil" extraction. Within three years, 3m boe was coming out of the Hills in the area per day. The commercializing of the industry started with the Standard Oil Company, created by John D Rockefeller, which became a business with absolute influence over the US oil refining and production. Standard Oil determined the price of the petroleum to be sold in the open market and then told the producers the price they would receive. The company was dissolved in 1911 and split into 34 independent companies. Today these represent some of the biggest companies in the industry like Exxon, Texaco and BP (Deutsche bank, 2013).

In the period that followed, petroleum was discovered in more and more places around the world. The demand for oil increased as a result of the introduction of gasoline driven cars and increasing usage in military equipment and transportation. Consequently, oil was rapidly becoming a very sought after commodity. In 1947, the offshore part of the industry was formally born, with the first successful well drilled in the Gulf of Mexico (Deutsche Bank, 2013).

At the same time, nationalization of oil supplies was staring to occur in many locations in South-America and the Middle East. This is the process where a government revokes the production privileges of private companies and gives the recourses partly or completely to national oil companies (NOCs). This is done to increase the national government´s share of the industry´s profits (Deutsche bank, 2013).

In 1960, the largest oil exporting countries at the time founded the Organization of Petroleum Exporting Countries (OPEC). OPEC is an organization that attempts to "coordinate and unify the petroleum policies of its member countries" (OPEC, 2015). This is done to ensure a stable petroleum market and that the supply is regular and efficient (Store norske leksikon, 2014b). The formation of OPEC represented a cooperative act of sovereignty by the exporting nations, and marked the turning point in the control of the world´s petroleum reserves. Up until the 1970s the international oil companies controlled the most of the reserves while now the national oil companies control nearly 90% of the proven reserves. As a result, the competition for the remaining reserves has become fierce by the international petroleum companies. This has led to a lot of large mergers & acquisitions (M&As), creating some very large multinationals (Deutsche bank, 2013).

In the last few years the dynamics of the world market has gone trough some radical change after the introduction of Shale Petroleum. The use of this method has increased the flexibility of petroleum production and a large increase in supply. This topic is discussed further in section 7.2.

4.3 The Petroleum industry in Norway

The first oil was discovered on the NCS the day before Christmas in 1969. The petroleum industry is Norway´s biggest industry in terms of value creation, government income and export value (Norwegian Petroleum directorate, 2014). It is the Norwegian government that owns the petroleum reserves on the NCS. The Norwegian petroleum management system is based on the belief that the values produced should create the greatest possible value for society and that the revenues should benefit the Norwegian people. As a result, the Norwegian state claims a large proportion of the value created trough taxes, fees and the State´s Direct Financial Interest (SDFI) (Norwegian Petroleum Directorate, 2014). This is the main reason why Norway is one of the richest countries in the world per capita and the best place to live based on HDI (UNSDN, 2015).

4.3.1 Size and future outlook

The NCS is 2 039 951 km^2, which is almost three times the size of mainland Norway. This is divided into three regions; The North Sea, The Norwegian Sea and the Barents Sea. These areas are subsequently split into blocks of approximately 500 km^2 (Ryggvik, 2014). Some of these blocks are classified as mature and other as immature. A mature area is characterized by known geology and well-developed or planned infrastructure. It is not in these areas that one will find large discoveries, but there is a high probability of new, smaller discoveries. In these areas it is important to explore promptly as these smaller discoveries may only be profitable if the company can use the exciting infrastructure, and this is usually removed after a certain time period without production. This is the reason the Norwegian government has adopted the licensing policy, to facilitate optimal production of time-critical resources. Immature areas (often called frontier areas) are characterized by limited geological information, significant technical challenges and lack of infrastructure. It is therefore higher risk, as it is uncertain whether there will be anything in the area, but it is also here companies may locate new, major discoveries (Norwegian Petroleum Directorate, 2014).

The NPD´s estimate for the recoverable petroleum resources are approximately 14,2 billion Sm^3 oil equivalents on the NCS. This is further divided into undiscovered resources (21%), contingent resources in discovered areas (7%), contingent resources in oil fields (6%), reserves (22%), and amounts sold and delivered (44%). In 2013 215 million Sm^3 oil equivalents was sold and delivered (Norwegian Petroleum directorate, 2014).

4.4 Value chain analysis

To analyse an industry it is important to understand the activities that the firms engage in. A value chain analysis is a breakdown of the activities performed, and it is used to understand and examine where the value is created. According to Porter (1985) a value chain analysis will assist in determining the basis of a company´s competitive advantage. A competitive advantage is created and sustained when a firm performs some of the functions in the value chain, more cheaply or better than its competitors (Thompson and Martin, 2010). The analysis will not try to evaluate a competitive advantage for DETNOR, as it is outside of the scope of this thesis. The activities performed are the same for all firm operating in the Norwegian upstream petroleum industry, thus the analysis will not be specific to DETNOR. Examining the value chain, with special emphasis on the investment activities, will give insight into the cost and income structure of firms operating in the industry.

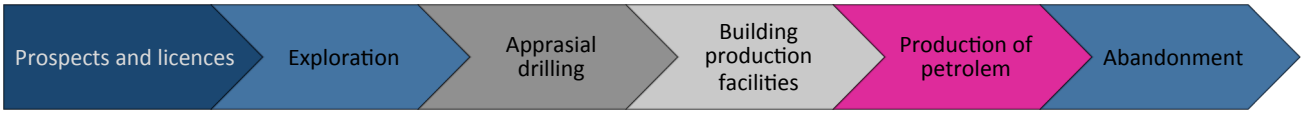

Figure 4.4.1: The value chain of an upstream petroleum company.
Source: Own contribution

The framework developed by Porter (1985) will not be applicable to this industry, as the chain of activities is very different from a traditional manufacturing company. In the case of the upstream petroleum industry it will be natural to examine the stages of an exploration and production license. The value chain observed for a license is presented in figure 4.4.1 and will be further elaborated the next sections.

4.4.1 Prospects and licenses

The first stage of the value chain is to acquire an exploration and production license. The Ministry of Petroleum and Energy regulates petroleum activities on the NCS. The Norwegian government has, as a part of the long-term resource management, created an extensive system for companies to receive licenses to explore (Norwegian Petroleum directorate, 2014). The licensing system consists of two types of licensing rounds. The first type is to receive an immature part of the shelf. It is the petroleum companies that nominate the blocks they want to be announced. The government then evaluates the suggestions and announce which blocks will be available. To be able to explore these immature areas, the companies must have broad experience, technical and geological expertise, as well as being in a solid financial situation. The second round is “Awards in

Pre-defined Areas (APA)", which is to receive licenses in the mature blocks of the NCS (Norwegian Petroleum directorate, 2014).

In the licensing rounds, a firm can apply individually or together with one or more companies. The awarding of exploration and production licenses is based on pre-announced criteria. The ministry of Petroleum and Energy will award a license to a partnership of companies, with predetermined holdings for each firm. The ministry designates an operator for the partnership, which is the company responsible for the operational activities authorized under the license. A license can last up to ten years.

Holding a license offers both rights and obligations. It gives the proprietor an exclusive right for exploration and production of petroleum in the geographical area specified in the license. The license holder receives property right to the petroleum. Each license will also include a set of obligations that are required to be fulfilled within a specified period. These obligations may include the acquisition of seismic data or exploration drilling (Norwegian Petroleum Directorate, 2014). A partnership can give the license back to the government, after the obligations have been fulfilled, if all of the licensees agree (Norwegian Petroleum directorate, 2014).

4.4.2 Exploration

The second stage is exploration. This involves a detailed examination of the geographical area specified in the license. This is normally done by acquiring seismic data and surveys, which provides information about the geological conditions of the subsea region. If the results look promising, the companies may invest in exploration drilling to verify if there is petroleum in those areas (Smit, 1998). This type of drilling is called wild-cat drilling. The exploration phase is quite costly, and requires significant investments in terms of both the acquisition of data and the possible drilling of exploration wells.

4.4.3 Appraisal drilling

The next phase is the appraisal drilling. Investments in appraisal drilling are only done if the results from the exploration phase indicate the presence of petroleum. Appraisal drilling is used to get more information about the petroleum discovered. This includes an assessment of the extant of the field, the quality and type of reserve and the possible rate of production (Lund, 1999). This information is retrieved by drilling additional wells into the area where petroleum have been located in the exploration phase.

The companies will thereafter evaluate the results and make a decision if the reserve is commercial. This decision should incorporate economic, technological and environmental

considerations. If the licensees determine that the resources are appropriate for further development, they need to apply for approval to start production. This is called a Plan for Development and Operations (PDO). The ministry of Petroleum and Energy has created a framework for development and operation that aims to ensure exhaustive, long-term management of the petroleum resources, while also protecting other public considerations. The companies must find effective solutions for the entire lifecycle of the production facilities to get their PDO approved (Norwegian Petroleum directorate, 2014).

4.4.4 Building production facilities

The highest cost encountered by an upstream petroleum company is by far the cost of investing in production facilities. The building of production facilities involves drilling wells, install, test and commission offshore installation. This includes advanced engineering work, extensive procurement activities and complex construction work for each new production facility. The cost will depend on the amount of existing infrastructure already in place in the area. If the petroleum field is located close to another field, it may in some cases use the same production facilities. DETNOR has used this opportunity with the Alvheim FPSO, where the production ship has been connected to four other external fields by the use of subsea wells (DETNOR, 2014a).

There are many different types of production facilities available, and the company should consider the characteristics of the field before the final decision is made. In general, the investment cost of this stage will be higher for licenses in immature areas, than mature once, due to the lack of infrastructure. This phase is characterised by large capital outlay, and a time frame up to five years (Norwegian Petroleum Directorate, 2014).

4.4.5 Production

Production of petroleum involves extracting the resources from the subsea. The production volume will gradually increase, as it takes time to get the production facilities to work properly and the facilities are often built in stages. Production then reaches a top fairly early and lies on this level for some years, the length depending on the characteristics of the field. As the pressure in the reservoir begins to drop, the production will continue to decrease until it is not economical to produce any more (Höök et al., 2009). As the pressure drops, the company will need to use different techniques to keep production high. This may cause the marginal operating cost to increase, as the field get older (Lund, 1997).

4.4.6 Abandonment

There are strict rules regarding the abandonment of a production facility. The license holders are required to deliver a plan of abandonment to the Ministry of Petroleum and Energy, between two

and five years before production ceases. The complete removal of facilities will in most cases be required (Norwegian Petroleum Directorate, 2014). This involves a large capital outlay, which is important to take into account when determining the profitability of a petroleum field.

5. Industry analysis

The next part will be an overview of the competitiveness of the industry, through an analysis of Porter (1969)´s five forces. The goal of this analysis is to contribute to the understanding of the industry, and specifically the inflow of current and future profits.

5.1 Porter´s Five Forces

To get an overview of the attractiveness of the petroleum industry, the competitiveness of the industry will be analysed. According to Porter (1979) the state of competition will depend on five forces. The collective power of these will determine the profit potential in the industry. These five forces are; the threat of new entrants, bargaining powers of customers, bargaining powers of suppliers, threat of substitute products or services, and rivalry of the industry. The purpose of this analysis is to highlight the most important factors affecting the level of competition in the industry. Consequently, the list of factors is not comprehensive and attempts to only list the most central industry traits.

The first force is the **threat of new entrants**. The seriousness of this threat depends on the entry barriers present in the industry (Porter, 1979). There are three main barriers to enter the petroleum industry in Norway. Firstly, the industry is characterized by large capital investments and thus the capital requirements to enter the industry will be very high. This is further increased by the fact there is a quite long-time period from the initial capital investment until the firm gets positive cash flows. The investment costs are largely sunk costs, and cannot be retrieved easily (Chorn and Shokhor, 2006). Secondly, to be able to cover the high investments the firms need a low marginal operating cost, which is only achieved through economies of scale. It is more difficult for new firms to enter, as they will be further down the learning curve and hence have a higher marginal cost. Thirdly, to enter the industry a firm need an exploration and production license from the Norwegian Petroleum Directorate. The requirements to receive a license are based on fixed criteria and existing firms with more technical experience are consistently chosen over newcomers. Overall the threat of new entrants from companies outside the industry is fairly low. However, for existing petroleum companies the move to the NCS the entry barriers are not equally high.

The second threat is **the bargaining powers of customers**. The significance of this threat depends on the size and level of importance of the industry´s customers, and how much these can affect the firms' prices and quality requirements (Porter, 1979). The bargaining power of buyers is very low in the petroleum industry as the price of crude oil is determined on a global level, based on the international supply and demand. However, some of the buyers are so large that they can affect the demand of petroleum. These large consumers include countries like the US or China. The demand and supply of oil is examined further in part 7.2.

The third threat is **the bargaining power of suppliers**. Suppliers can in some cases exert bargaining power by raising prices or reducing the quality of the supplied goods (Porter, 1979). In the upstream petroleum industry there are two kinds of suppliers; the suppliers of access to hydrocarbons, the Norwegian government, and the suppliers of services and equipment. The government is a supplier of the access to explore areas offshore. This makes the supplier power very strong, as the dependency is high. However, the power is somewhat limited due to strict regulations regarding how the awarding of licenses should be executed, and as a result, it is a time consuming process even for the government to change the legislation. As long as the Norwegian Government has an interest of the NCS being explored, the bargaining power is slightly reduced.

In terms of the suppliers of equipment and services, the power lies mainly with the petroleum companies. This is due to the fact that most petroleum companies are much larger in size than the suppliers. Most suppliers are small and as a result, the suppliers are usually more dependent on the petroleum companies than the other way around. This have become obvious in the recent "oil crisis", where the supply companies have had to make much larger cuts in staff and expenses than the petroleum firms (Kaspersen, 2015).

The forth force is **the threat of substituting products**. The significance of this threat is based on how easy it is for the buyers to change to other energy sources. The main substitutes for petroleum are coal, nuclear energy and renewable energy sources, such as hydropower, tidal power, biomass, solar power and wind power. Petroleum has multiple usages, varying from petrol to electricity and production material. At this time, no substituting product can substitute petroleum completely in all of the applications (IEA, 2014).

In terms of other non-renewable sources, coal is the most used source of energy. Coal is important due to its steady supply and availability. It is expected to stay at around 20% of total world energy consumption, which is close to its current level. However, coal is not a well-suited substitution for petroleum, as it has high CO_2-emissions and is unable to be used as gasoline for vehicles

(Cooperman, 2004). As a result, the threat is to petroleum is low. The second type of non-renewable energy is nuclear power, which can provide energy without adding to the CO_2-emmisions. However, as there is no safe way to dispose of nuclear waste the use such an energy source is highly discouraged. As a result, an increase from the current 2,5% of total energy consumption is improbable, and thus nuclear power represents no current threat to petroleum.

Renewable energy sources are energy that comes from resources that are naturally replenished over a fairly short period of time (IEA, 2014). The most used renewable energy source is by far hydropower. Hydropower is energy derived from falling or running water. Wind power, on and offshore, is the second largest source of renewable energy, and is the process of capturing air forces by the use of wind turbines or sails. Total wind power generation is expected to double by 2020. The only renewable energy source that is able to threaten petroleum in terms of vehicle gasoline is bio fuels. However, this source is expected to only reach 4% of total transportation fuel by 2020. Renewable energy is expected to grow 45% and represent 30% of all electricity by 2020 (IEA, 2014). However, investments in this type of energy are expected to fall slightly in the future. At the current low price of petroleum, the incentives to invest in this more expensive technology are low.

In summation, despite the efforts to create substitutions for petroleum, it is expected that demand will continue to grow. It is in terms of vehicle fuel that the alternatives are furthest away from a source of replacement. It is expected that petroleum will continue to provide more than 95 percent of fuel at least up to 2030. Consequently, it is unlikely that a substitute will threaten the demand of petroleum used in gasoline in the near future. However, the demand for petroleum may be lowered in terms of its other uses, electricity and production, if the oil price increases.

Taking all of the factors mentioned in the previous four forces into account, the fifth force is **industry rivalry** and represents the intensity of competition in the industry (Porter, 1969). The Norwegian petroleum industry is characterised by a few large international, integrated petroleum companies and a lot of mid-size national or international firms (Norwegian Petroleum Dierectorate, 2013). The main factor influencing the industry´s rivalry is the acquisition of exploration and production licenses. The awarding is based on technical abilities and experience. An upstream petroleum company do not compete directly on price, as the oil price is set in a global market place. Consequently, there is no direct competition between the companies. To conclude, there is low rivalry in the general industry. However, there is some competition in terms of obtaining licenses, but this is not based on costs.

6. Company description

Det Norske Oljeselskap ASA is one of Europe's largest independent upstream petroleum companies, measured in boe of production (DETNOR, 2014a). The company operates solely on the NCS, and has operations in the North Sea, the Norwegian Sea and the Barents Sea. The firm currently has ownership interest in 79 licenses, and is operator for 35 of these. This makes DETNOR one of the biggest participant´s on NCS. As the company has ownership in the huge Johan Sverdrup field, the firm is likely to hold this position in the future as well. The next part of this thesis will present a brief overview of the company´s history, vision and operations, as well as an overview of their most crucial risk factors. The goal of this part is to introduce the company, and create the foundation for the upcoming valuation of the company.

6.1 History

The firm was established in 2001, as a wholly owned E&P subsidiary of PGS named Petra. The company was created to pursue small petroleum resources on NCS. Till May 2005, the company drilled 10 wells, and was successful operator for one producing field, Varg. The company was sold from PGS and was listed on Oslo stock exchange as Petra ASA in 2006. In 2007, the board of directors of Petra decided to merge with the Norwegian interest of DNO. Consequently, the company changed its name to Det Norske Oljeselskap ASA. In 2009 the company merged with Aker Explorations and as a result, Aker ASA is the biggest shareholder in DETNOR (49,99% ownership). As the firm started their own production in the Jette field in 2009, the company became a fully integrated upstream petroleum company, with activities in the entire value chain of exploration, development and production (DETNOR, 2014b).

In 2014 DETNOR acquired Marathon Oil Norway AS (MO). The transaction was announced in June, and by 15th of October the two companies were fully integrated. Through this acquisition, DETNOR's production quadrupled, and the production is expected to quadruple again in 2015 (DETNOR, 2014c). This acquisition has transformed the company from being a firm with many future projects to a major producer on the NCS. Accordingly, the number of employees doubled and is currently at 507. The main motivation for the acquisition was the inclusion of MO´s significant operational experience. DETNOR paid 2,1 billion USD for MO, and the acquisition was financed through a combination of debt and equity. This has increased DETNOR´s financial robustness, as the cash flows have grown due to increased production. Consequently, it reduces the need for additional financing for their other large developments (DETNOR, 2014c).

6.2 Vision

DETNOR´s vision is “Always moving forward to create value on the Norwegian shelf. “ The company attempts to make bold choices and embrace possibilities rather than focus on limitations. The values are to be committed, reliable, enquiring and responsible (DETNOR, 2014d). A major focus for the company is placed on health, safety and the environment (HSE), and they aim to carry out all of their activities in accordance with the highest standards of the industry. The company´s goal is that “all business shall be conducted in a manner that ensures that the company; avoids injuries to personnel and harm the environment and assets, avoids work-related illness, secure the technical integrity of the facilities, and avoid being imposed by the Norwegian authorities” (DETNOR, 2014e).

6.3 DETNOR’S operations

The next section will give an overview of the firm’s operations. The emphasis will be on the three main activities in the firm´s value chain; exploration, development, which includes appraisal drilling and building production facilities, and production.

6.3.1 Exploration

Exploration covers the following steps in the value chain of an upstream petroleum company, prospects and licenses, and exploration from section 4.4. DETNOR has ownership interest, of varying degree, in 79 licenses and is operator in 35 of these. The operator is, on behalf of all the licensees, in charge of the daily management of the petroleum activities. The operator of a license is appointed by the Ministry of petroleum.

DETNOR is an active explorer. Exploration activities are the main driver to increase future production for the company, and it is therefore a big priority. In 2014 the exploration expenses amounted to 1,17 billion NOK, which is approximately 70% of DETNOR´s operating expenses. The result was that DETNOR made discoveries in 8 licenses in 2014, and hit 4 dry wells. This makes DETNOR one of the most aggressive explorers on NCS.

DETNOR has a twofold exploration strategy, which has been to use about two-thirds of the exploration budget on mature areas and invest one-third in immature areas. However, as the pressure in the industry has increased due to a reduced oil price, the firm will focus more on exploration in mature areas in the coming years, as this is associated with lower investment costs. With the introduction of new technologies, wells that were once deemed non-commercial might be profitable as the amount recoverable is increased.

6.3.2 Development

When petroleum is found through exploration activities, the company must decide whether the resources discovered are attractive enough to continue investing and if it should be started now or later. The development of production facilities involves carrying out drilling operations, install, test and commission offshore installation. This includes advanced engineering work, extensive procurement activities and complex construction work carried out at different locations offshore (DETNOR, 2014f)

DETNOR is currently participating in four projects that are in the planning or building of production facilties: Bøyla (65%, operator, the project started to produce as of January 2015), Ivar Aasen (34,7862%, operator), Gina Krogh (3,3%, partner) and Johan Sverdrup (11,8933%, partner). Before the building can start, the companies must deliver a PDO to the Ministry of Petroleum. According to the petroleum legislation, the plan must contain a description of the planned field development, with special focus on the economic, technical, safety and environmental aspects. A PDO normally takes anywhere from six months to two years to get approved (Store norske leksikon, 2007).

Two of the company´s developing projects, Ivar Aasen and Johan Sverdrup, are very large. Ivar Aasen is DETNOR´s first large development as an operator. The PDO was approved in mid-2013, and the field is expected to start production in the last quarter of 2016. It is estimated to hold 210 million boe, produce 24 000 boe per day, and last 20 years. The development is coordinated with the Edvard Grieg field close by. Edvard Grieg will receive the partly processed petroleum from Ivar Aasen, and the petroleum will continue processing through their exciting infrastructure (DETNOR, 2014g).

Johan Sverdrup is the largest discovery on NCS since the 1980s. It is expected to contain between 1,7 and 3 billion boe, and may produce as much as 380 000 boe per day, which will constitute approximately 40% of all Norwegian petroleum production. It will be one of the largest industrial projects in Norway in modern time. The plan is to make the project very cost-efficient and the goal is to have a break-even price at $32 per barrel (Ramsdal, 2015). The PDO is delivered, but not yet approved. If everything goes according to plan, the field will start production in late 2019. The project is in the investment phase, and the total investment costs is estimated to be 177 million NOK (DETNOR, 2014g).

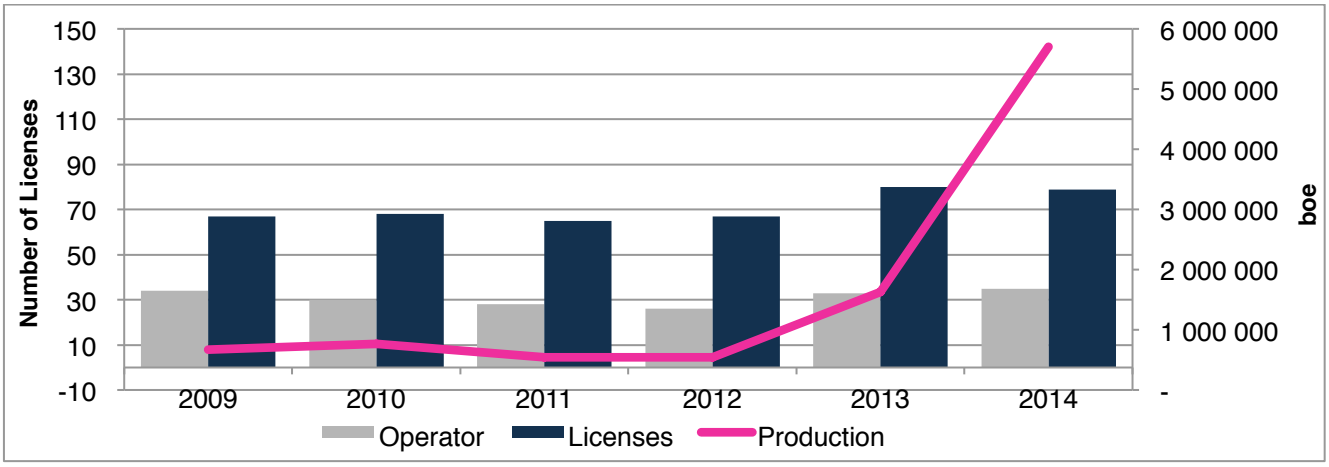

Figure 6.3.1: An overview of the firm´s licenses, operatorships and productions.
Source: Own contribution based on DETNOR, 2014h

6.3.3. Production

DETNOR has production in 7 fields as of 31st of December 2014: Alvheim (65%, operator), Volund (65%, operator), Vilje (46,9 %, operator), Jette (70%, operator), Atla (10%, partner), Jotun (7%, partner) and Varg (5%, partner). Bøyla field (65%, operator) started to produce in January 2015. In 2014, the company produced 5 704 900 boe, which was a large increase from 2013 with only 1 629 115 boe. The large increase was mostly a result of the acquisition of MO, which gave DETNOR access to Alvheim, Volund and Vilje (DETNOR, 2014i).

The main driver in terms of production for DETNOR is the Alvheim area, which includes Alvheim, Volund, Vilje and Bøyla. It contributes to 97% of the firm's production. It is located in the northern part of the North Sea. The Alvheim field is run by a floating production device (Floating, Production, Storage and Offloading (FPSO)). This is known for its high regularity and levels of production. All of the fields in the Alvheim area are connected as subsea fields, tied back to the Alvheim FPSO. The operation of Alvheim has been very successful and in February 2015 the company was awarded "Field Operator of the year" also called "Gullkronen". In 2015 the company will continue to develop the Alvheim area by connecting two fields to the Alvheim FPSO, Viper and Kobra. The plan is to add three additional fields in 2016. The Alvheim area is expected to have reserves of 111,7 million boe belonging to DETNOR (DETNOR, 2014i)

One of the strengths of DETNOR is that they are able to produce at a relatively low break-even price. The FSPO and the other of DETNOR's production facilities produce strong revenues at a low operational cost. The inclusion of developing production facilities will improve this further. However, due to more challenging market conditions, the company is currently focusing on cost efficiency by streamlining processes and cutting staff.

6.4 Risk factors

Risk factors are elements that increase the risk of a certain bad outcome. Operational risks are the risks a firm assumes when it operates within a given industry in a certain way. The next section of this thesis is an overview of the largest operational risks faced by DETNOR. Financial risks are not examined in this section, as they are outside the focus of this thesis.

The largest operational risk faced by DETNOR is that most of their operations are concentrated to relatively few fields. Currently 97% of the company´s productions come from the Alvheim area. The company will therefore be very affected by any problems, such as shutdowns or other technical issues, to the Alvheim FPSO. As a consequence, DETNOR have added a "loss of production" insurance on this vessel. However, it is not just production that is exposed for risks by having concentrated operations. The operational results, and thus financial conditions, will be affected negatively if actual reserves are less than estimated reserves (DETNOR, 2014j)

A large portion of the firm's resources is placed in projects in development. This requires large amount of capital, which makes the company very sensitive to events that may affect the scheduled development. The occurrence of such an event may result in delays or increased costs (DETNOR, 2014j) DETNOR is particularly sensitive changes in projects in their early development, like Johan Sverdrup. The main installation for this field, which includes the installation of four fixed platforms and subsea infrastructure, are associated with a cost of 177 million NOK (DETNOR, 2014i)

The final risk mentioned is the risk the firm faces by co-owning all of their projects. The company does not hold any licenses alone, and has partners in all of their projects. In about half of the DETNOR´s licenses, the company is the operator. This means that they are managing the daily petroleum interests of the license on behalf of the other licensees. As most decisions regarding the management of a license requires only a simple majority, the firm is prone to third-party risks. DETNOR has varying degree of ownership in the different licenses. As a result, in many situations they will have limited control over the management or rather the mismanagement of assets. This may result in significant delays, losses or increased costs to the firm (DETNOR, 2014j)

7. The determinants of the oil price

Oil is the worlds most traded commodity, measured by volume. Oil is traded on commodity exchanges, where the New York Mercantile Exchange (NYMEX) and the Intercontinental exchange (ICE, formerly the international petroleum exchange) are the main exchanges. It is possible to trade petroleum at both the spot price and with the use of futures contracts. There are

many different variations of oil, but the two most common proxies used for the oil price is the Brent crude or West Texas intermediate (WTI). Other types of oil are traded on a discount or premium to these two based on the gravity and sulphur content (Deutsche Bank, 2013).

The revenue of an upstream petroleum company is the volume of petroleum produced multiplied by the oil price. The most important economic variable for an upstream petroleum firm is therefore the oil price (Carlye, 2013). The next section will be an overview of the mechanisms in place that determines the oil price. The first part will be a historic review of the movements of the oil price. To create the foundation for forecasting the oil price, an analysis of the supply and demand of petroleum will follow. The goal of this section is to establish an understanding of how the oil price is determined and what factors affects it.

7.1 Historical development

The world petroleum market is characterized by short- and long-term fluctuations. This is evident in figure 7.1.1, which shows the annual crude oil price, in both nominal and inflation adjusted rates. The next section will be an overview of the shocks and important events affecting in the oil price. This is done to get a better overview of the mechanisms of pricing oil. The discussion will be brief and will only focus on the largest price movements' underlying causes.

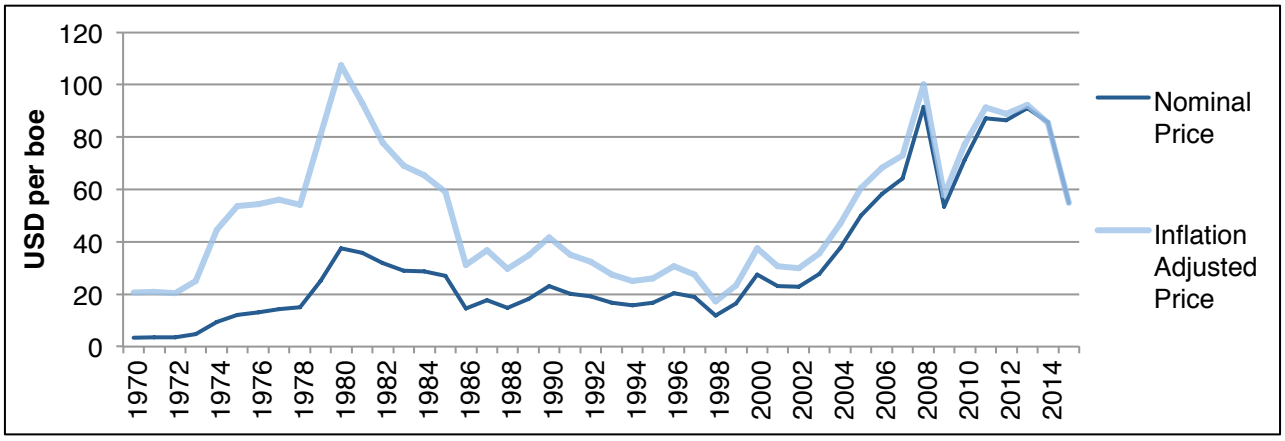

Figure 7.1.1: Annual oil Brent price for the period 1970-2014.
Source: Own contribution based on data from McMahon (2015)

The first large increase came as a result of the Yom Kippur War and the following oil embargo in late 1973. The Arab members of OPEC, OAPEC, announced an oil embargo on the US, and other industrial countries, as a response to their support of Israel in the war. This led to an increase of almost 50% in a year (Austvik, 1986). The next large jump occurred in 1978, mainly due to the Iranian revolution. The exports from Iran were suspended for a period and production overall were reduced. In just two years the oil price increased by over 250%. The reason for the increase was because of lower supply than demand (Lund, 1997). In the years after 1980, the oil price steadily

decreased, with an average reduction of 6% per year. This was due to lowered oil consumption, as a result of the previous years´ shortages, while the world ´s oil production increased (Koutsomitis, 1990). To maintain relatively high prices, OPEC decreased its production correspondingly. However, the members were not able to keep production low for a long period, and in 1986 the oil price collapsed (Lund, 1997).

Over the next 20 years, there were no shocks of equal magnitude. Nonetheless, there have been some fluctuations due to different political frictions in the Middle East, like the Gulf war (Lund, 1997). In the beginning of the 2000s, the oil price began to steadily increase. This is the result of a combination of reduced supply due to political instability in the Middle East and increased demand because of economic growth in developing countries, like China and India. The oil price reached $60 in 2005, just after hurricane Katrina, where multiple production rigs in the Mexican gulf was destroyed (Deutsche Bank, 2013). The price continued to rise until the financial crisis in mid-2008. Subsequently, the price plummeted from about $140 to a bottom of $32 in approximately six months. In January 2009, OPEC decided to cut production with 4,2 million boe and with the rising demand in Asia, the prices started to increase again. With the start of the Libyan civil war and the country's forced cut in production, prices stabilized over the next two years at around $105 (Seth, 2015).

In mid-2014, there was a new shock to the oil price. Demand had been declining due to expected economic slowdowns in Europe and China. The production of shale oil in the US increased aggressively, and was making the country almost self-sufficient in terms of oil. This led to a sharp fall in prices and by the start of 2015 the prices were down to $55 per barrel (Anderson, 2015). Experts have predicted that prices will increase in the future, but never reach the same level as the average from the last few of years (Noreng, 2015).

From overview it is clear that the major sources of price change have been due to external, and in many cases political, events. The mechanisms that price oil is complex and this brief overview has been provided as background information to the next part, which is a presentation of the most influential determinants of the supply and demand of petroleum.

7.2 The supply and demand of petroleum

The price of oil reflects different considerations regarding supply and demand fundamentals and the risk factors these present (Deutsche Bank, 2013). In the last few decades, the pricing mechanisms have become more complex as financial investors have entered the market. The role of speculators will not be included in this analysis. This is done to reduce the complexity and the

fact that researchers do not agree on how this affects the pricing of oil (Reitz and Slopek, 2009). The next section will analyse the demand and supply of petroleum.

7.2.1 Demand

There are three main factors influencing the demand of petroleum. These are income (GDP), the price and availability of substituting products.

Income (GDP): The main driver of demand growth has historically been income. Strong economic growth in terms of GDP per capita, increases the demand for oil. Increased income leads to people consuming more energy-intensive products like cars and home appliances, and the local industries using more energy-intensive machinery and requiring more transportation. The income elasticity is lower in mature economies as they often have shifted towards service economies, which requires less energy. Consequently, developing countries have higher income elasticity of oil demand (Deutsche Bank, 2013)

Price: In theory, oil prices and demand will have an inverse relationship. This is evident in most periods of high oil prices demand is reduced. However, when looking at the price developments historically, this does not always hold true. An example of this is the last boom period from 2004-2008, both the oil price and demand increased. However, this is most likely a result of increased economic growth in developing countries, and not a sign of an inelastic relationship between oil price and demand (Deutsche Bank, 2013).

Substituting products: The demand for oil is depended on the availability of viable substitutes. As mentioned in the Porter´s five forces analysis in section 5.1, there are many different substitutes for petroluem, but none that can substitute petroleum in all of its current applications. The better substitutes available, the more effect an increase in price will have on demand (Deutsche Bank, 2013). Fuel oil used to heating and professional services are less elastic than transportation fuel as there is no well-functioning substitute available.

In conclusion, the main driver of the demand for petroleum is state of the world economy, and especially the growth of developing economies. The oil price is also important to determine demand, but the connection is not always represented by the theoretical expected inverse relationship. The continued development of substituting, and especially in terms of renewable, sources of energy will affect demand in a negative manner in the future.

7.2.2 Supply

Supply in the global petroleum sector is the amount of petroleum available to buy. In contrast to most industries, national governments through the use of national petroleum companies, control

more than 90% of the proven reserves (Deutsche Bank, 2013). As a result, supply is not mainly determined by companies, but by governments. Consequently, the dynamics of the supply patterns are very different from most other industries.

Oil is a non-renewable energy source, and thus the amount remaining is limited. However, as new extraction techniques are developed, the volume that is recoverable increases. According to Wood Mackenzie data (2013) approximately 59% of all recoverable resources have already been produced. Consequently, the world will most likely run out of petroleum in the distant future.

The most important actor affecting supply is OPEC. The OPEC countries control about 75% of the global oil reserves and most of the production, about 40% (EIA, 2015a). As described in the historical review of the oil price, OPEC has previously exerted significant control over the oil price, and has created price shocks by reducing their supply. At the current oil price drop, OPEC has not reacted. This suggests that their ability to control the oil price may be reduced. This decrease in control is mainly due to two elements. The first is that since the 70s there have been large discoveries in the North Sea, Russia and the United States, which has reduced the percentage of OPEC production. Two out of the three largest oil producing countries are now outside of OPEC, and the profit from a OPEC supply cut will benefit the outside countries at the expense of OPEC. It is therefore speculated that OPEC does not have high enough incentives anymore, as they control less than half of the world's production. This is further aggregated by the fragile state of the economies in Iraq, Iran, Nigeria and Venezuela. These countries would not be able take the reduction in supply, with petroleum revenue being their main source of governmental income (Hirst, 2015).

Secondly, many of the largest national and international oil producing companies have sharply increased the amount of debt outstanding. Debt requires payment to creditors, which reduces the flexibility of the companies to change the amount of production easily (Hirst, 2015). The increase in debt is something that has happened throughout the industry, not only in the OPEC countries, and as a result, the overall production flexibility is reduced.

The introduction of Shale oil has changed the supply structure of the industry. Oil shale is a type of sedimentary rock that has low permeability that contains hydrocarbon, which can be extracted when heated (Morse and Turgeon, 2013). This has been possible through the development of horizontal drilling and hydraulic fractioning (fracking), and permitted petroleum producers to extract resources form shale rock and other low permeability formations. "Shale oil production has changed the market fundamentally. The time it takes from you decide to invest in a project to oil

production is underway has fallen from three to four years down to 30 days" Jeff Currie, Chief analyst Goldman Sachs (TDN finans, 2015). Production of shale petroleum has mostly been a US phenomenon. The US has always been a large petroleum producer, but after the introduction of Shale oil, their production has increased by more than 50%, which makes them the largest petroleum producer in the World (Doman, 2015). The increase in production makes it likely that the US will be a net exporter in the future. This may lead to the country lifting the 40-year-old ban on exports. If the ban is not lifted and production in the US continues to increase, the US price of crude oil will most likely decrease and this would cause some odd pricing dynamics (Brown et al, 2014).

It is not only in the United States that there is potential to derive shale petroleum. Large reserves have been located in many areas of the globe, and the EIA estimates that multiple other countries will have reserves larger than the US (EIA, 2013). The extraction of Shale petroleum will definitely play an important role in the future of petroleum supply, however how important is currently unknown. The method has been highly criticized due to the effect it has on the environment. One of the major issues is the fact that to produce shale petroleum there has to be injected massive amounts of water into the boreholes, which will not only limit the water supply in the area, but it may also contaminate the groundwater supply in the surrounding areas. The production of shale oil also has high pollution emissions, and creates toxic by-products (Bjørlykke, 2014). This is the reason why the introduction of shale oil production in Europe has been limited, as the European Union has stricter environmental regulations than the United States (Anderson, 2014). The latest research also shows a correlation between the production of shale petroleum and earthquakes. In Oklahoma the average number of earthquakes, of a scale of more than three, have increased from less than five a year to 585, in just 5 years (NTB, 2014).

Most of the supply of petroleum is located in the Middle East. In the past few decades, the political situation in many of the areas producing the most petroleum has been very unstable. The development of the political situations will most likely affect the oil price in the future. Currently there is a ban on petroleum production in Iran. Approximately 10% of the world's reserves are located in Iran, and if the ban is lifted the world supply will increase.

To conclude, there are many factors affecting the supply of oil. OPEC, shale oil and the political situation in the Middle East are currently the most influential factors in determining the world supply. The question is now how all of these factors will affect the oil price in the future. The next part of the thesis will now try to predict the future price movements of oil.

8. Oil price forecasting

As previously mentioned, the oil price is the most important revenue driver in a petroleum company. Consequently, a prediction of the future oil price is very important for the upcoming valuation of DETNOR. The next section of this thesis is thus an overview of how the future oil price can be estimated. It will start of with a brief overview of the most common models and their theoretical foundation. Thereafter, a short overview of the different methods that can be used to measure the volatility in the oil price will follow. The volatility is the most important variable in most forecasting models, and will also be very important in terms of the real option valuation. The last part of this section will be a 45-year oil price forecast.

8.1 Forecasting models

From the overview of historical oil price movements, most of the fluctuations have been difficult to predict beforehand. Especially unexpected political events may be impossible to foresee before it happened. Nevertheless, creating an accurate oil price forecast is something that is continuously attempted. The ideal would be to create a comprehensive model that captures all aspects of the oil market, including possible strategic choices, bargaining process, supply and demand characteristics, governmental regulations and many more as explanatory variables (Lund, 1997). Obviously this will not be possible to do well, as the number of elements will rapidly get out of hand. It violates the core purpose of modelling, which is to capture the essential variables and ignore the less significant.

The need for a simplified model has been discussed in many different scientific articles, but a unified solution has not been reached. The different models can be sorted into three different groups; scenario/qualitative models, economic models and stochastic models. There is not a very clear distinction between the first two, but the last is based on a different theoretical foundation. The next part of the thesis will be a brief overview of the different forecasting models.

8.1.1 Scenario/Quantitative analysis

Scenario/Qualitative models focus on the political and strategic interactions between the actors in the market, and forecast the future oil price based on the expected future market situation. This means that the model give a broad outline of anticipated future situations, and minor focus on details and microeconomic concepts (Austvik, 1986). Most commonly, this is an analysis of the supply and demand dynamics and how both sides are likely to continue in the future. To forecast a future scenario of the oil price some factors should be predicted; estimations of new resources,

production technology, preservation of demand, substituting technology, new governmental regulation, world economy, and power of organizations, like OPEC (Lund, 1997).

A model will normally forecast two to three different scenarios. These will be based on the predictions of the factors described above. In general, there is established a worst case, a most likely case, and a best case. Some researchers have tried to quantify the probability of the different scenarios, but this has not led to any scientific accuracy (Lund, 1999).

The advantage of using this type of methodology is that you can forecast over a relative long time-period. This makes it an appropriate tool to in strategic planning and company valuations. The limitation are that it is nearly impossible to predict the future, not matter how much you know about the market in question. Again and again experts wrongfully forecast the future price movements, and this model will in many cases not be much more than an educated guess (Lund, 1997).

8.1.2 Economic models

Economic models are based on the same theoretical foundation as scenario/qualitative models, but use a more quantitative approach to forecasting. The major advantage of this type of model is that uncertainty is quantified. The inputs are mostly the same as in scenario/qualitative models, which are the factors that affect the supply and demand of petroleum (Lund, 1997). Consequently, the requirements for data collection are high, and the number of variables that need to be forecasted is very large. As a result, economic models are too complex for this thesis and will not be discussed further.

8.1.3 Stochastic models[1]

The two first types of modelling tools rest on a common fundamental assumption that the price of oil is determined by the supply and demand of petroleum. Stochastic models, in contrasts, assume that price movements are random. The model is not based on assumptions about the market mechanisms, but focus on the random price movements itself. The justification for the use of this model is that the historical oil price pattern looks irregular and unpredictable. By looking at the oil price in figure 8.3.1 (a) it is understandable why this has become an accepted view among economist (Lund, 1997).

The main reason why many researchers prefer this type of modelling tool, to the other more comprehensive models, is that it is relatively simple. Furthermore, in many cases stochastic modelling has proven to be better at forecasting future price movements. It is important that the modelled process satisfies the Markov property, which is that the price tomorrow is only depended

[1] All stochastic models illustrated have been created with the following input: S_t=$55,27, Drift=0,00035, Volatility=17,21%, Upper limit =$120, Lower limit =$25, Mean =$60, Mean reversion beta = 1

on the price today, and not historic prices. The two main stochastic models that have been used to model the future oil price through stochastic modelling are the Geometric Brownian motion and mean reversion (Ornstein-Ulenbeck process).

8.1.3.1 Geometric Brownian motion

A Geometric Brownian motion (GBM) is a stochastic process used on prices where the logarithm of the underlying variable follows a general Wiener process (Hull, 2008). It is a common assumption in option literature that the stochastic process is a GBM, and that the prices follow a random walk. To model oil prices, a geometric Brownian motion with drift is often used. The motion is a Markov process and the increment over a set interval of time is normally distributed and independent. The following formula is used (Hull, 2008):

(8.1) $$S_{t+1} = S_t \sigma W_t + \mu S_t t$$

(8.2) $$W_t = \varepsilon \sqrt{t}$$

Where S_t is the spot price of oil, W_t is the Wiener process, ε is the normally distributed random variable (0,1), μ is the drift rate, *t* is time and σ is the volatility in the oil prices. By using this motion the prices will never reach zero or below. However, they will move towards zero or infinity. This is one of the limitations of this process, as the prices moves towards extreme values in both directions. To get more constrained values, one can put in upper and lower limits to the price. A model with long-term limits will still have short-term volatility, but not the extreme outlier values (Ross, 2003). It means that if the price hits the lower limit, the lower limit will be the lowest price. If the model gives values where the price continues to go down, the price will stay at the lower limits. If it at some point starts to move up again then the motion with and without limits will follow the same pattern, but the price with limits will be at a higher level. Figure 8.1.1 show the difference between a geometric Brownian motion with and without limits (Lund, 1997).

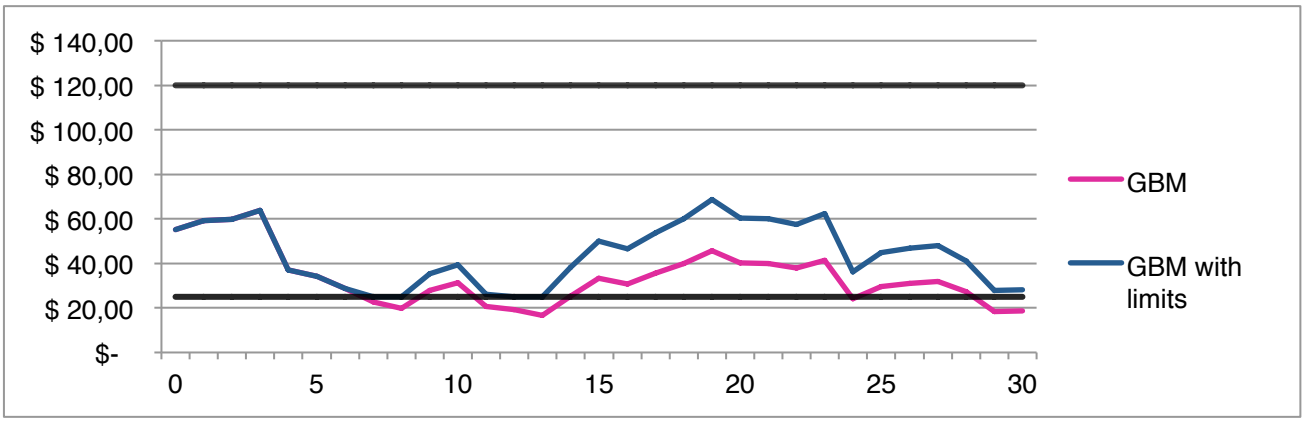

Figure 8.1.1: Example of a Geometric Brownian motion with and without limits.
Source: Own contribution

8.1.3.2 Mean reverting process

Another way to avoid the problem of too extreme values, which can occur with the GBM, is to use a mean reverting process. It is based on the reasoning that the price for goods should be related to the cost of production, and hence that the price should revert back to this cost over a set period of time (Lund, 1997). In terms of commodities this means the marginal production cost. The simplest mean reverting process is the Ornstein-Uhlenbeck process, which is given in equation 8.3:

(8.3) $$S_{t+1} = S_t - \beta(S_t - \bar{S})t + \sigma W_t$$

Where St is the spot price, β is the rate of reversion, $\bar{S}$ the mean price level, t is time, σ is the volatility and W_t is the Wiener process, equal to the one described in the GBM ((Uhlenbeck and Ornstein, 1930). The smaller the β, the more time before the price returns to the mean and thus the larger the price movements. If β is zero, the mean reversion process will give the same result as GBM. From the equation 8.3 it is deductible that the further away the price moves from the mean, the stronger the propensity to move towards it again. An Ornstein-Uhlenbeck mean reverting process is illustrated in figure 8.1.3.2.

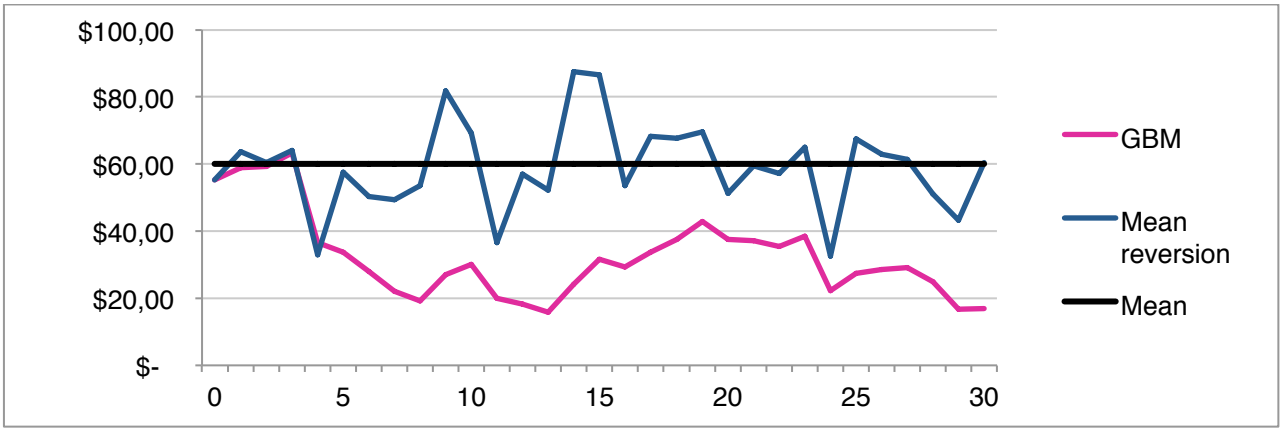

Figure 8.1.2: Comparision between a mean reverting process and a Geometric Brownian motion.
Source: Own contribution

8.1.3.3 Empirical evidence

There have been multiple theoretical studies that have tried to uncover how to most efficiently model the oil price. It is difficult to compare stochastic models with economic and Scenario/qualitative models, due to different structural foundation. However, several studies have compared whether the oil price is modelled best as a mean reverting process or a geometric Brownian motion. The results are mixed and no absolute conclusions can be drawn (Lund, 1997). Dixit and Pindyck (1994), Pindyck (1988), and Gibson and Swartz (1991) draw the conclusion that no mean reverting process can be found in the price of oil where the time period is relatively short, less than 2 years. Dixit and Pindyck (1994) have concluded that you can detect some mean

reversion if the whole time period where oil has been traded is considered, 120 years. However, it is too slow for normal petroleum project periods, 30-40 years, and accordingly it is not possible to reject that the oil price follows a random walk (GBM).

There have not been many empirical comparisons between a Geometric Brownian motion with limits and a mean reversion process. This is based on the fact that both processes require some judgements of the analyst in setting the inputs in the model. As the model should be based on expected future price movements, and not on historical data. The analyst must decide to the best of their knowledge the future expected limits, the future mean and to some degree the mean reversion speed. The results will be dependent on the choices of these inputs, and they can therefore not be compared directly.

8.2 Oil price volatility

From the model presented in the last section, it is evident that volatility is a fundamental parameter in any oil price forecasting. Volatility is a parameter for the size of the fluctuations in a time series of price movements of a specific asset (Alexander, 1998). There are two common methods to oil price volatility estimation; historical and implied. The implied volatility is based on derivative pricing, and the volatility measure reflects the market participants' view on the future uncertainty of the asset (Rakkestad, 2002). This is contrast to historical volatility, which is estimated by analysing the past price movements. Historical volatility will as a result reflect past price movements, while implied volatility reflects the markets expected future movements (Hull, 2008).

8.2.1 Historical volatility

To estimate the historical volatility, the simplest and most common practice involves finding the standard deviation for a certain period of the data, most commonly a year. Standard deviation is estimated using formula 8.4 (Rakkestad, 2002).

(8.4) $$\sigma_t^2 = \sum_{t=t-n}^{t=T-1} (r_t - \bar{r})^2$$

(8.5) $$\sigma_t = \sqrt{\sigma_t^2}$$

By using this method you will find the estimated standard deviation for a set period, n. To get the annualized volatility you need to multiply the standard deviation with an annual data factor. The size of this factor will depend on frequency of the historical data used.

(8.6) $$Annual\ data\ factor = \sqrt{No\ of\ obervations\ per\ year\ in\ data}$$

The reason for using such a method for estimating volatility, is that the method is unaffected by short-term extreme volatility. As a result this is a common thing to include when forecasting future volatility. The longer the time periods chosen, the less short-term volatility is present. This is evident in figure 8.2.1, where there is a large difference between the smoothening of the volatility in the 10 weeks average and a one-year average. This method gives a constant volatility over a year. Most forecasting models use a constant volatility, and this is estimated by taking at the average annual volatility over a predetermined time frame, like the last 10 years.

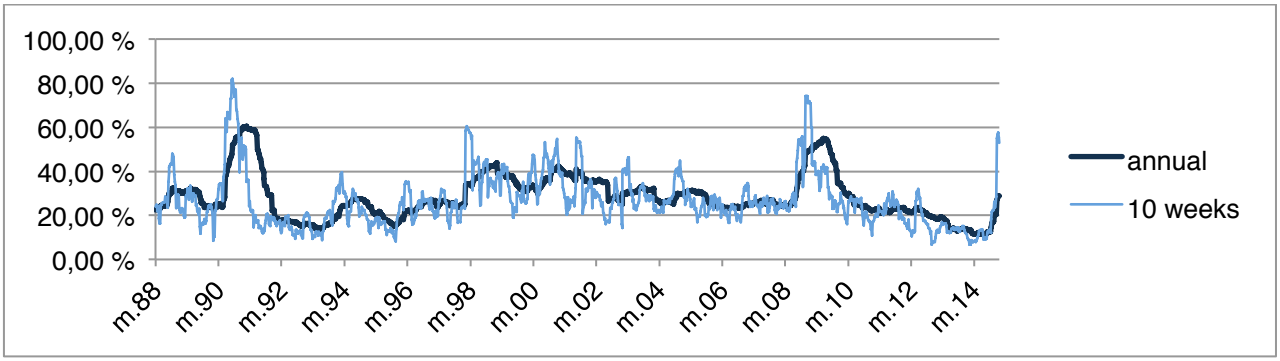

Figure 8.2.1: Annualized and 10-week smoothening of volatility.
Source: Own contribution

8.2.2 Implied volatility

Implied volatility is the market´s opinion of the future volatility of a financial asset. Calculating implied volatility is a complicated process, but it is based on option pricing models. Briefly explained, it involves using the option-pricing model backwards, and instead of using it to estimate the price, one uses the price and the other imputes to solve for volatility. This is the most common tool to use when valuing stocks and other financial assets (Rakkestad, 2002).

8.3 Forecasting the oil price

Parts 8.1 and 8.2 laid the theoretical foundation, and the next step is to actually forecast the future oil price using the different models. Economic forecasting models have been ruled out due to being too complex. The next part will hence be a presentation of the applicability of two different types of forecasting methods: Scenario/Qualitative modelling and stochastic processes. Before the use of a random walk model, some statistical inputs must be estimated. The forecasted oil price will be used in both of the upcoming valuation models.

8.3.1 Scenario/Qualitative analysis

The most common way to forecast the oil price using a Scenario/Qualitative analysis is to analyse the factors affecting the supply and demand of petroleum, and forecast these into a set future period. This will be outside the scope of this thesis as it covers too many different scenarios and is

very complicated. The main factors affecting supply and demand was identified in part 7.2. Based on that analysis, three scenarios will be identified. This is a simple estimation founded on educated guesses of the development of the oil price. The three different scenarios will be characterised by static prices over entire time period.

The first scenario is the low scenario, which is the scenario that represents the most negative outlook for the future oil price. The lower limit price is estimated to be $35. Most of the world´s petroleum fields have a break even well above $40, and it is mainly in the onshore production in the Middle East, where a lower rate than this can be found. The current break-even price of onshore-oil production in the Middle East is $25, and it is unlikely that the price will ever go that low, as then the entire industry would have a negative profit (Kristopher, 2015). The estimated low scenario is thus $35. Then most of the NCS, the US and Russia would loose money, and thus supply would be reduced as a consequence.

The second scenario is the base case scenario, and it the most likely scenario. The oil price is estimated to be $60, which is just above the January 1st 2014 price. This is based on that supply will continue to stay at a relatively high level, and no very high growth in demand. This will lead to the oil price staying approximately where it is today (Anderson, 2015). If OPEC or no other of the major countries decides to cut supply, this may be the result. The price will most likely stay around the current level if supply is unaffected by political interruptions like war in some of largest oil producing countries or a large increase in shale petroleum around the globe.

The third scenario is the high scenario, and is it the most positive outlook of future development of the oil price. The oil price is estimated to be $110, which is around the average price before the crash in 2014. This can happen if the production of shale oil continues to decline as a result of more countries ban development and production of this type of petroleum due to increased earthquake danger and pollution. The oil price may also reach this high level if the political situation in the Middle East forces one or more countries to shut down production, which reduces world supply. The reason this price is not higher than $110 is that many researchers believes that the level of supply will never be low enough that the oil price will be as high as before the drop in 2014. The cost of reducing supply is too high for most countries, which reduces the likelihood of an artificially high and manipulated oil price.

The scenarios presented are three different scenarios that may occur. There will also be a large number of other possibilities, but these three are designed to capture the most probable scenarios of the oil price. There are many combinations of things that may occur that can lead to the different scenarios. The pricing of oil consists of a lot of factors that may all move in different directions, and

it is nearly impossible to tell which combination will happen in the future. The probability is decided to be equal for all scenarios. It is difficult to specify the probabilities of a outcome with any scientific accuracy and it is consequently not recommended (Lund, 1997).

8.3.2 Stochastic modelling

As mentioned in the section 8.1.3.3 “Empirical evidence”, there is no consensus about which type of stochastic modelling tool that best captures the movement of the oil price. Multiple researchers have concluded that there is no mean reversion for short time-periods, but that there may be some when you have a very long time horizon (Dixit and Pindyck, 1994). The forecasting of the oil price will therefore be based on a Geometric Brownian motion with limits.

8.4.2.1 Estimation of the input parameters

To be able to predict the future oil price, many factors must be estimated before the forecasts can be conducted. The next section of this thesis will give a brief explanation as to how the different input parameters has been estimated. This is done to increase the reliability of the thesis.

8.3.2.1.1 Volatility

Volatility is one of the most important variables in terms of predicting future oil price movements. It is also the most significant value driver of the value of the firm´s real options, which will be presented in the model in section 11.1. The volatility will be calculated as historical volatility. The main reason for this, is that the time periods needed for the analysis are not present in the future market for commodities. The time period available from the future with adequately high volume is only six months ahead. The longest future available is to December 2016 (Intercontinental exchange, 2015). As the average projects will continue at least 20 years into the future, the volatility implied by these derivatives will not be valid for the analysis. As a result, historical volatility will be used to forecast the oil price.

The time period chosen to determine the historical volatility is shorter than the period of data available. The is due to the fact that the volatility has been decreasing over time, and it is believed that as high volatility as observed over the entire period will overstate the expected future volatility. This is mainly based on the reduced control of OPEC to keep the oil price high, and as a result will shocks of equal magnitude of those that have previously occurred not likely happen again (Reed, 2014). The time period used is the last 5 years.

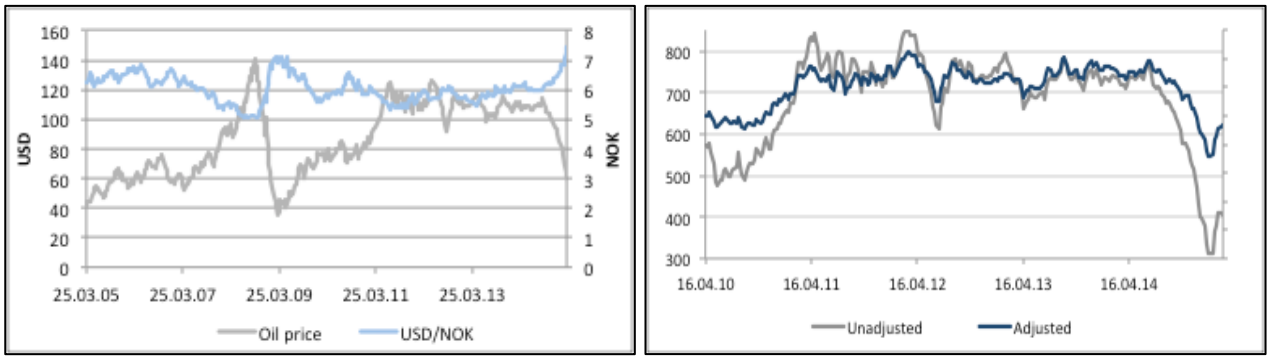

Figure 8.3.1 (a) Price movements of the oil price and the USD/NOK exchange rate, (b) adjusted and unadjusted oil price for exchange rate fluctuations.
Source: Own contribution based on data from EIA (2015b)

To reflect the volatility experienced by DETNOR, it is important that it reflects the actual costs incurred. The petroleum industry is the largest contributor in terms of revenue in Norway, and as a result, a decrease in the oil price will affect the state of the economy (Norwegian Petroleum Directorate, 2014). Consequently, the exchange rate will depreciate. The USD/NOK rate and the oil price will normally move in opposite directions, and have a correlation of -42,63%. The relationship is shown in figure 8.3.1 (a and b). The volatility used in the model is the exchange rate adjusted volatility. This gives an annual volatility of 17,21%. The estimation can be found in appendix 2 and 3.

8.3.2.1.2 stochastic modelling input parameters

To be able to forecast the oil price through stochastic modelling with Geometric Brownian motion with limits, one need estimate certain inputs factors. These are the limits, the spot and drift rate. The limits are decided to be 60% over and under the high and low scenario from the qualitative/scenario model as presented in the last section. This is based on what the author believes is possible for the oil price to reach the next 45 years. The lower limit is thus $14 and the upper limit is $175.

The **spot rate** is the starting point for the analysis, and represents the current price of the asset, which is the oil price. The goal of the valuation of DETNOR is to find the value of the company as of 31st of December 2014, and the oil price at this time is the spot rate. The closing price is used and this is $55,27 (EIA, 2015b).

The **drift** is the change of the average value of a stochastic process. The rate of the drift represents the rate at which the averages change (Lund, 1999). This means that a high number represent a positive trend and a low or negative number will give a downward sloping trend. The oil price have had an upward sloping trend, also if you look at inflation adjusted data as evident from

figure 7.1.1. The drift in the model is calculated based on historical drift plus an added growth premium. In total, this gives a drift of 3,5%.

8.3.2.2 Forecasting the oil price

When forecasting the future oil price, with a stochastic model with a Wiener process it gives different paths for each simulation. The simulation has run a 1000 times and the used oil price is the average of the simulated values. This is evident from figure 8.3.1, which shows the different pricing paths of a 100 simulations, and the average price highlighted.

The forecasted oil price starts at the spot price, and has a slight upward sloping trend. If the limits had not been in place the estimated slope would be steeper. Consequently, the limits are examined closer in the sensitivity analysis in section 11.4 as the forecasted values are of great importance to the estimated firm value.

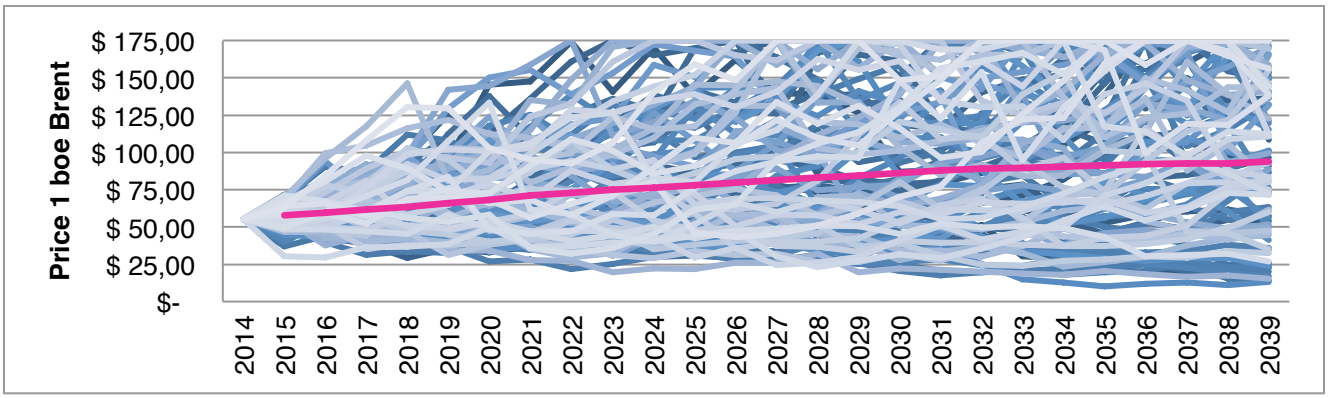

Figure 8.3.2: The simulated path for the first 100 simulations of the oil price. The pink line represents the forecasted oil price. Actual forecasts can be viewed in appendix 6.
Source: Own contribution

9. Fundamental financial statement analysis

The most common tool used to value a company is the discounted cash flow approach (DCF) based on a financial statement analysis. This will be the first method used to value DETNOR. The purpose of a financial statement analysis is to get an overview of the financial situation of the firm. One of the most common uses of a financial statement analysis is to determine the "true" value of a firm (Petersen and Plenborg, 2012). The value of a firm is found by looking at the forecasted future cash flows. These forecasts are based on an analysis of the firm's historical financial statements. This analysis is conducted to get an overview of a firm's historical development and reveal the company´s financial value drivers, which is found by examining DETNOR´s performance. The financial analysis, along with the information from part 4, 5 and 6, which focus

on the company and the petroleum industry, will form the foundation for forecasting DETNOR´s future performance.

The next part of this thesis will therefore conduct a financial statement analysis of DETNOR, and use a fundamental approach to value the company. A few adjustments must be made to the financial figures before they are ready to be analysed. This is done to "clean up" the figures to give a more accurate overview of the company´s financial situation.

9.0.1 Change in reported currency

As a result of the acquisition of Marathon Oil Norway AS, DETNOR has changed its functional currency from NOK to USD as of 15th of October 2014. IAS 21 states that the functional currency of a company should be "the currency of the primary economic environment in which the entity operates "(IAS, 2015). After a careful consideration, the company determined that the firm has most of its economic activity in USD (DETNOR, 2014k). The acquisition of Marathon Oil forced this change as it led to a much higher level of production, and as a result, a drastic increase in the petroleum income of the company. Most petroleum is sold in USD and thus this will be the functional currency of DETNOR.

To be able to forecast the future of DETNOR, it is important to understand the company´s past. As the company´s annual reports every year before 2014 is presented in NOK, this thesis will continue to use NOK as the currency for the company´s financial analysis. To convert the latest financial figures into NOK, the exchange rate of 31th of December 2014 is used. This is consistent with what the company has done in their annual report (DETNOR, 2014k). The exchange rate that is used is USD/NOK =7.4163.

9.0.2 Transitory income and costs

To be able to use a firm´s financial statement to forecast future earnings it is important to separate permanent from transitory items. Transitory income or costs should not be included when budgeting for the future, as they will not reoccur. The permanent numbers is the base of company, and only these can give an indication of actual trends in the financial figures (Petersen and Plenborg, 2012). In the financial statements of DETNOR, the following three items has been identified as transitory:

In 2014, the company experienced a drastic increase in **consulting fees** due to the acquisition of Marathon oil (DETNOR, 2014l) The company will not likely buy any equally large companies in the future, and the consulting fee will be reduced to the 2013 level to get a better understanding of the actual company operations. The 2013 consulting fee was 33 563 000 NOK. To take exchange rate fluctuations and the general growth of the company into account, the normalized fee for 2014 has

been estimated to 40 000 000 NOK. This alteration will reduce the other operating expenses with nearly 200 000 000 NOK. The adjustments can be found in appendix 9.

In 2012, the company had large **impairment loss**. It was an impairment of non-current assets, which came as a result of technical challenges with completing the well, Jette. This led to higher boring costs and lower estimates of recoverable reserves. These problems have forced DETNOR to change their drilling plan for future operations. Therefore, will this post be view as transitory as it is unlikely to occur again. This cost is alone responsible for an amortization cost of 1 963 351 000 NOK. This cost is hence removed from the income statement (DETNOR, 2012)

In 2014 another large **impairment loss** occurred, which was a result of the sharp fall in the oil price. This led to a large reduction of the expected future oil price. When the carrying amount of an asset or cash-generating unit exceeds its recoverable amount, an impairment loss will be recorded. To value the recoverable amount of petroleum reserves, the most important factor to consider when calculating the present value is the future expected oil price. The large impairment loss in 2014 will most likely not happen again, as an oil price drop of this magnitude is unlikely to reoccur in the near future. This post is thus classified as a transitory item, and it will be removed from DETNOR´s income (DETNOR, 2014m). The adjustments can be found in appendix 9.

9.1 Reformulation

To get a better overview of the value drivers of a company, the financial statements needs to be reformulated into financing and operating items. The goal by reforming the income statement is to get the net operating profit after tax (NOPAT). This can be calculated from equation 9.1 (Petersen and Plenborg, 2012):

(9.1) $$NOPAT = operating\ profit\ x\ (1 - Tax)$$

NOPAT excludes all financial income and costs, and it will therefore measure operating efficiency better than net income. As DETNOR have separated operating and financing items on their income statement, no reclassification has been necessary.

When reformulating a company´s balance sheet by separating operating and financing activities one obtain the invested capital. According to Petersen and Plenborg (2012) “invested capital represents the amount a firm has invested in its operating activities and which requires a return.” Invested capital is a measure of value creation in a company and can be calculated from the following equations:

(9.2) $$Invested\ Capital\ (Net\ Operating\ assets) = Operating\ assets - Operating\ liabilities$$

(9.3) $$Invested\ Capital\ (Financing) = Net\ interst\ bearing\ debt + Shareholder´s\ Equity$$

Net interest bearing debt is the interest bearing debt minus interest bearing assets, like excess cash and investments in marked based securities. Invested capital should be balanced and hence be equal on both net operating assets and financing side (Petersen and Plenborg, 2012). Classification of a firm's operating activities is not an exact science, and will be industry and firm specific. The classification and analytical balance sheet can be viewed in appendix 10 and 11.

9.2 Profitability analysis

The goal of the profitability analysis will be to determine which factors that drive profitability in DETNOR. This is used to forecast the future profitability of the company. The focus will be on decomposing Return on Equity (ROE). Insight into the value drivers of the company is important when forecasting the future performance of the firm. The analysis will be based on the DuPont-model, which can be found in appendix 13. The presented ratios are all on an after-tax basis. The equation for ROE is presented in formula 9.4.

(9.4) $$Return\ on\ Equity\ (ROE) = ROIC + (ROIC - NBC)\ x\ \frac{NIBD}{BVE}$$

To get a better overview of the financial situation of the company, the first thing that is looked at is the **Return on Invested capital (ROIC)**. ROIC measures the overall profitability of the firm´s operations (Copeland et al., 2000). It measures how much profit the company creates per unit of invested capital, and gives an indication of how well the company are able to utilize the resources they have invested in. It is therefore positive with a high ROIC and upward trend. The development in ROIC can be seen in the graph 9.2.1 (a) below.

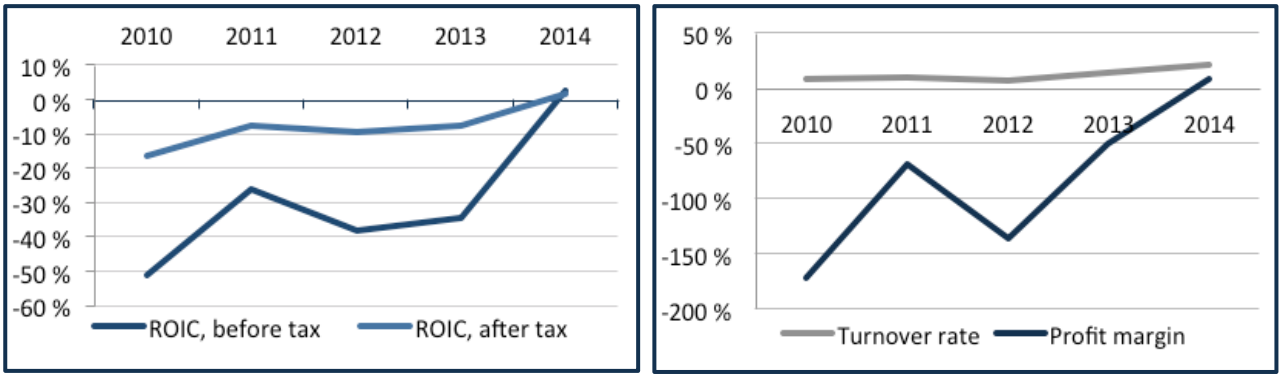

Figure 9.2.1: (a) DETNOR´s return on invested capital and (b) decomposition of ROIC
Source: Own contribution, figures are in appendix 12.

The company has a negative ROIC in all years except for 2014. This could indicate poor resource management. However, as the DETNOR is a fairly young company their investments are currently

much larger than their profits. This is further affected by the long time periods that exist in the petroleum industry. The trend shows that the situation is improving for the company. This means that DETNOR is making more profit per invested unit. To get a better insight into what causes this upward trend, but still negative ROIC, it will be decomposed into profit margin and turnover rate of invested capital.

(9.5) *ROIC = Profit margin x Turnover rate of invested capital*

From the graph 9.2.1 (b), the turnover rate is fairly stable over time compared to the firm´s profit margin. The **Profit margin** describes the relationship between operating profit and revenues (Copeland et al., 2000). DETNOR´s profit margin is negative throughout the period, and this means that operating income after tax is negative. The results is consistent with what is expected for an young upstream petroleum, as they have large investments, but the revenues are delayed due to the long-time periods of the industry. The trend is upward sloping, and this indicates that the company is generating more revenue now than previous years. However, the structure of the petroleum industry is making the financial statements difficult to analyse, as the exploration costs will be many years ahead of the revenue of a project. The production costs and revenues are much easier to track as they occur at approximately the same time. The long time frame is reflected in the low turnover rate. **The turnover rate of invested capital** is the firm´s ability to utilize invested capital (Petersen and Plenborg, 2012).

Financial leverage is how much a firm has in net interest bearing debt (NIBD) compared to the book value of equity (Petersen and Plenborg, 2012). This part of the estimation of ROE shows how the firm´s capital structure will affect the owners. From table 9.2.1 below, it is evident that the company´s has an increasing amount of debt in their capital structure.

	2010	2011	2012	2013	2014
Net borrowing rate	14,85 %	10,04 %	2,70 %	2,77 %	4,06 %
Spread	-31,08 %	-17,52 %	-12,00 %	-10,26 %	-2,30 %
Financial leverage	11,16 %	19,12 %	24,12 %	62,80 %	190,97 %

Table: 9.2.1: Overview of the historical development of a few financial ratios.
Source: Own contribution

The company's growth has mainly been financed with increasing amounts interest-bearing debt. The acquisition of Marathon Oil Norway in 2014 was financed by increasing the amount of debt outstanding and consequently the financial leverage of DETNOR.

To analyse whether increased leverage has been beneficial for DETNOR´s owners, one have to look at the firm´s **spread**. This is calculated by subtracting net borrowing costs (NBC) from ROIC. If ROIC is larger than NBC, increasing financial leverage will increase ROE. Although the company

has a fairly low NBC, it will be impossible for the NBC to be lower than ROIC, as DETNOR´s ROIC is mainly negative. The spread is therefore not a very good indicator whether it will be favourable for DETNOR to increase its debt.

	2010	2011	2012	2013	2014
Return on equity (ROE)	-19,69 %	-10,83 %	-12,20 %	-13,93 %	-2,62 %

Table 9.2.2: The historical development of ROE
Source: Own contribution

In total, DETNOR´s ROE is not unexpected negative for the entire period. ROE measures the profitability by taking both the operational and financial leverage into account. As DETNOR had mostly a negative ROIC and a negative spread, the ROE does not look very good. However, as with most of the numbers, the financial situation looks like it is improving as it follows an upward sloping trend. Nevertheless, the situation does not appear very promising, which may indicate that value creation in an upstream petroleum company is not easily captured through a profitability analysis. All of DETNOR´s profitability ratios can be viewed in appendix 12.

9.3 Liquidity risk analysis

Liquidity is very important to pay attention to for all businesses. Weak liquidity can impose restrictions on the company´s opportunities to make profitable investments and may cause problems for the firm to pay its bills (Petersen and Plenborg, 2012). The next section will first analyse DETNOR´s short-term liquidity risks, and thereafter conduct a credit rating of the company to get an indication of the firm´s long-time liquidity risk. The reason for doing a credit rating is that as most measures of long-time liquidity will be industry specific, and to get some insight into the situation for the company one must compare the figures to its peers.

9.3.1 Short-term liquidity risk

Short-term liquidity risk reveals a firm´s ability to pay all short-term obligations as they come due (Petersen and Plenborg, 2012). In contrast to the profitability analysis, which shows how well the company is at creating value, a liquidity analysis shows if the company has enough cash and other assets to continue its operations in the future. Table 9.3.1 shows DETNOR´s historical development of short-term liquidity risk.

Liquidity risk analysis	2010	2011	2012	2013	2014
Current ratio	1,47	2,76	1,99	2,26	1,57
Quick ratio	1,47	2,73	1,98	2,24	1,54
CFO to current liabilities	0,23	1,42	0,85	0,75	0,19

Table 9.3.1: The historical development of a few short-term liquidity ratios.
Source: Own contribution

Current ratio measures a firm´s ability to meet its short-term obligations. More specifically this is the degree of current assets to current liabilities. In terms of liquidity risk, the higher the ratio, the lower short-term risk. In general a ratio greater than 2 suggest low short-term liquidity risk, but this will vary across industries. The current ratio of DETNOR varies from year to year, but is around 2 each year. This indicates that the company is not experiencing any critical short-term liquidity problems.

The **quick ratio** is almost the same as the current ratio, but instead of current assets it only includes assets that are easily converted to cash. This includes items such as cash, marketable securities and receivables. However, as the company´s current assets mainly include assets that are easily converted into cash the ratio is very close to the current ratio.

To capture more of the liquidity risk of the company, one can replace the balance sheet items with cash flows from operations (CFO). CFO is usually a better indicator of cash available to pay current liabilities than current assets. **CFO to current liabilities** gives a worse picture of the liquidity situation in the company as it is only above one in one year. This implies that in some years CFO is less than short-term debt, which indicates that there may occur some problems with short-term liquidity.

9.3.2 Long-term liquidity risk

Long-term liquidity risk refers to the firm´s long-time financial health and the ability to satisfy all future obligations (Petersen and Plenborg, 2012). The long-term risk can be analysed through financial ratios, but to get any indication of the solvency situation of the firm the ratios need to be compared to a peer group and the industry standards. As analysing peers is deemed outside the scope of this thesis, the long-term liquidity risk will be accessed through a credit rating framework. The framework is based on Moody´s approach to accessing risk in the global production and exploration industry (E&P). The framework contains four factors that are important determinants of the financial health of an upstream petroleum firm (Moody´s, 2011):

1. Reserves and Production characteristics
2. Operational and Capital Efficiency
3. Leverage and Cash Flow coverage
4. Production mix overlay

Det norske oljeselskap AS Credit rating analysis				2014	2013	Rating	Weighted score
Rating factor	*Factor Weight*	*Rating sub factor*	*Sub-factor Weight*				
Reserves and production	40 %	Avg. Daily production (Mboe/d)	15 %	15,63	4,463	Caa	2,70
		Proved Developed Reserves (Mill boe)	15 %	179,12	65,8	Ba	1,80
		Total Proven reserves (Mill boe)	10 %	205,5	65,8	Ba	1,20
Operating and capital efficiency	20,0%	Leveraged full-cycle ratio	20 %	0,955	- 0,015	Caa	3,60
Leverage and Cash Flow coverage	40,0%	E&P Debt/Average Daily Production	10 %	$ 188 673	$ 195 084	Ca	2,00
		E&P Debt/PD boe reserves	10 %	$ 16,46	$ 13,23	Caa	1,80
		RCF/Total debt	10 %	8,9%	30,2%	Ca	2,00
		EBITDA/Interest expense	10 %	3,06	- 3,43	B	1,50
							16,60
Production mix overlay		E&P Unleveraged Cash margin/BOE		$ 50,99	$ 23,31	-1	
Total score	**15,600**	**Rating**	**B3**				

Table 9.3.2: Credit rating of DETNOR[2]
Sources: Own contribution based on framework created by Moody´s (2011).

As seen from table 9.3.2, DETNOR was given a credit rating of B3, which is the weakest B a company can attain. The company scores among the lowest ratings in terms of Operation and Capital Efficiency and Leverage and Cash flow coverage. DETNOR performs somewhat better in terms of Reserves and Production Characteristics. This may be as a result of the firm is relatively early in their life cycle. The company scores average on proven and developed reserves, but experiences high risk on daily production. This reduces their operational and capital efficiency and leverage and cash flow coverage. The company scores very well in terms of their productions mix. Overall the credit rating indicates that the company may have problems with its long-term liquidity. The company will be classified as being a speculative investment and by having a high credit risk (Moody´s, 2011).

9.4 Budgeting

To predict the future financial position of DETNOR, some of the value drivers need to be forecasted. The budgeting process is not an exact science, but is based on the best guess for the future by the author. The firm value will be calculated based on the forecasted financial statements.

DETNOR´s revenue is calculated by adding together “petroleum income” and “other income”. The “petroleum income” is calculated by multiplying the expected oil price, the expected production and the USD/NOK exchange rate. The production is found by looking at the expected production per field currently in production or the development phase. In the terminal period production growth is estimated to be 3%, which is the average estimated growth based on expected production. An overview of expected production is found in appendix 24. The oil price was estimated in section 8.3 and both forecasting methods are included. To ensure equal growth in all periods, the estimated oil price is fixed in the terminal period. There is no trend in “other income” and the expected value is

[2] The calculations can be viewed in appendix 15, while the long-term solvency ratios are located in appendix 14.

set to 20% of petroleum income, which is in line with the average of the historical figures of the company. The estimation of revenue is thus very important to the overall firm value as most of the other financial numbers are calculated by multiplying a set percentage with DETNOR´s revenue.

The EBITDA-margin is an indication of how well the company is managing their expenses. Historically, DETNOR has had a negative EBITDA margin due to relative high costs, mainly as a result of high levels of exploration activity. Furthermore, as it is just in the last year that the company has had a significant size of petroleum income, the result is a negative margin. The EBITDA-margin has been budgeted to be 70% of total revenue, which gives a slight increasing trend for the operating expenses. This seems realistic, as the operating costs are likely to increase with production. The company has announced that they are cutting exploration expenses due to the low oil price. However, as production will increase quite extensively over the next period, the production costs will increase and thus the overall trend is expected to be increasing.

The effective tax rate for petroleum activities is 78%. In reality only some of DETNOR´s income and expenses are related to "production of petroleum". The tax regulations are quite comprehensive, and only some of the aspects are included in this analysis. This includes the special uplift, the write-off of exploration and the special depreciation present on the NCS. The calculations can be viewed in appendix 23. This also includes the calculation of depreciation, amortization and impairments. The interest rate is set to be 3% of NIBD, which is close to what they are currently paying.

Investments in non-current assets have historically been very high, as the company are in a relative early stage of development in many of their fields. DETNOR have planned to continue to invest in production facilities in multiple of the fields with established commercial resources. As a result, the investments will increase in the near future. However, as the revenue will increase with quite high growth, the investments will not grow as fast due to financial restraint on investment activity. This will also be the case with net interest-bearing debt as a percentage of invested capital. Invest capital grows in approximately the same pace as revenues, but as a result of constraints regarding the amount of debt, the net interest-bearing debt will not grow as fast. Nonetheless, they will still continue to grow and follow an upward sloping trend. Inventories and receivables are budgeted to continue to grow, but be approximately the same percentage of revenue as they are today. The budgeted value drivers and the forecasted financial statements are found in appendix 18-22.

9.5 Cost of Capital (WACC)

The weighted average cost of capital (WACC) is the lowest rate of return a company's projects can have to satisfy both lenders and owners required rate of return. WACC expresses what an investor sacrifices by investing in this firm compared to other companies with same risk. The method is therefore used to estimate DETNOR´s cost of capital, which will be used to discount the firm's future cash flows. WACC is calculated by using the following formula:

(9.6) $$WACC = \frac{NIBD}{(NIBD+E)} * r_D * (1-t) + \frac{E}{(NIBD+E)} * r_E$$

The next section will be a discussion of the different components and their value.

9.5.1 Capital structure

The capital structure of a company should be based on the firm´s target capital structure. However, DETNOR does not disclose their long-term capital structure and this must therefore be determined using other methods. As only market value reflect the true opportunity cost of equity and debt, and the capital structure should therefore be based on market values (Copeland et al., 2000). Information available regarding the book value of the firm´s debt is released is in their annual reports and the newest information is from 31st of December 2014. By assuming that the capital structure DETNOR had at that point in time reflects the firm´s target capital structure, the market value of equity must be based on prices from the same date. The market value of equity is found by multiplying that date's stock price with the number of shares outstanding. This gives a market value if equity of 7 879 837 000 NOK and NIBD of 17 356 359 000 NOK, which give a capital structure of 31,2% equity and 68,8% Debt.

9.5.2 Owners required rate of return

The owners required rate of return is the return an investor minimum demands to invest in the company. This will be estimated from the Capital Asset Pricing Model (CAPM). From CAPM, the owners required rate of return is calculated with the following equation:

(9.7) $$r_e = r_f + \beta(r_m - r_f)$$

The first component is the **risk-free rate**. Theoretically this would be the return on a zero-beta portfolio. However, as constructing a zero-beta portfolio is associated with great problems, other methods have been more common to use in practice (Petersen and Plenborg, 2012). The most common proxy is a zero-coupon government bond. To handle issues such as inflation and exchange rate fluctuations, it is important to use the local governments bonds. In theory, the time to maturity of the bond should reflect the expected life of the investment. To reduce illiquidity and

availability problems, 10 years government bonds will be used. The risk-free rate from January 2015 is 1,54%.

The **market risk premium**, $(r_m - r_f)$, is the excess return investors get in compensation for investing in firms with risk. The topic of the market risk premium is highly discussed and there is no general consensus about how it is most precisely estimated. The two most common ways to estimate the market risk premium is the ex-post approach and the ex-ante approach (Petersen and Plenborg, 2012). Estimation of this parameter is outside the scope of this assignment and it will therefore be based on consensus surveys. PwC (2014) has surveyed 142 companies operating within the finance sector in Norway, and asked them what they use as a market risk premium. The average for the asked firms was 5,4% for companies listed on Oslo Stock exchange.

The firm´s systematic risk is measured through its **beta**. Generally, beta is estimated by comparing the firm´s historical stock returns to a benchmark for the market portfolio´s return. Beta thus measures the co-variation between company specific returns and market returns. If beta is higher (lower) than 1 the company has greater (lower) systematic risk than the market (Petersen and Plenborg, 2012). The benchmark for Oslo stock exchange, which is the stock exchange where DETNOR is listed, is OSEBX. The trading volume of DETNOR´s share has increased significantly in the last year, and as a result only this time period will be examined. Beta is found by running a regression of DETNOR´s stock returns on OSEBX (Brealey, Myers and Allen, 2014). The estimated beta of DETNOR is 1,71, which implies that DETNOR has greater systematic risk than the market. The regression can be found in appendix 16.

In total, this gives the following required return to the owners:

(9.8) $r_e = 1{,}54\% + 1{,}71\ (5{,}4\%) = \ 10{,}78\%$

9.5.3 Interest rate on debt

Interest rate on debt is the creditors required return to provide debt financing. DETNOR has two main sources of debt; a reserve based lending facilities and unsecured bonds. Both of the credit sources have a floating rate, based on NIBOR and LIBOR respectively. The required rate of return on debt has been calculated as a weighted average of the two sources based on current rates. The calculations are in appendix 17.

(9.9) $r_d = 3{,}14\%$

9.5.4 Tax rate

The tax rules for companies operating on the NCS are very complex, and the company is more or less operating with two tax rates, 27% and 78% respectively. The interest shield the company can

obtain depend on the tax rate the company can deduct their interest payments. The regulation regarding calculating effective tax rates is described in PTA section 3. The discussion is regarding whether the firm´s debt is onshore or offshore, which is the basis for the calculations. The common use in the industry is that debt is onshore, and thus only taxed at the Norwegian corporate tax rate of 27%. This rate is thus used in the WACC. The actual rate will be above this number, and as a result the value of the firm will be somewhat downward biased.

9.5.5 Calculation of WACC

All of the component described can now be inserted into equitation 9.6. This gives the following calculation:

$$(9.10) \quad WACC = 68{,}8\% * (1 - 27\%) * 3{,}14\% + 68{,}8\% * 10{,}75\% = 4{,}94\%$$

DETNOR´s WACC is thus 4,94%.

9.6 Valuation

The value of the firm is calculated using the DCF-model, which is common when analysing a company through its financial statements. This model is based on the expected cash flows to the firm (FCFF). The cash flows are discounted with the WACC, which is DETNOR´s cost of capital. The model is based on the assumption that the firm will stay in business indefinitely (Sørensen, 2012). The value of DETNOR, using stochastic modelling of the future oil price, is presented in the table 9.6.1.

Det norske oljeselskap AS		Budget period				Terminal period	
DCF-valuation	2015E	2016E	2017E	2018E	2019E	2020E	2120E
FCFF	3 850 911 -	3 371 906	419 043 -	1 158 706 -	1 838 840 -	726 743	492 752
WACC	4,95 %	4,95 %	4,95 %	4,95 %	4,95 %	4,95 %	4,95 %
Df	0,9528	0,9079	0,8651	0,8243	0,7855	0,7484	
PV of FCFF	3 669 336 -	3 061 424	362 519 -	955 145 -	1 444 323 -	543 908	
PV FCFF -	1 972 945						
PV terminal	20 648 610						
EV	18 675 665						
NIBD	17 294 552						
Equity	1 381 113						
Share price	**6,82**						

Table 9.6.1 The DCF valuation of DETNOR using stochastic modelling of the future oil price
Source: Own contribution.

Table 9.6.1 shows the FCFF of DETNOR during the budget and terminal period. The FCFF is mostly negative, which gives a quite low company value of 6,82NOK. The present value of the free cash flows is negative in the budgeting period, and all of the enterprise value stems from the terminal period. As DETNOR has multiple profitable projects already in place at that time, this does not make much sense. The company value will depend on which method has been chosen to simulate the oil price. Figure 9.6.1 below shows the share price for each of the different methods of

oil price forecasting. This revels how depended DETNOR´s share price is on the expected oil price as the variations are very large.

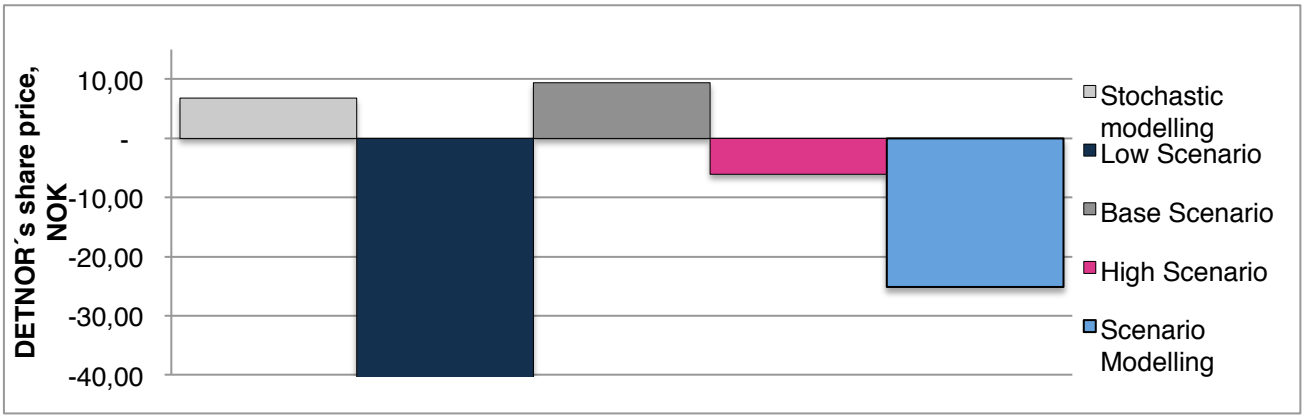

Figure 9.6.1: The share price of DETNOR using different forecasting methods for the oil price[3]
Source: Own contribution.

9.7 Evaluation of the method

The financial statement analysis using the DCF-method is the most common tool when valuing companies. Unfortunately it is not very appropriate for the upstream petroleum industry. This is mainly due to the long-time frames that are found in the industry. From the time of the initial investment to the last production of oil can be as long as 60 years. As a result, looking at a short-time period, which is common in the DCF-model, does not capture the value creation of the company. Due to the nature of the operations of DETNOR, the cash revenue will vary radically from year to year, and with little or no trend. This makes forecasting the future performance of the firm with the help of a financial statement analysis very difficult. One of the assumptions of the DCF-model is that the cash flows are indefinite. This is violated in this industry as the reserves on the NCS is fixed and will eventually run out. Another problem with using this type of analysis is that it is most common to use revenue as the main driver of growth in the firm. This has been done in the valuation presented above. However, as the more revenue leads to higher investments, free cash flow to the firm may be lower when revenue is over a certain level. This is the reason why the share price may be lower when the oil price is high. This is evident in the scenarios where the share price is higher in in the base case scenario than in the high scenario.

The model is static and does not take the probabilities of the actual outcome into consideration. This was evident in the analysis as the company is grows at a certain pace regardless of if they

[3] The complete valuation can be found in appendix 26 to 28.

actually find more petroleum in the subsea or at what level the future oil price is at. As a result, this method does not capture the structure of income in the company. One way to overcome this is to include scenario analysis. This was incorporated in the financial statement analysis presented in the last section. However, this does not cover all the probable outcomes, and each scenario will still be based on fixed paths. Some prominent researchers in the area like Brennan and Schwartz (1985) and Copeland and Antikarov (2003), argues that the DCF-method is not viable alone as a valuation tool. This is the result of that it does not take managerial response to varying marked conditions into consideration. Consequently the DCF-method will systematically undervalue every project and thus the overall company value. This was evident in the previous analysis of DETNOR as the expected share price was mainly negative or very low.

To conclude, financial statement analysis using the DCF-method is a well functioning valuation tool to use on stable companies with even streams of revenue. When things are unstable with varying growth, high risk, and long-time periods this basic model is unable to capture the value creation in the company. As a result, it is not a well-suited model to use on upstream petroleum companies.

10. Introduction to Real Options

The next valuation tool used to try to find the value of DETNOR is a Real Option Analysis (ROA). The first section will be an overview as to why ROA is a well-suited tool for an upstream petroleum company. Thereafter there will be a literature review, focusing on the different types of options and which tools can be used to value these. The reason for this thorough review of theory is that real options is not a very common tool to use within company valuation, and as a result the framework presented has not been described in published work. The goal of this part is thus to lay the theoretical foundation for the valuation framework.

10.1 Why use Real Options?

From the financial statement analysis in the previous section it was clear that the DCF-method had problems of capturing the value of the company. The two main problems were related to the unstable cash flows of the company, and trouble with capturing the value creation in the firm when looking at the company as a one unit. As each current and future petroleum field has its own characteristics, estimating the value of DETNOR as one unit does not capture the operational structure and thus not the potential for value creation. Consequently, in the rest of this thesis the value is estimated by looking at the resources of the company, and valuing each license separately. This means that value of the company is found by looking at the current operations plus the value of its future investment opportunities. As a result, the next analysis will be based on

project or investment valuation. This is in line with Kaiser and Yu (2012) that find that the value of a petroleum company is in the reserves, level of production and the oil price, as all of these elements is in focus when valuing the licenses separately.

In the DCF model the future cash flows is discounted at a higher cost of capital to compensate for high uncertainty. As the uncertainty increases and thus the risk, so does the risk premium in the discount rate. This means that only the downside risk is accounted for, but not the reward associated with increased risk (Kodukula and Papudesu, 2006). This bias will make the value much lower than it actually is.

Real options can be used to cope with some of the problems identified in the previous section. ROA allow for change in the underlying assets due to uncertainty over the life of a project. ROA accounts for a whole range of uncertainty using stochastic processes and calculates a "compounded" value for a project (Kodukula and Papudesu, 2006). The value of a project considers only those outcomes that are favourable, i.e. where the options are exercised, and overlooking those that are not. This is based on the assumption that decision makers will always take value-maximizing decisions at each stage of the project (Kodukula and Papudesu, 2006). In contrast to the DCF-method, which accounts for the downside risk of a project by using a risk-adjusted discount rate, ROA captures the value of the project by its upside potential, assuming proper managerial decisions is taken to limit the downside risk (Copeland and Antikarov, 2003).

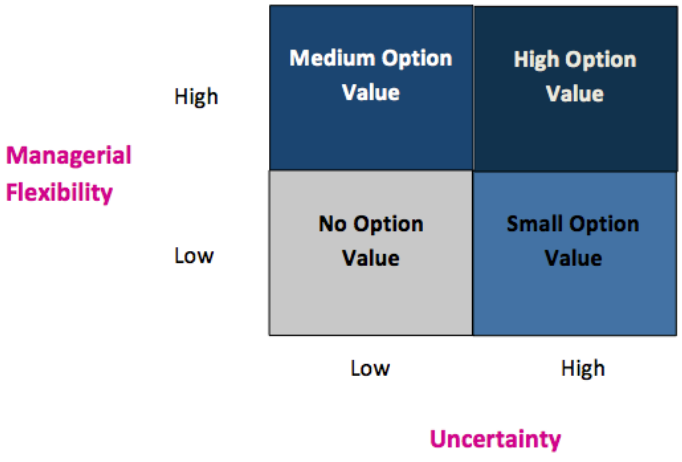

Figure 10.1: Relationship between option value, uncertainty and flexibility.
Source: Own contribution based on Kodukula and Papudesu, 2006

A real option analysis is most beneficial when the uncertainty is high, the management has high flexibility to respond to the uncertainty and the net present value (NPV) is close to zero (Copeland and Antikarov, 2003). If NPV is very high, the real options that provide more flexibility will have a small chance of being exercised, and will hence have a low value. If NPV is highly negative, no

managerial flexibility will be able to save the project. The additional value of flexibility is largest when NPV of a project or investment is close to zero. The relationship between managerial flexibility and uncertainty is shown in figure 10.1.

ROA is not a substitute to DCF-method, rather an extension. The value of the underlying asset is calculated using the DCF method, and then the value is adjusted based on the opportunity to make contingent decisions. Hence, it captures the additional value created by the options embedded in a project when the uncertainty of the payoff is high. ROA is therefore a more sophisticated tool and takes the DCF-analysis to a more realistic level (Brealey, Myers and Allen, 2011).

In terms of the petroleum industry ROA is a well-suited tool to use in valuation. This is because the industry is characterized by high uncertainty, where oil price uncertainty and reserve size being the most significant. The projects allow for some management flexibility, and the investments in the early phases of development will resolve the reserve uncertainty (Smit, 1997).

With DCF-valuation you adjust for risk by increasing the cost of capital. In an industry with long time frames and high risks, this method will not give many profitable projects. The NPV of an oil field will be very low or negative if management´s flexibility is not included. This is due to the fact that the investments in each phase are very large, and the probability of finding a commercially attractive field relatively low. Real options have been identified and used to value natural resource investments by many prominent researchers such as Smit (1997), Bjersund and Ekern (1990), Smith and McCardle (1988).

Real options will much more realistically capture the value of a petroleum-producing field. The management team of a company would never decide to start production in area on the NCS, without doing thorough testing and determining if the area is commercially attractive. The downside risks would be enormous and completely random if a project is profitable or not. Valuing a company based on these assumptions does not give a good estimation of the potential earnings of the firm.

To conclude, there are many arguments as to why it is useful to use real options in general but also specifically in the petroleum industry. The next part of the thesis will take a step back and lay the theoretical foundation of this subject by creating an overview of what real options is and how they are valued. The will be the basis for the valuation framework presented in the next part of the thesis.

10.2 Introduction to Real Option Theory

A real option is the right, but not the obligation to take an action on an underlying real asset, such as abandoning, expanding, or contracting a project (Kodukula and Papudesu, 2006). This right can be used at a predetermined cost called the exercise price, for a predetermined period of time, the life of the option (Copeland and Antikarov, 2003). Real options can be either American, where they can be exercised on or before a predetermined expiration date, or European, where they only can be exercised on a fixed date (Kodukula and Papudesu, 2006).

Real options are different from financial options in that they are used on physical assets, rather than on financial. However, the two types of options share the same characteristics and can therefore be valued by using the same tools (Kodukula and Papudesu, 2006). Financial options are split into call (the right to buy) and put (the right to sell) options, while real options are rights to take actions that can be replicated by a call or put option. An example of this is that an option to expand is a call option, where the exercise price can be the cost of expanding or a certain level of sales. A very simple example of a put option is the option to abandon, where the abandonment costs is the exercise price. One key difference between financial and real options is that in terms of real option the exercise decision may have political or emotional implications, while financial decisions are mostly rationale.

The value of an option can be expressed in the following equations (Copeland and Antikarov, 2003):

(10.1) $Call\ option: Max\ (S - X), 0$

(10.2) $Put\ option: Max\ (X - S), 0$

Where S represents the value of the underlying asset, X is the exercise price, which is the price that has to be paid for the underlying asset. The value of an option can never be negative, as it only entails a right and not an obligation. However, the payoff can be negative if the option price is more than the value.

The value of an option depends on five variables:

1. *The value of the underlying risky asset:* In relation to real options, this is a project, investment or acquisition (Copeland and Antikarov, 2003). If the value of the underlying asset goes up, the value of a call option will increase and the opposite is true for a put option. In relation to this thesis, this may be the value of a producing petroleum field goes up when the oil price increase, and hence the value on an option to expand will increase. In

contrast to financial options, the owner of a real option can in many cases affect the value of the underlying assets and thereby increasing the value of all real options depended on that asset.

2. *The exercise price:* The exercise price is the amount of money you need to invest when exercising the option if it is a call option, or the amount of money you receive if you get rid of the asset if it is a put option. The value of a call (put) option will decrease (increase) with an increase in the exercise price (Copeland and Antikarov, 2003).
3. *The expiration time of the option:* In general the option value will increase with the time to expiration. However, in the case of many real options, the value of the underlying asset may decrease with time due to factors such as increased competition, and the net effect on option value may be negative (Kodukula and Papudesu, 2006).
4. *Volatility:* The option value will increase with volatility. In terms of real options this means that the value of managerial flexibility will grow as the uncertainty increase (Copeland and Antikarov, 2003).
5. *The risk-free interest rate:* As the value of the risk-free interest rate goes up, the value of the option also increase. This is due to time value of money of deferring the investment cost (Copeland and Antikarov, 2003).

A sixth variable have also been suggested, which is the dividends on the underlying asset.

10.3 Types of Real Options

There are many different types of real options that a company has related to their operations. As mentioned in section 4.4, the petroleum industry is characterised by different phases, and there is different types managerial flexibility in each phase. The next section will therefore be short introduction to the different types of real options one can encounter in the petroleum industry. The list is not exhaustive, but these are the most commonly identified real options of the industry (Lund, 1997).

10.3.1 Simple options

Simple options are options that primarily involve a simple call or a put. It is options that can be valued relatively easily, but the challenge is in determining the inputs (Copeland and Antikarov, 2003).

10.3.1.1 Option to defer

An option to defer exists if the management has the possibility to delay the investments or development of a project. There is value in an option to defer if the expected cash flows or cost of

capital changes over time. One of the largest advantages of deferring the starting time is that normally more information will be available the longer you wait.

This is a commonly observed option in the petroleum industry, as the investments are phased. The firms will have the option to wait a specified number of years before starting next phase. As the time frame is very long and the revenue is based on a very volatile underlying variable, the profitability of projects will change over time. The option to wait is therefore very valuable in periods with low expected oil price (Lund, 1999). According to Bjerksund and Eikern (1998) most of the value in offshore petroleum licenses is in the option to wait.

10.3.1.2 Option to Abandon

An option to abandon is a choice the management has when the cash flows are lower than expected. This may be as a result of both internal and external events that have had a negative impact on the project. The option to cancel the projects before the asset expires of old age may be of great value, especially if the expected life span is long.

The option to abandon can be observed at any stage in the life cycle of a project. In terms of a petroleum company, a firm has an option to abandon in all stages of development and during the production phase. The value of an option to abandon is reduced during the production phase due to government obligations and other types of contracts, like lease obligations, which increases the implicit option price.

10.3.1.3 Option to Expand

If the production level can be increased at some point in the life span of the investment there exists an option to expand. The option is usually only alive after the investment decision has been made. The expansion will often cost a fixed amount, and this will be the exercise price of the option.

Within the petroleum industry, an option to expand will be available after petroleum is established, but the appraisal drilling show a much larger reserve than estimated. The companies can then build larger production facilities than planned to increase efficiency. It will also be possible expand during production, by drilling more wells, if the oil price is high enough to support this. However, options in the production phase will have a lower value due to high volatility in oil prices and the long time requirements to expand.

10.3.1.4 Option to Contract

This is the same as the option to expand, but now it is the opportunity to reduce the project size. By reducing the size of a project or investment, companies may receive a cash inflow by selling equipment and forgo future expenditures. In the petroleum industry, reducing the size of the

investment before the production phase may be valuable if the estimated reserves are lower than expected. Reducing production will be very expensive when production has already started, and the option value will hence be lower in the production phase.

10.3.2 Complex options

Complex options are more advanced and deal with more realistic investment decisions. Complex options are often combinations of simple options, and require more advanced techniques to value. Only compounded and rainbow options will be discussed in this thesis, as they are the most relevant for the petroleum industry.

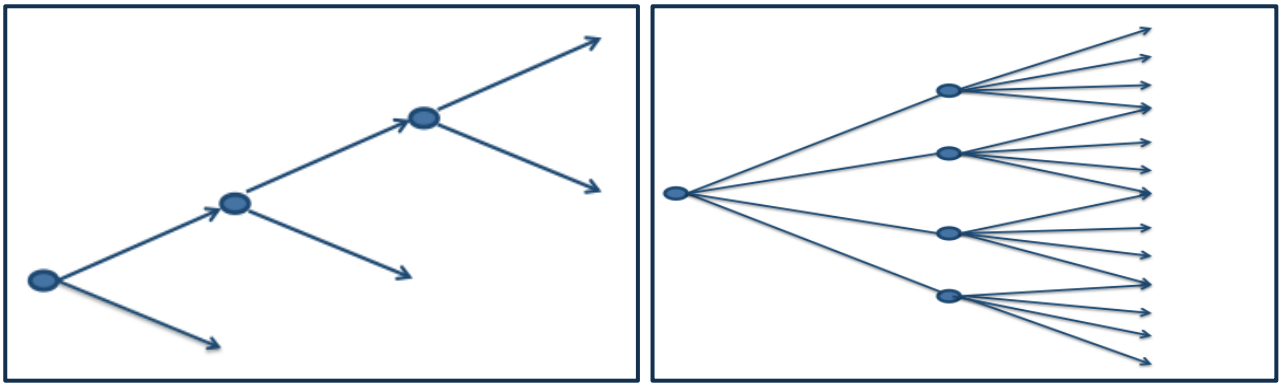

Figure 10.3.2: (a) Sequential compounded option and (b) rainbow option
Source: Own contribution

10.3.2.1 Compounded options

Compounded options are the option to stage. Many projects require multistage investments, where management can decide to expand, scale back, continue planned operations, or abandon after gaining new information that resolves some uncertainty. It is an option where exercising one option will create another, and thereby making the value of one option contingent upon the value of another (Kodukula and Papudesu, 2006).

A compounded option may be either parallel (simultaneous) or sequential. In parallel options both options are alive at the same time, where one option is dependent on the other option. The life must be equal or longer for the independent option. In contrast, sequential options are options where exercise of one option creates a new option, but they are not alive at the same time (Kodukula and Papudesu, 2006). This is the type of option that is found in phased projects and is thus the most applicable for the petroleum industry. A sequential compounded option is illustrated in figure 10.3.2 (a).

The phases identified in this industry were presented in section 4.4: The value chain of a petroleum license. In each phase the management will have the option to continue or abandon the project. For example, if the license gives a dry well after the exploration phase, the company may abandon

the project at that stage and further investments will not be made. In general, the exercise of an option early, will affect the value of the underlying asset, and thus the value of the options in the other phases of the project.

10.3.2.2 Rainbow options

Rainbow options are options where there is more than one source of uncertainty. There is a different volatility factor for each source of uncertainty. The valuation method is the same as with simple options, but now you get a quadrinomial tree instead of a binomial if there are two sources of uncertainty. This is illustrated in figure 10.3.2 (b). The assets can now take four values as you move from one time period to the other. Rainbow options can represent one or more of the options in a compounded option.

In terms of petroleum fields, there are two main uncertainties, oil price and reserve size. The second uncertainty, reserve size, will be resolved over time, and hence it is only in the early phases that there are multiple sources of uncertainty. This means that rainbow options could be well suited for this industry. However, as you have two volatilities the possible outcomes are twice as many. This makes a very complex method as in just three years there will be 64 different outcomes. In an industry with long time frames, this will get unmanageable very fast and consequently this type of option will not be used in the valuation of DETNOR.

10.4 Valuation methods for Real Options

According to Trigeoris (2001) are there two main types of numeric techniques to value options:

1. Direct approximations of the underlying stochastic process
2. Solutions to partial differential equations.

The first category includes multiple types of decision tree´s, like the well-known binomial tree developed by Cox, Ross and Rubenstein (1979). This also includes Monte Carlo simulations. The second category is more appropriate when a large number of option values are calculated before the project has started. This method is more mechanical and may seem less intuitive than decision three models, but it represents a more robust framework. The most used method in this category is the Black-Scholes model.

The next section of this thesis will give a short introduction to the three most common valuation tools for options: Black-Scholes, Monte-Carlo simulations and Binominal tree.

10.4.1 Black-Scholes Equation

When this model was launched in the early 1970´s, Fisher Black, Myron Scholes and Robert Merton made a major breakthrough in option pricing. The authors later won a Nobel Prize in

Economics. It provides a closed-form solution for the equilibrium price of an option (Copeland and Antikarov, 2003). The model is based on the same way of thinking as the replicating portfolio, and the goal is to replicate the options cash flows with a combination of the price of the underlying asset and a risk-free asset. The equation is as follows:

(10.3) $C_0 = S_0 N(d_1) - Xe^{-rt} N(d_2)$

Where S_0 is the price of the underlying, N(d) is the cumulative normal probability density function, X is the exercise price, r is the risk-free rate and t is the time to maturity (Hull, 2002).The formula can be explained more simply as the value of a replicating portfolio where $N(d_1)$ is the number of units necessary to form a mimicking portfolio, and the second part is the number of risk-free assets, each paying $1 at expiration. This is found by multiplying $N(d_2)$, which is the probability that the option will finish "in the money", and Xe^{-rt} which is the exercise price at the time of maturity discounted back to present time (Copeland and Antikarov, 2003). The formula preforms very well in the real world. It has proven to be very flexible and can be used on not only stocks, but also foreign currencies, bonds and commodities (Brealey, Myers and Allen, 2011).

For optimal use of the model seven assumptions that must be upheld (Copeland and Antikarov, 2003):

1) It has to be a European option
2) There is only one source of uncertainty
3) The option is contingent on a single underlying risky asset
4) There are no dividends
5) The current marketplace and the stochastic process followed by the underlying asset is known
6) The variance of return of the underlying asset is constant through time
7) The exercise price is known and constant

Consequently, in order to be realistic in terms of real options, one or more of the Black-Scholes assumptions must be relaxed. Most investments or projects in the petroleum industry consist of compounded options and there is normally more than one source of uncertainty. As a result, the method is not very appropriate for the purpose of this thesis.

10.4.2 Monte Carlo simulations

A Monte Carlo simulation involves simulating thousands of paths of the underlying assets given the boundaries of uncertainty, which is defined by the volatility of the asset value. To conduct a Monte Carlo simulation, the following parameters needs to be identified: Current value of the underlying asset (s_0), Volatility of the asset value (σ), exercise price (X), Option life (t), risk-free rate

corresponding to option life (r), and incremental time steps that will be considered over the option life (δt) (Kodukula and Papudesu, 2006).

The option life is split into a selected number of time steps, and thousands of simulations are made to find asset value at each step. At time 0 the asset value is at S_0 and equal. The price can than go both up and down. This is calculated by finding the motion equation that fits best with the movements of the underlying asset. The simulation will give a varying value of the assets, which is calculated over the life of the option. At each time step, it is used to calculate the value of the option if the current price had incurred. When the simulations have run thousands of times, one will get a probability distribution over the value of the option (Hull, 2002).

The method includes multiple value drivers and it is flexible enough to capture many situations that may incur in real life. Monte Carlo simulations are especially useful in terms of European options, where there is a fixed exercise date. The method is not equally functional for American options, and especially in terms of staged sequential options. This is due to that decisions can be made at any stage, and when this has incurred a new path is formed. This will be a daunting task even for the fastest computer (Kodukula and Papudesu, 2006). As a result, Monte Carlo simulations will not be used directly to value the real options embedded in the firm's petroleum licenses.

10.4.3 Binomial Trees

One of the most popular methods for determining option value includes constructing a binomial tree. The most used approach is the method developed by Cox, Ross, Rubenstein (1979) in their paper "Option pricing: a simplified approach". This involves using a risk neutral method to valuing options (Hull, 2008).

The model is based on the assumption that the underlying asset can move either up (u) or down (d), where $u > 1$ and $d < 1$ over a time period (Δt). The u and d are determined by the underlying assets volatility, by the use of the following formulas:

(10.4) $u = e^{\sigma\sqrt{\Delta t}}$

(10.5) $d = \frac{1}{u}$

The probability of an up-movement is denoted by p, and $(1 - p)$ is the probability for a down-movement. p is calculated using the principle of risk-neutral valuation, which is based on the assumption that the world is risk-free. This assumes that the expected return of the underlying asset is the risk-free rate, and that future cash flows can be valued by discounting the expected

value at the risk-free rate. *p* is calculated using the following equation (Cox, Ross, Rubenstein, 1979):

(10.6) $p = \frac{e^{r\Delta t} - d}{u - d}$

The option value is found by using backward induction, which means starting at the end and working backwards. The option value is not decided by the expected price, but the current price that reflects future expectations. When valuing American options one has to check if it is preferable to exercise the options early or holding the option for an additional period. This is done by comparing the go-forward value to the intrinsic value of the option (Hull, 2008).

The use of a binominal tree is the only method of the common option valuation models that can value American options efficiently. It also handles complex options, like rainbow and sequential options well. This is due to the relative simplicity of the model. The simplicity is also the drawback of the model, as you are limited to low dimensions. It does not capture paths for the underlying assets, which leads to extreme values when using it over long time periods on high volatility assets.

Based on this overview, it seems that the binominal tree is the most suitable method to value the real options present in the upstream petroleum industry. This is mainly a result of this model being the only method able to value complex and American options. The binominal tree will hence be used to value the options identified in the next section of this thesis.

11. Real Option Valuation

The next part of this thesis will try to estimate the true value of the company by including real options to the analysis. The framework is based on the literature presented in the last section of the thesis. The goal is to create a framework that captures the revenue creation of the company, and as a result more accurately estimate the value of DETNOR. To overcome the challenges identified in the financial statement analysis, the valuation will be based on the firm's resources, namely their licenses. The value of the company is the total value of all of their licenses. This part of the thesis will start with an overview of the framework created to value an exploration and production license. Thereafter the inputs required to value the licenses will be presented. Finally, the value of DETNOR will be estimated using the real option valuation framework.

11.1 Framework to value a petroleum license

Copeland and Antikarov (2003) present a four-step method to valuing investment opportunities and projects using real option theory. The first step is to do a regular NPV analysis of the project. This

is calculated by discounting the future cash flows of the project with the company´s cost of capital. The result is the value of the underlying asset. In the second step, the uncertainties are identified and modelled in a decision three. The goal is to create an overview of the uncertainty that drives the value of the underlying asset over time. In the third step you include the flexibility/ options that are available for the management of the firm, and create a decision three. Each step in the three represents choices where the management are assumed to make rational responses to new information. By valuing the flexibility, the risk profile of the project changes as the company will not accept risks where the uncertainty can be resolved. The projects can accordingly be valued at the risk-free rate. In the final step, the project will be valued through a numerical real option analysis.

In this model, the value of flexibility is included, and the goal is that this better captures the value of an investment in the petroleum industry in Norway. The framework will be used to describe the valuation process of a license or field in DETNOR´s portfolio. The steps in the framework is illustrated in figure 11.1.

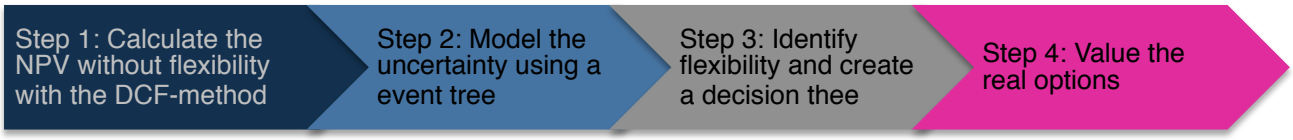

Figure 11.1: The four-step model to project valuation using real option analysis.
Source: Copeland and Antikarov, 2003

11.1.1 Step 1: Calculating the NPV without flexibility

The first step is to calculate the NPV of an exploration and production license. To find the value without flexibility, one calculates the value of the expected cash flows at the expected oil price. At time zero, this is not without complications, as neither the expected size of the reserve nor the future oil price is known. The task is therefore to model the probable cash flows at the probable price.

The NPV is the value of the underlying asset minus the investment costs. The underlying asset is the expected DCF of a petroleum field. As mentioned in section 10.1, there are two sources of uncertainty present when one determines the value of a petroleum field. Copeland and Antikarov (2003) suggest that if you have an underlying asset that has more than one source of uncertainty, you can use Monte Carlo simulations to get distributions for the value of the underlying asset. This can be done using different stochastic processes. This may include different variables such as prices, market, size etc. and gives a single volatility measure for the underlying asset.

There are two main problems associated with using this method. The first problem is that as the time frames in the industry are very long, the values will already reach extremely high and low

values. By adding more than one source of volatility, the volatility measure will increase, and thus the spread of the estimated values will be even wider. The second problem is that the field will have different production rates each year, and the model required to simulate this for a long period will have to be extremely complex. As a result it will be nearly impossible to calculate the value of the underlying asset in this manner.

To find the value of an underlying asset with different production pattern each year, a forecasting model for the oil price is a more efficient tool. As mentioned in section 8.1, are there three types of models used to forecast future oil price: scenario/Qualitative models, economic models and stochastic models. As presented, the value will be found using both Scenario/Qualitative and a stochastic model with a geometric Brownian motion.

To include the reserve uncertainty, probabilities will be used instead of increased volatility. This will give a more correct overview of the value of the licenses, as the uncertainty regarding the reserve will be resolved over time. This is achieved by calculating the conditional probabilities of the cash flows.

When valuing a production license with no flexibility, only the investment in the production facilities has incurred. The NPV at time zero can hence be estimated using the following equation:

(11.1) $$NPV_{pl,t=0} = \left(-PV(I_3) + DCF_{ua} - PV(AC)\right) * P\langle P_{vg} | P_{fo} | P_{cf} \rangle$$

Where I_3 is the cost of building production facilities, DCF_{ua} is the discounted cash flows of the underlying asset, AC is the abandonment costs, P_{vg} is the probability for viable ground, P_{fo} is the probability of finding oil, P_{cf} is the probability of a commercial find. The total probability is the sum of the conditional probabilities that the event before has already incurred.

The DCF of the underlying asset are estimated using the following equation (Damodaran, 2014):

(11.2) $$DCF = \sum_{t=1}^{n} \frac{CF_t}{(1+r)^t}$$

Where CF_t is the expected cash flows of the project and *r* is DETNOR´s cost of capital.

The expected CF of a petroleum field will be estimated using the following equation:

(11.3) $$CF = (P_t - OPEX) * (\propto * R) * (1 - T_c)$$

Where P_t is the forecasted oil price at time t, OPEX is the operating expense, $\propto$ is the proportion of reserve that will pumped that year, R is total reserve size, and T_c is the company´s tax rate.

The last part of the calculation is the present value of the abandonment costs. This cost is calculated using the following equation:

$$(11.4) \quad PV\ (AC) = \frac{Abandonment\ costs * (1-T_c)}{(1+r)^{t+1}}$$

The abandonment costs are calculated on an after-tax basis and this is as a result of that abandonment costs can be expensed when incurred. The present value is calculated based on the assumption that the abandonment costs will occur one year after production ends.

Equation 11.1 estimates the NPV of a production license at time zero with no flexibility included. The value of an exploration and production license will depend on where it is in the value chain. The further along in the value chain, the less uncertainty will be present, and the value of flexibility will be smaller. In line with economic theory, the investments that have already taken place will not be included in the valuation, as these constitute sunk costs (Brealey, Myers and Allen, 2013).

11.1.2 Step 2: Model the uncertainty using an event tree

The goal of this step is to get an understanding as to how the uncertainty will develop over time. As no flexibility is included the estimated value should be the same as the one found in the previous step (Copeland and Antikarov (2003). The uncertainty of an exploration and petroleum license will develop over time. Throughout the lifetime there is oil price uncertainty, which affects the expected cash flows. In the two first phases there will also be reserve uncertainty and this will be resolved by investing in different types of exploration activities. The reserve uncertainty can be view in figure 11.1.1, and is represented by a square (□). The oil price uncertainty will be present in the entire model, and will be included in the volatility of the underlying asset.

11.1.3 Step 3: Identify the flexibility and create a decision tree

In this step, the event three will be analysed to identify the flexibility of the project. By including the projects flexibility in each node of the event tree, it becomes a decision tree. The following section will identify the possible flexibility in an exploration and production license.

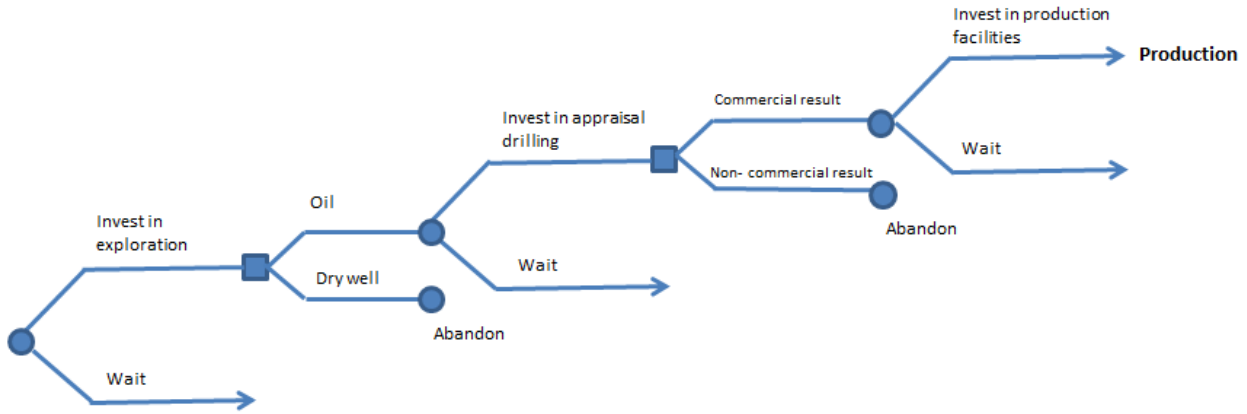

Figure 11.1.1: The decision tree for a license. A circle (O) represents a source of flexibility for the management, while a square (□) represent a source of reserve uncertainty. The uncertainty of the oil price is present throughout the model.
Source: Own contribution

11.1.3.1 Flexibility to invest in exploration

At time zero DETNOR has the option to invest in exploration. This entails acquiring seismic data and thereafter performing will-cat drilling if the preliminary data looks promising. Exploration is costly, but will remove the uncertainty whether there is petroleum in the subsoil or not. The rationale is that if the expected value of the option is higher than the uncertainty, the firm will choose to invest in exploration. At the current conditions in the NCS it will never be economically wise not to invest in exploration, as this will require the management to guess where there might be oil. There is not enough petroleum in the seabed that this could be a business model that delivered profits. Consequently, the choice is to invest in exploration or abandon the license.

The value of the option is that the company can choose to invest now or wait a certain number of years. This is due to the high volatility in the oil price, which affects the underlying value of the option. The more volatile the oil price, the more is the waiting option is worth. The reasoning for this is that the project will be more profitable if the expected future oil price is high, and this will be more likely to occur if oil price is volatile. The decision to invest in exploration should be based on the expected future cash flows from the production phase, which is the underlying asset, plus the investments from the appraisal drilling (I_2) and building the production facilities (I_3). This is illustrated in the following formula:

$$(11.5) \quad V_{EO} = MAX_{t=1:7}(((DCF_{ua} - I_2 - I_3 - PV(AC)) - I_1); 0)$$

This means that if the expected value of the project after the exploration phase is larger than the cost of exploration then the firm will invest, otherwise it will wait. If the investment cost is higher than the expected value of the project the entire waiting period, the firm will abandon and not move

further with the project. The cost of exploration is the exercise price of the option. The company has an opportunity to wait up to seven years before it has to decide to invest in exploration or not for an average license. The waiting time is estimated based on the normal length a company get to keep a license.

11.1.3.2 Flexibility to invest in appraisal drilling

The possibility of investing in appraisal drilling is contingent on that DETNOR has already invested in exploration. This means that you can only invest in the appraisal drilling if the company has completed the exploration phase and found petroleum. The appraisal drilling phase is executed to determine the size of the discovery from the exploration phase, and establish the quality and type of petroleum. It is therefore very important information for the firm to have when planning the possible production facilities for a petroleum field. Consequently, it is not probable that any firms that are investing in a petroleum license would not invest in appraisal drilling.

The value of this flexibility will also be in the option the firm has to delay this decision. The waiting time is shorter here than with exploration as the subsea environment may change over longer periods of time when there already has been activity in the soil (Bjerksund and Eikern, 1998). The waiting time is as a result estimated to be only three years. The firm will invest in phase two if the investment costs, I_2 is smaller than the expected NPV of the future operations at that point in time. The formula for the company to invest now or later in appraisal drilling is described in the following equation:

(11.6) $$V_{AD} = MAX_{t=2:4}(\big(DCF_{ua} - I_3 - PV(AC)\big) - I_2); 0)$$

If the expected value of future production after all investments have been made is positive, the firm will redeem the option. It is assumed the management team is rational, and hence that they will not invest in appraisal drilling if expected future operations return an unprofitable value. It is assumed that they then will use the option to wait and see if the expected future conditions improve.

11.1.3.3 Flexibility to invest in production facilities

The option to choose to invest in production facilities is contingent on that DETNOR has invested in exploration and appraisal drilling, and that the result of both studies were positive. Building the production facilities is the largest single investment in the life of an exploration and production license. It is thus very important that the investment is only undertaken if the expected value of the production outweighs the costs. Included in “building production facilities” are building and instalment of the rigs/boat, pipeline access to transport the petroleum to a refinement facility and

multiple subsea instalments among other things. Most production installations are so large they even include large living quarters for the employees.

The size of the investment will depend on the area where the license is located, and the existing infrastructure in place. If the area is immature, the costs will be much larger as there will be no excising subsea instalments, and the production facility will probably not be able to connect any other platforms nearby. Hence everything needs to be built from scratch. The investment costs is much smaller in mature areas where the company can connect their new installations to exciting pipelines or use production facilities that already are in place. An example of this in the Alvheim area where DETNOR has one production facility, the Alvheim FPSO, for all of the petroleum fields in the area.

The company should only invest when the expected profits outweigh the investment. This is illustrated in the following formula:

(11.7) $V_{BP} = MAX_{t=3:8}(\left(DCF_{ua} - PV(AC)\right) - I_{3,M}/I_{3,IM}); 0)$

The firm has an option to delay up to five years before making their final decisions regarding a full-scale investment in production facilities.

11.1.3.4 Flexibility in the production phase

There has been a lot of research regarding valuation of the flexibility in the petroleum industry. The authors are not in concession about what type of management flexibility that actually exits at the different stages. This is particularly true after production have started, where the identified flexibility differ largely between researchers. Monetezano et al. (n.d.) finds that there is flexibility in terms of both expansion and divestments of petroleum resources once production has started. However this study was based on onshore production facilities and the flexibility offshore may differ drastically. Lund (1999) has identified that companies operating on the NCS have capacity flexibility, and start/ stop or terminate options after production have started. Felten et al. (2011), Lund (1999), Smit (1997) have all identified that there may be an abandonment option for petroleum producing firms. A reason for these differences may be that the flexibility during production will largely depend on the production facilities used.

An abandonment option is the flexibility a firm may have to stop production early. This is an irreversible decision. It is associated with an abandonment cost, which among other thing includes the removal of the production facilities and plugging of the used wells. The argument is that a company can decide to abandon a project ahead of time if the expected future cash flows are low. The company needs to take the equipment's age and the operating costs into account when

deciding if this is a good choice for the field in question. According to Felten et al. (2011) the value of this option will not be very high. This is as a result of that the costs to decompose a producing field is quite large and comparison to the low marginal operating costs. Consequently, it is unlikely that that management will use this option as the cost of continuing operations is so low. The average operating costs for DETNOR is approximately $11 per boe. As the investment costs are sunk, it is very unlikely that the company will decide to abandon early as long as the oil price does not reach levels much lower than $11. At the current economic climate, this seems improbable and thus an abandonment option in the production phase will not be included in the analysis.

Another option that may be present in the production phase is the option to increase (or decrease) production. This means that the firm has the opportunity to change the level of production, after the rigs or other type of production facility has started to produce oil. This is done by increasing the number of producing wells or plugging existing production facilities. The change is permanent and the level of production cannot be altered again. The cost of doing such an operation will be substantial in most cases, and this will only be a favourable when the expected future oil price deviates a lot from the expected price in the building the production facilities. As mentioned in part 8, forecasting the future oil price is associated with great difficulty. As the process of increasing or decreasing production is linked with large capital expenses, it is not probable that a company will decide to make this investment when the volatility is as high as it is in the oil price.

The last of the suggested options is a switching option. This entails that the company can switch the production level, and decrease or increase as the management see fit. In contrast to the option to increase or decrease production that was mentioned in the last section, the change to production is not permanent. The option to switch exits when the production facilities are flexible enough that the company can switch between different modes of production. This feature may be available on some production facilities, but it outside the scope of this thesis to examine the production specific features on different production equipment available. However, it is unlikely that such a feature exists for rigs in the rough conditions of the North Sea. The option to switch production level will as a result not be included in this analysis.

In conclusion, there will not be included any real options from the production phase. This is in line with Bjerksund and Ekern´s (1990) findings, which proposes that the managerial flexibility in the production phase will have a small effect on total value compared to the flexibility in the investment phases. According to Smit (1997), Bjerksund and Ekern (1990) and Sunnevåg (1998) is the most valuable option for an upstream petroleum company the option to wait and see. This is in contrast to Lund (1999), who does not find a high value for deferment options. The findings are from a

period exhibited with relatively high oil prices, and he suggests that deferment flexibility is more valuable in periods with a low oil price. However, he does find that most of the option value for a petroleum company is found when uncertainty regarding the petroleum reserves is high, which is before production starts.

The goal of this framework is to capture the value of the most important options available while still keeping the analysis as simple as possible. Options that only give a small increase in value will most likely not increase the accuracy of the valuation, only the complexity. These options are therefore excluded from this thesis. As a result, the focus will be on the options in the periods before production starts, as these are the periods with most uncertainty.

11.1.4 Step 4: The Real option analysis

The final step in the framework is to value the identified flexibility from step 3. The valuation method is chosen based on the discussion from part 10 in regards to real option valuation methods. The method chosen is valuation using binominal trees. The license or field will be valued by looking at the flexibility the firm has before production has started. The options are all in the in sequence, where exercising one option will create a new option. This is called sequential compounded options.

This type of option has been chosen as it captures the value of staged projects well, which is a characteristic of the development phases of an exploration and production license. To value this type of option you have to start at the end and follow a recursive process. The starting point of this valuation is by taking the value of the underlying asset that was estimated from equations 11.2 and 11.3. The value of the production phase is estimated using the following equation:

$$(11.8) \quad V_p = \sum_{t=1}^{n} (DCF) - PV(AC)$$

The value of the production license is found by using the binominal tree method, based on the theory from Cox, Ross and Rubenstein (1979). The options will be valued as American call options, where the number of nodes per year is one. The value of the production phase is the underlying asset of the value to invest in production facilities. The value of this option is the underlying asset in the “invest in appraisal drilling” option. The result of this valuation is subsequently used as the underlying asset for the “investment in exploration” option.

As mentioned earlier, the value of the underlying asset is not just affect by oil price uncertainty, but also uncertainty in relation to reserve size. To include this second source of uncertainty one could use rainbow options in the two beginning phases, but this was ruled out due to being too complex.

To handle the challenge of the two types of uncertainty, a method inspired by the technique Smit (1997) is implemented. The second type of uncertainty will not be handled as volatility, but as a fixed probability of success. The fixed probabilities are illustrated in figure 11.1.2.

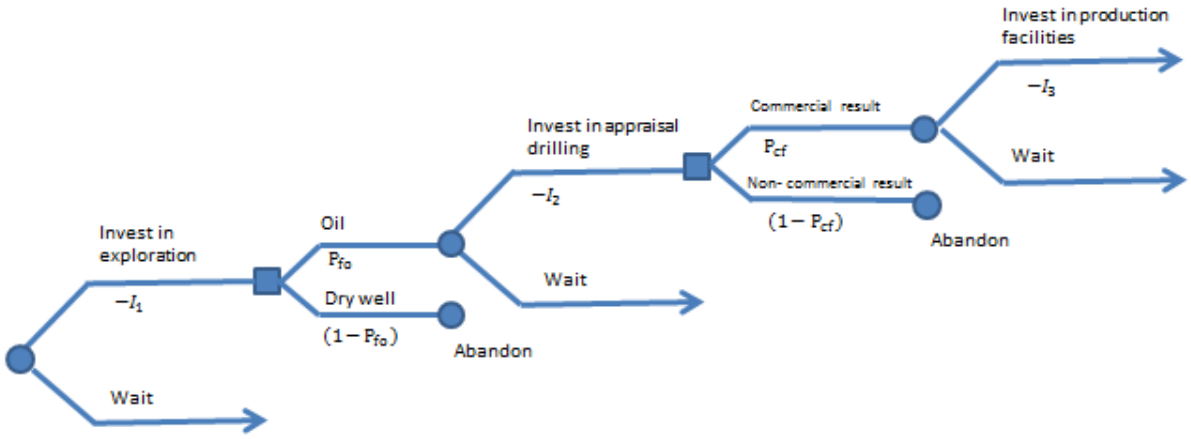

Figure 11.1.2: The decision tree faced by DETNOR per production license. Now illustrated with investment costs and probabilities.
Source: Own contribution

Figure 11.1.2 illustrates where the company has an option (O) and where there is an uncertain outcome (□), and each option has a respective investment costs, I_t, and each uncertain outcome a fixed probability P. The probabilities are multiplied in before the value of the phase is used as the underlying asset of the phase ahead. This method is constructed upon the assumption that if the outcome of the reserve uncertainty is not positive, the company will abandon the project, i.e. rational management.

11.2 Estimation of input parameters

To be able to use the framework presented in the previous section to value DETNOR, some input parameters must be determined. This includes the different costs, probabilities, taxes and the reserve size. The inputs in relation to oil price forecasting were presented in section 8.3. Most of this information is impossible for an outside analysis to get a hold of, and as a result some of the inputs are educated guesses based on historical data. Consequently, a thorough sensitivity analysis will be presented in the last part of the real option valuation to get an overview over how sensitive the share price is to the most important input parameters.

11.2.2 Production and petroleum reserve size

The production phase of a petroleum license is the only period when the company get cash inflows. To successfully find the value of a production license, the parameters related to the production phase are imperative to estimate accurately. There are two main variables that are

used to predict production: the reserve size and the production profile. The next sections will be an explanation of the estimation of these variables.

11.2.2.1 The reserve size

The reserve size is the size of the available petroleum below the seabed in an area. Before there has been invested in exploration there is no information to indicate how large the possible reserve may be. In the case of DETNOR´s exploration and production licenses where no such investment has been made, the reserve size must be estimated. The difficulty is that by looking at the average reserve size historically on the NCS, the estimated size will likely be largely overvalued. This is due to the fact most large fields, have most likely already been discovered. This is not always the case, such as with Johan Sverdrup, which is one of the largest fields on the NCS and discovered fairly recently. However, most experts do not believe this will happened again, especially not in the mature areas of the North Sea and Norwegian Sea (Norwegian Petroleum Directorate, 2014).

As DETNOR is a fairly young company, most of their petroleum resources have been discovered in recent years. To find an approximation of the reserve size for a mature production license, the average of the company´s exciting field has been calculated. The Johan Sverdrup field has been excluded, as a discovery of that size is unlikely to reoccur. This gives an average size of 50,000,000 boe per production license in mature areas.

To estimate the expected reserve size in immature areas other methods have had to been used as the company has only one field with established resources. There is only one immature field currently in production on the NCS, Snøhvit. Both of these have a size around 200,000,000 boe and this has thus been used as a proxy for size of an immature petroleum license. The estimation of four times as big field with immature field is in line with the Norwegian Petroleum Directorate´s (2014) predictions that it is only in these area where there can be expect to locate large petroleum resources.

11.2.2.2 The production profile

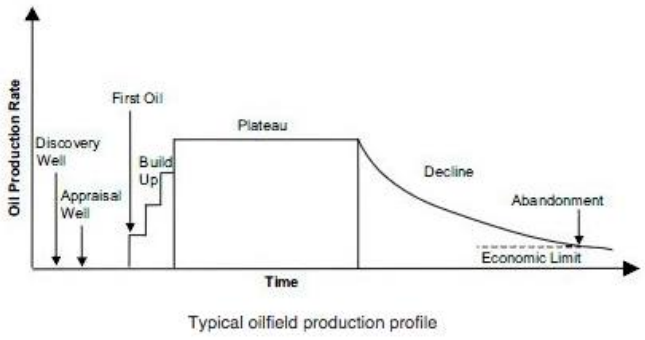

Figure 11.2.1: A typical production profile for a petroleum field.
Source: Höök et al., 2009

A production profile for a field is an overview of how the recovery of resources is spread throughout the estimated production period. Every field will have a different production profile, and this will again develop over time as the technology improves. There are a few trends that are visible on all fields. The first years after initiation, the volume is relative low with an upward sloping trend. This is as a result of that it takes some time from the production starts until the facilities are fully up and running. Many companies start to produce even though the entire production facilities are not completely in place. The production soon reaches a top level, and stays there for a period. The pressure in the reservoir is the highest while it is relatively full, and falls as the amount of recoverable reserves diminishes. The production will peak fairly early and have a downward sloping trend until the field is abandoned (Höök et al., 2009). Figure 11.2.1 illustrates a typical oil field production profile.

Figure 11.2.1 has also been the model for the production profile for DETNOR´s licenses. To make the computations as simple as possible, the production after the peak is straight and not downward sloping. This may make the cash flows somewhat downward biased, but it the complexity of the model will be greatly reduced. The complexity occurs as a result of that all of the developing or producing fields have different time frames, and needs to be modelled independently. The production profile for a 15-year field is as showed in figure 11.2.2. Two exciting closed-down fields have been used to compare the estimated production profile to actual production profiles.

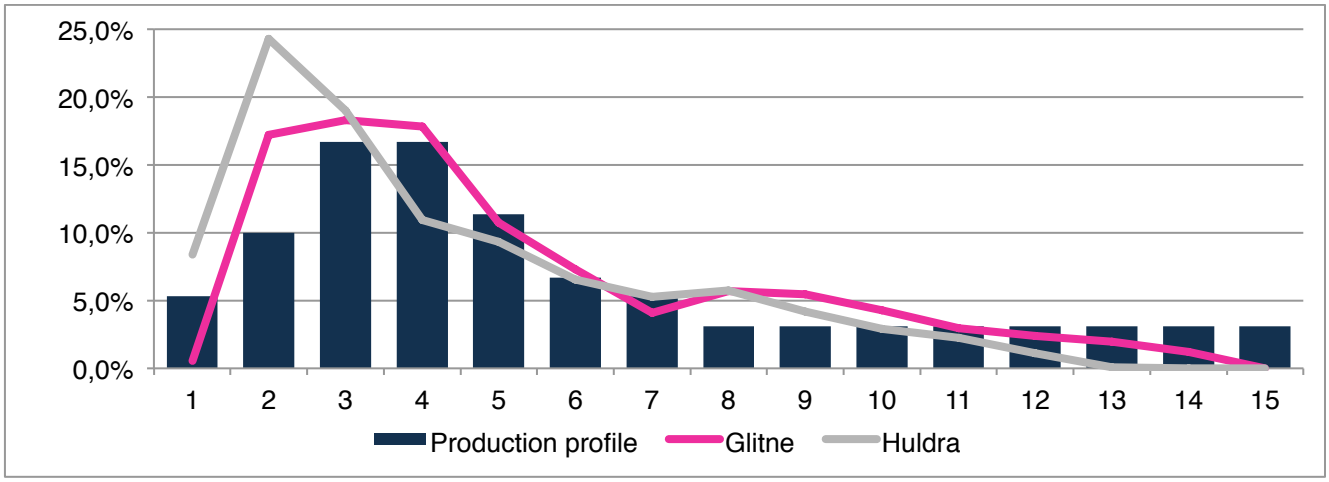

Figure 11.2.2: The estimated production profile for a producing field compared to two real closed-down fields.
Source: Own contribution

11.2.3 Probabilities

A firm in the upstream petroleum sector will experience some reserve uncertainty in the earliest stages of development. This includes uncertainties regarding where in the oil field there may be petroleum, if there is petroleum present and if the petroleum found is viable for production. The

probability of finding petroleum will differ if the license is mature or immature. There is no available external data on these probabilities and they are based on predicted values. Historical data could have been used, but there is neither complete data available nor does it capture the entire uncertainty a firm will experience at time zero. It is also likely that it will be a lower probability moving forward of finding commercial petroleum than it was in the past. Table (11.2.3) describes the probabilities used in the model.

Probability	Explanation
$P_{vg} = 10\%$	*Probability of viable ground:* this is he probability of finding petroleum by drilling with no seismic data. Only used to estimate the value identified by real option analysis.
$P_{fo,\,m} = 50\%$, $P_{fo,im} = 30\%$	*Probability of finding oil:* The probability of there being petroleum in the license area. More probable in mature areas as more data available.
$P_{cd} = 70\%$	*Probability of a commercial discovery:* The probability of that the petroleum discovered is commercially viable. This is based on he size of the field and the quality of the petroleum.

Table 11.2.3: An explanation of the observed probabilities.
Source: Own contribution

The probabilities have been predicted based on the available information about the remaining resources on the NCS, mostly from the Norwegian petroleum directorate (2014). These are not exact estimations, and they will thus be sustainable to approximation errors. As a consequence, the sensitivity of the firm-value to these probabilities will be carefully reviewed in the sensitivity analysis.

11.2.4 Costs

Companies operating in the petroleum industry face large fixed cost. These represent large risks for the company because as much as 70 percent of total costs are incurred before production has started. Determining the different costs at the different stages is thus an important part of the analysis. The estimated inputs will be split into three different categories: investment costs, operating costs, and abandonment costs.

11.2.4.1 Investment costs

Investment costs are the costs that are related to locating petroleum and building production facilities. From part 4.4 and 11.1 it is evident that each phase before production in the value chain of an exploration and production license is represented by a different investment cost. The simplest costs to identify are the development costs found in stage four “building production facilities”. For licenses where the PDO have been delivered is the costs pubic information. For licenses in earlier stages of the development, where the company have not applied for PDO, this number is not public and maybe not even estimated by the firms. For these the expected development cost is the

average development cost per boe multiplied by expected production. The expected development cost per boe is calculated by looking at DETNOR´s exciting portfolio of projects where this this cost is known and divide by the projects projected boe.

The development cost per boe will differ if the license in question is in a mature or immature area of the NCS. As immature field does not have any existing infrastructure in place, the costs of building production facilities will be much higher. Currently, there are not delivered many PDOs for licenses in immature areas, but there is one field in the Barents Sea, Snøhvit, where production has started. The development cost per boe for this field was $30. This is more than three times of the estimated development cost for fields in mature areas, which was $9. The cost per boe from Snøhvit is consequently used as a proxy for development costs for projects in immature areas.

The investment costs in the first two phases are more challenging to estimate. The first phase is the exploration phase. The costs included here are investments in seismic tests and trial drilling, also known as wild-cat drilling. The costs related to this stage of the development of license are hard to estimate, as they are not explicitly separated by project in the firm's annual reports. The second stage is the appraisal drilling, which ensures if the discovery in stage one is commercial. This is done by drilling more wells, which determines the size and type of petroleum available. The appraisal drilling costs are not either presented separately by the company.

According to the Norwegian Petroleum Directorate (1997), 12% of total costs for an upstream petroleum company will be related to the exploration and planning phase. This is interpreted to include the first two stages of the production chain. The development costs are on average 58% of total costs (Norwegian petroleum directorate, 1997). Total costs are calculated by looking at developing costs, and dividing these costs by 58%. Total costs are calculated in this manner to decrease complexity, as operating costs will vary with production. The exploration and planning costs are hence calculated as 12% of total costs. Based on the investments required in the different stages it is estimated that 2/3 of the costs will be in the exploration phase and 1/3 of the cost in the appraisal drilling phase. The reason for this distribution is that there is usually drilled more wild-cat wells than appraisal wells, and that the acquisition of seismic data is very costly (Norwegian petroleum directorate, 2014). An overview of all investment costs can be found in appendix 31.

11.2.4.2 Operating costs

The operating costs are the expenses associated with DETNOR´s production. These include costs linked to leasing, operating and maintenance of subsea installations, modifications, and production ships/platforms. Environmental tax is also included in the operating costs. It also includes the

share of payroll and administration expenses that can be attributed to operations (DETNOR, 2014n). The operating costs for the entire company can be found in DETNOR´s annual reports. It has been assumed that these costs vary with the production level i.e. number of boe. Operating costs per boe is calculated by dividing “Total production costs” by “Total production (boe)”.

Operating costs are considered variable costs and are deducted from the expected oil price to find operating income. Total operating costs will therefore vary with the expected production.

11.2.4.3 Overhead costs

Overhead costs are on-going expenses that are not directly related to a firm´s operation and thus cannot be traced to a specific field or license. In the case of DETNOR, the overhead costs are the cost found in the “Other operating costs” their annual report. These include office costs, IT-costs, advertising, travel expenses, underwriting and consultant fees, area fees, preparations of development licenses and other expenses. It can be argued that some of these costs will vary with production and should therefore be added to the variable operating costs. However, as most of the fees are decidedly fixed, all overheads will be incorporated into the valuation model as a fixed cost. The costs will be directly deducted from the estimated company value using the following perpetuity formula:

(11.9) $$PV\ Overhead\ costs = \frac{Overhead\ costs * (1-Tax)}{r}$$

11.2.4.4 Abandonment costs

When companies in the petroleum industry in Norway build production facilities at sea, companies are not allowed to forsake these when there is no more petroleum left. To preserve the environment, there are rigid requirement for the shutting down procedure for such facilities. The facilities must be removed and the area cleared. Each licensee must present a “plan of cessation” to the Norwegian Ministry of Petroleum between two and five years before the production ends (Norwegian Petroleum Directorate, 2014).

The cost of this is quite large and it is important to estimate this when valuing DETNOR. The basic assumption is that the abandonment costs are based on reserve size. It is therefore assumed that the large the reservoir, the larger the costs. This may not be the case in the real world, as it will depend on the types of production facility used and the number of other producing fields in the area. However, looking at these factors for all of DETNOR´s licenses will be a very comprehensive task and outside the scope of this thesis. The abandonment cost for each license can be view in appendix 34.

11.2.5 Taxes

The taxes are an important element to incorporate in any model of petroleum projects, as the marginal tax rate on the NCS is as high as 78%. The tax regulations regarding petroleum activities are very comprehensive and complex, and including all elements of these is outside the scope of this thesis. However, the most important aspects must be included to get a realistic value of a license. This includes the special rules regarding exploration costs, depreciation on production facilities, uplifting, and petroleum income.

In the model, the petroleum income has been taxed with 78%, which is consistent with the PTA. The presented project value is an after-tax figure. The present value of the abandonment costs that have been deducted the expected value, is the after-tax value. This is consistent with current regulations, which states that abandonment costs can be expensed when incurred. The regulations of expensed as incurred are also true for exploration costs (Deloitte, 2014). These are also presented in the model on an after-tax basis.

The challenge in terms of modelling the after-tax value of a petroleum project is in terms of the production facilities. Production facilities are depreciated in a straight-line over six years. The total investment costs can use an uplift of 22% (5,5% annually over four years), to reduce the amount taxed at the offshore tax of 51% percent (Harboe, 2014). The following example illustrates how the uplift is used. To start, a normal corporate tax at 27% is calculated on EBT. The uplift is then deducted from the profit margin before tax, and a special tax of 51% is added on the remaining amount. The two amounts of tax are then added together and total company tax is established (Harboe, 2014). As this is too complicated to incorporate in the value of all the 79 licenses that the company possesses, simplifications has been made. A tax percentage has been calculated that represent the same after-tax amount as calculating the full depreciation and uplift cycle. This percentage represent the effective tax rate the company would have if written the asset off immediately. This percentage is used to calculate the after-tax cost of investments in production facilities and is lower than the general tax of 78%. The method can be view in appendix 33.

11.3 Valuation

The value of the company is found by adding together the value of their current and future resources expected from their current license holdings. When using an additive approach one implicitly assumes that the firm has no financial restraints in terms of starting new projects. This may not be the case in real life, but as the firm is only expected to find petroleum in some of their licenses it lessens the financial pressure of the company. It has also been assumed that the company value is based on the current portfolio of licenses, and that the company will not get

access to more in the future. This is a result of the future being unknown, and any attempt to model this would include no known information.

The licenses are split into five categories; producing fields, developing fields, other fields with petroleum, mature licenses and immature licenses. In the first three categories there is already established viable resources, but the differences are found in how far in the planning and investment phase each license have reached. Other fields with petroleum are those fields where the petroleum has been discovered, but development is not currently planned, i.e. no PDO has been delivered. Developing licenses have come one step further and are planning or building production facilities. This means that almost all of the information regarding these fields is available. Mature and Immature licenses are those licenses that the company holds where no investment in exploration or appraisal drilling have been completed. In neither case there is any information about the future outlook of the license, and thus all of the numbers are based on estimations. As the fewest investments have been made in these two categories, it is in these that most of the value of the firm's real options will be. The percentage of value originating from real options will decrease the longer the license is in its life cycle.

The value of the company has been simply calculated by adding all of the firm's licenses together. This gives the firm enterprise value before overhead. By deducting the overhead costs in perpetuity and net interest bearing debt (NIDB), the equity value is established. This is shown in table 11.3.1.

Value of DETNOR´s licenses	**kr.**	**29 077 378 884,58**
Overhead costs in perpetuity	kr.	1 624 749 192,27
Enterprise Value	**kr.**	**27 452 629 692,31**
Net Interest Bearing Debt (NIBD)	kr.	17 356 359 347,35
Equity Value	kr.	10 096 270 344,96
No of Shares outstanding		202 618 602
Estimates Share price	**kr.**	**49,83**

Table 11.3.1: Estimated firm value, and calculation of share price.
Source: Own contribution

The estimated share price is 49,83 NOK at 31st of December 2014. The actual share price at that date was 39,87 NOK. However, the share price has laid around 55$ per share in the months after this. This means that according to this model, the share was undervalued at this date. The value of the company can be broken down into the category, and shows which category contributes the most to firm value. Interestingly, most of the firm value is in the reserves not currently in

production. Of DETNOR´s value only a small share of its value, 25,6% is from its producing fields. The breakdown is presented in the figure 11.3.2 below.

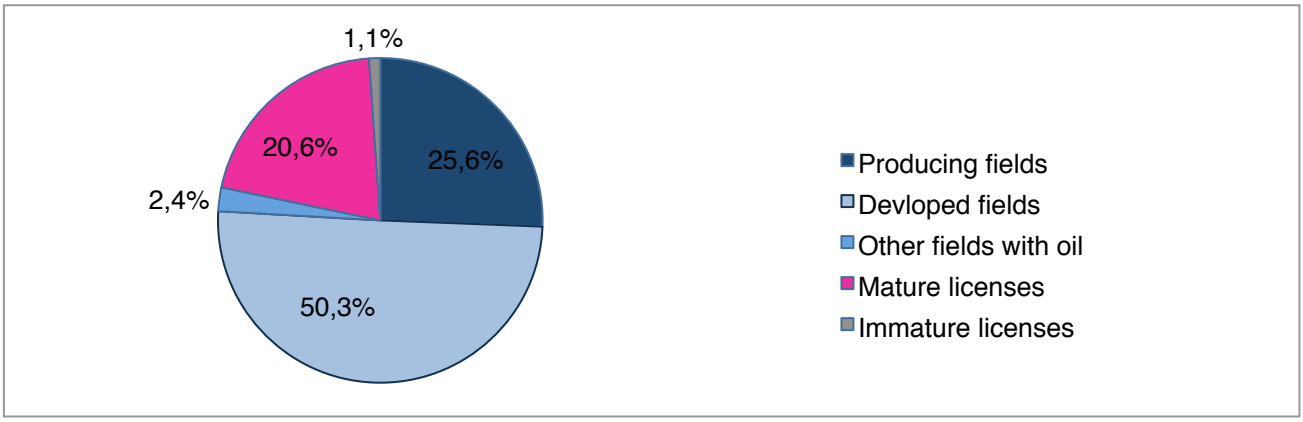

Figure 11.3.2: The breakdown of the origin of DETNOR´s value.
Source: Own contribution.

The result that most of the firm´s value originates from future projects, seems realistic as DETNOR is a relatively young company. DETNOR ha no fields in production of medium or large size before the acquisition of Marathon oil, The firm has only one large field currently in production, Alvheim, and it is not surprising that most of the value is from future sources of revenue. The firm value is estimated by looking at the value of all of the firm´s licenses, and adding the value of managerial flexibility trough the use of real options. The enterprise value was increased by 7 925 694 722,02 NOK, which represent 27,26% of DETNOR´s value by adding managerial flexibility. If the real options had not been included, the identified equity value would be very low, resulting in an undervaluation of DETNOR.

The model has been run with the different scenarios identified in section 8.3. The share price for the different scenarios and methods is shown in figure 11.3.3. The value of the firm, and thus the share price varies greatly with the three scenarios. This indicates that the model is very sensitive to variations in the oil price. However, the total value obtained by using scenario modelling is not that far away from the stochastic value. This share price is estimated to be 27,11 NOK. The reason why this is lower than the simulated values is that the scenario prices are static and show no growth. This is not inconsistent with the historical development, as even the inflation adjusted oil prices show an upward sloping trend. Consequently, the Quantitative/Scenario method´s values are downward biased.

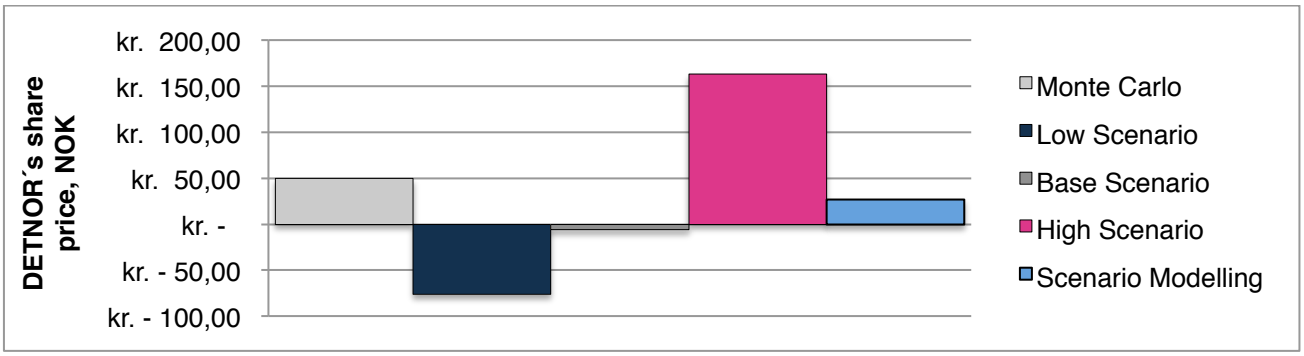

Figure 11.3.3: The share price of DETNOR using different forecasting methods for the oil price.
Source: Own contribution

All of the value estimations and calculations can be viewed in Appendix 35 –41.

11.4 Sensitivity analysis

As this thesis is written from the point of view of an outside analyst, all of the required information will not be available for people outside the company. Consequently, some of the information used in the valuation has been estimated. The next section will be an investigation of how robust the estimated share price is to selected parameters.

	Volatility	*Optimistic*		*Realistic*	*Pessimistic*	
WACC		**15,00 %**	**16,00 %**	**17,20 %**	**18,00 %**	**19,00 %**
Optimistic	**4,30 %**	67,54	65,54	62,92	61,05	58,57
	4,80 %	56,68	54,89	52,55	50,86	48,63
Realistic	**4,94 %**	53,78	52,05	49,83	48,14	45,97
	5,10 %	50,54	48,67	46,48	44,90	43,00
Pessimistic	**5,60 %**	40,85	39,36	37,39	35,97	34,10

Figure 11.4.1: DETNOR´s sensitivity matrix with respect to WACC and volatility
Source: Own contribution.

The first two parameters examined are the firm´s cost of capital (WACC) and the volatility of the oil price. From figure 11.4.1 it is obvious that the estimated share price is quite sensitive to both variables.

	OPEX	*Optimistic*		*Realistic*	*Pessimistic*	
Exchange rate		**$ 9,00**	**$ 10,00**	**$ 11,70**	**$ 13,00**	**$ 14,00**
Optimistic	**8,00**	73,01	69,35	63,13	58,37	54,71
	7,70	65,78	62,26	56,27	51,69	48,16
Realistic	**7,41**	58,94	55,55	49,83	45,37	41,97
	7,30	56,14	52,80	47,12	42,78	39,44
Pessimistic	**7,00**	48,91	45,70	40,26	36,09	32,89

Figure 11.4.2: DETNOR´s sensitivity matrix with respect to OPEX and exchange rate.
Source: Own contribution

The next two variables examined are the OPEX and the USD/NOK exchange rate. As the values calculated is in USD, the exchange rate for converting the numbers into NOK is a crucial element, and will affect the estimated value a lot. The share price is also sensitive over the OPEX, but not as much as the exchange rate.

	Mature development cost	*Optimistic*	*Realistic*	*Pessimistic*		
Immature development cost		**$ 7,00**	**$ 8,00**	**$ 9,00**	**$ 10,00**	**$ 11,00**
Optimistic	**$ 25,00**	57,57	55,32	53,07	50,82	48,62
	$ 28,00	55,40	53,15	50,90	48,65	46,44
Realistic	**$ 30,00**	54,28	52,03	49,83	47,52	45,32
	$ 32,00	53,27	51,02	48,77	46,52	44,31
Pessimistic	**$ 35,00**	52,41	50,16	47,91	45,66	43,45

Figure 11.4.3: DETNOR´s sensitivity matrix with respect to development costs of immature and mature areas
Source: Own contribution

In terms of development costs, the share price is much more sensitive against changes in the mature development costs than the immature once. This is as a result of that a larger share of the firm´s resources are mature than immature. However, the share price is in general quite robust against changes in these development costs.

	Optimistic		*Realistic*	*Pessimistic*	
Probabilities	**70 %**	**60 %**	**50 %**	**40 %**	**30 %**
Finding oil, mature	62,57	56,10	49,83	43,58	37,53

	Optimistic		*Realistic*	*Pessimistic*	
Probabilities	**40 %**	**35 %**	**30 %**	**25 %**	**20 %**
Finding oil, immature	50,54	50,14	49,83	49,44	49,13

	Optimistic		*Realistic*	*Pessimistic*	
Probabilities	**90 %**	**80 %**	**70 %**	**60 %**	**50 %**
Commerical find	57,79	53,78	49,83	46,46	42,39

Figure 11.4.4: Share price fluctuations as a result of changes in the probability of (a) finding oil in an mature filed, (b) finding oil in an immature field, and (c) that the discovery is commercial.
Source: Own contribution.

The probabilities are used to quantify the uncertainty the firm faces in regards to the petroleum reserves of each licenses. This uncertainty is resolved as the license moves forward in the value chain. The value is quite sensitive to changes in the probabilities for commercial find and finding oil in mature fields. However, as mentioned earlier the share price is more robust against changes in parameters in regards to the immature licenses. This is also obvious in terms of production, where changes in the estimated production of immature fields do not particularly affect the share price.

Production in mature licenses impacts the share price some, but not as much as the first four parameters. This is due to that the estimated production just affects the licenses where the reserves have not been estimated, which is only the licenses where reserves have not been established, i.e. immature and mature licenses.

	Production, mature	*Optimistic*		*Realistic*		*Pessimistic*
Production, immature		**70**	**60**	**50**	**40**	**30**
Optimistic	**250**	61,32	55,76	50,20	44,64	39,07
	225	61,14	55,58	50,01	44,45	38,89
Realistic	**200**	60,95	55,39	49,83	44,27	38,70
	175	60,77	55,21	49,64	44,08	38,52
Pessimistic	**150**	60,58	55,02	49,46	43,90	38,33

Figure 11.4.5: DETNOR´s sensitivity matrix with respect to the expected production of mature and immature production licenses.
Source: Own contribution

	Upper limit	*Optimistic*	*Realistic*	*Pessimistic*		
Lower limit		**$ 300,00**	**$ 200,00**	**$ 175,00**	**$ 150,00**	**$ 100,00**
Optimistic	**$ 30,00**	66,32	57,78	53,29	46,57	18,80
	$ 20,00	63,16	54,68	50,20	43,48	15,94
Realistic	**$ 14,00**	62,79	54,31	49,83	43,11	15,58
	$ 10,00	62,73	54,26	49,78	43,06	15,52
Pessimistic	**$ -**	62,73	54,25	49,77	43,05	15,51

Figure 11.4.6: DETNOR´s sensitivity matrix with respect to the upper and lower limits of the oil price.
Source: Own contribution

The last parameters examined are the upper and lower limits used in the stochastic modelling of the oil price. These limits are derived from the high and low scenario presented in the Scenario/Qualitative model. It is evident that the limits impact when they are tightened. As a result, lowering the high and increasing the lower limit impacts the estimated share value. The same effect is not present when the limits are widened.

To conclude, the value of the company is quite sensitive to a many of the different input parameters. However, many of the factors estimated may move in opposite direction, decreasing the margin of error. The firm value is particularly sensitive towards changes in the forecasted oil price, and hence the factors affecting that estimation. However, as the future is impossible to predict, this uncertainty will be present in all valuation models for petroleum companies. The industry in general characterized with high uncertainty in the estimated reserve size and production level, as this is based on approximations from the firm´s engineers as well.

12. Conclusion

The main objective of this thesis was to estimate the value of Det Norske Oljeselskap as of 31st of December 2014. The petroleum industry has been known as an industry where it is difficult to estimate company value. This thesis has thus tested this by attempting to estimate the value of DETNOR using two different valuation methods. The firm was first valued using a financial statement analysis, where the value was estimated by looking at expected future cash flows of the company as one unit. The estimated share price was 7,89 NOK. It was evident that the model had problems with the operational structure and estimating the future potential of DETNOR.

The second method was a real option valuation. Multiple researchers have suggested that ROA more precisely estimates the value of petroleum projects. The hypothesis was that petroleum resources, based on the exploration and petroleum licenses, could be valued using project-based real options, and summing these would estimate the value of the company. This valuation method is based on the assumption that firm value is the total of the value of the firms current and future operations. The estimated share price was 49,89 NOK. In contrast to the financial statement analysis, the estimated value for the company is the value as long as the resources are kept the same, and not specifically for a date. This is consequence of that the firm's resources do not change frequently.

The actual share price at 31st of December was 38,89 NOK. The value estimated using real option was much closer to the price determined by the market, and the share price has risen after the date for the valuation. This may suggest that this method more accurately estimates firm value. However, the market capitalization may not reflect the true value of the company, as there are a lot of speculators in the stock market. In the ROA, 27,5% of firm value came from the company´s real options. The difference between the two value estimates may be in the inclusion of the options.

The two methods cannot be directly compared as they are based on different theoretical foundations. However, some general conclusions can be drawn. In terms of the financial statement analysis, the main problem was related to the use of a constant growth model for the terminal value. The company will probably not reach steady state as the uneven production profile and high investments do not lead to steady growth. This was not a problem in the ROA as the valuation was based on the firm´s licenses. However, the ROA required a high number of input parameters to be estimated, which increased the sensitivity of the calculated firm value. Also the method is more technically complex and requires a deeper understanding of the industry and company. This means that it is more challenging estimating firm value by using the real option valuation.

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Table of Appendices

Appendix 1: Explanation of Petroleum phrases and words (Source: npd.com)

Abandoned well: A well permanently plugged in the drilling phase for technical reasons.

Appraisal well: An exploration well drilled to determine the extent and size of a petroleum deposit that has already been discovered by a wildcat well.

Area fee: An annual fee which the licensees on the Norwegian shelf pay the Government for each square kilometre of the acreage covered by a production licence. The fee is demanded pursuant to the provisions in §4-9, paragraph 2 of the Petroleum Act.

Associated gas: Natural gas dissolved in oil.

Awards: Companies that are approved as operators or licensees on the Norwegian shelf may apply to be awarded production licences. The awards take place through licensing rounds and annual allocations in predefined areas. The authorities decide which areas of the Norwegian shelf are to be opened for petroleum activity and which companies are to be awarded production licences.

Barrel of oil: An American volumetric measurement = 159 litres.

Block: A geographical unit of division used in the petroleum activities on the continental shelf. The maritime areas within the outermost limit of the continental shelf are divided into blocks measuring 15 minutes of latitude and 20 minutes of longitude, unless adjacent areas of land, borders with the continental shelves of other nations, or other factors decree otherwise.

Blow-out: Sudden, powerful, uncontrolled discharge of gas, oil, drilling mud and water from a well.

Branch drilling: Drilling from an existing well path towards a new well target.

CNG (Compressed Natural Gas): Natural gas under pressure in tanks.

CO2 tax: A tax paid for burning petroleum and emitting natural gas on platforms used in connection with the production or transportation of petroleum (see the CO2 Tax Act).

Cold flaring: Controlled emission of cold gas.

Condensate: A mixture of the heaviest components of natural gas. Condensate is fluid at normal pressure and temperature.

Continental shelf: The sea bed and its substrata in the maritime areas which extend beyond Norwegian territorial waters over the entire natural continuation of the land territory to the outermost extent of the continental margin, but not less than 200 nautical miles from the sea boundaries from which the breadth of the territorial waters is measured, yet not beyond the centre line relative to another nation.

Contingent resources: Recoverable petroleum volumes that have been discovered, but for which no decision has been taken, or permission given, to recover.

Core sample: Sample taken from a rock formation by core drilling or the use of a sidewall core.

Crude oil: Liquid petroleum from the reservoir. Most of the water and dissolved natural gas have been removed.

Discovery: A petroleum deposit, or several petroleum deposits combined, discovered in the same well, and which testing, sampling or logging have shown probably contain mobile petroleum. The definition covers both commercial and technical discoveries. The discovery receives the status of a field, or becomes part of an existing field when a Plan for Development and Operation (PDO) is approved by the authorities (see Field).

Discovery success: Technical discovery success is the relationship between the number of technical discoveries and the number of wildcat wells. Economic or commercial discovery success is the relationship between the number of discoveries that are developed or are clearly profitable today and the number of wildcat wells.

Drilling programme: Description that contains specific information concerning wells and well paths relating to planned drilling and well activities.

Dry gas: Almost pure methane gas, lacking water and with few heavy components.

E-operation: See integrated operation

EOR (Enhanced Oil Recovery): The term used for advanced methods of reducing the residual oil saturation in the reservoir.

Exploration well: A well drilled to prove a possible deposit of petroleum or obtain information to delimit a discovered deposit. The term covers both wildcat and appraisal wells.

Field: One discovery, or a number of concentrated discoveries, which the licensees have decided to develop and for which the authorities have approved, or granted exemption for, a Plan for Development and Operation (PDO).

Fixed facility: A facility or installation permanently located on the field during the lifetime of the field. Production ships are covered by this definition if they are intended to be permanently placed on the field.

Flaring: Controlled burning of gas for safety purposes.

Growth in reserves: Any increase in the reserves on a defined field, whether it concerns improved recovery from the same deposit or results from increasing the reserves by developing new discoveries and linking these to the field.

Hydrocarbons: Chemical compounds with molecular chains composed of carbon (C) and hydrogen (H) atoms. Oil and gas consist of hydrocarbons.

Integrated operation: Integrated operation denotes the kind of operation where use is made of the opportunities which new and improved information technology provide by utilising approximate real-time data to achieve better and quicker decisions.
Kick: Loss of control over a well, resulting in uncontrolled backflow of drilling liquid. It is an indication of a blow-out due to the well taking in gas, oil or water.
Licensed acreage: The acreage awarded in a production licence. Only exploration drilling and production may take place in an area covered by a production licence.
Licensee: A physical or legal person, or several such persons, who, under the terms of the Petroleum Act or earlier jurisdiction, has a licence to search for, recover, transport or utilise petroleum. If a licence is awarded to several such persons together the expression licensee can cover both the licensees combined and the individual participant.
Licensing round: See Awards.
LNG (Liquefied Natural Gas): Mainly methane (CH4) transformed into liquid form by cooling.
LPG (Liquefied Petroleum Gases): Mainly propane (C3H8) and butane (C4H10) transformed into liquid by raising the pressure or cooling.
Moveable facility: A facility or installation not intended to be permanently located on the field during the lifetime of the field; for instance, a drilling platform or a well intervention device (see § 3 of the Directions for the Framework Provisions).
Multibranch well: A well drilled to produce and/or inject from several well paths simultaneously.
Natural gas: Hydrocarbons in gaseous form. Gas sold under the name natural gas mainly consists of methane (CH4), and some ethane and propane, small amounts of other, heavier hydrocarbons and traces of contaminants like CO2 and H2S.
NGL (Natural Gas Liquids): A collective term for the petroleum qualities, ethane, propane, isobutane, normal butane and naphtha. NGL are partially liquid at normal pressure.
nmVOC (non-methane Volatile Organic Compounds): The term for volatile, organic compounds, except methane, that evaporate from, among other things, crude oil.
Oblique drilling: Drilling of an exploration well whose path is not planned to be drilled vertically.
Observation well: Production or test production well used to measure specific well parameters.
Oil: Collective term for crude oil and other liquid petroleum products.
Oil equivalents (o.e.): Used when oil, gas, condensate and NGL are to be totalled. The term is either linked to the amount of energy liberated by combustion of the various types of petroleum or to the sales values, so that everything can be compared with oil.
Operator: The agent who, on behalf of the licensee, is in charge of the day-to-day management of the petroleum activity.
Originally, recoverable petroleum volumes: The total, saleable volumes of petroleum from the start to the end of production, based on the prevailing estimate of the in-place volumes and the recovery factor.
PDO: Plan for Development and Operation of petroleum deposits.
Petroleum: Collective term for hydrocarbons. The term covers all liquid and gaseous hydrocarbons found in a natural state in the substrate, and also other substances recovered in connection with such hydrocarbons.
Petroleum Act: Act of 29 November 1996 No. 72 concerning Petroleum Activities.
Petroleum activity: All activity linked to subsea petroleum deposits, including investigation, exploratory drilling, recovery, transport, utilisation and termination, and also the planning of such activities, but not the transportation of petroleum in bulk by ship.
Petroleum deposit: An accumulation of petroleum in a geological unit, delimited by rock types at structural or stratigraphical boundaries, contact surfaces between petroleum and water in the formation, or a combination of these, such that the petroleum concerned is everywhere in pressure communication through liquid or gas.
Petroleum register: A register of all production licences and licences for the construction and operation of installations for transportation and utilisation of petroleum (see § 6-1 of the Petroleum Act).
PIO: Plan for Installation and Operation.
Play: A geographically and stratigraphically delimited area where a specific set of geological factors is present so that petroleum should be able to be proven in producible volumes. Such geological factors are a reservoir rock, trap, mature source rock, migration routes, and that the trap was formed before the migration of petroleum ceased. All discoveries and prospects in the same play are characterised by the play's specific set of geological factors.
Probability of discovery: Describes the feasibility of proving petroleum in a prospect by drilling. The probability of discovery results from multiplying the probabilities of the existence of the play, the presence of a reservoir, a trap, the migration of petroleum into the field and the preservation of petroleum in the field (see Play).
Production licence: This licence gives a monopoly to perform investigations, exploration drilling and recovery of petroleum deposits within the geographical area stated in the licence. The licensees become owners of the petroleum that is produced. A production licence may cover one or more blocks or parts of

blocks and regulates the rights and obligations of the participant companies with respect to the Government. The document supplements the provisions of the Petroleum Act and states detailed terms for the individual licences. Exploration period: At the outset, the production licence is awarded for an initial period (exploration period) that may last up to 10 years. In this period, the licensees are obliged to carry out specific tasks, such as seismic surveying and/or exploration drilling. If these mandatory tasks are fulfilled within the exploration period, the licensees may, in principle, demand to retain up to half the area covered by the award for up to 30 years.

Production well: Collective term for wells used to recover petroleum, including injection wells, observation wells and possible combinations of these.

Prospect: A possible petroleum trap with a mappable, delimited volume of rock.

Recovery: The production of petroleum, including the drilling of production wells, injection, assisted recovery, treatment and storage of petroleum for transport, and loading of petroleum for transportation by ship, as well as the construction, location, operation and use of installations used for recovery.

Recovery factor: The relationship between the volume of petroleum that can be recovered from a deposit and the volume of petroleum originally in place in the deposit.

Recovery well: A well used for production or injection.

Refining: The refining of crude oil is really a distillation process. The components with different boiling points are separated in a distillation tower. When heated, the oil is converted to gas, which condenses again at different temperatures to, among others, petrol, paraffin, diesel, heating oils, coke and sulphur.

Reserves: Remaining, recoverable, saleable volumes of petroleum which the licensees have decided to recover and the authorities have given permission to recover.

Rich gas: A mixture of wet and dry gas (methane, ethane, propane, butanes, etc.).

Rig: A derrick, essential machinery and additional equipment used when drilling for oil or gas on land or from a drilling platform at sea.

Riser: A pipe that transports liquid up from the well to the production or drilling platform.

Royalty: A fee payable to the Government, calculated on the basis of the volume and the value of produced petroleum, at the shipping point on the production site. The fee is demanded pursuant to § 4-9, paragraph 1 of the Petroleum Act.

Seismic (geophysical) investigations: Seismic profiles are acquired by transmitting sound waves from a source above or in the substratum. The sound waves travel through the rock layers which reflect them up to sensors on the sea bed or at the surface, or down in a borehole. This enables an image of formations in the substratum to be formed. The seismic mapping of the Norwegian continental shelf started in 1962.

Shallow borehole: A hole drilled to obtain information about the rock characteristics and/or to perform geotechnical investigations before installations are sited, and which is not drilled to prove or delimit a petroleum deposit, or produce or inject petroleum, water or other medium.

Termination plan: Plan to be presented to the authorities by the licensees before a production permit or a permit to install and operate installations for transport and utilisation of petroleum expires or is relinquished, or the use of an installation finally ceases. The plan must include proposals for continued production or shutdown of production and how installations are to be disposed of.

Undiscovered resources: Recoverable volumes of petroleum that it is estimated may be discovered with further exploration.

Well: A hole drilled to find or delimit a petroleum deposit and/or produce petroleum or water for injection purposes, inject gas, water or another medium, or map or monitor well parameters. A well may consist of one or more well paths and may have one or more terminal points.

Well path: Denotes the location of a well from a terminal point to the wellhead. A well path may consist of one or more well tracks.

Well track: The part of a well path that stretches from a drilling out point on an existing well path to a new terminal point for the well.

Wet gas: A mixture of gas mainly in liquid phase.

Wildcat well: An exploration well drilled to find out whether petroleum exists in a prospect.

Zero emissions and discharges: Means that, in principle, no environmentally hazardous substances, or other substances, are to be emitted or discharged if they can result in damage to the environment (detailed definition in White Paper no. 25 (2002-2003)). Special demands for emissions and discharges in the Barents Sea are that, in principle, no emissions or discharges are to take place during normal operations, irrespective of whether they may result in damage to the environment (detailed definition in White Paper no. 38 (2003-2004)).

Common abbreviations

CO carbon monoxide

CO2 carbon dioxide

Sm3 standard cubic metre

o.e. oil equivalents

t tonne

mill. millions

bill. billions
bbl barrel (of oil)
boe barrels of oil equivalents
Mbbl Million bbl 1)
Mboe: Million boe 1)

Appendix 2: The USD/NOK exchange rate and the oil price

Date	USD/NOK	Brent	Date	USD/NOK	Brent	Date	USD/NOK	Brent	Date	USD/NOK	Brent
07.01.05	6,22426	42,07	06.01.06	6,60406	61,72	05.01.07	6,26872	55,63	04.01.08	5,3867	96,5
14.01.05	6,22378	44,59	13.01.06	6,63038	62,18	12.01.07	6,41684	51,79	11.01.08	5,34066	94,4
21.01.05	6,2806	45,08	20.01.06	6,69606	63,54	19.01.07	6,45	51,4	18.01.08	5,3764	90,03
28.01.05	6,32006	45,82	27.01.06	6,58488	63,77	26.01.07	6,36856	54,87	25.01.08	5,48858	88,46
04.02.05	6,37052	44,04	03.02.06	6,6784	64	02.02.07	6,2704	55,92	01.02.08	5,4319	91,77
11.02.05	6,54794	43,29	10.02.06	6,73068	61,23	09.02.07	6,24406	57,9	08.02.08	5,49814	89,88
18.02.05	6,41926	45,22	17.02.06	6,8167	58,04	16.02.07	6,18078	55,54	15.02.08	5,45724	94,98
25.02.05	6,26578	48,23	24.02.06	6,7618	59,39	23.02.07	6,1325	58,16	22.02.08	5,3435	97,13
04.03.05	6,2294	51,33	03.03.06	6,71648	61,06	02.03.07	6,135	60,62	29.02.08	5,23826	99,1
11.03.05	6,12596	53,09	10.03.06	6,7071	59,5	09.03.07	6,20998	60,35	07.03.08	5,15426	101,9
18.03.05	6,10848	54,85	17.03.06	6,6081	62,42	16.03.07	6,12834	60,87	14.03.08	5,12692	107,69
25.03.05	6,26732	53,76	24.03.06	6,59142	61,61	23.03.07	6,12808	61,09	21.03.08	5,18184	103,05
01.04.05	6,35154	52,23	31.03.06	6,58538	64,76	30.03.07	6,08688	66,1	28.03.08	5,14846	102,05
08.04.05	6,34742	53,79	07.04.06	6,46384	66,93	06.04.07	6,09824	68,55	04.04.08	5,11908	100,88
15.04.05	6,3628	50,43	14.04.06	6,48314	68,91	13.04.07	6,02866	68,2	11.04.08	5,04252	106,6
22.04.05	6,2616	51,23	21.04.06	6,36296	72,54	20.04.07	5,96024	66,21	18.04.08	4,99782	110,42
29.04.05	6,28084	51,64	28.04.06	6,25898	72,84	27.04.07	5,9653	67,39	25.04.08	5,02948	114,34
06.05.05	6,2957	50,05	05.05.06	6,13448	72,92	04.05.07	5,96686	66,04	02.05.08	5,1199	111,98
13.05.05	6,33732	48,7	12.05.06	6,06996	70,44	11.05.07	6,01756	63,91	09.05.08	5,09154	119,84
20.05.05	6,41978	46,98	19.05.06	6,10612	67,84	18.05.07	6,0427	67,55	16.05.08	5,04898	122,58
27.05.05	6,3973	48,59	26.05.06	6,11744	68,47	25.05.07	6,03376	70,65	23.05.08	5,00604	126,47
03.06.05	6,43066	50,46	02.06.06	6,07684	68,75	01.06.07	6,0329	68,45	30.05.08	5,04082	128,76
10.06.05	6,43216	51,9	09.06.06	6,1019	67,89	08.06.07	6,0001	71,23	06.06.08	5,11544	126,33
17.06.05	6,50514	54,17	16.06.06	6,21408	66,17	15.06.07	6,07382	69,89	13.06.08	5,15926	134,12
24.06.05	6,5218	56,95	23.06.06	6,29008	68,33	22.06.07	5,98902	71,78	20.06.08	5,17474	132,08
01.07.05	6,55862	56,69	30.06.06	6,2862	71,82	29.06.07	5,9235	71,76	27.06.08	5,10018	135,54
08.07.05	6,61564	57,98	07.07.06	6,23688	73,45	06.07.07	5,817	74,79	04.07.08	5,08224	141,07
15.07.05	6,54172	57,43	14.07.06	6,25868	73,99	13.07.07	5,77646	77,76	11.07.08	5,1039	137,43
22.07.05	6,61124	56,39	21.07.06	6,3071	73,52	20.07.07	5,72302	78,24	18.07.08	5,07062	135,05
29.07.05	6,54456	58,5	28.07.06	6,2599	73,53	27.07.07	5,79466	76,66	25.07.08	5,12682	126,7
05.08.05	6,39604	60,42	04.08.06	6,14704	76,32	03.08.07	5,80886	76,34	01.08.08	5,14654	124,43
12.08.05	6,3787	64,46	11.08.06	6,18568	76,98	10.08.07	5,79736	70,7	08.08.08	5,21914	116,56
19.08.05	6,48324	64,23	18.08.06	6,2785	72,35	17.08.07	5,911	70,09	15.08.08	5,38206	110,16
26.08.05	6,48692	65,68	25.08.06	6,28878	71,92	24.08.07	5,89418	68,44	22.08.08	5,37938	111,66
02.09.05	6,3642	66,09	01.09.06	6,31352	68,35	31.08.07	5,82614	70,55	29.08.08	5,39114	112,4
09.09.05	6,2591	63,24	08.09.06	6,40718	65,76	07.09.07	5,78604	75,06	05.09.08	5,52384	103,69
16.09.05	6,3669	61,22	15.09.06	6,54908	61,38	14.09.07	5,6552	76,89	12.09.08	5,72882	97,28
23.09.05	6,41162	63,63	22.09.06	6,53444	60,23	21.09.07	5,58038	78,17	19.09.08	5,80886	89,35
30.09.05	6,51312	62,16	29.09.06	6,51238	58,76	28.09.07	5,4808	78,15	26.09.08	5,60842	100,91
07.10.05	6,56532	58,93	06.10.06	6,61642	57,15	05.10.07	5,41376	77,98	03.10.08	5,9086	91,9
14.10.05	6,5072	58,59	13.10.06	6,71518	58,33	12.10.07	5,41404	78,85	10.10.08	6,19572	80,98
21.10.05	6,50842	58,15	20.10.06	6,739	58,51	19.10.07	5,38336	84,29	17.10.08	6,4022	69,28
28.10.05	6,46586	58,5	27.10.06	6,61618	57,73	26.10.07	5,4212	83,72	24.10.08	6,86856	64,4
04.11.05	6,5076	58,74	03.11.06	6,50214	56,48	02.11.07	5,3854	90,42	31.10.08	6,80898	60,61
11.11.05	6,59336	56,79	10.11.06	6,4348	58,02	09.11.07	5,31934	93,54	07.11.08	6,73454	59,43
18.11.05	6,68378	53,77	17.11.06	6,4309	57,85	16.11.07	5,41954	90,74	14.11.08	6,91414	53,27
25.11.05	6,69428	53,57	24.11.06	6,3968	59,2	23.11.07	5,42904	94,01	21.11.08	7,0672	47,79
02.12.05	6,74204	53,59	01.12.06	6,2337	62,59	30.11.07	5,474	92,16	28.11.08	6,99806	48,53
09.12.05	6,71936	56,07	08.12.06	6,11532	63,63	07.12.07	5,4893	89,09	05.12.08	7,11148	43,7
16.12.05	6,6357	58,75	15.12.06	6,18002	62,56	14.12.07	5,45172	90,24	12.12.08	6,98906	41,01
23.12.05	6,76682	56,36	22.12.06	6,20604	62,44	21.12.07	5,58502	90,82	19.12.08	6,87146	41,71
30.12.05	6,7665	57,38	29.12.06	6,25114	59,69	28.12.07	5,49862	94,39			

Date	USD/NOK	Brent	Date	USD/NOK	Brent	Date	USD/NOK	Brent	Date	USD/NOK	Brent
02.01.09	6,96724	37,04	01.01.10	5,79454	77,19	07.01.11	5,90412	94,72	06.01.12	5,97172	112,51
09.01.09	6,95572	45,25	08.01.10	5,6978	79,82	14.01.11	5,9107	97,09	13.01.12	6,02238	111,78
16.01.09	7,0993	42,38	15.01.10	5,64236	78,31	21.01.11	5,84054	97,34	20.01.12	5,98538	109,6
23.01.09	7,00434	41,67	22.01.10	5,74858	74,28	28.01.11	5,78692	96,62	27.01.12	5,85764	109,18
30.01.09	6,78194	44,2	29.01.10	5,8604	71,88	04.02.11	5,74516	100,36	03.02.12	5,82836	111,2
06.02.09	6,89978	43,64	05.02.10	5,9095	72,54	11.02.11	5,7953	99,9	10.02.12	5,7669	117,21
13.02.09	6,74604	45,59	12.02.10	5,91874	70,85	18.02.11	5,76092	102,81	17.02.12	5,73078	119,79
20.02.09	6,91642	40,91	19.02.10	5,91408	75,8	25.02.11	5,64688	110,49	24.02.12	5,64432	123,34
27.02.09	6,90154	42,68	26.02.10	5,92936	76,23	04.03.11	5,57724	114,53	02.03.12	5,58528	124,88
06.03.09	7,12552	43,86	05.03.10	5,91828	77,86	11.03.11	5,60034	114,45	09.03.12	5,65316	126,62
13.03.09	6,95704	43,98	12.03.10	5,87452	79,36	18.03.11	5,63576	112,67	16.03.12	5,74674	126,22
20.03.09	6,59312	46,43	19.03.10	5,8575	79,05	25.03.11	5,56666	115,41	23.03.12	5,75454	124,35
27.03.09	6,46706	51,46	26.03.10	6,00082	78,38	01.04.11	5,56224	116,49	30.03.12	5,71986	124,43
03.04.09	6,67716	48,49	02.04.10	5,95426	80,59	08.04.11	5,45796	123,03	06.04.12	5,74042	124,18
10.04.09	6,65498	51,48	09.04.10	5,95052	83,88	15.04.11	5,42638	123,57	13.04.12	5,793	120,87
17.04.09	6,65562	51,59	16.04.10	5,87638	85,23	22.04.11	5,39854	122,74	20.04.12	5,74796	117,18
24.04.09	6,70456	48,97	23.04.10	5,91266	84,61	29.04.11	5,3038	125,36	27.04.12	5,73178	118,1
01.05.09	6,6157	49,92	30.04.10	5,92312	85,98	06.05.11	5,33906	119,56	04.05.12	5,74476	116,67
08.05.09	6,4884	54,83	07.05.10	6,08586	82,5	13.05.11	5,49756	114,53	11.05.12	5,83108	111,78
15.05.09	6,4796	56,39	14.05.10	6,16876	78,32	20.05.11	5,55282	112,02	18.05.12	5,96858	109,87
22.05.09	6,42136	57,89	21.05.10	6,3957	72,17	27.05.11	5,53582	113,41	25.05.12	5,98566	108,14
29.05.09	6,3695	62,2	28.05.10	6,49862	70,79	03.06.11	5,3844	115,68	01.06.12	6,07066	103,47
05.06.09	6,27722	67,17	04.06.10	6,48498	72,71	10.06.11	5,39438	117,73	08.06.12	6,07774	99,03
12.06.09	6,36912	69,88	11.06.10	6,57342	72,76	17.06.11	5,48052	116,79	15.06.12	5,99062	97,21
19.06.09	6,40972	69,68	18.06.10	6,37974	76,22	24.06.11	5,49232	110,18	22.06.12	5,94528	92,46
26.06.09	6,49482	67,58	25.06.10	6,45124	76,64	01.07.11	5,40344	109,03	29.06.12	6,0216	91,23
03.07.09	6,3985	68,03	02.07.10	6,46154	73,86	08.07.11	5,38496	115,39	06.07.12	6,00956	98,8
10.07.09	6,51526	60,39	09.07.10	6,38192	73,95	15.07.11	5,53466	117,72	13.07.12	6,10314	99,88
17.07.09	6,42648	61,11	16.07.10	6,25962	75,7	22.07.11	5,49208	118,2	20.07.12	6,08662	105,4
24.07.09	6,27952	66,56	23.07.10	6,24216	76,64	29.07.11	5,38892	117,7	27.07.12	6,06786	104,18
31.07.09	6,19228	68,6	30.07.10	6,12624	77,24	05.08.11	5,43226	112,65	03.08.12	6,02448	107,27
07.08.09	6,0497	73,99	06.08.10	5,97364	82,69	12.08.11	5,50538	105,3	10.08.12	5,9138	112,49
14.08.09	6,13026	72,9	13.08.10	6,10822	78,21	19.08.11	5,43612	109,54	17.08.12	5,93662	115,04
21.08.09	6,08704	71,52	20.08.10	6,17146	74,94	26.08.11	5,41676	111,06	24.08.12	5,8654	116,1
28.08.09	6,02802	72,33	27.08.10	6,2826	72,82	02.09.11	5,3694	116,11	31.08.12	5,81926	113,02
04.09.09	6,04428	67,6	03.09.10	6,20452	75,41	09.09.11	5,41016	115,97	07.09.12	5,80548	114,11
11.09.09	5,94078	69,17	10.09.10	6,1767	77,17	16.09.11	5,6223	114,98	14.09.12	5,73996	115,41
18.09.09	5,88342	68,85	17.09.10	6,0823	78,44	23.09.11	5,74344	111,98	21.09.12	5,71748	111,83
25.09.09	5,8308	66,96	24.09.10	5,9594	78,38	30.09.11	5,7737	107,69	28.09.12	5,73432	110,35
02.10.09	5,817	65,9	01.10.10	5,8658	79,82	07.10.11	5,85704	104,03	05.10.12	5,70648	111,41
09.10.09	5,68554	67,87	08.10.10	5,81998	83,87	14.10.11	5,66204	111,59	12.10.12	5,7106	114,88
16.10.09	5,60478	72,29	15.10.10	5,80636	83,11	21.10.11	5,6111	111,47	19.10.12	5,65552	113,59
23.10.09	5,5595	77,24	22.10.10	5,8398	81,43	28.10.11	5,4856	111,33	26.10.12	5,73726	108,27
30.10.09	5,65226	76,07	29.10.10	5,85906	82,25	04.11.11	5,61318	109,84	02.11.12	5,71756	108,85
06.11.09	5,71216	76,6	05.11.10	5,81212	85,6	11.11.11	5,66394	114,68	09.11.12	5,73246	107,78
13.11.09	5,61014	76,25	12.11.10	5,86548	87,43	18.11.11	5,75784	110,69	16.11.12	5,76106	109,12
20.11.09	5,60814	77,04	19.11.10	6,00832	83,94	25.11.11	5,84096	106,67	23.11.12	5,71424	110,26
27.11.09	5,60892	76,52	26.11.10	6,08722	83,51	02.12.11	5,81484	110,05	30.11.12	5,67592	109,82
04.12.09	5,6413	77,78	03.12.10	6,11866	88,1	09.12.11	5,75962	109,31	07.12.12	5,63882	109,08
11.12.09	5,75844	73,14	10.12.10	6,01142	90,25	16.12.11	5,93778	106,26	14.12.12	5,63884	109,1
18.12.09	5,81894	71,8	17.12.10	5,9434	90,91	23.12.11	5,93876	107,72	21.12.12	5,57788	109,79
25.12.09	5,8379	73,35	24.12.10	5,98342	92,9	30.12.11	5,98544	107,51	28.12.12	5,59548	109,81
			31.12.10	5,92424	93,17						

Date	USD/NOK	Brent	Date	USD/NOK	Brent	Date	USD/NOK	Brent
04.01.13	5,56778	112,35	03.01.14	6,0972	108,73	02.01.15	7,47574	56,03
11.01.13	5,56958	112,37	10.01.14	6,1763	107,01	09.01.15	7,65986	49,47
18.01.13	5,56004	111,35	17.01.14	6,1353	107,83	16.01.15	7,6681	46,58
25.01.13	5,5625	113,72	24.01.14	6,14688	109,14	23.01.15	7,65774	46,44
01.02.13	5,48264	115,13	31.01.14	6,1961	108,83	30.01.15	7,76664	46,76
08.02.13	5,5039	117,15	07.02.14	6,23936	107,73	06.02.15	7,5666	54,62
15.02.13	5,50378	118,1	14.02.14	6,1107	109,12	13.02.15	7,61238	56,57
22.02.13	5,5974	115,3	21.02.14	6,07128	109,74	20.02.15	7,54648	60,57
01.03.13	5,71538	112,42	28.02.14	6,03112	109,17	27.02.15	7,61548	60,63
08.03.13	5,7078	109,98	07.03.14	5,99976	109,14	06.03.15	7,76758	60,12
15.03.13	5,75378	108,41	14.03.14	5,95072	108,01			
22.03.13	5,82236	107,33	21.03.14	6,00282	106,53			
29.03.13	5,84252	107,68	28.03.14	6,03008	106,54			
05.04.13	5,7923	107,06	04.04.14	5,9927	105,26			
12.04.13	5,72374	103,25	11.04.14	5,95018	106,51			
19.04.13	5,77744	98,09	18.04.14	5,97184	109,07			
26.04.13	5,87922	100,61	25.04.14	5,99946	109,21			
03.05.13	5,78916	101,53	02.05.14	5,96904	109,15			
10.05.13	5,79662	103,77	09.05.14	5,9124	108,48			
17.05.13	5,8291	102,91	16.05.14	5,92934	109,53			
24.05.13	5,82094	102,3	23.05.14	5,94792	110,72			
31.05.13	5,85808	102,03	30.05.14	5,96788	109,62			
07.06.13	5,7878	102,92	06.06.14	5,98736	108,98			
14.06.13	5,75362	103,39	13.06.14	5,98812	110,98			
21.06.13	5,85576	103,93	20.06.14	6,05304	114,29			
28.06.13	6,10654	101,43	27.06.14	6,12886	113,09			
05.07.13	6,12344	105,18	04.07.14	6,16584	110,26			
12.07.13	6,1269	108,26	11.07.14	6,17108	107,03			
19.07.13	6,01022	109,41	18.07.14	6,1942	105,39			
26.07.13	5,91642	108,4	25.07.14	6,20382	106,34			
02.08.13	5,9286	108,61	01.08.14	6,25782	105,71			
09.08.13	5,90554	108,56	08.08.14	6,26066	103,6			
16.08.13	5,90044	110,73	15.08.14	6,1608	101,94			
23.08.13	6,00544	111,12	22.08.14	6,16002	99,88			
30.08.13	6,0688	115,32	29.08.14	6,17766	100,64			
06.09.13	6,09236	116,03	05.09.14	6,23254	100,45			
13.09.13	5,93714	113,22	12.09.14	6,3501	97,32			
20.09.13	5,88798	109,98	19.09.14	6,37266	97,02			
27.09.13	5,97066	108,8	26.09.14	6,3872	95,01			
04.10.13	5,98434	108,63	03.10.14	6,45914	93,41			
11.10.13	5,99432	110,3	10.10.14	6,48704	90,19			
18.10.13	5,97576	110,11	17.10.14	6,55346	85,5			
25.10.13	5,90228	107,82	24.10.14	6,58046	85,58			
01.11.13	5,91412	107,61	31.10.14	6,66208	85,56			
08.11.13	6,0141	104,54	07.11.14	6,83146	83,04			
15.11.13	6,16298	107,1	14.11.14	6,78658	79,9			
22.11.13	6,09706	109,32	21.11.14	6,77188	77,62			
29.11.13	6,10968	111,32	28.11.14	6,84838	76,63			
06.12.13	6,13506	112,28	05.12.14	7,02878	69,72			
13.12.13	6,15116	109,1	12.12.14	7,21276	64,08			
20.12.13	6,13924	110,34	19.12.14	7,39962	59,77			
27.12.13	6,14082	111,72	26.12.14	7,4405	58,69			

Appendix 3: Adjusted and unadjusted USD/NOK

Date	Adjsted	Unadjusted	Date	Adjsted	Unadjusted	Date	Adjsted	Unadjuste	Date	Adjsted	Unadjusted
16.04.10	573,80	500,84	08.07.11	776,85	621,37	28.09.12	742,92	632,78	20.12.13	742,85	677,40
23.04.10	569,63	500,27	15.07.11	792,53	651,54	05.10.12	750,05	635,76	27.12.13	752,14	686,05
30.04.10	578,85	509,27	22.07.11	795,77	649,16	12.10.12	773,41	656,03	03.01.14	732,01	662,95
07.05.10	555,42	502,08	29.07.11	792,40	634,28	19.10.12	764,73	642,41	10.01.14	720,43	660,93
14.05.10	527,28	483,14	05.08.11	758,40	611,94	26.10.12	728,91	621,17	17.01.14	725,95	661,57
21.05.10	485,87	461,58	12.08.11	708,92	579,72	02.11.12	732,82	622,36	24.01.14	734,77	670,87
28.05.10	476,58	460,04	19.08.11	737,46	595,47	09.11.12	725,61	617,84	31.01.14	732,68	674,32
04.06.10	489,51	471,52	26.08.11	747,70	601,59	16.11.12	734,64	628,65	07.02.14	725,28	672,17
11.06.10	489,85	478,28	02.09.11	781,70	623,44	23.11.12	742,31	630,05	14.02.14	734,64	666,80
18.06.10	513,14	486,26	09.09.11	780,75	627,42	30.11.12	739,35	623,33	21.02.14	738,81	666,26
25.06.10	515,97	494,42	16.09.11	774,09	646,45	07.12.12	734,37	615,08	28.02.14	734,97	658,42
02.07.10	497,25	477,25	23.09.11	753,89	643,15	14.12.12	734,50	615,20	07.03.14	734,77	654,81
09.07.10	497,86	471,94	30.09.11	725,01	621,77	21.12.12	739,15	612,40	14.03.14	727,16	642,74
16.07.10	509,64	473,85	07.10.11	700,37	609,31	28.12.12	739,28	614,44	21.03.14	717,20	639,48
23.07.10	515,97	478,40	14.10.11	751,26	631,83	04.01.13	756,38	625,54	28.03.14	717,27	642,44
30.07.10	520,01	473,19	21.10.11	750,46	625,47	11.01.13	756,52	625,85	04.04.14	708,65	630,79
06.08.10	556,70	493,96	28.10.11	749,51	610,71	18.01.13	749,65	619,11	11.04.14	717,06	633,75
13.08.10	526,54	477,72	04.11.11	739,48	616,55	25.01.13	765,60	632,57	18.04.14	734,30	651,35
20.08.10	504,52	462,49	11.11.11	772,07	649,54	01.02.13	775,10	631,22	25.04.14	735,24	655,20
27.08.10	490,25	457,50	18.11.11	745,21	637,34	08.02.13	788,70	644,78	02.05.14	734,84	651,52
03.09.10	507,69	467,88	25.11.11	718,14	623,06	15.02.13	795,09	650,00	09.05.14	730,33	641,38
10.09.10	519,54	476,66	02.12.11	740,90	639,92	22.02.13	776,24	645,38	16.05.14	737,40	649,44
17.09.10	528,09	477,10	09.12.11	735,92	629,58	01.03.13	756,85	642,52	23.05.14	745,41	658,55
24.09.10	527,68	467,10	16.12.11	715,38	630,95	08.03.13	740,43	627,74	30.05.14	738,00	654,20
01.10.10	537,38	468,21	23.12.11	725,21	639,72	15.03.13	729,86	623,77	06.06.14	733,69	652,50
08.10.10	564,64	488,12	30.12.11	723,80	643,49	22.03.13	722,59	624,91	13.06.14	747,16	664,56
15.10.10	559,53	482,57	06.01.12	757,46	671,88	29.03.13	724,94	629,12	20.06.14	769,44	691,80
22.10.10	548,22	475,53	13.01.12	752,54	673,18	05.04.13	720,77	620,12	27.06.14	761,36	693,11
29.10.10	553,74	481,91	20.01.12	737,87	656,00	12.04.13	695,12	590,98	04.07.14	742,31	679,85
05.11.10	576,29	497,52	27.01.12	735,04	639,54	19.04.13	660,38	566,71	11.07.14	720,57	660,49
12.11.10	588,61	512,82	03.02.12	748,64	648,11	26.04.13	677,34	591,51	18.07.14	709,52	652,81
19.11.10	565,11	504,34	10.02.12	789,10	675,94	03.05.13	683,54	587,77	25.07.14	715,92	659,71
26.11.10	562,22	508,34	17.02.12	806,47	686,49	10.05.13	698,62	601,52	01.08.14	711,68	661,51
03.12.10	593,12	539,05	24.02.12	830,37	696,17	17.05.13	692,83	599,87	08.08.14	697,47	648,60
10.12.10	607,60	542,53	02.03.12	840,74	697,49	24.05.13	688,72	595,48	15.08.14	686,30	628,03
17.12.10	612,04	540,31	09.03.12	852,45	715,80	31.05.13	686,90	597,70	22.08.14	672,43	615,26
24.12.10	625,44	555,86	16.03.12	849,76	725,35	07.06.13	692,90	595,68	29.08.14	677,55	621,72
31.12.10	627,25	551,96	23.03.12	837,17	715,58	14.06.13	696,06	594,87	05.09.14	676,27	626,06
07.01.11	637,69	559,24	30.03.12	837,71	711,72	21.06.13	699,69	608,59	12.09.14	655,19	617,99
14.01.11	653,65	573,87	06.04.12	836,03	712,85	28.06.13	682,86	619,39	19.09.14	653,17	618,28
21.01.11	655,33	568,52	13.04.12	813,74	700,20	05.07.13	708,11	644,06	26.09.14	639,64	606,85
28.01.11	650,48	559,13	20.04.12	788,90	673,55	12.07.13	728,85	663,30	03.10.14	628,87	603,35
04.02.11	675,66	576,58	27.04.12	795,09	676,92	19.07.13	736,59	657,58	10.10.14	607,19	585,07
11.02.11	672,56	578,95	04.05.12	785,47	670,24	26.07.13	729,79	641,34	17.10.14	575,62	560,32
18.02.11	692,15	592,28	11.05.12	752,54	651,80	02.08.13	731,20	643,91	24.10.14	576,16	563,16
25.02.11	743,86	623,92	18.05.12	739,69	655,77	09.08.13	730,87	641,11	31.10.14	576,02	570,01
04.03.11	771,06	638,76	25.05.12	728,04	647,29	16.08.13	745,48	653,36	07.11.14	559,06	567,28
11.03.11	770,52	640,96	01.06.12	696,60	628,13	23.08.13	748,10	667,32	14.11.14	537,92	542,25
18.03.11	758,54	634,98	08.06.12	666,71	601,88	30.08.13	776,38	699,85	21.11.14	522,57	525,63
25.03.11	776,98	642,45	15.06.12	654,45	582,35	06.09.13	781,16	706,90	28.11.14	515,90	524,79
01.04.11	784,25	647,95	22.06.12	622,47	549,70	13.09.13	762,24	672,20	05.12.14	469,38	490,05
08.04.11	828,28	671,49	29.06.12	614,19	549,35	20.09.13	740,43	647,56	12.12.14	431,41	462,19
15.04.11	831,92	670,54	06.07.12	665,16	593,74	27.09.13	732,48	649,61	19.12.14	402,39	442,28
22.04.11	826,33	662,62	13.07.12	672,43	609,58	04.10.13	731,34	650,08	26.12.14	395,12	436,68
29.04.11	843,97	664,88	20.07.12	709,59	641,53	11.10.13	742,58	661,17	02.01.15	377,21	418,87
06.05.11	804,92	638,34	27.07.12	701,38	632,15	18.10.13	741,30	657,99	09.01.15	333,05	378,93
13.05.11	771,06	629,64	03.08.12	722,18	646,25	25.10.13	725,88	636,38	16.01.15	313,59	357,18
20.05.11	754,16	622,03	10.08.12	757,32	665,24	01.11.13	724,47	636,42	23.01.15	312,65	355,63
27.05.11	763,52	627,82	17.08.12	774,49	682,95	08.11.13	703,80	628,71	30.01.15	314,81	363,17
03.06.11	778,80	622,87	24.08.12	781,63	680,97	15.11.13	721,04	660,06	06.02.15	367,72	413,29
10.06.11	792,60	635,08	31.08.12	760,89	657,69	22.11.13	735,98	666,53	13.02.15	380,85	430,63
17.06.11	786,27	640,07	07.09.12	768,23	662,46	29.11.13	749,45	680,13	20.02.15	407,78	457,09
24.06.11	741,77	605,14	14.09.12	776,98	662,45	06.12.13	755,91	688,84	27.02.15	408,18	461,73
01.07.11	734,03	589,14	21.09.12	752,88	639,39	13.12.13	734,50	671,09	06.03.15	404,75	466,99

Appendix 4: Historical volatility calculation

Average Volatility:		19.88%		Average Adjusted Volatility			17,21 %				
Data	Volatility	Adjusted Vol	Data	Volatility	Adjusted Vol	Data	Volatility	Adjusted Vol	Data	Volatility	Adjusted Vol
16.04.10	30,3 %	25,6 %	08.07.11	21,6 %	17,1 %	28.09.12	22,3 %	19,7 %	20.12.13	13,8 %	15,9 %
23.04.10	29,9 %	25,1 %	15.07.11	21,8 %	17,3 %	05.10.12	22,2 %	19,7 %	27.12.13	13,8 %	15,9 %
30.04.10	29,9 %	25,1 %	22.07.11	21,8 %	17,7 %	12.10.12	21,9 %	19,4 %	03.01.14	13,9 %	15,9 %
07.05.10	29,3 %	24,6 %	29.07.11	21,7 %	17,7 %	19.10.12	21,8 %	19,6 %	10.01.14	14,1 %	16,3 %
14.05.10	29,7 %	24,7 %	05.08.11	21,8 %	18,0 %	26.10.12	20,6 %	19,4 %	17.01.14	14,0 %	16,2 %
21.05.10	29,0 %	24,2 %	12.08.11	22,4 %	18,4 %	02.11.12	21,1 %	19,6 %	24.01.14	14,0 %	16,2 %
28.05.10	30,1 %	24,7 %	19.08.11	22,6 %	18,9 %	09.11.12	21,2 %	19,5 %	31.01.14	14,1 %	16,2 %
04.06.10	30,1 %	24,6 %	26.08.11	22,0 %	18,7 %	16.11.12	21,1 %	19,5 %	07.02.14	13,9 %	16,1 %
11.06.10	29,4 %	24,0 %	02.09.11	21,5 %	18,3 %	23.11.12	20,7 %	18,9 %	14.02.14	13,9 %	16,1 %
18.06.10	28,4 %	23,3 %	09.09.11	21,5 %	18,5 %	30.11.12	20,4 %	18,8 %	21.02.14	13,8 %	16,0 %
25.06.10	28,5 %	22,8 %	16.09.11	21,4 %	18,4 %	07.12.12	20,1 %	18,7 %	28.02.14	13,8 %	16,0 %
02.07.10	28,5 %	22,9 %	23.09.11	21,4 %	18,5 %	14.12.12	19,9 %	18,5 %	07.03.14	13,6 %	16,0 %
09.07.10	28,6 %	23,1 %	30.09.11	21,6 %	18,6 %	21.12.12	19,9 %	18,5 %	14.03.14	13,4 %	16,0 %
16.07.10	28,5 %	23,1 %	07.10.11	22,1 %	18,8 %	28.12.12	19,7 %	18,5 %	21.03.14	13,3 %	16,0 %
23.07.10	26,2 %	20,4 %	14.10.11	22,4 %	19,0 %	04.01.13	19,6 %	18,4 %	28.03.14	13,3 %	16,0 %
30.07.10	26,2 %	20,4 %	21.10.11	22,9 %	18,9 %	11.01.13	19,7 %	18,5 %	04.04.14	13,2 %	16,0 %
06.08.10	24,8 %	19,6 %	28.10.11	22,9 %	18,9 %	18.01.13	19,2 %	18,0 %	11.04.14	13,3 %	16,1 %
13.08.10	25,5 %	20,0 %	04.11.11	22,8 %	19,0 %	25.01.13	19,2 %	18,0 %	18.04.14	13,3 %	16,0 %
20.08.10	25,0 %	19,7 %	11.11.11	22,8 %	19,0 %	01.02.13	19,2 %	18,0 %	25.04.14	13,0 %	15,4 %
27.08.10	25,3 %	20,0 %	18.11.11	22,9 %	19,3 %	08.02.13	19,3 %	17,8 %	02.05.14	12,0 %	14,8 %
03.09.10	25,4 %	19,8 %	25.11.11	23,2 %	19,3 %	15.02.13	19,2 %	17,9 %	09.05.14	11,7 %	14,2 %
10.09.10	25,6 %	19,9 %	02.12.11	23,1 %	19,4 %	22.02.13	18,5 %	17,4 %	16.05.14	11,7 %	14,3 %
17.09.10	24,8 %	18,8 %	09.12.11	23,2 %	19,5 %	01.03.13	18,5 %	17,3 %	23.05.14	11,6 %	14,2 %
24.09.10	24,8 %	18,8 %	16.12.11	22,7 %	18,9 %	08.03.13	18,4 %	17,3 %	30.05.14	11,6 %	14,2 %
01.10.10	24,8 %	18,8 %	23.12.11	22,9 %	18,9 %	15.03.13	18,5 %	17,4 %	06.06.14	11,6 %	14,2 %
08.10.10	24,6 %	18,4 %	30.12.11	22,9 %	18,9 %	22.03.13	18,5 %	17,2 %	13.06.14	11,6 %	14,2 %
15.10.10	25,0 %	18,7 %	06.01.12	22,8 %	18,7 %	29.03.13	18,5 %	17,1 %	20.06.14	11,7 %	14,3 %
22.10.10	24,9 %	18,7 %	13.01.12	23,2 %	19,1 %	05.04.13	18,4 %	17,1 %	27.06.14	12,0 %	14,8 %
29.10.10	24,2 %	18,3 %	20.01.12	23,2 %	19,1 %	12.04.13	18,4 %	17,1 %	04.07.14	12,1 %	14,7 %
05.11.10	23,3 %	17,5 %	27.01.12	23,2 %	19,1 %	19.04.13	18,7 %	17,7 %	11.07.14	12,1 %	14,7 %
12.11.10	23,5 %	17,7 %	03.02.12	23,2 %	19,3 %	26.04.13	19,2 %	18,1 %	18.07.14	12,0 %	14,6 %
19.11.10	23,6 %	17,9 %	10.02.12	23,3 %	19,3 %	03.05.13	19,2 %	18,3 %	25.07.14	11,7 %	14,3 %
26.11.10	24,0 %	17,8 %	17.02.12	23,5 %	19,4 %	10.05.13	19,2 %	18,3 %	01.08.14	11,7 %	14,3 %
03.12.10	24,0 %	17,8 %	24.02.12	23,6 %	19,5 %	17.05.13	19,3 %	18,4 %	08.08.14	11,7 %	14,1 %
10.12.10	24,5 %	18,6 %	02.03.12	23,6 %	19,4 %	24.05.13	18,9 %	18,3 %	15.08.14	11,8 %	14,3 %
17.12.10	24,6 %	18,5 %	09.03.12	22,5 %	18,8 %	31.05.13	18,8 %	18,3 %	22.08.14	11,9 %	14,6 %
24.12.10	23,8 %	17,9 %	16.03.12	22,3 %	18,8 %	07.06.13	18,8 %	18,2 %	29.08.14	11,9 %	14,6 %
31.12.10	23,7 %	18,0 %	23.03.12	22,3 %	18,9 %	14.06.13	18,3 %	18,0 %	05.09.14	11,9 %	14,5 %
07.01.11	23,6 %	17,9 %	30.03.12	22,3 %	18,9 %	21.06.13	17,8 %	17,5 %	12.09.14	11,2 %	13,7 %
14.01.11	23,2 %	17,6 %	06.04.12	22,2 %	18,9 %	28.06.13	17,7 %	17,3 %	19.09.14	11,5 %	13,7 %
21.01.11	23,1 %	17,6 %	13.04.12	22,2 %	18,9 %	05.07.13	17,1 %	16,3 %	26.09.14	11,3 %	12,8 %
28.01.11	23,0 %	17,4 %	20.04.12	21,6 %	18,6 %	12.07.13	17,4 %	16,7 %	03.10.14	11,2 %	12,3 %
04.02.11	22,3 %	17,1 %	27.04.12	21,8 %	19,1 %	19.07.13	15,7 %	15,3 %	10.10.14	11,3 %	12,3 %
11.02.11	22,2 %	17,1 %	04.05.12	21,9 %	19,0 %	26.07.13	15,7 %	15,1 %	17.10.14	11,7 %	12,7 %
18.02.11	22,2 %	17,1 %	11.05.12	21,8 %	19,1 %	02.08.13	14,7 %	14,5 %	24.10.14	12,5 %	13,2 %
25.02.11	22,1 %	16,9 %	18.05.12	21,7 %	18,8 %	09.08.13	14,7 %	14,4 %	31.10.14	12,5 %	13,2 %
04.03.11	22,3 %	16,5 %	25.05.12	21,4 %	18,8 %	16.08.13	14,4 %	14,3 %	07.11.14	12,4 %	12,9 %
11.03.11	22,5 %	16,6 %	01.06.12	21,3 %	18,8 %	23.08.13	13,7 %	14,1 %	14.11.14	12,6 %	12,9 %
18.03.11	22,4 %	16,6 %	08.06.12	21,7 %	19,0 %	30.08.13	13,5 %	14,0 %	21.11.14	12,8 %	13,6 %
25.03.11	22,5 %	16,6 %	15.06.12	22,0 %	19,5 %	06.09.13	14,0 %	14,8 %	28.11.14	12,7 %	12,9 %
01.04.11	22,6 %	16,6 %	22.06.12	21,9 %	19,6 %	13.09.13	13,8 %	14,3 %	05.12.14	12,4 %	12,8 %
08.04.11	22,5 %	16,5 %	29.06.12	22,4 %	20,4 %	20.09.13	13,9 %	15,3 %	12.12.14	14,7 %	14,2 %
15.04.11	22,9 %	16,7 %	06.07.12	21,8 %	19,6 %	27.09.13	14,2 %	15,7 %	19.12.14	16,2 %	15,0 %
22.04.11	22,7 %	16,4 %	13.07.12	23,3 %	20,9 %	04.10.13	13,9 %	15,3 %	26.12.14	17,1 %	15,4 %
29.04.11	22,7 %	16,5 %	20.07.12	22,6 %	20,4 %	11.10.13	13,8 %	15,3 %	02.01.15	17,0 %	15,3 %
06.05.11	22,7 %	16,5 %	27.07.12	23,2 %	20,5 %	18.10.13	13,9 %	15,4 %	09.01.15	17,1 %	15,5 %
13.05.11	23,3 %	17,1 %	03.08.12	23,2 %	20,5 %	25.10.13	13,5 %	15,0 %	16.01.15	20,0 %	18,0 %
20.05.11	23,3 %	17,1 %	10.08.12	23,4 %	20,5 %	01.11.13	13,6 %	15,3 %	23.01.15	20,4 %	18,6 %
27.05.11	22,8 %	16,6 %	17.08.12	23,6 %	20,4 %	08.11.13	12,8 %	14,9 %	30.01.15	20,3 %	18,6 %
03.06.11	21,1 %	15,8 %	24.08.12	22,7 %	19,7 %	15.11.13	13,1 %	14,9 %	06.02.15	20,3 %	18,7 %
10.06.11	20,9 %	15,8 %	31.08.12	22,4 %	19,6 %	22.11.13	13,3 %	15,6 %	13.02.15	27,2 %	22,9 %
17.06.11	20,9 %	15,8 %	07.09.12	22,5 %	19,9 %	29.11.13	13,4 %	15,6 %	20.02.15	27,6 %	23,4 %
24.06.11	20,9 %	15,7 %	14.09.12	22,1 %	19,6 %	06.12.13	13,5 %	15,7 %	27.02.15	28,7 %	24,3 %
01.07.11	21,6 %	16,9 %	21.09.12	22,1 %	19,6 %	13.12.13	13,5 %	15,7 %	06.03.15	28,7 %	24,4 %
										28,7 %	24,4 %

Appendix 5: Estimation of GBM and mean reversion examples

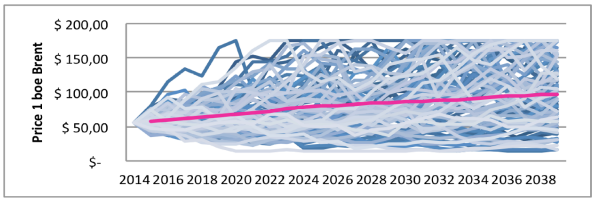
Inputs			
Volatility	17,21 %	Upper band	$ 120,00
Drift	0,0035	Lower band	$ 25,00
Spot	$ 55,27	Mean	$ 60,00
Time	1	Beta	$ 1,00

t	N(1,0)	Rand	GBM	GBM with limits	Mean reversion	Upper limit	Lower limit	Mean
0			$ 55,27	$ 55,27	$ 55,27	$ 120,00	$ 25,00	$ 60,00
1	-0,70552	0,38924	$ 59,17	$ 59,17	$ 63,90	$ 120,00	$ 25,00	$ 60,00
2	-0,13584	0,03557	$ 59,74	$ 59,74	$ 60,61	$ 120,00	$ 25,00	$ 60,00
3	-1,28502	0,37990	$ 63,85	$ 63,85	$ 64,18	$ 120,00	$ 25,00	$ 60,00
4	0,06117	-2,46168	$ 37,02	$ 37,02	$ 33,04	$ 120,00	$ 25,00	$ 60,00
5	-1,10011	-0,44562	$ 34,31	$ 34,31	$ 57,58	$ 120,00	$ 25,00	$ 60,00
6	-0,76364	-0,97377	$ 28,68	$ 28,68	$ 50,55	$ 120,00	$ 25,00	$ 60,00
7	0,39937	-1,22840	$ 22,72	$ 25,00	$ 49,49	$ 120,00	$ 25,00	$ 60,00
8	-0,82055	-0,75467	$ 19,85	$ 25,00	$ 53,75	$ 120,00	$ 25,00	$ 60,00
9	0,34865	2,35443	$ 27,96	$ 35,22	$ 81,97	$ 120,00	$ 25,00	$ 60,00
10	0,49065	0,65315	$ 31,20	$ 39,30	$ 69,50	$ 120,00	$ 25,00	$ 60,00
11	1,39152	-1,96640	$ 20,75	$ 26,14	$ 36,72	$ 120,00	$ 25,00	$ 60,00
12	0,03106	-0,47294	$ 19,13	$ 25,00	$ 57,14	$ 120,00	$ 25,00	$ 60,00
13	0,23836	-0,79209	$ 16,59	$ 25,00	$ 52,41	$ 120,00	$ 25,00	$ 60,00
14	0,75825	3,06394	$ 25,40	$ 38,27	$ 87,82	$ 120,00	$ 25,00	$ 60,00
15	-0,07462	1,76455	$ 33,20	$ 50,03	$ 86,98	$ 120,00	$ 25,00	$ 60,00
16	-1,99341	-0,42744	$ 30,88	$ 46,52	$ 53,91	$ 120,00	$ 25,00	$ 60,00
17	2,34042	0,89246	$ 35,73	$ 53,83	$ 68,47	$ 120,00	$ 25,00	$ 60,00
18	-1,09270	0,65743	$ 39,90	$ 60,11	$ 67,99	$ 120,00	$ 25,00	$ 60,00
19	-0,33898	0,81550	$ 45,63	$ 68,75	$ 69,78	$ 120,00	$ 25,00	$ 60,00
20	1,13381	-0,72389	$ 40,11	$ 60,43	$ 51,55	$ 120,00	$ 25,00	$ 60,00
21	1,33787	-0,05639	$ 39,86	$ 60,05	$ 59,68	$ 120,00	$ 25,00	$ 60,00
22	0,25992	-0,27998	$ 38,08	$ 57,37	$ 57,33	$ 120,00	$ 25,00	$ 60,00
23	1,53515	0,50165	$ 41,50	$ 62,52	$ 65,15	$ 120,00	$ 25,00	$ 60,00
24	0,21562	-2,45844	$ 24,09	$ 36,29	$ 32,66	$ 120,00	$ 25,00	$ 60,00
25	0,76482	1,33602	$ 29,71	$ 44,76	$ 67,62	$ 120,00	$ 25,00	$ 60,00
26	1,93596	0,25347	$ 31,11	$ 46,87	$ 63,19	$ 120,00	$ 25,00	$ 60,00
27	0,64768	0,12285	$ 31,88	$ 48,02	$ 61,56	$ 120,00	$ 25,00	$ 60,00
28	1,46366	-0,85103	$ 27,32	$ 41,16	$ 51,20	$ 120,00	$ 25,00	$ 60,00
29	0,86063	-1,90966	$ 18,44	$ 27,78	$ 43,35	$ 120,00	$ 25,00	$ 60,00
30	-1,88157	0,05060	$ 18,66	$ 28,12	$ 60,53	$ 120,00	$ 25,00	$ 60,00

Appendix 6: Stochastic oil price forecasting- First 75 price paths

Volatility	17 %
Spot	55,27
Delta	1
t	45
Drift	0,035
Upper band	175
Lower band	14

Parametere	
Vola	0,172
dri	0,035



Predicted oil price																
Trial/t	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Avg.		$ 57,36	$ 59,68	$ 61,30	$ 63,62	$ 66,18	$ 68,96	$ 70,68	$ 72,63	$ 75,52	$ 77,36	$ 79,62	$ 80,92
1	$ 55,27	$ 57,68	$ 63,42	$ 58,27	$ 50,09	$ 51,32	$ 56,58	$ 46,76	$ 30,48	$ 34,32	$ 34,19	$ 39,84	$ 55,33
2	$ 55,27	$ 76,88	$ 53,37	$ 57,86	$ 62,07	$ 64,26	$ 85,28	$ 108,49	$ 79,54	$ 74,10	$ 71,95	$ 61,35	$ 69,63
3	$ 55,27	$ 57,78	$ 67,24	$ 72,63	$ 70,30	$ 66,12	$ 43,40	$ 46,14	$ 61,99	$ 73,59	$ 56,84	$ 57,45	$ 70,10
4	$ 55,27	$ 58,22	$ 65,37	$ 51,71	$ 59,82	$ 62,38	$ 75,30	$ 74,45	$ 72,44	$ 88,38	$ 88,03	$ 102,77	$ 103,94
5	$ 55,27	$ 52,72	$ 62,53	$ 52,40	$ 31,52	$ 38,58	$ 50,83	$ 41,13	$ 42,66	$ 42,38	$ 42,09	$ 55,69	$ 52,98
6	$ 55,27	$ 51,19	$ 59,87	$ 76,71	$ 96,31	$ 107,64	$ 143,55	$ 151,67	$ 146,06	$ 175,00	$ 175,00	$ 175,00	$ 175,00
7	$ 55,27	$ 55,17	$ 55,81	$ 71,16	$ 62,71	$ 75,47	$ 87,66	$ 77,94	$ 86,52	$ 100,27	$ 102,15	$ 107,98	$ 87,37
8	$ 55,27	$ 66,55	$ 55,46	$ 50,75	$ 57,45	$ 67,81	$ 62,64	$ 80,64	$ 56,65	$ 80,58	$ 86,25	$ 105,34	$ 96,64
9	$ 55,27	$ 58,61	$ 58,32	$ 57,48	$ 59,17	$ 74,12	$ 95,00	$ 94,88	$ 139,41	$ 144,30	$ 153,19	$ 164,94	$ 175,00
10	$ 55,27	$ 62,37	$ 67,24	$ 54,56	$ 54,88	$ 49,39	$ 39,34	$ 42,39	$ 50,99	$ 55,23	$ 63,97	$ 57,82	$ 62,49
11	$ 55,27	$ 57,64	$ 65,63	$ 71,88	$ 72,15	$ 69,64	$ 58,91	$ 64,74	$ 71,33	$ 81,71	$ 101,36	$ 118,13	$ 116,90
12	$ 55,27	$ 77,41	$ 91,49	$ 86,52	$ 73,16	$ 67,27	$ 64,45	$ 66,47	$ 79,20	$ 98,19	$ 103,65	$ 114,75	$ 160,17
13	$ 55,27	$ 72,72	$ 72,77	$ 52,01	$ 42,79	$ 58,07	$ 66,54	$ 79,51	$ 89,21	$ 83,16	$ 94,73	$ 126,90	$ 113,07
14	$ 55,27	$ 42,97	$ 43,90	$ 58,86	$ 61,94	$ 61,11	$ 32,08	$ 37,76	$ 45,45	$ 53,18	$ 51,46	$ 62,01	$ 69,62
15	$ 55,27	$ 49,63	$ 51,26	$ 61,31	$ 50,58	$ 53,72	$ 48,09	$ 54,69	$ 53,89	$ 62,60	$ 57,83	$ 59,46	$ 66,98
16	$ 55,27	$ 54,70	$ 67,19	$ 66,66	$ 56,33	$ 61,44	$ 75,97	$ 88,57	$ 84,98	$ 86,84	$ 71,20	$ 67,95	$ 49,63
17	$ 55,27	$ 38,50	$ 41,55	$ 46,68	$ 46,68	$ 52,24	$ 64,69	$ 47,79	$ 47,66	$ 41,05	$ 36,97	$ 36,25	$ 39,78
18	$ 55,27	$ 44,03	$ 36,45	$ 33,66	$ 38,12	$ 35,68	$ 37,03	$ 33,28	$ 37,56	$ 44,80	$ 44,97	$ 45,04	$ 50,02
19	$ 55,27	$ 75,24	$ 53,32	$ 65,10	$ 72,87	$ 62,71	$ 60,44	$ 79,41	$ 84,81	$ 90,26	$ 108,97	$ 134,21	$ 149,26
20	$ 55,27	$ 47,82	$ 49,18	$ 71,02	$ 89,22	$ 94,04	$ 114,55	$ 144,79	$ 144,36	$ 152,31	$ 175,00	$ 175,00	$ 145,22
21	$ 55,27	$ 44,17	$ 47,69	$ 46,62	$ 34,39	$ 33,41	$ 39,08	$ 36,10	$ 38,91	$ 33,25	$ 36,08	$ 38,23	$ 33,53
22	$ 55,27	$ 63,25	$ 59,54	$ 62,36	$ 56,14	$ 79,43	$ 79,02	$ 51,01	$ 64,59	$ 68,42	$ 83,88	$ 89,59	$ 64,66
23	$ 55,27	$ 48,67	$ 48,48	$ 45,28	$ 45,01	$ 44,69	$ 45,68	$ 45,66	$ 44,09	$ 46,08	$ 47,66	$ 46,35	$ 42,94
24	$ 55,27	$ 80,36	$ 114,59	$ 133,11	$ 123,68	$ 165,57	$ 175,00	$ 101,52	$ 85,11	$ 96,45	$ 96,11	$ 109,10	$ 120,80
25	$ 55,27	$ 67,74	$ 59,05	$ 45,76	$ 37,67	$ 34,61	$ 34,12	$ 32,27	$ 29,71	$ 36,91	$ 19,38	$ 17,56	$ 22,87
26	$ 55,27	$ 59,16	$ 59,14	$ 64,56	$ 55,44	$ 67,27	$ 79,51	$ 112,05	$ 116,06	$ 114,10	$ 112,17	$ 134,34	$ 121,82
27	$ 55,27	$ 46,79	$ 46,83	$ 47,08	$ 33,62	$ 29,21	$ 29,16	$ 26,80	$ 24,40	$ 31,20	$ 32,88	$ 36,26	$ 36,55
28	$ 55,27	$ 63,34	$ 71,98	$ 67,58	$ 79,91	$ 105,07	$ 111,49	$ 108,79	$ 115,55	$ 124,95	$ 124,57	$ 137,39	$ 87,08
29	$ 55,27	$ 56,20	$ 45,33	$ 37,78	$ 42,33	$ 53,21	$ 45,23	$ 42,20	$ 36,25	$ 33,99	$ 36,83	$ 33,86	$ 24,69
30	$ 55,27	$ 76,32	$ 70,32	$ 77,34	$ 74,34	$ 53,69	$ 44,46	$ 41,74	$ 35,65	$ 28,52	$ 33,51	$ 39,87	$ 42,89
31	$ 55,27	$ 42,14	$ 38,57	$ 40,56	$ 57,80	$ 76,44	$ 55,11	$ 61,14	$ 46,49	$ 37,40	$ 25,39	$ 30,84	$ 34,02
32	$ 55,27	$ 58,15	$ 57,17	$ 54,18	$ 58,63	$ 79,42	$ 100,27	$ 99,32	$ 122,05	$ 101,83	$ 118,98	$ 120,37	$ 130,76
33	$ 55,27	$ 61,70	$ 65,24	$ 69,18	$ 85,05	$ 90,41	$ 79,24	$ 80,05	$ 64,56	$ 81,66	$ 65,92	$ 73,96	$ 77,32
34	$ 55,27	$ 63,15	$ 78,46	$ 80,36	$ 84,14	$ 92,43	$ 78,90	$ 75,35	$ 87,75	$ 108,36	$ 114,08	$ 78,94	$ 87,77
35	$ 55,27	$ 49,04	$ 46,90	$ 50,27	$ 50,38	$ 62,53	$ 70,58	$ 76,34	$ 79,73	$ 61,58	$ 58,34	$ 68,99	$ 64,19
36	$ 55,27	$ 55,50	$ 58,48	$ 50,73	$ 62,69	$ 57,60	$ 57,96	$ 40,90	$ 37,93	$ 39,19	$ 44,38	$ 42,11	$ 46,68
37	$ 55,27	$ 43,47	$ 37,06	$ 44,92	$ 45,75	$ 50,04	$ 56,29	$ 56,31	$ 44,08	$ 45,64	$ 45,86	$ 43,10	$ 39,93
38	$ 55,27	$ 59,85	$ 53,50	$ 47,55	$ 52,20	$ 62,18	$ 55,77	$ 45,56	$ 53,44	$ 37,60	$ 20,46	$ 21,80	$ 22,60
39	$ 55,27	$ 56,93	$ 60,19	$ 56,70	$ 70,39	$ 50,88	$ 69,27	$ 76,68	$ 60,09	$ 60,48	$ 40,96	$ 38,05	$ 39,23
40	$ 55,27	$ 43,91	$ 48,62	$ 68,34	$ 79,16	$ 80,11	$ 56,51	$ 52,04	$ 46,67	$ 46,98	$ 52,76	$ 61,52	$ 71,97
41	$ 55,27	$ 57,62	$ 65,06	$ 66,56	$ 61,79	$ 66,56	$ 57,93	$ 49,07	$ 59,77	$ 71,88	$ 54,04	$ 51,44	$ 67,98
42	$ 55,27	$ 48,79	$ 43,64	$ 40,49	$ 38,53	$ 48,15	$ 43,83	$ 48,54	$ 42,69	$ 47,82	$ 67,64	$ 61,07	$ 63,57
43	$ 55,27	$ 55,54	$ 67,50	$ 50,62	$ 67,32	$ 75,57	$ 100,43	$ 111,23	$ 111,98	$ 68,08	$ 75,23	$ 65,21	$ 44,62
44	$ 55,27	$ 47,43	$ 44,62	$ 34,71	$ 30,42	$ 39,17	$ 35,17	$ 31,99	$ 31,88	$ 34,86	$ 29,09	$ 31,63	$ 23,04
45	$ 55,27	$ 63,72	$ 60,46	$ 64,66	$ 55,73	$ 47,71	$ 46,14	$ 33,53	$ 36,49	$ 40,30	$ 31,62	$ 32,15	$ 26,50
46	$ 55,27	$ 53,35	$ 61,17	$ 59,08	$ 61,52	$ 67,57	$ 60,65	$ 62,34	$ 66,99	$ 61,25	$ 69,74	$ 62,58	$ 56,59
47	$ 55,27	$ 56,00	$ 65,66	$ 68,18	$ 67,88	$ 67,11	$ 78,29	$ 80,90	$ 83,07	$ 96,03	$ 66,24	$ 88,54	$ 91,41
48	$ 55,27	$ 64,17	$ 64,93	$ 73,93	$ 66,77	$ 76,86	$ 98,55	$ 104,53	$ 86,78	$ 106,22	$ 99,79	$ 93,24	$ 94,46
49	$ 55,27	$ 69,27	$ 96,60	$ 103,60	$ 72,18	$ 74,12	$ 71,10	$ 77,40	$ 64,82	$ 54,12	$ 44,81	$ 41,27	$ 39,59
50	$ 55,27	$ 50,89	$ 53,66	$ 70,22	$ 52,01	$ 59,23	$ 68,25	$ 72,40	$ 57,94	$ 71,65	$ 95,24	$ 96,33	$ 100,81
51	$ 55,27	$ 76,00	$ 88,96	$ 76,82	$ 88,50	$ 77,83	$ 88,97	$ 119,26	$ 92,48	$ 104,81	$ 121,42	$ 135,65	$ 99,78
52	$ 55,27	$ 44,43	$ 38,03	$ 30,31	$ 35,42	$ 42,40	$ 45,12	$ 49,65	$ 49,50	$ 56,82	$ 58,16	$ 51,48	$ 71,13
53	$ 55,27	$ 45,57	$ 49,26	$ 53,77	$ 44,25	$ 49,15	$ 43,29	$ 61,58	$ 44,24	$ 59,23	$ 66,06	$ 67,38	$ 58,28
54	$ 55,27	$ 68,87	$ 48,05	$ 54,50	$ 66,93	$ 55,34	$ 41,87	$ 40,20	$ 37,27	$ 44,26	$ 44,28	$ 52,80	$ 65,99
55	$ 55,27	$ 56,72	$ 46,78	$ 34,02	$ 37,57	$ 45,58	$ 40,31	$ 43,98	$ 50,74	$ 55,66	$ 55,87	$ 54,96	$ 58,57
56	$ 55,27	$ 59,41	$ 56,34	$ 50,81	$ 67,62	$ 68,53	$ 67,44	$ 50,37	$ 43,73	$ 40,08	$ 41,76	$ 57,49	$ 54,52
57	$ 55,27	$ 54,20	$ 54,76	$ 54,67	$ 47,30	$ 60,98	$ 63,00	$ 46,55	$ 41,51	$ 40,96	$ 57,39	$ 44,35	$ 45,25
58	$ 55,27	$ 64,38	$ 74,31	$ 83,50	$ 94,21	$ 103,78	$ 123,85	$ 101,71	$ 112,95	$ 137,87	$ 160,92	$ 142,80	$ 140,33
59	$ 55,27	$ 63,49	$ 64,71	$ 81,17	$ 99,81	$ 108,00	$ 117,84	$ 124,19	$ 142,87	$ 133,78	$ 133,25	$ 100,81	$ 138,23
60	$ 55,27	$ 55,42	$ 70,56	$ 83,40	$ 109,13	$ 96,09	$ 98,99	$ 105,16	$ 92,20	$ 83,37	$ 65,61	$ 63,02	$ 74,96
61	$ 55,27	$ 61,58	$ 78,37	$ 72,47	$ 75,47	$ 87,25	$ 96,58	$ 111,78	$ 118,63	$ 106,32	$ 98,32	$ 111,65	$ 87,32
62	$ 55,27	$ 66,35	$ 64,89	$ 80,60	$ 80,69	$ 81,84	$ 76,94	$ 69,19	$ 73,77	$ 68,69	$ 56,52	$ 54,11	$ 76,84
63	$ 55,27	$ 36,34	$ 54,75	$ 35,96	$ 32,83	$ 35,54	$ 30,98	$ 28,97	$ 25,35	$ 28,58	$ 30,81	$ 28,78	$ 30,54
64	$ 55,27	$ 53,79	$ 62,54	$ 54,22	$ 56,63	$ 45,30	$ 51,11	$ 54,20	$ 72,04	$ 93,77	$ 107,20	$ 140,44	$ 100,29
65	$ 55,27	$ 37,29	$ 38,67	$ 36,42	$ 31,41	$ 36,77	$ 47,14	$ 37,69	$ 43,79	$ 53,18	$ 44,18	$ 35,40	$ 41,14
66	$ 55,27	$ 65,30	$ 53,70	$ 33,76	$ 29,45	$ 29,11	$ 30,27	$ 32,44	$ 29,74	$ 27,71	$ 33,63	$ 35,55	$ 32,14
67	$ 55,27	$ 59,24	$ 45,93	$ 38,47	$ 42,94	$ 37,20	$ 47,51	$ 47,09	$ 46,03	$ 53,51	$ 56,28	$ 54,05	$ 57,06
68	$ 55,27	$ 67,90	$ 73,92	$ 71,09	$ 52,46	$ 66,05	$ 54,56	$ 57,60	$ 55,61	$ 53,38	$ 39,25	$ 42,90	$ 50,11
69	$ 55,27	$ 48,77	$ 55,53	$ 67,48	$ 73,27	$ 73,55	$ 86,32	$ 97,29	$ 104,73	$ 116,65	$ 136,56	$ 154,14	$ 150,41
70	$ 55,27	$ 44,40	$ 41,69	$ 35,47	$ 35,04	$ 40,16	$ 34,25	$ 39,12	$ 46,97	$ 59,31	$ 73,04	$ 70,82	$ 84,55
71	$ 55,27	$ 73,41	$ 85,12	$ 71,28	$ 82,45	$ 92,43	$ 113,31	$ 129,50	$ 134,09	$ 166,45	$ 171,12	$ 147,90	$ 144,86
72	$ 55,27	$ 60,14	$ 51,46	$ 53,35	$ 47,91	$ 45,09	$ 52,91	$ 51,42	$ 52,64	$ 50,77	$ 46,27	$ 51,02	$ 60,12
73	$ 55,27	$ 48,07	$ 44,89	$ 53,45	$ 40,03	$ 42,96	$ 38,17	$ 27,24	$ 33,46	$ 34,08	$ 28,64	$ 31,55	$ 31,98
74	$ 55,27	$ 48,16	$ 60,38	$ 50,28	$ 46,03	$ 47,30	$ 48,05	$ 53,25	$ 42,54	$ 54,21	$ 57,97	$ 67,56	$ 70,41
75	$ 55,27	$ 55,19	$ 61,27	$ 54,68	$ 50,86	$ 64,87	$ 57,61	$ 67,69	$ 59,78	$ 64,03	$ 62,93	$ 54,23	$ 60,13

2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
$ 82,57	$ 84,19	$ 85,27	$ 86,55	$ 87,58	$ 89,27	$ 89,46	$ 90,85	$ 93,16	$ 94,28	$ 95,76	$ 96,42	$ 96,76	$ 98,04	$ 99,33
$ 64,35	$ 56,36	$ 76,76	$ 69,66	$ 70,89	$ 55,85	$ 57,65	$ 60,67	$ 52,06	$ 38,85	$ 31,20	$ 37,96	$ 41,98	$ 41,94	$ 67,10
$ 97,66	$ 73,01	$ 92,29	$ 111,37	$ 105,81	$ 102,43	$ 104,12	$ 117,47	$ 97,21	$ 111,27	$ 87,86	$ 82,47	$ 58,79	$ 59,25	$ 52,92
$ 81,69	$ 70,11	$ 100,97	$ 101,87	$ 69,41	$ 60,38	$ 65,96	$ 55,35	$ 75,31	$ 94,33	$ 91,47	$ 66,42	$ 69,26	$ 51,27	$ 58,99
$ 157,71	$ 131,01	$ 150,51	$ 163,81	$ 152,84	$ 145,36	$ 149,98	$ 174,56	$ 175,00	$ 148,87	$ 134,78	$ 168,23	$ 175,00	$ 175,00	$ 175,00
$ 59,52	$ 48,18	$ 41,20	$ 46,00	$ 50,68	$ 53,77	$ 41,15	$ 37,08	$ 32,85	$ 29,84	$ 38,58	$ 48,15	$ 55,60	$ 53,29	$ 66,43
$ 159,16	$ 129,09	$ 126,86	$ 109,22	$ 113,20	$ 114,80	$ 138,76	$ 132,57	$ 155,24	$ 156,86	$ 133,63	$ 121,04	$ 117,68	$ 113,02	$ 120,48
$ 68,52	$ 74,62	$ 101,77	$ 81,33	$ 65,18	$ 52,73	$ 55,26	$ 64,35	$ 69,35	$ 68,17	$ 72,92	$ 68,31	$ 81,66	$ 91,24	$ 68,12
$ 110,05	$ 103,64	$ 112,14	$ 122,49	$ 148,37	$ 175,00	$ 175,00	$ 174,20	$ 175,00	$ 157,14	$ 135,16	$ 175,00	$ 175,00	$ 175,00	$ 135,00
$ 175,00	$ 175,00	$ 134,47	$ 153,99	$ 147,21	$ 170,39	$ 175,00	$ 152,32	$ 145,78	$ 154,70	$ 152,09	$ 155,76	$ 175,00	$ 161,49	$ 175,00
$ 78,84	$ 95,59	$ 107,41	$ 79,94	$ 85,84	$ 102,03	$ 83,95	$ 95,61	$ 97,44	$ 119,53	$ 165,89	$ 149,41	$ 175,00	$ 175,00	$ 175,00
$ 94,58	$ 110,90	$ 116,38	$ 130,18	$ 118,81	$ 128,39	$ 160,74	$ 172,04	$ 161,21	$ 158,57	$ 154,77	$ 175,00	$ 136,02	$ 97,91	$ 113,63
$ 154,92	$ 175,00	$ 175,00	$ 175,00	$ 168,47	$ 153,64	$ 175,00	$ 175,00	$ 158,52	$ 155,20	$ 135,42	$ 117,97	$ 107,23	$ 142,45	$ 118,98
$ 76,92	$ 55,33	$ 50,36	$ 46,46	$ 56,59	$ 57,69	$ 68,77	$ 75,75	$ 71,76	$ 70,48	$ 85,07	$ 69,43	$ 74,02	$ 65,39	$ 55,95
$ 60,11	$ 81,62	$ 76,48	$ 78,16	$ 94,73	$ 131,69	$ 122,93	$ 137,06	$ 98,44	$ 93,17	$ 120,24	$ 118,39	$ 101,27	$ 98,12	$ 89,97
$ 67,16	$ 59,10	$ 60,45	$ 72,19	$ 52,62	$ 64,45	$ 76,25	$ 78,08	$ 79,10	$ 70,29	$ 75,11	$ 73,99	$ 80,94	$ 97,56	$ 125,63
$ 64,96	$ 78,88	$ 75,65	$ 92,00	$ 46,86	$ 45,74	$ 42,31	$ 39,87	$ 37,96	$ 48,52	$ 49,80	$ 60,49	$ 61,82	$ 75,72	$ 81,39
$ 41,86	$ 47,14	$ 48,37	$ 39,62	$ 41,33	$ 38,62	$ 32,32	$ 32,44	$ 39,53	$ 56,51	$ 53,68	$ 64,52	$ 68,26	$ 81,57	$ 105,93
$ 70,36	$ 82,82	$ 106,69	$ 107,54	$ 110,02	$ 114,10	$ 127,84	$ 115,32	$ 125,38	$ 116,92	$ 113,38	$ 126,35	$ 114,60	$ 90,90	$ 90,80
$ 145,45	$ 164,34	$ 156,40	$ 175,00	$ 175,00	$ 167,27	$ 162,97	$ 171,62	$ 138,29	$ 168,17	$ 161,62	$ 175,00	$ 175,00	$ 169,22	$ 175,00
$ 145,57	$ 133,32	$ 115,99	$ 107,11	$ 135,46	$ 96,68	$ 103,52	$ 117,62	$ 99,25	$ 102,64	$ 117,97	$ 110,37	$ 109,82	$ 121,44	$ 134,39
$ 42,09	$ 55,89	$ 48,78	$ 51,22	$ 58,77	$ 70,51	$ 80,89	$ 76,33	$ 71,56	$ 94,81	$ 99,07	$ 117,59	$ 124,61	$ 166,69	$ 126,18
$ 60,26	$ 57,55	$ 60,92	$ 53,05	$ 58,39	$ 32,15	$ 40,54	$ 29,03	$ 27,43	$ 32,43	$ 32,28	$ 41,95	$ 38,15	$ 41,88	$ 51,97
$ 43,92	$ 42,69	$ 33,11	$ 35,94	$ 28,33	$ 18,39	$ 14,00	$ 16,20	$ 16,30	$ 15,31	$ 14,00	$ 14,00	$ 15,53	$ 14,54	$ 14,71
$ 97,54	$ 115,06	$ 130,25	$ 145,90	$ 129,51	$ 173,09	$ 175,00	$ 175,00	$ 175,00	$ 151,52	$ 160,95	$ 162,60	$ 175,00	$ 175,00	$ 175,00
$ 21,08	$ 24,07	$ 29,15	$ 28,30	$ 26,27	$ 27,83	$ 27,61	$ 20,65	$ 19,58	$ 24,43	$ 26,05	$ 30,27	$ 29,71	$ 25,44	$ 26,14
$ 107,14	$ 99,59	$ 102,81	$ 126,15	$ 115,26	$ 110,21	$ 105,54	$ 126,84	$ 115,58	$ 129,84	$ 110,39	$ 105,69	$ 101,56	$ 121,11	$ 114,02
$ 42,86	$ 37,74	$ 42,95	$ 45,17	$ 50,58	$ 59,55	$ 75,51	$ 72,10	$ 68,88	$ 82,54	$ 67,94	$ 70,06	$ 85,87	$ 86,70	$ 90,02
$ 104,37	$ 97,21	$ 100,57	$ 107,95	$ 131,96	$ 142,47	$ 112,18	$ 124,62	$ 139,45	$ 117,27	$ 110,31	$ 126,44	$ 137,50	$ 113,56	$ 113,52
$ 30,91	$ 35,21	$ 27,87	$ 32,06	$ 32,71	$ 33,20	$ 35,36	$ 48,51	$ 52,16	$ 53,39	$ 54,25	$ 48,66	$ 47,01	$ 39,25	$ 46,27
$ 55,47	$ 58,35	$ 47,97	$ 54,99	$ 61,40	$ 60,92	$ 45,28	$ 44,24	$ 57,85	$ 76,86	$ 87,66	$ 94,73	$ 112,00	$ 146,10	$ 136,03
$ 39,83	$ 49,94	$ 37,96	$ 43,53	$ 39,09	$ 47,79	$ 57,40	$ 55,45	$ 39,02	$ 51,62	$ 60,70	$ 69,47	$ 78,58	$ 51,25	$ 62,08
$ 127,05	$ 132,09	$ 149,90	$ 130,01	$ 137,90	$ 141,64	$ 161,78	$ 160,25	$ 135,92	$ 102,60	$ 124,03	$ 139,30	$ 143,62	$ 131,69	$ 131,44
$ 68,85	$ 69,18	$ 83,91	$ 80,29	$ 55,78	$ 53,83	$ 57,55	$ 64,67	$ 50,23	$ 61,78	$ 58,91	$ 76,58	$ 62,28	$ 89,88	$ 98,31
$ 90,42	$ 81,28	$ 65,85	$ 53,12	$ 50,67	$ 51,45	$ 52,05	$ 52,85	$ 61,54	$ 60,56	$ 51,09	$ 53,82	$ 52,44	$ 61,48	$ 56,94
$ 66,37	$ 68,16	$ 85,70	$ 97,15	$ 116,83	$ 117,02	$ 134,59	$ 122,55	$ 156,75	$ 105,11	$ 97,02	$ 80,43	$ 87,51	$ 92,25	$ 125,41
$ 39,01	$ 44,68	$ 44,13	$ 31,84	$ 44,07	$ 68,84	$ 60,89	$ 60,62	$ 74,67	$ 77,71	$ 87,92	$ 76,35	$ 97,30	$ 90,14	$ 121,29
$ 42,35	$ 45,87	$ 22,51	$ 17,01	$ 15,67	$ 15,04	$ 19,44	$ 16,26	$ 15,88	$ 16,31	$ 17,25	$ 15,63	$ 16,13	$ 22,65	$ 22,88
$ 23,25	$ 30,48	$ 36,59	$ 44,22	$ 46,19	$ 43,35	$ 49,84	$ 43,38	$ 42,95	$ 38,65	$ 51,95	$ 58,95	$ 62,58	$ 51,24	$ 48,16
$ 45,43	$ 52,65	$ 67,06	$ 77,01	$ 94,80	$ 115,79	$ 112,34	$ 99,12	$ 99,08	$ 80,85	$ 113,09	$ 115,53	$ 130,96	$ 134,81	$ 161,76
$ 67,05	$ 59,26	$ 74,36	$ 79,96	$ 99,23	$ 124,53	$ 149,39	$ 136,30	$ 124,23	$ 98,79	$ 97,44	$ 88,18	$ 64,75	$ 73,59	$ 80,68
$ 48,06	$ 51,05	$ 40,56	$ 41,24	$ 49,98	$ 48,88	$ 49,90	$ 67,84	$ 74,43	$ 75,53	$ 92,72	$ 98,73	$ 103,58	$ 79,10	$ 103,62
$ 61,76	$ 82,11	$ 81,60	$ 57,57	$ 32,68	$ 34,58	$ 36,62	$ 31,36	$ 33,54	$ 31,74	$ 35,92	$ 32,05	$ 27,45	$ 28,53	$ 23,14
$ 52,68	$ 56,36	$ 80,12	$ 80,80	$ 97,12	$ 95,07	$ 98,42	$ 125,03	$ 110,36	$ 109,89	$ 123,86	$ 149,32	$ 155,69	$ 175,00	$ 149,96
$ 29,12	$ 27,41	$ 24,53	$ 27,45	$ 30,85	$ 31,44	$ 38,89	$ 35,27	$ 46,80	$ 48,21	$ 58,46	$ 66,22	$ 68,00	$ 70,09	$ 83,10
$ 24,67	$ 25,16	$ 25,71	$ 24,03	$ 22,85	$ 17,48	$ 16,12	$ 18,33	$ 25,32	$ 24,63	$ 24,34	$ 29,16	$ 32,01	$ 41,19	$ 41,64
$ 48,74	$ 53,06	$ 74,81	$ 83,55	$ 108,80	$ 95,53	$ 94,47	$ 103,39	$ 131,42	$ 163,14	$ 133,36	$ 155,17	$ 175,00	$ 172,55	$ 175,00
$ 87,58	$ 95,99	$ 101,27	$ 105,83	$ 120,99	$ 143,57	$ 124,58	$ 154,72	$ 162,03	$ 175,00	$ 171,19	$ 139,30	$ 155,37	$ 170,42	$ 175,00
$ 108,17	$ 100,58	$ 74,80	$ 70,56	$ 81,39	$ 95,68	$ 89,55	$ 68,66	$ 62,85	$ 57,57	$ 57,14	$ 58,53	$ 69,84	$ 79,77	$ 74,63
$ 34,20	$ 25,55	$ 22,25	$ 21,41	$ 24,33	$ 24,39	$ 23,22	$ 24,72	$ 32,95	$ 22,33	$ 23,27	$ 28,90	$ 29,08	$ 22,90	$ 21,53
$ 102,08	$ 87,48	$ 62,01	$ 66,95	$ 54,91	$ 50,69	$ 52,34	$ 66,87	$ 62,49	$ 58,84	$ 61,21	$ 79,66	$ 79,40	$ 95,24	$ 103,58
$ 127,10	$ 133,70	$ 163,98	$ 131,35	$ 163,51	$ 175,00	$ 173,12	$ 175,00	$ 175,00	$ 175,00	$ 175,00	$ 175,00	$ 129,99	$ 156,47	$ 113,32
$ 78,42	$ 73,21	$ 70,35	$ 74,49	$ 74,29	$ 101,73	$ 96,99	$ 85,69	$ 93,40	$ 80,65	$ 88,32	$ 81,82	$ 108,00	$ 99,61	$ 117,24
$ 56,74	$ 64,32	$ 55,84	$ 82,93	$ 100,98	$ 105,68	$ 104,99	$ 105,94	$ 148,06	$ 153,60	$ 161,21	$ 175,00	$ 127,42	$ 125,04	$ 117,08
$ 83,44	$ 75,76	$ 75,29	$ 96,92	$ 103,33	$ 96,57	$ 103,91	$ 109,82	$ 110,66	$ 133,68	$ 148,01	$ 171,21	$ 164,83	$ 175,00	$ 175,00
$ 69,78	$ 60,96	$ 82,41	$ 92,28	$ 119,72	$ 72,55	$ 94,06	$ 101,94	$ 102,82	$ 109,86	$ 88,41	$ 76,78	$ 111,46	$ 105,63	$ 116,34
$ 57,93	$ 62,21	$ 57,31	$ 76,30	$ 84,56	$ 110,29	$ 105,01	$ 146,21	$ 164,51	$ 110,96	$ 111,89	$ 116,02	$ 97,60	$ 113,18	$ 118,24
$ 55,39	$ 62,45	$ 67,89	$ 63,89	$ 69,27	$ 77,73	$ 96,50	$ 75,41	$ 72,80	$ 78,90	$ 63,86	$ 66,36	$ 68,17	$ 63,79	$ 43,39
$ 133,94	$ 126,77	$ 152,32	$ 175,00	$ 174,97	$ 175,00	$ 175,00	$ 131,45	$ 134,79	$ 140,48	$ 126,09	$ 155,47	$ 172,96	$ 175,00	$ 175,00
$ 163,12	$ 163,14	$ 151,34	$ 138,15	$ 175,00	$ 175,00	$ 175,00	$ 148,94	$ 157,94	$ 175,00	$ 175,00	$ 162,03	$ 138,90	$ 159,19	$ 175,00
$ 65,75	$ 73,28	$ 66,86	$ 74,21	$ 64,13	$ 71,35	$ 75,03	$ 89,29	$ 109,00	$ 115,73	$ 111,56	$ 110,79	$ 130,18	$ 142,12	$ 138,64
$ 93,71	$ 90,07	$ 104,80	$ 141,81	$ 155,27	$ 175,00	$ 175,00	$ 139,19	$ 129,57	$ 118,01	$ 148,95	$ 147,60	$ 143,80	$ 116,43	$ 77,72
$ 101,91	$ 128,29	$ 111,23	$ 144,07	$ 175,00	$ 165,62	$ 124,77	$ 145,84	$ 138,84	$ 167,14	$ 175,00	$ 175,00	$ 175,00	$ 175,00	$ 175,00
$ 35,01	$ 43,54	$ 48,15	$ 41,07	$ 50,76	$ 47,08	$ 52,25	$ 52,87	$ 57,98	$ 73,03	$ 76,31	$ 90,52	$ 100,80	$ 117,22	$ 154,50
$ 117,30	$ 118,39	$ 145,56	$ 175,00	$ 158,37	$ 175,00	$ 143,57	$ 175,00	$ 133,83	$ 117,77	$ 149,44	$ 122,69	$ 155,58	$ 146,49	$ 175,00
$ 46,46	$ 49,72	$ 41,51	$ 35,85	$ 23,98	$ 24,58	$ 29,64	$ 35,47	$ 36,27	$ 38,31	$ 46,20	$ 44,92	$ 52,03	$ 57,03	$ 71,46
$ 26,82	$ 27,10	$ 33,24	$ 40,81	$ 43,54	$ 53,72	$ 40,50	$ 48,05	$ 53,84	$ 53,65	$ 60,63	$ 64,33	$ 68,43	$ 67,33	$ 49,81
$ 57,78	$ 66,51	$ 54,85	$ 78,07	$ 91,93	$ 101,32	$ 104,86	$ 93,52	$ 104,44	$ 120,24	$ 147,90	$ 164,31	$ 175,00	$ 175,00	$ 171,21
$ 63,68	$ 67,51	$ 82,87	$ 77,66	$ 52,89	$ 72,16	$ 74,06	$ 82,73	$ 65,59	$ 66,52	$ 66,12	$ 59,13	$ 59,48	$ 70,90	$ 60,87
$ 98,15	$ 107,91	$ 113,73	$ 108,46	$ 130,62	$ 110,57	$ 141,63	$ 159,18	$ 175,00	$ 175,00	$ 175,00	$ 175,00	$ 175,00	$ 175,00	$ 93,62
$ 77,36	$ 76,38	$ 82,36	$ 71,80	$ 68,11	$ 64,65	$ 58,82	$ 67,66	$ 78,70	$ 84,20	$ 110,99	$ 80,76	$ 90,33	$ 90,28	$ 84,92
$ 84,32	$ 85,72	$ 64,60	$ 67,29	$ 66,23	$ 85,40	$ 72,00	$ 72,51	$ 81,40	$ 86,62	$ 114,90	$ 99,22	$ 119,95	$ 134,68	$ 155,12
$ 64,09	$ 53,50	$ 42,25	$ 38,51	$ 42,45	$ 47,37	$ 64,52	$ 59,95	$ 59,37	$ 50,16	$ 57,29	$ 69,22	$ 71,26	$ 60,40	$ 46,80
$ 36,59	$ 40,29	$ 47,87	$ 37,45	$ 34,54	$ 33,23	$ 35,30	$ 30,55	$ 31,81	$ 25,78	$ 22,87	$ 23,83	$ 31,34	$ 31,54	$ 39,28
$ 81,59	$ 97,31	$ 103,53	$ 118,50	$ 170,51	$ 171,21	$ 175,00	$ 175,00	$ 175,00	$ 169,42	$ 153,89	$ 155,61	$ 144,08	$ 169,99	$ 175,00
$ 68,48	$ 66,89	$ 74,26	$ 51,84	$ 65,91	$ 64,83	$ 83,54	$ 80,86	$ 101,99	$ 88,62	$ 64,76	$ 47,92	$ 56,03	$ 49,99	$ 63,37
$ 41,00	$ 38,61	$ 56,09	$ 65,58	$ 73,78	$ 94,17	$ 99,28	$ 112,64	$ 106,32	$ 87,60	$ 78,43	$ 68,68	$ 89,64	$ 105,53	$ 79,95
$ 74,02	$ 71,81	$ 90,52	$ 73,76	$ 73,93	$ 115,71	$ 89,13	$ 68,10	$ 72,81	$ 53,00	$ 53,61	$ 52,83	$ 71,11	$ 72,00	$ 69,46
$ 77,25	$ 77,03	$ 76,33	$ 83,29	$ 72,88	$ 69,82	$ 83,13	$ 106,33	$ 122,04	$ 131,60	$ 156,06	$ 175,00	$ 175,00	$ 138,82	$ 147,62
$ 68,46	$ 50,83	$ 49,45	$ 53,29	$ 42,16	$ 44,48	$ 50,36	$ 63,00	$ 64,97	$ 57,85	$ 46,08	$ 60,24	$ 57,08	$ 53,11	$ 76,29
$ 139,25	$ 137,43	$ 127,58	$ 125,21	$ 125,41	$ 115,13	$ 126,65	$ 138,98	$ 113,71	$ 134,11	$ 105,81	$ 115,92	$ 117,58	$ 139,92	$ 104,38
$ 98,43	$ 77,87	$ 98,99	$ 112,52	$ 122,35	$ 142,53	$ 143,54	$ 160,20	$ 161,21	$ 162,24	$ 175,00	$ 175,00	$ 152,13	$ 115,51	$ 113,73
$ 108,90	$ 119,36	$ 119,82	$ 126,03	$ 147,89	$ 171,32	$ 175,00	$ 175,00	$ 175,00	$ 175,00	$ 175,00	$ 175,00	$ 156,26	$ 175,00	$ 171,79
$ 83,98	$ 73,43	$ 60,77	$ 72,95	$ 71,45	$ 83,39	$ 75,72	$ 79,87	$ 96,52	$ 83,46	$ 101,08	$ 90,42	$ 103,29	$ 108,03	$ 107,62
$ 74,53	$ 85,44	$ 75,59	$ 65,63	$ 91,88	$ 82,12	$ 76,26	$ 81,27	$ 91,57	$ 94,19	$ 119,47	$ 113,11	$ 125,49	$ 78,39	$ 75,27

Appendix 7: Glossary NOR-ENG financial statements

Glossary

Income statement	
Petroliumsinntekter	Petroleum revenue
Andre driftsinntekter	Other operating revenue
Driftsinntekter	Operating revenues
Utforskningskostnader	Exploration expenses
Produksjonskostnader	Production costs
Lønn og lønnsrelaterte kostnader	Payroll expenses
Avskrivninger	Depreciation and amortization
Nedskrivninger	Impairments
Andre driftskostnader	Other operating expenses
Driftskostnader	Operating expenses
Driftsresultat	Operating profit (EBIT)
Renteinntekter	Interest income
Annenfinansinntekt	Other financial income
Rentekostnader	Interest expenses
Annen finanskostnad	Other financial expenses
Nettofinanskostnader (-)/inntekter (+)	Net financing costs (-)/Revenues (+)
Resultat før skattekostnad	Earnings before taxes (EBT)
Skattekostnad (+)/Skatteinntekt (-)	Tax
Årets resultat	Net income
Tidsveiet gjennomsnittlig antall aksjer i perioden	Time weighted number of shares outstanding
Tidsveiet gjennomsnittlig antall aksjer i perioden utvannet	Time weighted number of shares outstanding -diluted
Resultat etter skatt per aksjer (justert for splitt)	Profit after tax per share
Resultat etter skatt per aksjer (justert for splitt)- utvannet	Profit after tax per share-diluted

Balance sheet	
Eiendeler	Assets
Immaterielle eiendeler	Intangible assets
Goodwill	Goodwill
Aktiverte leteutgifter	Capitalized exploration expenditures
Andre immaterialle eiendeler	Other intangible assets
Utsatt skattefordel	Deferred tax assets
Varige driftsmidler	Property, plant and equipment
Finansielle anleggsmidler	Financial assets
Langsiktige fordringer	Long-term receivables
Andre langsiktige eiendeler	Other non-current assets
Sum anleggsmidler	Total non-current assets
Varer	Inventories
Varelager	Inventories
Fordringer	Receivables

Kundefordringer	Account receivables
Andre kortsiktige fordringer	Other short-term receivables
Markedsbaserte finansielle plasseringer	Other current financial assets
Beregnet skatt til utbetaling	Tax receivables
Betalingsmidler	Cash and cash equivalents
Betalingsmidler	Cash and cash equivalents
Sum omløpsmidler	Total current assets
Sum eiendeler	Total assets
Egenkapital og gjeld	Equity and liabilities
Inskutt egenkapital	Paid-in capital
Aksjekapital	Share capital
Overkursfond	Share premium
Annen innskutt egenkapital	Other paid in capital
Sum innskutt egenkapital	Total paid-in capital
Annen egenkapital	Other equity
Sum egenkapital	Total Equity
Avsetning for forpliktelser	Provisions for liabilities
Pensjonsforpliktelser	Pension obligations
Utsatt skatt	Deferred tax
Fjernings- og nedsteningsforpliktelser	Abandonment provision
Avsetning for andre forpliktelser	Provisions for other liabilities
Langsiktig gjeld	Long-term debt
Obligasjonslån	Bonds
Andre rentebærende gjeld	Other interest bearing debt
Derivater	Long-term derivatives
Kortsiktig gjeld	Current liabilities
Kortsiktig lån	Short-term loans
Leverandørgjeld	Trade creditors
Betalbar skatt	Tax payable
Kortsiktige derivater	Short-term derivatives
Utsatt inntekt	Deferred revenue
Offentlige trekk og avgifter	Social security and other indirect taxes
Fjernings- og nedstengningsforpliktelser	Abandonment provisions
Annen kortsiktig gjeld	Other current liabilities
Sum gjeld og avsetning for forpliktelser	Total liabilities
Sum egenkapital og gjeld	Total Equity and liabilities

Appendix 8: Financial statements of DETNOR

Det norske oljeselskap AS Income statement (NOK 1000)	2009	2010	2011	2012	2013	2014
Petroleum revenue	255 135	362 115	361 774	325 093	933 162	3 055 486
Other operating revenue	9 882	3 855	75 768	7 351	10 719	387 390
Operating revenues	**265 017**	**365 970**	**437 542**	**332 444**	**943 881**	**3 442 876**
Exploration expenses	1 186 084	1 777 337	1 012 191	1 609 314	1 637 063	1 168 646
Production costs	144 399	154 960	181 888	210 962	249 619	495 068
Payroll expenses	11 827	14 763	31 732	11 000	38 025	- 126 389
Depreciation and amortization	53 469	159 049	78 518	111 687	470 529	1 188 492
Impairments	213 304	170 508	150 990	2 149 653	666 135	2 569 155
Other operating expenses	91 438	88 977	60 721	82 799	109 886	364 830
Operating expenses	**1 700 521**	**2 365 594**	**1 516 040**	**4 175 415**	**3 171 257**	**5 659 801**
Operating profit (EBIT)	- 1 435 504	- 1 999 624	- 1 078 498	- 3 842 971	- 2 227 376	- 2 216 925
Interest income	49 589	51 255	69 900	54 997	40 750	51 981
Other financial income	57 618	89 431	26 825	68 399	80 567	144 136
Interest expenses	26 104	218 647	305 969	128 250	301 834	621 820
Other financial expenses	45 454	105 844	23 111	101 050	137 435	143 105
Net financing costs (-)/Revenues (+)	**35 649**	**- 183 805**	**- 232 355**	**- 105 904**	**- 317 952**	**- 568 808**
Earnings before taxes (EBT)	- 1 399 855	- 2 183 429	- 1 310 853	- 3 948 875	- 2 545 328	- 2 785 733
Tax	- 879 159	- 1 493 075	- 940 594	- 2 991 624	- 1 996 727	- 715 562
Net income	**- 520 696**	**- 690 354**	**- 370 259**	**- 957 251**	**- 548 601**	**- 2 070 171**
Time weighted number of shares outstanding	91 604 262	111 111 111	115 058 944	128 649 729	140 707 363	165 811 098
Time weighted number of shares outstanding -diluted	91 604 262	111 111 111	115 058 944	128 649 729	140 707 363	165 811 098
Profit after tax per share	- 5,68	- 6,21	- 3,22	- 7,44	- 3,90	- 1,68
Profit after tax per share-diluted	- 5,68	- 6,21	- 3,22	- 7,44	- 3,90	- 1,68
Effective tax rate	62,8%	68,4%	71,8%	75,8%	78,4%	25,7%

Det norske oljeselskap AS Balance sheet (NOK 1000)	31.12.09	31.12.10	31.12.11	31.12.12	31.12.13	31.12.14
Assets						
Intangible assets						
Goodwill	697 938	596 506	525 870	387 551	321 120	8 800 953
Capitalized exploration expenditures	893 467	1 802 234	2 387 360	2 175 492	2 056 100	2 162 734
Other intangible assets	1 320 484	1 107 693	905 726	665 542	646 299	4 811 606
Deferred tax assets	-	-	-	-	630 423	-
Property, plant and equipment						
Property, plant and equipment	447 553	406 834	902 071	1 993 269	2 657 566	18 906 159
Financial assets						
Long-term receivables	240 442	106 269	-	31 995	125 432	65 256
Other non-current assets	17 965	18 210	18 423	193 934	285 399	26 684
Total non-current assets	**3 617 849**	**4 037 746**	**4 739 450**	**5 447 783**	**6 722 339**	**34 773 392**
Inventories						
Inventories	14 655	10 249	37 039	21 209	40 880	185 467
Receivables						
Account receivables	30 414	60 719	146 188	101 839	134 221	1 382 851
Other short-term receivables	393 669	448 221	532 538	342 566	499 419	1 368 990
Other current financial assets	21 995	28 601	21 750	23 138	24 075	24 392
Tax receivables	2 060 124	2 344 753	1 397 420	1 273 737	1 411 251	-
Cash and cash equivalents						
Cash and cash equivalents	1 574 287	789 330	841 599	1 154 182	1 709 166	2 197 034
Total current assets	**4 095 144**	**3 681 873**	**2 976 534**	**2 916 670**	**3 819 012**	**5 158 734**
Total assets	**7 712 992**	**7 719 619**	**7 715 984**	**8 364 453**	**10 541 351**	**39 932 125**
Equity and liabilities						
Paid-in capital						
Share capital	111 111	111 111	127 916	140 707	140 707	278 334
Share premium	1 167 312	1 167 312	2 083 271	3 089 542	3 089 542	7 635 949
Other paid in capital	33 463	17 715	-	-	-	-
Total paid-in capital	1 311 886	1 296 138	2 211 187	3 230 249	3 230 249	7 914 282
Other equity	2 538 638	1 864 035	1 465 364	505 926	- 41 780	- 3 081 361
Total Equity	**3 850 524**	**3 160 173**	**3 676 551**	**3 736 175**	**3 188 469**	**4 832 921**
Provisions for liabilities						
Pension obligations	19 914	32 070	46 944	65 258	66 512	14 988
Deferred tax	1 173 477	1 757 481	2 042 051	126 604	-	9 540 009
Abandonment provision	224 472	268 227	285 201	798 057	828 529	3 584 468
Provisions for other liabilities	5 588	2 429	1 643	647	780	89 322
Long-term debt						
Bonds	390 600	-	587 011	589 078	2 473 582	1 877 370
Other interest bearing debt	-	-	-	1 299 733	2 036 907	15 109 221
Long-term derivatives	21 805	-	-	45 971	49 453	41 872
Current liabilities						
Short-term loans	1 090 258	1 532 320	379 550	567 075	478 050	-
Trade creditors	261 940	219 984	274 308	258 596	452 435	1 129 191
Tax payable	-	-	18 568	24 536	23 579	50 119
Short-term derivatives	-	-	-	-	-	1 402 407
Deferred revenue	53 001	-	-	-	-	-
Social security and other indirect taxes	22 618	20 013	-	-	-	187 069
Abandonment provisions	-	-	-	-	147 375	42 481
Other current liabilities	598 795	726 921	404 156	852 722	795 680	2 030 679
Total liabilities	**3 862 468**	**4 559 446**	**4 039 432**	**4 628 278**	**7 352 882**	**35 099 203**
Total Equity and liabilities	**7 712 992**	**7 719 619**	**7 715 984**	**8 364 453**	**10 541 351**	**39 932 124**

Det norske oljeselskap AS Kontantstrømoppstilling (NOK 1000)	2009	2010	2011	2012	2013	2014
Kontantstrømmer fra operasjonelle aktiviteter						
Resultat før skattekostnad	- 1 399 855	- 2 183 427	- 1 390 877	- 3 948 877	- 2 545 327	
Betalte skatter i perioden	-	- 1 390	- 5 489	-	- 26 585	
Periodens mottatte skattefordring	199 710	2 048 448	2 323 865	1 443 140	1 318 430	
Avskrivninger	53 469	159 049	78 518	111 687	470 529	
Nedskrivninger	213 304	160 488	197 673	2 149 653	666 135	
Kalkulatorisk rente i nåverdiberegningen av fjernforpliktelser	-	101 575	- 10 583	17 519	42 765	
Tilbakeføring av skatteelement mindreverdi purchase price allocation (PPA)	-	- 79 260	- 17 988	- 57 000	-	
Tap ved salg av lisensandeler	-	19 724	-	13 460	734	
Verdiendring på derivat til virkelig verdi over resultatet	-	- 27 838	6 033	44 847	3 174	
Amortisering av rente- og etableringskostnader	-	51 518	59 439	39 576	88 458	
Kostnadsføring av balanseførte letebrønner	784 027	1 239 257	534 640	1 116 403	1 150 541	
Endring i fjernings- og nedstengingsplikter	10 514	12 358	17 009	-	-	
Endring i lager, kreditorer og debitorer	125 178	- 51 264	- 57 935	44 466	141 786	
Endring i netto arbeidskapital	582 187	82 533	- 281 653	444 144	- 394 934	
Netto kontantstrøm fra operasjonelle aktiviteter	**568 534**	**1 531 771**	**1 452 652**	**1 419 018**	**915 706**	**1 948 937**
Kontantstrøm fra investeringsaktiviteter						
Utbetaling ved fjerning og nedstenging av oljefelt	-	- 765	- 35	- 678	- 36 739	
Utbetaling ved investering i varige driftsmidler	- 62 299	- 102 915	- 388 160	- 2 874 627	- 1 495 709	
Utbetaling ved investering i aktiverte leteutgifter og andre immaterielle eiendeler	- 1 442 455	- 2 162 660	- 1 440 812	- 1 114 277	- 1 358 941	
Salgssum ved salg av varige driftsmidler og licenser	320	8 700	110 574	414 335	86 472	
Netto kontantstrøm fra investeringsaktiviteter	**- 1 504 434**	**- 2 257 640**	**- 1 718 433**	**- 3 575 247**	**- 2 804 917**	**- 16 806 404**
Kontantstrøm fra finansieringsaktiviteter						
Emisjon	- 6 000	-	481 164	1 019 063	-	
Salg av egne konvertible obligasjoner	-	-	144 433	-	-	
Nedbetaling av kortsiktig gjeld	-	- 61 350	- 16 145	- 2 000 000	- 1 500 000	
Nedbetaling av langsiktig gjeld	-	- 2 613 075	- 2 539 850	- 600 000	- 2 185 102	
Opptak av langsiktig gjeld	-	2 615 337	2 248 448	1 849 749	4 729 297	
Opptak av kortsiktig gjeld	600 000	-	-	2 200 000	1 400 000	
Netto kontantstrøm fra finansieringsaktiviteter	**594 000**	**- 59 088**	**318 050**	**2 468 812**	**2 444 195**	**15 008 248**
Netto endring i betalingsmidler	- 341 900	- 784 957	52 269	312 583	554 984	113 484
Beholdning av betalingsmidler ved periodens begynnelse	1 916 187	1 574 287	789 330	841 599	1 154 182	2 083 550
Beholdning ved periodens slutt	1 574 287	789 330	841 599	1 154 182	1 709 166	2 197 034
Oppgitt	1 574 287	789 330	841 599	1 154 182	1 709 166	2 197 034
Diff	-	-	-	-	-	-

Appendix 9: Adjustments to the financial statements

Det norske oljeselskap AS	2009	2010	2011	2012	2013	2014
Other operating expenses	91 438	88 977	60 721	82 799	109 886	364 830
Where consulting fees	-	-	-	-	-	240 622
Other operating expenses after adjustment	131 438	128 977	100 721	122 799	149 886	164 208

Det norske oljeselskap AS	2009	2010	2011	2012	2013	2014
Amortization	213 304	170 508	150 990	2 149 653	666 135	2 569 155
Transitory imparments				1 963 351		2 392 647
Amortization after adjustment	**213 304**	**170 508**	**150 990**	**186 302**	**666 135**	**176 508**

Appendix 10: Reformulated Financial statements

Det norske oljeselskap AS Income statement (NOK 1000)	2009	2010	2011	2012	2013	2014
Petroleum income	255 135	362 115	361 774	325 093	933 162	3 055 486
Other operating income	9 882	3 855	75 768	7 351	10 719	387 390
Operating income	265 017	365 970	437 542	332 444	943 881	3 442 876
Exploration costs	1 186 084	1 777 337	1 012 191	1 609 314	1 637 063	1 168 646
Production costs	144 399	154 960	181 888	210 962	249 619	495 068
Payroll and related costs	11 827	14 763	31 732	11 000	38 025	- 126 389
Other operating expenses	91 438	88 977	60 721	82 799	109 886	164 208
Total costs	1 433 748	2 036 037	1 286 532	1 914 075	2 034 593	1 701 533
EBITDA	**- 1 168 731**	**- 1 670 067**	**- 848 990**	**- 1 581 631**	**- 1 090 712**	**1 741 343**
Depreciation	53 469	159 049	78 518	111 687	470 529	1 188 492
Impairments	213 304	170 508	150 990	186 302	666 135	176 508
Operating profit (EBIT)	**- 1 435 504**	**- 1 999 624**	**- 1 078 498**	**- 1 879 620**	**- 2 227 376**	**376 344**
Tax on operations	- 901 548	- 1 367 385	- 773 869	- 1 423 979	- 1 747 304	217 529
Net operational profit after tax (NOPAT)	**- 533 956**	**- 632 239**	**- 304 629**	**- 455 641**	**- 480 072**	**158 815**
Interest income	49 589	51 255	69 900	54 997	40 750	51 981
Other financing income	57 618	89 431	26 825	68 399	80 567	144 136
Interest expenses	26 104	218 647	305 969	128 250	301 834	621 820
Other financing expenses	45 454	105 844	23 111	101 050	137 435	143 105
Net financing costs (-)/Revenues (+)	35 649	- 183 805	- 232 355	- 105 904	- 317 952	- 568 808
Interest tax sheild	22 389	- 125 690	- 166 725	- 80 232	- 249 423	- 328 774
Financial costs/revenues after tax	**13 260**	**- 58 115**	**- 65 630**	**- 25 672**	**- 68 529**	**- 240 034**
Net income	**- 520 696**	**- 690 354**	**- 370 259**	**- 481 313**	**- 548 601**	**- 81 219**

Det norske oljeselskap AS Balance sheet (NOK 1000)	31.12.09	31.12.10	31.12.11	31.12.12	31.12.13	31.12.14
Operating assets						
Goodwill	697 938	596 506	525 870	387 551	321 120	8 800 953
Capitalized exploration expenditures	893 467	1 802 234	2 387 360	2 175 492	2 056 100	2 162 734
Other intangible assets	1 320 484	1 107 693	905 726	665 542	646 299	4 811 606
Deferred tax assets	-	-	-	-	630 423	-
Property, plant and equipment	447 553	406 834	902 071	1 993 269	2 657 566	18 906 159
Inventories	14 655	10 249	37 039	21 209	40 880	185 467
Account receivables	30 414	60 719	146 188	101 839	134 221	1 382 851
Other short-term receivables	393 669	448 221	532 538	342 566	499 419	1 368 990
Tax receivables	2 060 124	2 344 753	1 397 420	1 273 737	1 411 251	-
Total operating assets	**5 858 304**	**6 777 209**	**6 834 212**	**6 961 205**	**8 397 279**	**37 618 759**
Non-iterest bearing debt						
Other current liabilities	22 618	20 013	-	-	-	187 069
Abandonment provisions	53 001	-	-	-	-	-
Total liabilities	598 795	726 921	404 156	852 722	795 680	2 030 679
Short-term derivatives	261 940	219 984	274 308	258 596	452 435	1 129 191
Deferred revenue	-	-	18 568	24 536	23 579	50 119
Deferred tax	1 173 477	1 757 481	2 042 051	126 604	-	9 540 009
Provisions for other liabilities	5 588	2 429	1 643	647	780	89 322
Total non-interest bearing debt	**2 115 419**	**2 726 828**	**2 740 726**	**1 263 105**	**1 272 474**	**13 026 390**
Invested capital	**3 742 885**	**4 050 381**	**4 093 486**	**5 698 100**	**7 124 805**	**24 592 369**
Interest-bearing assets						
Long-term receivables	240 442	106 269	-	31 995	125 432	65 256
Other non-current assets	17 965	18 210	18 423	193 934	285 399	26 684
Other current financial assets	21 995	28 601	21 750	23 138	24 075	24 392
Cash and cash equivalents	1 574 287	789 330	841 599	1 630 121	2 185 103	4 661 924
Total interest bearing assets	**1 854 689**	**942 410**	**881 772**	**1 879 188**	**2 620 009**	**4 778 256**
Interest bearing debt						
Pension obligations	19 914	32 070	46 944	65 258	66 512	14 988
Abandonment provisions	-	-	-	-	147 375	42 481
Abandonment provision	224 472	268 227	285 201	798 057	828 529	3 584 468
Bonds	390 600	-	587 011	589 078	2 473 582	1 877 370
Other interest bearing debt	-	-	-	1 299 733	2 036 907	15 109 221
Long-term derivatives	21 805	-	-	45 971	49 453	41 872
Tax payable	1 090 258	1 532 320	379 550	567 075	478 050	-
Social security and other indirect taxes	-	-	-	-	-	1 402 407
Total interest bearing debt	**1 747 049**	**1 832 617**	**1 298 706**	**3 365 172**	**6 080 408**	**22 072 807**
Net interest bearing debt	**- 107 640**	**890 207**	**416 934**	**1 485 984**	**3 460 399**	**17 294 552**
		391 284	*653 571*	*951 459*	*2 473 191*	*10 377 475*
Equity						
Share capital	111 111	111 111	127 916	140 707	140 707	278 334
Share premium	1 167 312	1 167 312	2 083 271	3 089 542	3 089 542	7 635 949
Other paid in capital	33 463	17 715	-	-	-	-
Other equity	2 538 639	1 864 036	1 465 365	981 867	434 157	- 616 465
Total shareholder´s equity	**3 850 525**	**3 160 174**	**3 676 552**	**4 212 116**	**3 664 406**	**7 297 818**
		3 505 350	*3 418 363*	*3 944 334*	*3 938 261*	*5 481 112*
Invested capital	**3 742 885**	**4 050 381**	**4 093 486**	**5 698 100**	**7 124 805**	**24 592 369**

Appendix 11: Classification of financial statement items

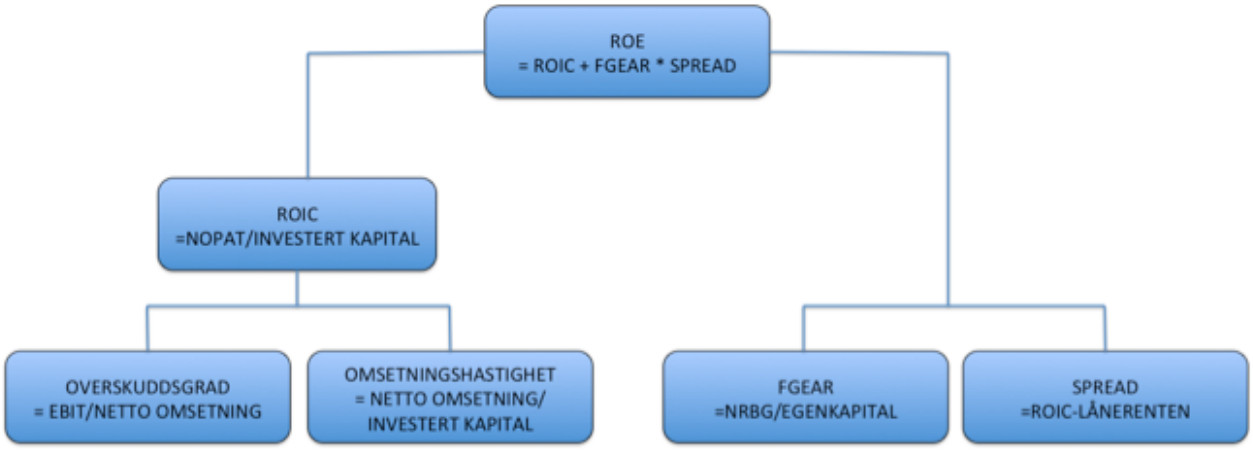
- **Intangible assets:** Goodwill, Capitalized exploration expenditures and other intangible assets. These have arisen as a result of the firm´s operations. The company has not bought any companies as investment´s and the goodwill is therefore related to companies that are now a part of DETNOR´s operations.
- **Cash** is assumed to be excess cash and will therefore be classified as a financing item.
- **Derivatives and current derivatives:** DETNOR uses derivatives to create interest rate swaps and to hedge their currency risk. These posts are therefore classified as financial.
- **Pension liabilities** are classified as financial as they are interest bearing and reported as discounted to present value.
- **Differed tax and tax payable and asset:** Has arisen as a result of operations, and will therefore be classified as operating. There is no evidence that the government has imposed any interest rates on tax payable.
- **Abandonment obligations:** In Norwegian it is called "Fjernings og nedsteningningsforpliktelser". These are obligations related to closing down production of different licenses. However the post is recorded at present value, which implies that it carries interest. It is therefore classified as financial.
- **Government fees:** In Norwegian called "offentlig trekk og avgifter ". No further elaboration in the annual report on what this post contains. I therefore assume that it is not interest bearing and classify these as operational, as they have occurred as a result of DETNOR´s operations.
- **Provisions for other liabilities**: no note in the annual report regarding what is included in post. It is therefore assumed to be financial as provisions are often reported at present value.
- **Trade receivables** are not interest bearing and directly related to DETNOR´s operations. It is therefore classified as a part of operations.
- **Other short-term receivables:** From the notes of DETNOR´s annual report it is evident that other short-term receivables are related to the firm´s operations.
- Accounts payable: No information available, but usually regarded as non-interest bearing and thereby as a part of operations.

- **Other long-term assets and long-term receivables:** DETNOR has classified these two items as financial assets. Long-term receivables is not from core operations, and written at present value. (Usikker på denne kanskje bør være operasjonell). Long-term assets are financial ownership in other companies. Not a part of the company's operations and is therefore classified as financial.
- **Other current liabilities** are categorized as operational. This is due to the fact the most of the debt is related to the licenses that DETNOR process.
- Differences between assets and liabilities and shareholder´s equity have been removed by adjusting the post "other equity". The differences are due to rounding errors from the company´s annual report. If this adjustment is not made, invested capital will not be equal on both sides of the equation.

Appendix 12: Profitability ratios

Det norske oljeselskap AS Profitability analysis (NOK 1000)	2010	2011	2012	2013	2014
Ratios before tax					
Profit margin	-546,39 %	-246,49 %	-565,39 %	-235,98 %	10,93 %
Tunover rate, invested capital	9 %	11 %	7 %	15 %	22 %
Return on invested capital (ROIC)	-51 %	-26 %	-38 %	-35 %	2 %
Return on invested capital (ROIC)	-51 %	-26 %	-38 %	-35 %	2 %
Net borrowing rate	46,97 %	35,55 %	11,13 %	12,86 %	5,48 %
Spread	-98,29 %	-62,04 %	-49,52 %	-47,60 %	-3,11 %
Financial leverage	11,16 %	19,12 %	24,12 %	62,80 %	189,33 %
Return on equity (ROE)	-62,29 %	-38,35 %	-50,34 %	-64,63 %	-3,51 %
Ratios after tax					
Profit margin	-173 %	-70 %	-137 %	-51 %	5 %
Tunover rate, invested capital	9 %	11 %	7 %	15 %	22 %
Return on invested capital (ROIC)	-16,23 %	-7,48 %	-9,31 %	-7,49 %	1,00 %
Return on invested capital (ROIC)	-16,23 %	-7,48 %	-9,31 %	-7,49 %	1,00 %
Net borrowing rate	14,9%	10,0%	2,7%	2,8%	2,3%
Spread	-31,08 %	-17,52 %	-12,00 %	-10,26 %	-1,31 %
Financial leverage	11,16 %	19,12 %	24,12 %	62,80 %	189,33 %
Return on equity (ROE)	-19,69 %	-10,83 %	-12,20 %	-13,93 %	-1,48 %

Appendix 13: DuPont – Model



Appendix 14: Liquidity risk analysis

Det norske oljeselskap AS Liquidity risk analysis	2010	2011	2012	2013	2014
Current ratio	1,47	2,76	1,99	2,26	1,57
Quick ratio	1,47	2,73	1,98	2,24	1,54
CFO to short-term debt	0,23	1,42	0,85	0,75	0,19
Long-term liquidity risk					
Financial leverage	1,301	1,182	1,173	1,867	6,404
Solvency ratio	0,454	0,443	0,476	0,397	0,205
Interest coverage ratio	- 10,879	- 4,642	- 17,748	- 7,005	0,662
CFO to debt ratio	3,093	6,592	13,717	4,463	1,610

Appendix 15: Credit rating analysis

Det norske oljeselskap AS Credit rating analysis				2014	2013	Rating	Weighted score
Rating factor	*Factor Weight*	*Rating sub factor*	*Sub-factor Weight*				
Reserves and production	40 %	Avg. Daily production (Mboe/d)	15 %	15,63	4,463	Caa	2,70
		Proved Developed Reserves (Mill boe)	15 %	179,12	65,8	Ba	1,80
		Total Proven reserves (Mill boe)	10 %	205,5	65,8	Ba	1,20
Operating and capital efficiency	20,0%	Leveraged full-cycle ratio	20 %	0,955 -	0,015	Caa	3,60
Leverage and Cash Flow coverage	40,0%	E&P Debt/Average Daily Production	10 %	$ 188 673	$ 195 084	Ca	2,00
		E&P Debt/PD boe reserves	10 %	$ 16,46	$ 13,23	Caa	1,80
		RCF/Total debt	10 %	8,9%	30,2%	Ca	2,00
		EBITDA/Interest expense	10 %	3,06 -	3,43	B	1,50
							16,60
Production mix overlay		E&P Unleveraged Cash margin/BOE		$ 50,99	$ 23,31	-1	
Total score	**15,600**	**Rating**	**B3**				

Det norske oljeselskap AS G&A expenses (1000 USD)	2013	2014
Lønn til ledende ansatte (Samlet godtgjørelse)	3947	7261
Kontorkostnader	10209	9133
IT-kostnader	15198	17463
Annonsering og profilering	1598	1218
Arealavgift	9822	6758
Andre driftskostnader	1719	7679
Reisekostnader	2881	4858
Total G&A expenses	**45374**	**54370**

Total boe	5704900	1629115

Det norske oljeselskap AS Calculation of full-cycle ratio		2013		2014
Realized price per boe production	$	72,22	$	77,24
Operating cost per boe	$	11,70	$	26,07
General and andministration per boe	$	9,53	$	27,85
Interest expense per boe	$	13,44	$	26,32
Leveraged pre-capex cash margin per boe	**$**	**37,54**	**$**	**-3,00**
Average Finding and development cost	$	39,32	$	197,06
Leverages full-cycle ratio		**0,955**	**-**	**0,015**

Appendix 16: Estimating DETNOR´s beta

Calculation of Beta	OSBEX	DETNOR
Variance of returns	0,0001	0,0007
Standard deviation	0,0095	0,0272
Correlation	0,5987	
Firm beta	**1,71079**	

Appendix 17: Cost of debt, Rd

Credit type	Year	Size	Used	Interest rate		Interest payment
Reserve based lending facility	2014	$ 2 690 000,00	$ 2 037 299,00	6 month libor	0,14 %	$ 76 302,41
				Margin	2,75 %	
				utilization fee, on used loan	0,50 %	
				Commitment fee, unused	1,10 %	
Bonds	2014	$ 253 141,00	$ 253 141,00	3 mobth NIBOR	1,39 %	$ 16 175,71
				Additonal margin	5 %	
Total Debt		*$ 2 943 141,00*		*Total interest payments*		*$ 92 478,12*
Average interest rate		**3,14 %**				

Appendix 18: Revenue drivers –All scenarios

Stochastic modelling

	2015E	2016E	2017E	2018E	2019E	2020E	2021E
Production	13 729 655	16 166 059	17 704 147	20 371 578	21 737 547	22 389 673	23 061 363
No. Of Licences							
No. Of operator							
Reserves							
Oil price (USD/barrel)	**$ 57,36**	**$ 59,68**	**$ 61,30**	**$ 63,62**	**$ 66,18**	**$ 68,96**	**$ 68,96**
Exchange rate NOK/USD	7,42	7,42	7,42	7,42	7,42	7,42	7,42
Petroleum revenue	5 831 698	6 920 288	7 848 536	9 307 611	10 261 004	10 960 208	11 289 014

Low Scenario

	2015E	2016E	2017E	2018E	2019E	2020E	2021E
Production	13 729 655	16 166 059	17 704 147	20 371 578	21 737 547	22 389 673	23 061 363
No. Of Licences							
No. Of operator							
Reserves							
Oil price (USD/barrel)	**$ 35,00**	**$ 35,00**	**$ 35,00**	**$ 35,00**	**$ 35,00**	**$ 35,00**	**$ 35,00**
Exchange rate (NOK/USD)	7,42	7,42	7,42	7,42	7,42	7,42	7,42
Petroleum income	3 563 813	4 196 232	4 595 474	5 287 861	5 642 426	5 811 699	5 986 050

Base Scenario

	2015E	2016E	2017E	2018E	2019E	2020E	2021E
Production	13 729 655	16 166 059	17 704 147	20 371 578	21 737 547	22 389 673	23 061 363
No. Of Licences							
No. Of operator							
Reserves							
Oil price (USD/barrel)	**$ 60,00**	**$ 60,00**	**$ 60,00**	**$ 60,00**	**$ 60,00**	**$ 60,00**	**$ 60,00**
Exchange rate (NOK/USD)	7,42	7,42	7,42	7,42	7,42	7,42	7,42
Petroleum income	6 109 394	7 193 541	7 877 956	9 064 904	9 672 730	9 962 912	10 261 799

High Scenario

	2015E	2016E	2017E	2018E	2019E	2020E	2021E
Production	13 729 655	16 166 059	17 704 147	20 371 578	21 737 547	22 389 673	23 061 363
No. Of Licences							
No. Of operator							
Reserves							
Oil price (USD/barrel)	**$ 110,00**	**$ 110,00**	**$ 110,00**	**$ 110,00**	**$ 110,00**	**$ 110,00**	**$ 110,00**
Exchange rate (NOK/USD)	7,42	7,42	7,42	7,42	7,42	7,42	7,42
Petroleum income	11 200 556	13 188 158	14 442 919	16 618 991	17 733 339	18 265 339	18 813 299

Appendix 19: Budgeted financial Statements –Stochastic modelling

	Budget period					Terminal period	
	2015E	2016E	2017E	2018E	2019E	2020E	2021E
Terminal period production growth						3,0%	3,0%
Other operating revenue	20 %	20 %	20 %	20 %	20 %	5,0%	5,0%
EBITDA-margin	70 %	70 %	70 %	70 %	70 %	70 %	70 %
Exploration as a percetage of operating costs	50 %	50 %	50 %	50 %	50 %	50 %	50 %
Interest rate	-3 %	-3 %	-3 %	-3 %	-3 %	-3 %	-3 %
Effective tax rate	68 %	68 %	68 %	68 %	68 %	68 %	68,0%
Depreciation and amortization	8 %	9 %	10 %	11 %	12 %	12 %	12,0%
Non-current assets in percent of revenue	550,0%	500,0%	450,0%	400,0%	350,0%	350,0%	350,0%
Inventories in percent of revenue	3,0%	3,0%	3,0%	3,0%	3,0%	3,0%	3,0%
Receivables in percent of revenue	40,0%	35,0%	30,0%	30,0%	30,0%	30,0%	30,0%
Operating debt in percent of revenue	250,0%	200,0%	175,0%	150,0%	100,0%	100,0%	100,0%
Net interest-bearing debt as a percent of invested capital	90,0%	80,0%	70,0%	70,0%	65,0%	65,0%	65,0%

Det norske oljeselskap AS	Budget period					Terminal period	
Income statement (NOK 1000)	2015E	2016E	2017E	2018E	2019E	2020E	2021E
Petroleum revenue	5 840 206	7 154 597	8 048 113	9 612 157	10 668 745	11 450 602	11 794 120
Other operating revenue	464 869	557 842	669 411	803 293	963 951	1 012 149	1 062 756
Operating revenues	**6 305 075**	**7 712 439**	**8 717 523**	**10 415 450**	**11 632 697**	**12 462 750**	**12 856 876**
Exploration expenses	945 761	1 156 866	1 307 629	1 562 317	1 744 905	1 869 413	1 928 531
Production costs							
Payroll expenses							
Other operating expenses							
Costs	1 891 522	2 313 732	2 615 257	3 124 635	3 489 809	3 738 825	3 857 063
EBITDA	**4 413 552**	**5 398 707**	**6 102 266**	**7 290 815**	**8 142 888**	**8 723 925**	**8 999 813**
Depreciation and amortization							
Impairments	748 815	1 276 244	1 627 565	2 039 351	1 969 758	2 542 397	2 667 696
Operating profit (EBIT)	3 664 737	4 122 463	4 474 702	5 251 464	6 173 130	6 181 529	6 332 118
Interest income							
Other financial income							
Interest expenses							
Other financial expenses							
Net financing costs (-)/Revenues (+)	**- 583 913**	**- 625 633**	**- 563 849**	**- 618 990**	**- 641 950**	**- 687 757**	**- 709 507**
Earnings before taxes (EBT)	3 080 824	3 496 830	3 910 852	4 632 474	5 531 180	5 493 772	5 622 611
Tax	2 336 877	2 589 443	2 861 214	3 338 350	4 092 217	4 051 961	4 194 672
Net income	**743 947**	**907 387**	**1 049 638**	**1 294 123**	**1 438 963**	**1 441 811**	**1 427 939**
Time weighted number of shares outstanding	202 618 602	202 618 602	202 618 602	202 618 602	202 618 602	202 618 602	202 618 602
Time weighted number of shares outstanding -diluted	202 618 602	202 618 602	202 618 602	202 618 602	202 618 602	202 618 602	202 618 602
Profit after tax per share	3,67	4,48	5,18	6,39	7,10	7,12	7,05
Profit after tax per share-diluted	3,67	4,48	5,18	6,39	7,10	7,12	7,05

Det norske oljeselskap AS		Budget period			Terminal period		
Balance sheet (NOK 1000)	31.12.2015	31.12.2016	31.12.2017	31.12.2018	31.12.2019	31.12.2020	31.12.2021
Assets							
Intangible assets							
Goodwill							
Capitalized exploration expenditures							
Other intangible assets							
Deferred tax assets							
Property, plant and equipment							
Property, plant and equipment	34 677 912	38 562 196	39 228 855	41 661 798	40 714 439	43 619 627	44 999 066
Financial assets							
Long-term receivables							
Other non-current assets							
Total non-current assets	**34 677 912**	**38 562 196**	**39 228 855**	**41 661 798**	**40 714 439**	**43 619 627**	**44 999 066**
Inventories							
Inventories	189 152	231 373	261 526	312 463	348 981	373 883	385 706
Receivables							
Account receivables							
Other short-term receivables							
Other current financial assets							
Tax receivables	2 522 030,0	2 699 353,7	2 615 257,0	3 124 634,9	3 489 809,0	3 738 825,1	3 857 062,8
Cash and cash equivalents							
Cash and cash equivalents	0	0	0	0	0	0	0
Total current assets	**2 711 182**	**2 930 727**	**2 876 783**	**3 437 098**	**3 838 790**	**4 112 708**	**4 242 769**
Total assets	**37 389 095**	**41 492 923**	**42 105 638**	**45 098 897**	**44 553 228**	**47 732 334**	**49 241 835**
Equity and liabilities							
Paid-in capital							
Share capital							
Share premium							
Other paid in capital							
Total paid-in capital							
Other equity							
Total Equity	**2 162 641**	**5 213 609**	**8 054 992**	**8 842 717**	**11 522 186**	**12 344 354**	**12 734 736**
Provisions for liabilities							
Pension obligations							
Deferred tax							
Abandonment provision							
Provisions for other liabilities							
Long-term debt							
Bonds							
Other interest bearing debt							
Long-term derivatives							
Net interest bearing debt	**19 463 766**	**20 854 436**	**18 794 980**	**20 633 006**	**21 398 346**	**22 925 229**	**23 650 223**
Current liabilities							
Short-term loans							
Trade creditors							
Tax payable							
Short-term derivatives							
Deferred revenue							
Social security and other indirect taxes							
Abandonment provisions							
Other current liabilities							
Operating debt	**15 762 687**	**15 424 879**	**15 255 666**	**15 623 174**	**11 632 697**	**12 462 750**	**12 856 876**
Total liabilities	**35 226 454**	**36 279 314**	**34 050 646**	**36 256 180**	**33 031 042**	**35 387 980**	**36 507 099**
Total Equity and liabilities	**37 389 095**	**41 492 923**	**42 105 638**	**45 098 897**	**44 553 228**	**47 732 334**	**49 241 835**

Det norske oljeselskap AS		Budget period				Terminal period	
Statement of equity (NOK 1000)	2015E	2016E	2017E	2018E	2019E	2020E	2021E
Equity, beginning of the period	**7 297 818**	**2 162 641**	**5 213 609**	**8 054 992**	**8 842 717**	**11 522 186**	**12 344 354**
Net income	743 947	907 387	1 049 638	1 294 123	1 438 963	1 441 811	**1 427 939**
Dividends paid (-) / issued shares (+)	- 5 879 124	2 143 581	1 791 744	- 506 398	1 240 507	- 619 643	**- 1 037 557**
Equity, end of the period	**2 162 641**	**5 213 609**	**8 054 992**	**8 842 717**	**11 522 186**	**12 344 354**	**12 734 736**

Det norske oljeselskap AS		Budget period				Terminal period	
Free cash flows to the owners (NOK 1000)	2015E	2016E	2017E	2018E	2019E	2020E	2021E
EBITDA	4 413 552	5 398 707	6 102 266	7 290 815	8 142 888	8 723 925	8 999 813
Other current financial assets	- 24 392						
Paid tax, operating	- 2 779 788	- 3 052 731	- 3 273 731	- 3 784 420	- 4 567 161	- 4 559 220	- 4 723 990
Cash flows from operations, before change in WC	**1 609 372**	**2 345 976**	**2 828 535**	**3 506 395**	**3 575 727**	**4 164 705**	**4 275 823**
Change in investories	- 3 685	- 42 221	- 30 153	- 50 938	- 36 517	- 24 902	- 11 824
Change in receivables	254 203	- 177 324	84 097	- 509 378	- 365 174	- 249 016	- 118 238
Change in operating debt	2 736 298	- 337 809	- 169 213	367 508	- 3 990 478	830 054	394 125
Cash flows from operations	**4 596 187**	**1 788 623**	**2 713 267**	**3 313 587**	**- 816 442**	**4 720 841**	**4 539 887**
Investments in current assets	-745 276	-5 160 528	-2 294 224	-4 472 294	-1 022 398	-5 447 585	-4 047 135
Free cash flow	**3 850 911**	**- 3 371 906**	**419 043**	**- 1 158 706**	**- 1 838 840**	**- 726 743**	**492 752**
Financial posts	- 583 913	- 625 633	- 563 849	- 618 990	- 641 950	- 687 757	- 709 507
Tax shield, financial posts	442 912	463 288	412 517	446 070	474 944	507 259	529 318
New debt	2 169 215	1 390 669	- 2 059 455	1 838 025	765 340	1 526 884	724 994
Free cash flow to the owners	**5 879 124**	**- 2 143 581**	**- 1 791 744**	**506 398**	**- 1 240 507**	**619 643**	**1 037 557**
Dividends (neg)/ Capital injection (pos)	- 5 879 124	2 143 581	1 791 744	- 506 398	1 240 507	- 619 643	- 1 037 557

Det norske oljeselskap AS		Budget period				Terminal period	
Statement of Tax	2015E	2016E	2017E	2018E	2019E	2020E	2021E
Percantage of fixed assets	**30 %**	**35 %**	**40 %**	**45 %**	**45 %**	**50 %**	**50 %**
Production wells	10 403 374	13 496 769	15 691 542	18 747 809	18 321 497	21 809 813	22 499 533
Depreciation	748 815	1 276 244	1 627 565	2 039 351	1 969 758	2 542 397	2 667 696
Investment in prodction facilities	1 458 745	3 093 395	2 194 773	3 056 267	- 426 312	3 488 316	689 720
Revenue	6 305 075	7 712 439	8 717 523	10 415 450	11 632 697	12 462 750	12 856 876
Costs, general	2 475 435	2 939 365	3 179 106	3 743 625	4 131 759	4 426 582	4 566 569
Depreciation	748 815	1 276 244	1 627 565	2 039 351	1 969 758	2 542 397	2 667 696
Gross profit	3 080 824	3 496 830	3 910 852	4 632 474	5 531 180	5 493 772	5 622 611
Tax on profit	*831 823*	*944 144*	*1 055 930*	*1 250 768*	*1 493 419*	*1 483 318*	*1 518 105*
Uplifting	129 737	270 754	371 080	539 175	435 497	457 217	374 439
Special tax	*1 505 054*	*1 645 299*	*1 805 284*	*2 087 582*	*2 598 798*	*2 568 643*	*2 676 567*
Total tax	2 336 877	2 589 443	2 861 214	3 338 350	4 092 217	4 051 961	4 194 672
Efficient tax rate	*75,85 %*	*74,05 %*	*73,16 %*	*72,06 %*	*73,98 %*	*73,76 %*	*74,60 %*
Total profit	**743 947**	**907 387**	**1 049 638**	**1 294 123**	**1 438 963**	**1 441 811**	**1 427 939**

Appendix 20: Budgeted financial Statements –Low case Scenario

	Budget period					Terminal period	
	2015E	2016E	2017E	2018E	2019E	2020E	2021E
						3,0%	3,0%
Other operating income	20 %	20 %	20 %	20 %	20 %	5,0%	5,0%
EBITDA-margin	70 %	70 %	70 %	70 %	70 %	70 %	70 %
Interest rate	-3 %	-3 %	-3 %	-3 %	-3 %	-3 %	-3 %
Effective tax rate, operations	76,32 %	78,45 %	77,10 %	75,09 %	75,44 %	73,56 %	74,61 %
Depreciation and amortization	8 %	9 %	10 %	11 %	12 %	12 %	12 %
Non-current assets in percent of revenue	550 %	500 %	450 %	400 %	350 %	350 %	350 %
Inventories in percent of revenue	3 %	3 %	3 %	3 %	3 %	3 %	3 %
Receivables in percent of revenue	40 %	35 %	30 %	30 %	30 %	30 %	30 %
Operating debt in percent of revenue	250 %	200 %	175 %	150 %	100 %	100 %	100 %
Net interest-bearing debt as a percent of invested capital	90 %	80 %	70 %	70 %	65 %	65 %	65 %

Det norske oljeselskap AS	Budget period					Terminal period	
Income statement (NOK 1000)	2015E	2016E	2017E	2018E	2019E	2020E	2021E
Petroleum income	3 563 813	4 196 232	4 595 474	5 287 861	5 642 426	5 811 699	5 986 050
Other operating income	464 869	557 842	669 411	803 293	963 951	1 012 149	1 062 756
Operating income	4 028 682	4 754 074	5 264 885	6 091 154	6 606 377	6 823 848	7 048 806
						3,29 %	3,30 %
Exploration expenses							
Production costs							
Payroll expenses							
Other operating expenses							
Total costs	1 208 605	1 426 222	1 579 465	1 827 346	1 981 913	2 047 154	2 114 642
EBITDA	**2 820 077**	**3 327 852**	**3 685 419**	**4 263 807**	**4 624 464**	**4 776 693**	**4 934 164**
Depreciation							
Impairments	1 772 620	2 139 333	2 369 198	2 680 108	2 774 678	2 866 016	2 960 499
Operating profit (EBIT)	**1 047 457**	**1 188 519**	**1 316 221**	**1 583 700**	**1 849 786**	**1 910 677**	**1 973 666**
Tax on operations	799 448	932 431	1 014 794	1 189 179	1 395 513	1 405 456	1 472 477
Net operational profit after tax (NOPAT)	**248 009**	**256 088**	**301 428**	**394 521**	**454 272**	**505 222**	**501 189**
Interest income							
Other financing income							
Interest expenses							
Other financing expenses							
Net financing costs (-)/Revenues (+)	- 373 096	- 385 650	- 340 533	- 361 997	- 364 573	- 376 574	- 388 988
Interest tax sheild	- 284 757	- 302 555	- 262 547	- 271 819	- 275 041	- 277 000	- 290 209
Financial costs/revenues after tax	**- 88 339**	**- 83 095**	**- 77 985**	**- 90 178**	**- 89 532**	**- 99 574**	**- 98 779**
Net income	**159 670**	**172 992**	**223 442**	**304 342**	**364 740**	**405 648**	**402 410**
Effective tax rate	75,85 %	74,05 %	73,16 %	72,06 %	73,98 %	73,76 %	74,60 %

Det norske oljeselskap AS	Budget period					Terminal period	
Balance sheet (NOK 1000)	2015E	2016E	2017E	2018E	2019E	2020E	2021E
Operating assets							
Goodwill	-	-	-	-	-	-	-
Capitalized exploration expenditures	-	-	-	-	-	-	-
Other intangible assets	-	-	-	-	-	-	-
Deferred tax assets	-	-	-	-	-	-	-
Property, plant and equipment	22 157 751	23 770 371	23 691 982	24 364 614	23 122 320	23 883 467	24 670 821
Inventories	120 860	142 622	157 947	182 735	198 191	204 715	211 464
Account receivables	-	-	-	-	-	-	-
Other short-term receivables	-	-	-	-	-	-	-
Tax receivables	1 611 473	1 663 926	1 579 465	1 827 346	1 981 913	2 047 154	2 114 642
Total operating assets	*23 890 084*	*25 576 919*	*25 429 394*	*26 374 695*	*25 302 425*	*26 135 336*	*26 996 927*
-	-	-	-	-	-	-	-
Non-iterest bearing debt	-	-	-	-	-	-	-
Other current liabilities	-	-	-	-	-	-	-
Abandonment provisions	-	-	-	-	-	-	-
Total liabilities	-	-	-	-	-	-	-
Short-term derivatives	-	-	-	-	-	-	-
Deferred revenue	-	-	-	-	-	-	-
Deferred tax	-	-	-	-	-	-	-
Provisions for other liabilities	-	-	-	-	-	-	-
Total non-interest bearing debt	*10 071 705*	*9 508 148*	*9 213 548*	*9 136 730*	*6 606 377*	*6 823 848*	*7 048 806*
-	-	-	-	-	-	0	0
Invested capital	**13 818 379**	**16 068 771**	**16 215 845**	**17 237 964**	**18 696 048**	**19 311 489**	**19 948 121**
Interest-bearing assets							
Long-term receivables	-	-	-	-	-	-	-
Other non-current assets	-	-	-	-	-	-	-
Other current financial assets	-	-	-	-	-	-	-
Cash and cash equivalents	-	-	-	-	-	-	-
Total interest bearing assets	-	-	-	-	-	-	-
Interest bearing debt							
Pension obligations	-	-	-	-	-	-	-
Abandonment provisions	-	-	-	-	-	-	-
Abandonment provision	-	-	-	-	-	-	-
Bonds	-	-	-	-	-	-	-
Other interest bearing debt	-	-	-	-	-	-	-
Long-term derivatives	-	-	-	-	-	-	-
Tax payable	-	-	-	-	-	-	-
Social security and other indirect taxes	-	-	-	-	-	-	-
Total interest bearing debt	-	-	-	-	-	-	-
Net interest bearing debt	**12 436 541**	**12 855 017**	**11 351 092**	**12 066 575**	**12 152 431**	**12 552 468**	**12 966 279**
	14 865 546	*12 645 779*	*12 103 054*	*11 708 833*	*12 109 503*	*12 352 449*	*12 759 373*
Equity							
Share capital	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Share premium	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Other paid in capital	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Other equity	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Total shareholder´s equity	**1 381 838**	**3 213 754**	**4 864 754**	**5 171 389**	**6 543 617**	**6 759 021**	**6 981 842**
	4 339 828	*2 297 796*	*4 039 254*	*5 018 071*	*5 857 503*	*6 651 319*	*6 870 432*
Invested capital	**13 818 379**	**16 068 771**	**16 215 845**	**17 237 964**	**18 696 048**	**19 311 489**	**19 948 121**
	19 205 374	*14 943 575*	*16 142 308*	*16 726 905*	*17 967 006*	*19 003 768*	*19 629 805*

Det norske oljeselskap AS		Budget period				Terminal period	
Free cash flows to the owners (NOK 1000)	2015E	2016E	2017E	2018E	2019E	2020E	2021E
EBITDA	2 820 077	3 327 852	3 685 419	4 263 807	4 624 464	4 776 693	4 934 164
Other current financial assets -	24 392						
Paid tax, operating -	799 448 -	932 431 -	1 014 794 -	1 189 179 -	1 395 513 -	1 405 456 -	1 472 477
Cash flows from operations, before change in WC	**1 996 237**	**2 395 421**	**2 670 626**	**3 074 628**	**3 228 951**	**3 371 238**	**3 461 688**
Change in investories	64 606 -	21 762 -	15 324 -	24 788 -	15 457 -	6 524 -	6 749
Change in receivables	1 164 760 -	52 453	84 461 -	247 881 -	154 567 -	65 241 -	67 488
Change in operating debt -	2 954 685 -	563 556 -	294 600 -	76 818 -	2 530 353	217 470	224 958
Cash flows from operations	**270 919**	**1 757 650**	**2 445 162**	**2 725 141**	**528 574**	**3 516 943**	**3 612 410**
Investments in current assets	10 751 081	-3 751 954	-2 290 809	-3 352 740	-1 532 385	-3 627 162	-3 747 853
Free cash flow	**11 022 000 -**	**1 994 304**	**154 353 -**	**627 599 -**	**1 003 811 -**	**110 220 -**	**135 443**
Financial posts -	373 096 -	385 650 -	340 533 -	361 997 -	364 573 -	376 574 -	388 988
Tax shield, financial posts	284 757	302 555	262 547	271 819	275 041	277 000	290 209
New debt -	4 858 010	418 475 -	1 503 925	715 483	85 856	400 037	413 811
Free cash flow to the owners	**6 075 650 -**	**1 658 924 -**	**1 427 557 -**	**2 293 -**	**1 007 487**	**190 243**	**179 589**
Dividends (neg)/ Capital injection (pos) -	6 075 650	1 658 924	1 427 557	2 293	1 007 487 -	190 243 -	179 589

Det norske oljeselskap AS		Budget period				Terminal period	
Statement of Tax	**2015E**	**2016E**	**2017E**	**2018E**	**2019E**	**2020E**	**2021E**
Percantage of fixed assets	**30 %**	**35 %**	**40 %**	**45 %**	**45 %**	**50 %**	**50 %**
Production wells	6 647 325	8 319 630	9 476 793	10 964 076	10 405 044	11 941 733	12 335 411
Investment in prodction facilities	- -	624 999	1 157 163	1 487 284	-	977 657	393 677
Revenue	4 028 682	4 754 074	5 264 885	6 091 154	6 606 377	6 823 848	7 048 806
Costs, general	835 508	1 040 572	1 238 933	1 465 349	1 617 340	1 670 580	1 725 653
Depreciation	1 772 620	2 139 333	2 369 198	2 680 108	2 774 678	2 866 016	2 960 499
Gross profit	1 420 554	1 574 169	1 656 754	1 945 697	2 214 359	2 287 251	2 362 654
Tax on profit	*383 549*	*425 026*	*447 324*	*525 338*	*597 877*	*617 558*	*637 917*
Uplifting	46 719 -	13 988	29 269	111 070	111 070	199 216	157 224
Special tax	*700 656*	*809 960*	*830 017*	*935 660*	*1 072 677*	*1 064 898*	*1 124 769*
Total tax	1 084 205	1 234 986	1 277 341	1 460 998	1 670 554	1 682 456	1 762 686
Efficient tax rate	*76,32 %*	*78,45 %*	*77,10 %*	*75,09 %*	*75,44 %*	*73,56 %*	*74,61 %*
Total profit	**336 349**	**339 183**	**379 413**	**484 699**	**543 804**	**604 795**	**599 968**

Appendix 21: Budgeted financial Statements –Base case Scenario

	Budget period					Terminal period	
	2015E	**2016E**	**2017E**	**2018E**	**2019E**	**2020E**	**2021E**
Terminal production growth						3,0%	3,0%
Other operating income	20 %	20 %	20 %	20 %	20 %	10,0%	10,0%
EBITDA-margin	70 %	70 %	70 %	70 %	70 %	70 %	70 %
Interest rate	-3 %	-3 %	-3 %	-3 %	-3 %	-3 %	-3 %
Effective tax rate	68 %	67 %	67 %	67 %	74 %	75 %	76 %
Depreciation and amortization	8 %	9 %	10 %	11 %	12 %	12 %	12 %
Non-current assets in percent of revenue	550 %	500 %	450 %	400 %	350 %	350 %	350 %
Inventories in percent of revenue	3 %	3 %	3 %	3 %	3 %	3 %	3 %
Receivables in percent of revenue	40 %	35 %	30 %	30 %	30 %	30 %	30 %
Operating debt in percent of revenue	250 %	200 %	175 %	150 %	100 %	100 %	100 %
Net interest-bearing debt as a percent of invested capital	90 %	80 %	70 %	70 %	65 %	65 %	65 %

Det norske oljeselskap AS		Budget period				Terminal period	
Income statement (NOK 1000)	**2015E**	**2016E**	**2017E**	**2018E**	**2019E**	**2020E**	**2021E**
Petroleum income	6 109 394	7 193 541	7 877 956	9 064 904	9 672 730	9 962 912	10 261 799
Other operating income	464 869	557 842	669 411	803 293	963 951	1 060 346	1 166 381
Operating income	6 574 263	7 751 383	8 547 366	9 868 197	10 636 681	11 023 259	11 428 181
Exploration expenses							
Production costs							
Payroll expenses							
Other operating expenses							
Total costs	1 972 279	2 325 415	2 564 210	2 960 459	3 191 004	3 306 978	3 428 454
EBITDA	**4 601 984**	**5 425 968**	**5 983 156**	**6 907 738**	**7 445 677**	**7 716 281**	**7 999 726**
Depreciation							
Impairments	2 187 586	2 622 280	2 893 959	3 189 895	3 109 601	3 346 485	1 825 287
Operating profit (EBIT)	**2 414 398**	**2 803 688**	**3 089 198**	**3 717 843**	**4 336 076**	**4 369 796**	**6 174 440**
Tax on operations	1 642 441	1 889 310	2 066 080	2 492 526	3 211 295	3 267 459	4 698 633
Net operational profit after tax (NOPAT)	**771 957**	**914 378**	**1 023 118**	**1 225 317**	**1 124 781**	**1 102 337**	**1 475 807**
Interest income							
Other financing income							
Interest expenses							
Other financing expenses							
Net financing costs (-)/Revenues (+)	- 608 842	- 628 792	- 552 844	- 586 467	- 586 985	- 608 319	- 630 664
Interest tax sheild	- 414 177	- 423 722	- 369 746	- 393 181	- 434 721	- 454 862	- 479 924
Financial costs/revenues after tax	**- 194 666**	**- 205 071**	**- 183 097**	**- 193 286**	**- 152 264**	**- 153 456**	**- 150 741**
Net income	**577 292**	**709 307**	**840 021**	**1 032 031**	**972 517**	**948 881**	**1 325 066**
Effective tax rate							

Det norske oljeselskap AS	Budget period					Terminal period	
Balance sheet (NOK 1000)	2015E	2016E	2017E	2018E	2019E	2020E	2021E
Operating assets							
Goodwill	-	-	-	-	-	-	-
Capitalized exploration expenditures	-	-	-	-	-	-	-
Other intangible assets	-	-	-	-	-	-	-
Deferred tax assets	-	-	-	-	-	-	-
Property, plant and equipment	36 158 446	38 756 914	38 463 149	39 472 788	37 228 385	38 581 405	39 998 632
Inventories	197 228	232 541	256 421	296 046	319 100	330 698	342 845
Account receivables	-	-	-	-	-	-	-
Other short-term receivables	-	-	-	-	-	-	-
Tax receivables	2 629 705	2 712 984	2 564 210	2 960 459	3 191 004	3 306 978	3 428 454
Total operating assets	*38 985 379*	*41 702 439*	*41 283 780*	*42 729 293*	*40 738 490*	*42 219 080*	*43 769 931*
-	-	-	-	-	-	-	-
Non-iterest bearing debt	-	-	-	-	-	-	-
Other current liabilities	-	-	-	-	-	-	-
Abandonment provisions	-	-	-	-	-	-	-
Total liabilities	-	-	-	-	-	-	-
Short-term derivatives	-	-	-	-	-	-	-
Deferred revenue	-	-	-	-	-	-	-
Deferred tax	-	-	-	-	-	-	-
Provisions for other liabilities	-	-	-	-	-	-	-
Total non-interest bearing debt	*16 435 657*	*15 502 766*	*14 957 891*	*14 802 295*	*10 636 681*	*11 023 259*	*11 428 181*
-	-	-	-	-	-	0	0
Invested capital	**22 549 722**	**26 199 674**	**26 325 888**	**27 926 997**	**30 101 809**	**31 195 822**	**32 341 751**
Interest-bearing assets							
Long-term receivables	-	-	-	-	-	-	-
Other non-current assets	-	-	-	-	-	-	-
Other current financial assets	-	-	-	-	-	-	-
Cash and cash equivalents	-	-	-	-	-	-	-
Total interest bearing assets	-	-	-	-	-	-	-
Interest bearing debt							
Pension obligations	-	-	-	-	-	-	-
Abandonment provisions	-	-	-	-	-	-	-
Abandonment provision	-	-	-	-	-	-	-
Bonds	-	-	-	-	-	-	-
Other interest bearing debt	-	-	-	-	-	-	-
Long-term derivatives	-	-	-	-	-	-	-
Tax payable	-	-	-	-	-	-	-
Social security and other indirect taxes	-	-	-	-	-	-	-
Total interest bearing debt	-	-	-	-	-	-	-
Net interest bearing debt	**20 294 750**	**20 959 739**	**18 428 122**	**19 548 898**	**19 566 176**	**20 277 284**	**21 022 138**
	18 794 651	*20 627 244*	*19 693 930*	*18 988 510*	*19 557 537*	*19 921 730*	*20 649 711*
Equity							
Share capital	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Share premium	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Other paid in capital	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Other equity	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Total shareholder´s equity	**2 254 972**	**5 239 935**	**7 897 767**	**8 378 099**	**10 535 633**	**10 918 538**	**11 319 613**
	4 776 395	*3 747 453*	*6 568 851*	*8 137 933*	*9 456 866*	*10 727 085*	*11 119 075*
Invested capital	**22 549 722**	**26 199 674**	**26 325 888**	**27 926 997**	**30 101 809**	**31 195 822**	**32 341 751**
	23 571 046	*24 374 698*	*26 262 781*	*27 126 443*	*29 014 403*	*30 648 815*	*31 768 786*

Det norske oljeselskap AS		Budget period				Terminal period	
Free cash flows to the owners (NOK 1000)	2015E	2016E	2017E	2018E	2019E	2020E	2021E
EBITDA	4 601 984	5 425 968	5 983 156	6 907 738	7 445 677	7 716 281	7 999 726
Other current financial assets -	24 392						
Paid tax, operating -	1 642 441	- 1 889 310	- 2 066 080	- 2 492 526	- 3 211 295	- 3 267 459	- 4 698 633
Cash flows from operations, before change in WC	**2 935 151**	**3 536 658**	**3 917 077**	**4 415 212**	**4 234 382**	**4 448 822**	**3 301 093**
Change in investories -	11 761	- 35 314	- 23 880	- 39 625	- 23 055	- 11 597	- 12 148
Change in receivables	146 527	- 83 279	148 774	- 396 249	- 230 545	- 115 973	- 121 477
Change in operating debt	3 409 268	- 932 892	- 544 874	- 155 596	- 4 165 614	386 577	404 922
Cash flows from operations	**6 479 185**	**2 485 174**	**3 497 097**	**3 823 742**	**- 184 832**	**4 707 829**	**3 572 391**
Investments in current assets	-3 664 580	-5 220 748	-2 600 194	-4 199 534	-865 198	-4 699 505	-3 242 514
Free cash flow	**2 814 604**	**- 2 735 574**	**896 903**	**- 375 792**	**- 1 050 030**	**8 324**	**329 877**
Financial posts -	608 842	- 628 792	- 552 844	- 586 467	- 586 985	- 608 319	- 630 664
Tax shield, financial posts	414 177	423 722	369 746	393 181	434 721	454 862	479 924
New debt	3 000 198	664 989	- 2 531 617	1 120 776	17 278	711 108	744 854
Free cash flow to the owners	**5 620 137**	**- 2 275 655**	**- 1 817 811**	**551 698**	**- 1 185 017**	**565 976**	**923 991**
Dividends (neg)/ Capital injection (pos) -	5 620 137	2 275 655	1 817 811	- 551 698	1 185 017	- 565 976	- 923 991

Det norske oljeselskap AS		Budget period				Terminal period	
Statement of Tax	**2015E**	**2016E**	**2017E**	**2018E**	**2019E**	**2020E**	**2021E**
Percantage of fixed assets	**30 %**	**35 %**	**40 %**	**45 %**	**45 %**	**50 %**	**50 %**
Production wells	10 847 534	13 564 920	15 385 259	17 762 754	16 752 773	19 290 702	19 999 316
Investment in prodction facilities	9 899 579	2 717 386	1 820 340	2 377 495	-	1 527 948	708 614
Revenue	6 574 263	7 751 383	8 547 366	9 868 197	10 636 681	11 023 259	11 428 181
Costs, general	1 363 436	1 696 623	2 011 366	2 373 992	2 604 019	2 698 659	2 797 790
Depreciation	2 187 586	2 622 280	2 893 959	3 189 895	3 109 601	3 346 485	1 825 287
Gross profit	3 023 241	3 432 480	3 642 041	4 304 310	4 923 062	4 978 114	6 805 104
Tax on profit	*816 275*	*926 770*	*983 351*	*1 162 164*	*1 329 227*	*1 344 091*	*1 837 378*
Uplifting	591 196	714 320	794 052	924 814	380 337	314 918	253 773
Special tax	*1 240 343*	*1 386 262*	*1 452 475*	*1 723 543*	*2 316 789*	*2 378 230*	*3 341 179*
Total tax	2 056 618	2 313 031	2 435 826	2 885 707	3 646 016	3 722 321	5 178 557
Efficient tax rate	*68,03 %*	*67,39 %*	*66,88 %*	*67,04 %*	*74,06 %*	*74,77 %*	*76,10 %*
Total profit	**966 623**	**1 119 449**	**1 206 215**	**1 418 603**	**1 277 045**	**1 255 793**	**1 626 547**

Appendix 22: Budgeted financial Statements –High case Scenario

	Budget period					Terminal period	
	2015E	**2016E**	**2017E**	**2018E**	**2019E**	**2020E**	**2021E**
Terminal production growth						3,0%	3,0%
Other operating income	20 %	20 %	20 %	20 %	20 %	15,0%	15,0%
EBITDA-margin	70 %	70 %	70 %	70 %	70 %	70 %	70 %
Interest rate	-3 %	-3 %	-3 %	-3 %	-3 %	-3 %	-3 %
Effective tax rate	67,99 %	67,16 %	66,54 %	66,66 %	74,01 %	74,80 %	76,14 %
Other deprecetiation and amoritization	1,50 %	1,50 %	1,50 %	1,50 %	1,50 %	1,50 %	1,50 %
Production well as a percentage of non-current asset	30,0%	35,0%	40,0%	45,0%	45,0%	50,0%	50,0%
Non-current assets in percent of revenue	550 %	500 %	450 %	400 %	350 %	350 %	350 %
Inventories in percent of revenue	3 %	3 %	3 %	3 %	3 %	3 %	3 %
Receivables in percent of revenue	40 %	35 %	30 %	30 %	30 %	30 %	30 %
Operating debt in percent of revenue	250 %	200 %	175 %	150 %	100 %	100 %	100 %
Net interest-bearing debt as a percent of invested capital	90 %	80 %	70 %	70 %	65 %	65 %	65 %

Det norske oljeselskap AS		Budget period				Terminal period	
Income statement (NOK 1000)	**2015E**	**2016E**	**2017E**	**2018E**	**2019E**	**2020E**	**2021E**
Petroleum income	11 200 556	13 188 158	14 442 919	16 618 991	17 733 339	18 265 339	18 813 299
Other operating income	464 869	557 842	669 411	803 293	963 951	1 108 544	1 274 826
Operating income	11 665 425	13 746 000	15 112 329	17 422 284	18 697 290	19 373 883	20 088 125
Exploration expenses							
Production costs							
Payroll expenses							
Other operating expenses							
Total costs	3 499 627	4 123 800	4 533 699	5 226 685	5 609 187	5 812 165	6 026 437
EBITDA	**8 165 797**	**9 622 200**	**10 578 631**	**12 195 599**	**13 088 103**	**13 561 718**	**14 061 687**
Depreciation							
Impairments	3 881 670	4 662 948	5 129 329	5 705 405	5 608 577	6 001 288	3 178 358
Operating profit (EBIT)	**4 284 127**	**4 959 252**	**5 449 302**	**6 490 193**	**7 479 526**	**7 560 430**	**10 883 329**
Tax on operations	2 912 651	3 330 547	3 626 030	4 326 658	5 535 471	5 655 103	8 286 562
Net operational profit after tax (NOPAT)	**1 371 476**	**1 628 705**	**1 823 272**	**2 163 535**	**1 944 055**	**1 905 327**	**2 596 767**
Interest income							
Other financing income							
Interest expenses							
Other financing expenses							
Net financing costs (-)/Revenues (+)	- 1 080 335	- 1 115 076	- 977 465	- 1 035 406	- 1 031 810	- 1 069 148	- 1 108 563
Interest tax sheild	- 734 488	- 748 865	- 650 417	- 690 249	- 763 625	- 799 709	- 844 060
Financial costs/revenues after tax	**- 345 847**	**- 366 210**	**- 327 048**	**- 345 157**	**- 268 185**	**- 269 439**	**- 264 504**
Net income	**1 025 629**	**1 262 495**	**1 496 223**	**1 818 378**	**1 675 870**	**1 635 888**	**2 332 263**
Effective tax rate	75,85 %	74,05 %	73,16 %	72,06 %	73,98 %	73,76 %	74,60 %

Det norske oljeselskap AS	Budget period				Terminal period		
Balance sheet (NOK 1000)	2015E	2016E	2017E	2018E	2019E	2020E	2021E
Operating assets							
Goodwill	-	-	-	-	-	-	-
Capitalized exploration expenditures	-	-	-	-	-	-	-
Other intangible assets	-	-	-	-	-	-	-
Deferred tax assets	-	-	-	-	-	-	-
Property, plant and equipment	64 159 837	68 729 999	68 005 483	69 689 135	65 440 515	67 808 590	70 308 436
Inventories	349 963	412 380	453 370	522 669	560 919	581 216	602 644
Account receivables	-	-	-	-	-	-	-
Other short-term receivables	-	-	-	-	-	-	-
Tax receivables	4 666 170	4 811 100	4 533 699	5 226 685	5 609 187	5 812 165	6 026 437
Total operating assets	*69 175 970*	*73 953 479*	*72 992 551*	*75 438 488*	*71 610 620*	*74 201 971*	*76 937 517*
-	-	-	-	-	-	-	-
Non-iterest bearing debt	-	-	-	-	-	-	-
Other current liabilities	-	-	-	-	-	-	-
Abandonment provisions	-	-	-	-	-	-	-
Total liabilities	-	-	-	-	-	-	-
Short-term derivatives	-	-	-	-	-	-	-
Deferred revenue	-	-	-	-	-	-	-
Deferred tax	-	-	-	-	-	-	-
Provisions for other liabilities	-	-	-	-	-	-	-
Total non-interest bearing debt	*29 163 562*	*27 492 000*	*26 446 577*	*26 133 426*	*18 697 290*	*19 373 883*	*20 088 125*
-	-	-	-	-	-	0	0
Invested capital	**40 012 408**	**46 461 480**	**46 545 975**	**49 305 063**	**52 913 331**	**54 828 088**	**56 849 393**
Interest-bearing assets							
Long-term receivables	-	-	-	-	-	-	-
Other non-current assets	-	-	-	-	-	-	-
Other current financial assets	-	-	-	-	-	-	-
Cash and cash equivalents	-	-	-	-	-	-	-
Total interest bearing assets	-	-	-	-	-	-	-
Interest bearing debt							
Pension obligations	-	-	-	-	-	-	-
Abandonment provisions	-	-	-	-	-	-	-
Abandonment provision	-	-	-	-	-	-	-
Bonds	-	-	-	-	-	-	-
Other interest bearing debt	-	-	-	-	-	-	-
Long-term derivatives	-	-	-	-	-	-	-
Tax payable	-	-	-	-	-	-	-
Social security and other indirect taxes	-	-	-	-	-	-	-
Total interest bearing debt	-	-	-	-	-	-	-
Net interest bearing debt	**36 011 167**	**37 169 184**	**32 582 182**	**34 513 544**	**34 393 665**	**35 638 257**	**36 952 105**
	26 652 859	*36 590 175*	*34 875 683*	*33 547 863*	*34 453 604*	*35 015 961*	*36 295 181*
Equity							
Share capital	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Share premium	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Other paid in capital	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Other equity	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Total shareholder´s equity	**4 001 241**	**9 292 296**	**13 963 792**	**14 791 519**	**18 519 666**	**19 189 831**	**19 897 287**
	5 649 529	*6 646 768*	*11 628 044*	*14 377 656*	*16 655 592*	*18 854 748*	*19 543 559*
Invested capital	**40 012 408**	**46 461 480**	**46 545 975**	**49 305 063**	**52 913 331**	**54 828 088**	**56 849 393**
	32 302 388	*43 236 944*	*46 503 727*	*47 925 519*	*51 109 197*	*53 870 709*	*55 838 740*

Det norske oljeselskap AS		Budget period				Terminal period	
Free cash flows to the owners (NOK 1000)	2015E	2016E	2017E	2018E	2019E	2020E	2021E
EBITDA	8 165 797	9 622 200	10 578 631	12 195 599	13 088 103	13 561 718	14 061 687
Other current financial assets -	24 392						
Paid tax, operating -	2 912 651	- 3 330 547	- 3 626 030	- 4 326 658	- 5 535 471	- 5 655 103	- 8 286 562
Cash flows from operations, before change in WC	**5 228 754**	**6 291 653**	**6 952 601**	**7 868 941**	**7 552 632**	**7 906 614**	**5 775 125**
Change in investories -	164 496	- 62 417	- 40 990	- 69 299	- 38 250	- 20 298	- 21 427
Change in receivables -	1 889 937	- 144 930	- 277 401	- 692 986	- 382 502	- 202 978	- 214 273
Change in operating debt	16 137 173	- 1 671 563	- 1 045 423	- 313 151	- 7 436 136	676 593	714 242
Cash flows from operations	**19 311 493**	**4 412 743**	**6 143 589**	**6 793 505**	**- 304 256**	**8 359 932**	**6 253 667**
Investments in current assets	-33 360 056	-9 233 110	-4 404 812	-7 389 058	-1 359 957	-8 369 363	-5 678 204
Free cash flow -	**14 048 562**	**- 4 820 366**	**1 738 777**	**- 595 553**	**- 1 664 213**	**- 9 431**	**575 463**
Financial posts -	1 080 335	- 1 115 076	- 977 465	- 1 035 406	- 1 031 810	- 1 069 148	- 1 108 563
Tax shield, financial posts	734 488	748 865	650 417	690 249	763 625	799 709	844 060
New debt	18 716 615	1 158 017	- 4 587 001	1 931 362	- 119 879	1 244 593	1 313 848
Free cash flow to the owners	**4 322 206**	**- 4 028 560**	**- 3 175 273**	**990 652**	**- 2 052 277**	**965 722**	**1 624 807**
Dividends (neg)/ Capital injection (pos) -	4 322 206	4 028 560	3 175 273	- 990 652	2 052 277	- 965 722	- 1 624 807

Det norske oljeselskap AS	Budget period					Terminal period	
Statement of Tax	2015E	2016E	2017E	2018E	2019E	2020E	2021E
Percantage of fixed assets	**30 %**	**35 %**	**40 %**	**45 %**	**45 %**	**50 %**	**50 %**
Production wells	19 247 951	24 055 500	27 202 193	31 360 111	29 448 232	33 904 295	35 154 218
Investment in prodction facilities	18 299 996	4 807 549	3 146 693	4 157 918	-	2 544 184	1 249 923
Revenue	11 665 425	13 746 000	15 112 329	17 422 284	18 697 290	19 373 883	20 088 125
Costs, general	2 419 292	3 008 724	3 556 233	4 191 279	4 577 377	4 743 017	4 917 874
Depreciation	3 881 670	4 662 948	5 129 329	5 705 405	5 608 577	6 001 288	3 178 358
Gross profit	5 364 462	6 074 327	6 426 767	7 525 599	8 511 336	8 629 578	11 991 893
Tax on profit	*1 448 405*	*1 640 068*	*1 735 227*	*2 031 912*	*2 298 061*	*2 329 986*	*3 237 811*
Uplifting	1 053 219	1 291 302	1 443 983	1 672 669	666 169	541 684	437 361
Special tax	*2 198 734*	*2 439 343*	*2 541 220*	*2 984 995*	*4 001 035*	*4 124 826*	*5 892 811*
Total tax	3 647 139	4 079 412	4 276 447	5 016 907	6 299 096	6 454 812	9 130 622
Efficient tax rate	*67,99 %*	*67,16 %*	*66,54 %*	*66,66 %*	*74,01 %*	*74,80 %*	*76,14 %*
Total profit	**1 717 323**	**1 994 916**	**2 150 320**	**2 508 693**	**2 212 240**	**2 174 766**	**2 861 271**

Appendix 23: Statement of Tax- Stochastic modelling

Det norske oljeselskap AS		Budget period				Terminal period	
Statement of Tax		2015E	2016E	2017E	2018E	2019E	2020E	2021E
Percantage of fixed assets		**30 %**	**35 %**	**40 %**	**45 %**	**45 %**	**50 %**	**50 %**
Production wells		10 403 374	13 496 769	15 691 542	18 747 809	18 321 497	21 809 813	22 499 533
Depreciation		748 815	1 276 244	1 627 565	2 039 351	1 969 758	2 542 397	2 667 696
Investment in prodction facilities		1 458 745	3 093 395	2 194 773	3 056 267	- 426 312	3 488 316	689 720
Depreciation								
	1	243 124	515 566	365 796	509 378		581 386	114 953
	2	243 124	515 566	365 796	509 378		581 386	114 953
	3	243 124	515 566	365 796	509 378		581 386	114 953
	4	243 124	515 566	365 796	509 378		581 386	114 953
	5	243 124	515 566	365 796	509 378		581 386	114 953
	6	243 124	515 566	365 796	509 378		581 386	114 953
Fixed assets, minus production wells		24 274 539	25 065 428	23 537 313	22 913 989	22 392 941	21 809 813	22 499 533
1,5% depreciation		364 118	375 981	353 060	343 710	335 894	327 147	337 493
Deprecition production		384 697	900 263	1 274 505	1 695 641	1 633 863	2 215 249	2 330 203
Total deprecation		748 815	1 276 244	1 627 565	2 039 351	1 969 758	2 542 397	2 667 696
Uplift		80 231	170 137	120 713	168 095	- 23 447	191 857	37 935
		80 231	170 137	120 713	168 095	- 23 447	191 857	37 935
		80 231	170 137	120 713	168 095	- 23 447	191 857	37 935
		80 231	170 137	120 713	168 095	- 23 447	191 857	37 935
Uplift		129 737	270 754	371 080	539 175	435 497	457 217	374 439
Revenue		6 305 075	7 712 439	8 717 523	10 415 450	11 632 697	12 462 750	12 856 876
Costs, general		2 475 435	2 939 365	3 179 106	3 743 625	4 131 759	4 426 582	4 566 569
Depreciation		748 815	1 276 244	1 627 565	2 039 351	1 969 758	2 542 397	2 667 696
Gross profit		3 080 824	3 496 830	3 910 852	4 632 474	5 531 180	5 493 772	5 622 611
Tax on profit		*831 823*	*944 144*	*1 055 930*	*1 250 768*	*1 493 419*	*1 483 318*	*1 518 105*
Uplifting		129 737	270 754	371 080	539 175	435 497	457 217	374 439
Special tax		*1 505 054*	*1 645 299*	*1 805 284*	*2 087 582*	*2 598 798*	*2 568 643*	*2 676 567*
Total tax		2 336 877	2 589 443	2 861 214	3 338 350	4 092 217	4 051 961	4 194 672
Efficient tax rate		*75,85 %*	*74,05 %*	*73,16 %*	*72,06 %*	*73,98 %*	*73,76 %*	*74,60 %*
Total profit		**743 947**	**907 387**	**1 049 638**	**1 294 123**	**1 438 963**	**1 441 811**	**1 427 939**

Appendix 24: Expected production

Felt	Nettoressurser	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Alvheim	90 000 000	8 437 500	8 437 500	8 437 500	7 312 500	6 187 500	4 653 409	4 653 409	4 653 409	4 653 409	4 653 409
Vilje	11 000 000	1 100 000	1 246 667	1 173 333	1 100 000	953 333	542 667	542 667	542 667	542 667	542 667
Volund	12 000 000	1 384 615	1 476 923	1 476 923	1 200 000	1 015 385	680 769	680 769	680 769	680 769	680 769
Alta	130 000	65 000	65 000	-	-	-	-	-	-	-	-
Jette	910 000	910 000	-	-	-	-	-	-	-	-	-
Jotun	63 000	63 000	-	-	-	-	-	-	-	-	-
Varg	1 600 000	1 600 000	-	-	-	-	-	-	-	-	-
Ivar Aasen	73 051 020	-	1 095 765	2 922 041	5 478 827	6 939 847	6 939 847	6 209 337	5 478 827	3 652 551	2 641 075
Gina Krogh	7 425 000	-	-	111 375	297 000	556 875	928 125	928 125	556 875	371 250	262 527
Viper Kobra	5 577 000	-	148 720	297 440	557 700	632 060	632 060	594 880	446 160	251 998	251 998
Enoch Unit	261 000	87 000	87 000	87 000	-	-	-	-	-	-	-
Bøyla	14 651 000	488 367	1 172 080	1 660 447	1 758 120	1 758 120	1 269 753	654 411	654 411	654 411	654 411
Johan Sverdrup	279 415 000	-	-	-	-	2 328 458	4 656 917	10 245 217	16 764 900	17 696 283	17 696 283
Fulla	4 650 000	-	-	-	-	-	124 000	248 000	465 000	527 000	527 000
Frigg/Gamma	25 000 000	-	-	-	-	-	666 667	1 333 333	2 500 000	2 833 333	2 833 333
Krafla	15 125 000	-	-	-	-	-	403 333	806 667	1 512 500	1 714 167	1 714 167
Storklakken	9 000 000	-	-	-	-	-	240 000	480 000	900 000	1 020 000	1 020 000
Total production		**14 135 482**	**13 729 655**	**16 166 059**	**17 704 147**	**20 371 578**	**21 737 547**	**27 376 815**	**35 155 518**	**34 597 838**	**33 477 640**

Appendix 25: DETNOR´s WACC

Det norske oljeselskap AS Weighted average cost of capital (NOK 1000)	2010	2011	2012	2013	2014	2015E	2016E	2017E	2018E	2019E
WACC	**4,95 %**	**4,95 %**	**4,95 %**	**4,95 %**	**4,95 %**	**4,95 %**	**4,95 %**	**4,95 %**	**4,95 %**	**4,95 %**
Marketvalue of equity	7 879 837	Market risk premium			5,4%		WACC	4,95 %		
Marketvalue of NIBD	17 294 552	Beta, Det Norske			1,71					
Enterprice value	25 174 389	E(r_)			10,78 %					
Tax	27,00 %									
riskfree-rate	1,54 %									
Return on debt	3,14 %									

Appendix 26: DCF and EVA-valuation –Stochastic modelling

Det norske oljeselskap AS		Budget period				Terminal period	
DCF-valuation	**2015E**	**2016E**	**2017E**	**2018E**	**2019E**	**2020E**	**2120E**
FCFF	3 850 911	- 3 371 906	419 043	- 1 158 706	- 1 838 840	- 726 743	492 752
WACC	4,95 %	4,95 %	4,95 %	4,95 %	4,95 %	4,95 %	4,95 %
Df	0,9528	0,9079	0,8651	0,8243	0,7855	0,7484	
PV of FCFF	3 669 336	- 3 061 424	362 519	- 955 145	- 1 444 323	- 543 908	
PV FCFF	- 1 972 945						
PV terminal	20 648 610						
EV	18 675 665						
NIBD	17 294 552						
Equity	1 381 113						
Share price	**6,82**						

Det norske oljeselskap AS							
EVA-valuation	**2015E**	**2016E**	**2017E**	**2018E**	**2019E**	**2020E**	**2120E**
NOPAT	884 949	1 069 732	1 200 971	1 467 044	1 605 969	1 622 309	1 608 127
Inv cap, beg	24 592 369	21 626 407	26 068 045	26 849 972	29 475 722	32 920 532	35 269 584
WACC	4,95 %	4,95 %	4,95 %	4,95 %	4,95 %	4,95 %	4,95 %
EVA	- 331 988	- 436	- 88 988	138 392	147 384	- 6 741	- 137 163
Df	0,9528	0,9079	0,8651	0,8243	0,7855	0,7484	
PV of EVA	- 316 333,97	- 395,73	- 76 984,92	114 079,15	115 763,01	- 5 045,00	
Inv kap, beg	24 592 369						
PV EVA	- 168 917						
PV terminal	- 5 747 787						
EV	18 675 665						
NIBD	17 294 552						
Equity	1 381 113						
Share price	**6,82**						

Appendix 27: DCF and EVA-valuation –All Scenarios

Det norske oljeselskap AS							
DCF-valuation, Low-value	**2015E**	**2016E**	**2017E**	**2018E**	**2019E**	**2020E**	**2120E**
FCFF	11 022 000	- 1 994 304	154 353	- 627 599	- 1 003 811	- 110 220	- 135 443
WACC	4,95 %	4,95 %	4,95 %	4,95 %	4,95 %	4,95 %	4,95 %
Df	0,9528	0,9079	0,8651	0,8243	0,7855	0,7484	
PV of FCFF	10 502 301	- 1 810 671	133 533	- 517 343	- 788 446	- 82 490	
PV FCFF	7 436 883						
PV terminal	- 6 136 902						
EV	1 299 981						
NIBD	17 294 552						
Equity	- 15 994 571						
Share price	**- 78,94**						

Det norske oljeselskap AS							
EVA-valuation, Low value	**2015E**	**2016E**	**2017E**	**2018E**	**2019E**	**2020E**	**2120E**
NOPAT	248 009	256 088	301 428	394 521	454 272	505 222	501 189
Inv cap, beg	24 592 369	13 818 379	16 068 771	16 215 845	17 237 964	18 696 048	19 311 489
WACC	4,95 %	4,95 %	4,95 %	4,95 %	4,95 %	4,95 %	4,95 %
EVA	- 968 927	- 427 705	- 493 724	- 407 909	- 398 737	- 419 939	- 454 427
Df	0,9528	0,9079	0,8651	0,8243	0,7855	0,7484	
PV of EVA	- 923 240,93	- 388 322,51	- 427 126,62	- 336 248,05	- 313 188,82	- 314 290,26	
Inv kap, beg	24 592 369						
PV EVA	- 2 702 417						
PV terminal	- 20 589 971						
EV	1 299 981						
NIBD	17 294 552						
Equity	- 15 994 571						
Share price	**- 78,94**						

Det norske oljeselskap AS							
DCF-valuation, Expected value	**2015E**	**2016E**	**2017E**	**2018E**	**2019E**	**2020E**	**2120E**
FCFF	2 814 604	- 2 735 574	896 903	- 375 792	- 1 050 030	8 324	329 877
WACC	4,95 %	4,95 %	4,95 %	4,95 %	4,95 %	4,95 %	4,95 %
Df	0,9528	0,9079	0,8651	0,8243	0,7855	0,7484	
PV of FCFF	2 681 893	- 2 483 685	775 922	- 309 773	- 824 750	6 230	
PV FCFF	- 154 163						
PV terminal	19 362 278						
EV	19 208 115						
NIBD	17 294 552						
Equity	1 913 563						
Share price	**9,44**						

Det norske oljeselskap AS							
EVA-valuation, Expected value	**2015E**	**2016E**	**2017E**	**2018E**	**2019E**	**2020E**	**2120E**
NOPAT	771 957	914 378	1 023 118	1 225 317	1 124 781	1 102 337	1 475 807
Inv cap, beg	24 592 369	22 549 722	26 199 674	26 325 888	27 926 997	30 101 809	31 195 822
WACC	4,95 %	4,95 %	4,95 %	4,95 %	4,95 %	4,95 %	4,95 %
EVA	- 444 979	- 201 479	- 273 355	- 77 401	- 257 167	- 387 230	- 67 897
Df	0,9528	0,9079	0,8651	0,8243	0,7855	0,7484	
PV of EVA	- 423 997,88	- 182 927,33	- 236 482,30	- 63 803,41	- 201 992,59	- 289 809,89	
Inv kap, beg	24 592 369						
PV EVA	- 1 399 013						
PV terminal	- 3 985 241						
EV	19 208 115						
NIBD	17 294 552						
Equity	1 913 563						
Share price	**9,44**						

Det norske oljeselskap AS								
DCF-valuation, High value		2015E	2016E	2017E	2018E	2019E	2020E	2120E
FCFF	-	14 048 562	- 4 820 366	1 738 777	- 595 553	- 1 664 213	- 9 431	575 463
WACC		4,95 %	4,95 %	4,95 %	4,95 %	4,95 %	4,95 %	4,95 %
Df		0,9528	0,9079	0,8651	0,8243	0,7855	0,7484	
PV of FCFF	-	13 386 158	- 4 376 512	1 504 236	- 490 926	- 1 307 161	- 7 058	
PV FCFF	-	18 063 580						
PV terminal		34 132 493						
EV		16 068 913						
NIBD		17 294 552						
Equity	-	1 225 639						
Share price	-	**6,05**						

Det norske oljeselskap AS							
EVA-valuation, High value	2015E	2016E	2017E	2018E	2019E	2020E	2120E
NOPAT	1 371 476	1 628 705	1 823 272	2 163 535	1 944 055	1 905 327	2 596 767
Inv cap, beg	24 592 369	40 012 408	46 461 480	46 545 975	49 305 063	52 913 331	54 828 088
WACC	4,95 %	4,95 %	4,95 %	4,95 %	4,95 %	4,95 %	4,95 %
EVA	154 540	- 351 281	- 475 842	- 139 760	- 495 772	- 713 053	- 116 363
Df	0,9528	0,9079	0,8651	0,8243	0,7855	0,7484	
PV of EVA	147 253,06	- 318 935,23	- 411 656,65	- 115 206,92	- 389 405,37	- 533 661,59	
Inv kap, beg	24 592 369						
PV EVA	- 1 621 613						
PV terminal	- 6 901 844						
EV	16 068 913						
NIBD	17 294 552						
Equity	- 1 225 639						
Share price	- **6,05**						

Appendix 28: DCF and EVA-valuation –Scenario Modelling

Det norske oljeselskap AS								
DCF-valuation		2015E	2016E	2017E	2018E	2019E	2020E	2120E
FCFF	-	70 653	- 3 183 415	930 011	- 532 981	- 1 239 351	- 37 109	256 632
WACC		4,95 %	4,95 %	4,95 %	4,95 %	4,95 %	4,95 %	4,95 %
Df		0,9528	0,9079	0,8651	0,8243	0,7855	0,7484	
PV of FCFF	-	67 321	- 2 890 289	804 563	- 439 347	- 973 452	- 27 773	
PV FCFF	-	3 593 620						
PV terminal		15 785 956						
EV		12 192 336						
NIBD		17 294 552						
Equity	-	5 102 215						
Share price	-	**25,18**						

Det norske oljeselskap AS								
EVA-valuation		2015E	2016E	2017E	2018E	2019E	2020E	2120E
NOPAT		797 148	933 057	1 049 273	1 261 124	1 174 369	1 170 962	1 524 588
Inv cap, beg		24 592 369	25 460 170	29 576 641	29 695 903	31 490 008	33 903 729	35 111 800
WACC		4,95 %	4,95 %	4,95 %	4,95 %	4,95 %	4,95 %	4,95 %
EVA	-	419 789	- 326 822	- 414 307	- 208 357	- 383 892	- 506 741	- 212 895
Df		0,9528	0,9079	0,8651	0,8243	0,7855	0,7484	
PV of EVA	-	399 995,25	- 296 728,36	- 358 421,85	- 171 752,79	- 301 528,93	- 379 253,92	
Inv kap, beg		24 592 369						
PV EVA	-	1 907 681						
PV terminal	-	10 492 352						
EV		12 192 336						
NIBD		17 294 552						
Equity	-	5 102 215						
Share price	-	**25,18**						

Appendix 29: DETNOR License overview

No	Field	Licens No	Ownership	Type	Note
1		PL 088 BS			
2	Alvheim	PL 203	65,00 %	Mature	
3		PL 036 C			
4	Vilje	PL 036 D	46,90 %	Mature	
5	Volund	PL 150	65,00 %	Mature	
6	Atla	PL 102 C	10,00 %	Mature	
7		PL 027 D			
8	Jette	PL 169 C	70,00 %	Mature	
9		PL 504			
10	Jotun	PL 027 B	7,00 %	Mature	
11		PL 103 B			
12	Varg	PL 038	5,00 %	Mature	
13		PL 001 B			
14	Ivar Aasen	PL 028 B	34,79 %	Mature	
15		PL 242			
16		PL 457			
17	Gina Krog	PL 029 B	3,30 %	Mature	
18	Viper-kobra	PL 203	65,00 %	Mature	
19	Enoch unit	PL 048 D	10,00 %	Mature	
20	Bøyla	340 BS	65,00 %	Mature	
21		PL 340			
22	Johan Sverdrup	PL 265	11,89 %	Mature	
23		PL 502			
24	Frøy	PL 364	50,00 %	Mature	Have been approved, but stopped due to low oil price. Will not start in the near future
25	Fulla	PL 035 B	15,00 %	Mature	
26		PL 362			Prossesen om kommersialisering av Fulla har startet
27	Frigg Gamma/Delta	PL 442	20,00 %	Mature	
28	Krafla	PL 272	25,00 %	Mature	
29		PL 035			
30	Storklakken	PL 460	100,00 %	Mature	
31	Garantiana	PL 554 B	20,00 %	Immature	
32		PL 554			
33	Gotha	PL 492	40,00 %	Immature	Unsure if anD when production should start
34	Trell	PL 102 F	10,00 %	Mature	Unsure if anD when production should start
35	Grevling	PL 038 D	30,00 %	Mature	Relativt utfordrende forhold
36	Svanefjellet	PL 659	20,00 %	Immature	Foreløbige dårlige producksjonsegenskaper, avgjørelse om produksjon senere, men veldig lite trolig
37	Arenaria	PL 709	40,00 %	Immature	Avgjørelse om prøveborring eller tilbakelevering
38	Åtind	PL 715	40,00 %	immature	Seismiske undersøkelser pågår
39	Komse	PL 438	10,00 %	Immature	Vurderer yttligere avgrensningsborring
40	Salina	PL 533	20,00 %	immature	Da det ikke er nok infrastrukture i BH, dømmes dette som ikke kommersielt
41	Fafner	PL 613	20,00 %	Immature	Avgjørelse om prøveborring eller tilbakelevering
42	Eiktunet	PL 706	20,00 %	Immature	Avgjørelse om prøveborring eller tilbakelevering
43	Terne	PL 558	10,00 %	Mature	Tørr brønn
44	Celsius	PL 653	30,00 %	Mature	Ingen informasjon, trolig ingen foreløbig investering
45	Langfjellet	PL 026 B	62,13 %	Mature	Ingen informasjon, trolig ingen foreløbig investering
46	Eitri, Iving	PL 027 ES	40,00 %	Mature	Ingen informasjon, trolig ingen foreløbig investering
47	Volund West	PL 150 B	65,00 %	Mature	Ingen informasjon, trolig ingen foreløbig investering
48	Thorshammer	PL 494	30,00 %	Mature	Tørr brønn
49	Heimdalshø	PL 494 C	30,00 %	Mature	Tørr brønn
50	Kvitola	PL 553	40,00 %	Mature	Tørr brønn
51	Rovarkula	PL 626	50,00 %	Mature	Avgjørelse om prøveborring eller tilbakelevering
52	Skåla	PL 663	30,00 %	Mature	Avgjørelse om prøveborring eller tilbakelevering
53	Hyrokkin	PL 677	60,00 %	Mature	Avgjørelse om prøveborring eller tilbakelevering
54	Ymmelstind	PL 724	40,00 %	Mature	Seismiske undersøkelser pågår
55	Ty	PL 736 S	65,00 %	Mature	Ingen informasjon, trolig ingen foreløbig investering
56	Huva	PL 748	40,00 %	Mature	Seismiske undersøkelser pågår
57	Kark	PL 019 C	30,00 %	Mature	Ingen informasjon, trolig ingen foreløbig investering
58	Kark	PL 019 D	30,00 %	Mature	Ingen informasjon, trolig ingen foreløbig investering
59	Krafla	PL 035 C	25,00 %	Mature	Ingen informasjon, trolig ingen foreløbig investering
60	Oter	PL 038 E	5,00 %	Mature	Ingen informasjon, trolig ingen foreløbig investering
61	Glitne	PL 048 B	10,00 %	Mature	Produksjonen er avsluttet
62	Angeya	PL 102 D	10,00 %	Mature	Ingen informasjon, trolig ingen foreløbig investering
63	Trell (2)	PL 102 G	10,00 %	Mature	Ingen informasjon, trolig ingen foreløbig investering
64	Clapton	PL 440 S	10,00 %	Mature	Tørr brønn
65	Gotama	PL 550	10,00 %	Mature	Tørr brønn, men vurderer andre deler av lisensen for seismiske undersøkelser
66	Mantra	PL 551	20,00 %	Mature	Tørr brønn, men vurderer andre deler av lisensen for seismiske undersøkelser
67	Garantiana	PL 554 C	10,00 %	Mature	Ingen informasjon, trolig ingen foreløbig investering
68	Freki	PL 567	40,00 %	Mature	Avgjørelse om prøveborring eller tilbakelevering
69	Kolsås	PL 574	10,00 %	Mature	Avgjørelse om prøveborring eller tilbakelevering
70	Færing	PL 619	30,00 %	Mature	Avgjørelse om prøveborring eller tilbakelevering
71	Snømus	PL 672	25,00 %	Mature	Planlegger å borre i løpet av 2015
72	Dama	PL 676 S	10,00 %	Mature	Avgjørelse om prøveborring eller tilbakelevering
73	Båtfjellet	PL 6678 BS	25,00 %	Mature	Avgjørelse om prøveborring eller tilbakelevering
74	Båtfjellet (2)	PL 678S	25,00 %	Mature	Avgjørelse om prøveborring eller tilbakelevering
75	Kuro	PL 681	16,00 %	Mature	Tørr brønn, men vurderer andre deler av lisensen for seismiske undersøkelser
76	Fannaråken	PL 730	30,00 %	Mature	Avgjørelse om prøveborring eller tilbakelevering

Appendix 30: Overview of Licences status

Field	Licens No	Ownership	Type	Ex. Drilling	Oil	Appraisal drilling	Devlopment planned	Approved for development	Production	Size	Years in production	Start
Alvheim	PL 088 BS PL 203 PL 036 C	65,00 %	Mature	-	Yes	-	-	-	Yes	90 000 000	16	-
Vilje	PL 036 D	46,90 %	Mature	-	Yes	-	-	-	Yes	11 000 000	15	-
Volund	PL 150	65,00 %	Mature	-	Yes	-	-	-	Yes	12 000 000	13	-
Atla	PL 102 C	10,00 %	Mature	-	Yes	-	-	-	Yes	130 000	2	-
Jette	PL 027 D PL 169 C PL 504	70,00 %	Mature	-	Yes	-	-	-	Yes	910 000	1	-
Jotun	PL 027 B PL 103 B	7,00 %	Mature	-	Yes	-	-	-	Yes	63 000	?	-
Varg	PL 038	5,00 %	Mature	-	Yes	-	-	-	Yes	1 600 000	1	-
Ivar Aasen	PL 001 B PL 028 B PL 242 PL 457	34,79 %	Mature	-	Yes	-	-	Yes	-	73 051 020	20	2016
Gina Krog	PL 029 B	3,30 %	Mature	-	Yes	-	-	Yes	-	7 425 000	20	2017
Viper-kobra	PL 203	65,00 %	Mature	-	Yes	-	-	Yes	-	5 577 000	15	2016
Enoch unit	PL 048 D	10,00 %	Mature	-	Yes	-	-	Yes	-	261 000	3	2015
Bøyla	340 BS PL 340	65,00 %	Mature	-	Yes	-	-	Yes	-	14 651 000	15	2015
Johan Sverdrup	PL 265 PL 502	11,89 %	Mature	-	Yes	-	Yes	-	-	279 415 000	30	2019
Frøy	PL 364	50,00 %	Mature	-	Yes	-	Yes	-	-	-	-	-
Fulla	PL 035 B PL 362	15,00 %	Mature	-	Yes Yes	- -	Yes	-	-	4 650 000	-	-
Frigg Gamma/Delta	PL 442	20,00 %	Mature	-	Yes	-	Yes	-	-	25 000 000	-	-
Krafla	PL 272 PL 035	25,00 %	Mature	-	Yes	-	Yes	-	-	15 125 000	-	-
Storklakken	PL 460	100,00 %	Mature	-	Yes	-	Yes	-	-	9 000 000	-	-
Garantiana	PL 554 B PL 554	20,00 %	Immatur	Yes	Yes	Yes	Hold	-	-	10 000 000	-	-
Gotha	PL 492	40,00 %	Immature	Yes	Yes	Yes	Hold	-	-	74 400 000	-	-
Trell	PL 102 F	10,00 %	Mature	Yes	Yes	Yes	Hold	-	-	200 000	-	-
Grevling	PL 038 D	30,00 %	Mature	Yes	Yes	Yes	Hold	-	-	7 800	-	-
Svanefjellet	PL 659	20,00 %	Immature	Yes	Yes	Yes	No	-	-	-	-	-
Arenaria	PL 709	40,00 %	Immature	No	-	-	-	-	-	-	-	-
Åtind	PL 715	40,00 %	immature	No	-	-	-	-	-	-	-	-
Komse	PL 438	10,00 %	Immature	Yes	Yes	No	-	-	-	-	-	-
Salina	PL 533	20,00 %	immature	Yes	Yes	No	No	-	-	9 000 000	-	-
Fafner	PL 613	20,00 %	Immature	No	-	-	-	-	-	-	-	-
Eiktunet	PL 706	20,00 %	Immature	No	-	-	-	-	-	-	-	-
Terne	PL 558	10,00 %	Mature	Yes	No	-	-	-	-	-	-	-
Celsius	PL 653	30,00 %	Mature	No	-	-	-	-	-	-	-	-
Langfjellet	PL 026 B	62,13 %	Mature	No	-	-	-	-	-	-	-	-
Eitri, Iving	PL 027 ES	40,00 %	Mature	No	-	-	-	-	-	-	-	-
Volund West	PL 150 B	65,00 %	Mature	No	-	-	-	-	-	-	-	-
Thorshammer	PL 494	30,00 %	Mature	Yes	No	-	-	-	-	-	-	-
Heimdalshø	PL 494 C	30,00 %	Mature	Yes	No	-	-	-	-	-	-	-
Kvitola	PL 553	40,00 %	Mature	Yes	No	-	-	-	-	-	-	-
Rovarkula	PL 626	50,00 %	Mature	No	-	-	-	-	-	-	-	-
Skåla	PL 663	30,00 %	Mature	No	-	-	-	-	-	-	-	-
Hyrokkin	PL 677	60,00 %	Mature	No	-	-	-	-	-	-	-	-
Ymmelstind	PL 724	40,00 %	Mature	No	-	-	-	-	-	-	-	-
Ty	PL 736 S	65,00 %	Mature	No	-	-	-	-	-	-	-	-
Huva	PL 748	40,00 %	Mature	No	-	-	-	-	-	-	-	-
Kark	PL 019 C	30,00 %	Mature	No	-	-	-	-	-	-	-	-
Kark	PL 019 D	30,00 %	Mature	No	-	-	-	-	-	-	-	-
Krafla	PL 035 C	25,00 %	Mature	No	-	-	-	-	-	-	-	-
Oter	PL 038 E	5,00 %	Mature	No	-	-	-	-	-	-	-	-
Glitne	PL 048 B	10,00 %	Mature	Yes	Yes	-	-	-	Yes	-	-	-
Angeya	PL 102 D	10,00 %	Mature	No	-	-	-	-	-	-	-	-
Trell (2)	PL 102 G	10,00 %	Mature	No	-	-	-	-	-	-	-	-
Clapton	PL 440 S	10,00 %	Mature	Yes	No	-	-	-	-	-	-	-
Gotama	PL 550	10,00 %	Mature	Yes	(No)	-	-	-	-	-	-	-
Mantra	PL 551	20,00 %	Mature	Yes	(No)	-	-	-	-	-	-	-
Garantiana	PL 554 C	10,00 %	Mature	No	-	-	-	-	-	-	-	-
Freki	PL 567	40,00 %	Mature	No	-	-	-	-	-	-	-	-
Kolsås	PL 574	10,00 %	Mature	No	-	-	-	-	-	-	-	-
Færing	PL 619	30,00 %	Mature	No	-	-	-	-	-	-	-	-
Snømus	PL 672	25,00 %	Mature	No	-	-	-	-	-	-	-	-
Dama	PL 676 S	10,00 %	Mature	No	-	-	-	-	-	-	-	-
Båtfjellet	PL 6678 BS	25,00 %	Mature	No	-	-	-	-	-	-	-	-
Båtfjellet (2)	PL 678S	25,00 %	Mature	No	-	-	-	-	-	-	-	-
Kuro	PL 681	16,00 %	Mature	Yes	(No)	-	-	-	-	-	-	-
Fannaråken	PL 730	30,00 %	Mature	No	-	-	-	-	-	-	-	-

Appendix 31: Inputs to the Real Option valuation

Modelling inputs		
Volatility (Oil price)		17,20 %
Risk free rate		1,54 %
Spot	$	55,27
Drift		0,035
Cost of Capital		4,94 %
Operating costs	$	11,70
Exchange rate USD/NOK	$	7,42
Tax rate		78 %
Tax production facilties		66,78 %

Option inputs		
Up factor		1,18768
Down factor		0,84198
Risk-free probability		0,50200
(1-p)		0,49800

Phase 1		
t		7
Cost	kr.	100 000 000,00
Probability (mature)		50 %
Probability (immature)		30 %

Phase 2		
t		3
Cost	kr.	50 000 000,00
Probability		70 %

Phase 3		
t		5
Cost (mature)	kr.	450 000 000,00
Cost (immature)	kr.	6 000 000 000,00
Development costs per boe (mature)	kr.	9,00
Development cost per boe (immature)	kr.	30,00

Production phase		
Expected production (mature)		50 000 000
Expected production (immature)		200 000 000
Expected lifetime		15

Appendix 32: Calculations of development costs

Development cost er boe, mature		9
Developmet cost per boe, mature in practice	$	8,85
Development cost per boe, immature	$	30,00
Snøhvit investment	$	5 865 728 193
Snøhvit boe		193 101 158
Development cost per boe, immature in practice	$	30,38

Appendix 33: Calculation of effective tax on production facilities

Tax sceme								
		$	-450 000 000		Uplift	$	-24 750 000	Total tax
	1	$	-75 000 000	-20250000	-50 250 000		-25 627 500	-45 877 500
	2	$	-75 000 000	-20250000	-50 250 000		-25 627 500	-45 877 500
	3	$	-75 000 000	-20250000	-50 250 000		-25 627 500	-45 877 500
	4	$	-75 000 000	-20250000	-50 250 000		-25 627 500	-45 877 500
	5	$	-75 000 000	-20250000	-75 000 000		-38 250 000	-58 500 000
	6	$	-75 000 000	-20250000	-75 000 000		-38 250 000	-58 500 000
								-300 510 000
						PV (after tax)	$	-149 490 000
						Effective tax rate		66,78 %

Appendix 34: Abandonment costs

Modelled abandonment costs:

Abandonment cost per boe	**$**	**4,23**
Abandonment, mature		211 338 945
Abandonment, immature		845 355 782

Abandonment costs –Producing fields

Field	Licens No	Ownership	Type	Abandonment liability
Alvheim	PL 088 BS PL 203 PL 036 C	65,00 %	Mature	$ 83 690 222
Vilje	PL 036 D	46,90 %	Mature	$ 10 228 805
Volund	PL 150	65,00 %	Mature	$ 11 158 696
Atla	PL 102 C	10,00 %	Mature	$ 120 886
Jette	PL 027 D PL 169 C PL 504	70,00 %	Mature	$ 846 201
Jotun	PL 027 B PL 103 B	7,00 %	Mature	$ 58 583
Varg	PL 038	5,00 %	Mature	$ 1 487 826

Abandonment costs –Developeing fields

Field	Licens No	Ownership	Type	Abandonment costs
Ivar Aasen	PL 001 B PL 028 B PL 242 PL 457	34,79 %	Mature	$ 67 929 512
Gina Krog	PL 029 B	3,30 %	Mature	$ 6 904 443
Viper-kobra	PL 203	65,00 %	Mature	$ 5 186 004
Enoch unit	PL 048 D	10,00 %	Mature	$ 242 702
Bøyla	340 BS PL 340	65,00 %	Mature	$ 13 623 838
Johan Sverdrup	PL 265 PL 502	11,89 %	Mature	$ 259 825 594
Frøy	PL 364	50,00 %	Mature	
Fulla	PL 035 B PL 362	15,00 %	Mature	$ 4 323 995
Frigg Gamma/Delta	PL 442	20,00 %	Mature	$ 23 247 284
Krafla	PL 272 PL 035	25,00 %	Mature	$ 14 064 607
Storklakken	PL 460	100,00 %	Mature	$ 8 369 022

Abandonment costs –Other fields with oil

Field	Licens No	Ownership	Type	Abandonment costs
Ivar Aasen	PL 001 B PL 028 B PL 242 PL 457	34,79 %	Mature	$ 67 929 512
Gina Krog	PL 029 B	3,30 %	Mature	$ 6 904 443
Viper-kobra	PL 203	65,00 %	Mature	$ 5 186 004
Enoch unit	PL 048 D	10,00 %	Mature	$ 242 702
Bøyla	340 BS PL 340	65,00 %	Mature	$ 13 623 838
Johan Sverdrup	PL 265 PL 502	11,89 %	Mature	$ 259 825 594
Frøy	PL 364	50,00 %	Mature	
Fulla	PL 035 B PL 362	15,00 %	Mature	$ 4 323 995
Frigg Gamma/Delta	PL 442	20,00 %	Mature	$ 23 247 284
Krafla	PL 272 PL 035	25,00 %	Mature	$ 14 064 607
Storklakken	PL 460	100,00 %	Mature	$ 8 369 022

Appendix 35: Valuation of fields in production

Field	Alvheim	Vilje	Volund	Atla	Jette
Licens No	PL 088 BS PL 203 PL 036 C	PL 036 D	PL 150	PL 102 C	PL 027 D
Ownership	65,00 %	46,90 %	65,00 %	10,00 %	70,00 %
Type	Mature	Mature	Mature	Mature	Mature
Ex. Drilling	0	0	0	0	0
Oil	Yes	Yes	Yes	Yes	Yes
Apprasial drilling	0	0	0	0	0
Devlopment planned	0	0	0	0	0
Approved for development	0	0	0	0	0
Production	Yes	Yes	Yes	Yes	Yes
Size	90 000 000	11 000 000	12 000 000	130 000	910 000
Years in production	16	15	13	2	1
Start	0	0	0	0	0
Percentage of production	77,79 %	9,51 %	10,37 %	0,11 %	0,79 %
Abandonment liability	83 690 222	10 228 805	11 158 696	120 886	846 201
Total value	779 192 552	95 802 714	105 703 310	1 140 490	7 941 485

Alvheim			Value	779 192 552
t	Oljepris	Production	Income	NPV
1	kr. 57,36	12,5%	112 996 500	107 677 245
2	kr. 59,68	12,5%	118 735 676	107 819 945
3	kr. 61,30	9,4%	92 060 309	79 661 641
4	kr. 63,62	8,1%	83 528 005	68 875 992
5	kr. 66,18	6,9%	74 156 978	58 270 229
6	kr. 68,96	4,6%	52 176 531	39 068 689
7	kr. 70,68	4,6%	53 746 431	38 349 722
8	kr. 72,63	4,6%	55 517 558	37 748 689
9	kr. 75,52	4,6%	58 153 194	37 679 405
10	kr. 77,36	4,6%	59 831 575	36 941 952
11	kr. 79,62	4,6%	61 892 193	36 415 327
12	kr. 80,92	4,6%	63 075 557	35 364 570
13	kr. 82,57	4,6%	64 576 087	34 501 498
14	kr. 84,19	4,6%	66 058 270	33 631 974
15	kr. 85,27	4,6%	67 039 054	32 524 601
16	kr. 86,55	4,6%	68 202 436	31 531 377

Vilje			Value	95 802 714
t	Oljepris	Production	Income	NPV
1	kr. 57,36	12,0%	13 258 256	12 634 130
2	kr. 59,68	11,3%	13 157 672	11 948 047
3	kr. 61,30	10,7%	12 802 066	11 077 885
4	kr. 63,62	10,0%	12 564 896	10 360 833
5	kr. 66,18	8,7%	11 425 668	8 977 932
6	kr. 68,96	4,7%	6 558 736	4 911 043
7	kr. 70,68	4,7%	6 756 076	4 820 667
8	kr. 72,63	4,7%	6 978 712	4 745 116
9	kr. 75,52	4,7%	7 310 019	4 736 406
10	kr. 77,36	4,7%	7 520 996	4 643 706
11	kr. 79,62	4,7%	7 780 021	4 577 508
12	kr. 80,92	4,7%	7 928 773	4 445 425
13	kr. 82,57	4,7%	8 117 394	4 336 934
14	kr. 84,19	4,7%	8 303 709	4 227 633
15	kr. 85,27	4,7%	8 426 996	4 088 433

Volund				Value	105 703 310
t	Oljepris		Production	Income	NPV
1	kr.	57,36	15,4%	18 543 015	17 670 112
2	kr.	59,68	13,8%	17 536 346	15 924 177
3	kr.	61,30	13,8%	18 128 799	15 687 215
4	kr.	63,62	10,0%	13 707 160	11 302 727
5	kr.	66,18	8,5%	12 169 350	9 562 294
6	kr.	68,96	4,8%	7 267 386	5 441 666
7	kr.	70,68	4,8%	7 486 049	5 341 525
8	kr.	72,63	4,8%	7 732 740	5 257 810
9	kr.	75,52	4,8%	8 099 843	5 248 160
10	kr.	77,36	4,8%	8 333 616	5 145 444
11	kr.	79,62	4,8%	8 620 628	5 072 094
12	kr.	80,92	4,8%	8 785 453	4 925 739
13	kr.	82,57	4,8%	8 994 453	4 805 527

Atla			Value	1 140 490
t	Oljepris	Production	Income	NPV
1	kr. 57,36	50,0%	652 869	622 135
2	kr. 59,68	50,0%	686 028	622 960

Jette			Value	7 941 485
t	Oljepris	Production	Income	NPV
1	kr. 57,36	100,0%	9 140 161	8 709 893

Jotun			Value	549 795
t	Oljepris	Production	Income	NPV
1	kr. 57,36	100,0%	632 780	602 993

Varg			Value	13 963 051
t	Oljepris	Production	Income	NPV
1	kr. 57,36	100,0%	16 070 613	15 314 097

Appendix 36: Valuation of fields in development

Field	Ivar Aasen	Gina Krog	Viper-kobra	Enoch unit	Bøyla
Licens No	PL 001 B PL 028 B PL 242 PL 457	PL 029 B	PL 203	PL 048 D	340 BS PL 340
Ownership	34,79 %	3,30 %	65,00 %	10,00 %	65,00 %
Type	Mature	Mature	Mature	Mature	Mature
Ex. Drilling	-	-	-	-	-
Oil	Yes	Yes	Yes	Yes	Yes
Apprasial drilling	-	-	-	-	-
Devlopment planned	-	-	-	-	-
Approved for development	Yes	Yes	Yes	Yes	Yes
Production	-	-	-	-	-
Size	73 051 020	7 425 000	5 577 000	261 000	14 651 000
Years in production	20	20	15	3	15
Start	2016	2017	2016	2015	2015
Years untill production	2	3	2	1	1
Waiting option?	No	Yes	No	No	Yes
Development costs	$ 1 294 446 017,56	$ 14 683 872,01	$ 50 193 000,00	$ -	$ 489 866 914,77
Abandonment costs	$ 67 929 512,32	$ 6 904 443,35	$ 5 186 004,11	$ 242 701,64	$ 13 623 838,31
Total value	$ 186 153 722,22	$ 54 598 341,83	$ 31 716 875,65	$ 2 297 204,29	$ 8 726 596,16
PV Development costs	$ 400 127 304,38	$ 4 432 968,20	$ 15 515 200,72	$ -	$ 162 733 789,09
Waiting option value	$ -	$ 328 527,92	$ -	$ -	$ 52 883 712,05

Field	Johan Sverdrup	Fulla	Frigg Gamma/Delta	Krafla	Storklakken
Licens No	PL 265	PL 035 B	PL 442	PL 272	PL 460
	PL 502	PL 362		PL 035	
Ownership	11,9 %	15,0 %	20,0 %	25,0 %	100,0 %
Type	Mature	Mature	Mature	Mature	Mature
Ex. Drilling	-	-	-	-	-
Oil	Yes	Yes	Yes	Yes	Yes
Apprasial drilling	-	-	-	-	-
Devlopment planned	Yes	Yes	Yes	Yes	Yes
Approved for development	-	-	-	-	-
Production	-	-	-	-	-
Size	279 415 000	4 650 000	25 000 000	15 125 000	9 000 000
Years in production	30	15	15	15	15
Start	2019	-	-	-	-
Years untill production	5	6	6	6	6
Waiting option?	Yes	Yes	Yes	Yes	Yes
Development costs	$ 1 875 773 633,75	$ 41 850 000,00	$ 225 000 000,00	$ 136 125 000,00	$ 81 000 000,00
Abandonment costs	$ 259 825 594,29	$ 4 323 994,82	$ 23 247 283,99	$ 14 064 606,82	$ 8 369 022,24
Total value	$ 1 396 616 481,14	$ 26 306 656,65	$ 135 021 690,59	$ 81 688 122,81	$ 48 607 808,61
PV Development costs	$ 540 463 183,92	$ 12 058 163,01	$ 64 828 833,39	$ 39 221 444,20	$ 23 338 380,02
Waiting option value	$ 40 053 805,68	$ 893 632,23	$ 4 804 474,33	$ 2 906 706,97	$ 1 729 610,76

Ivar Aasen	
Waiting option?	No

Ivar Aasen				**Value**	**586 281 027**
t	**Oljepris**		**Production**	**Income**	**NPV**
2	kr.	59,68	1,5%	11 565 016	10 501 809
3	kr.	61,30	4,0%	31 881 953	27 588 097
4	kr.	63,62	7,5%	62 582 625	51 604 733
5	kr.	66,18	12,5%	109 439 250	85 993 933
6	kr.	68,96	12,5%	115 026 165	86 129 174
7	kr.	70,68	7,5%	71 092 260	50 726 501
8	kr.	72,63	5,0%	48 956 660	33 287 663
9	kr.	75,52	3,5%	36 262 869	23 495 929
10	kr.	77,36	3,5%	37 309 465	23 036 072
11	kr.	79,62	3,5%	38 594 415	22 707 682
12	kr.	80,92	3,5%	39 332 331	22 052 456
13	kr.	82,57	3,5%	40 268 024	21 514 266
14	kr.	84,19	3,5%	41 192 276	20 972 053
15	kr.	85,27	3,5%	41 803 868	20 281 523
16	kr.	86,55	3,5%	42 529 324	19 662 173
17	kr.	87,58	3,5%	43 114 641	18 994 451
18	kr.	89,27	3,5%	44 075 170	18 503 544
19	kr.	89,46	3,5%	44 187 592	17 677 474
20	kr.	90,85	3,5%	44 973 579	17 144 951
21	kr.	93,16	3,5%	46 287 318	16 815 112

Gina Krog						
Waiting option?				Yes		
0	1	2	3	4	5	
$ 58 702 782	$ 69 719 993	$ 82 804 890	$ 98 345 533	$ 116 802 809	$ 138 724 107	
	$ 49 426 520	$ 58 702 782	$ 69 719 993	$ 82 804 890	$ 98 345 533	
		$ 41 616 100	$ 49 426 520	$ 58 702 782	$ 69 719 993	
			$ 35 039 890	$ 41 616 100	$ 49 426 520	
				$ 29 502 857	$ 35 039 890	
					$ 24 840 792	
$ 54 269 814	$ 65 287 025	$ 78 371 922	$ 93 912 564	$ 112 369 841	$ 134 291 139	
	$ 44 993 552	$ 54 269 814	$ 65 287 025	$ 78 371 922	$ 93 912 564	
		$ 37 183 132	$ 44 993 552	$ 54 269 814	$ 65 287 025	
			$ 30 606 922	$ 37 183 132	$ 44 993 552	
				$ 25 069 889	$ 30 606 922	
					$ 20 407 823	
$ 54 598 342	$ 65 551 855	$ 78 572 066	$ 94 047 019	$ 112 437 586	$ 134 291 139	
	$ 45 258 382	$ 54 469 958	$ 65 421 479	$ 78 439 667	$ 93 912 564	
		$ 37 383 276	$ 45 128 006	$ 54 337 559	$ 65 287 025	
			$ 30 741 376	$ 37 250 877	$ 44 993 552	
				$ 25 137 634	$ 30 606 922	
					$ 20 407 823	

Gina Krog				Value	58 702 782
t	Oljepris	Production	Income	NPV	
3	kr. 61,30	1,5%	1 215 196	1 051 534	
4	kr. 63,62	4,0%	3 392 522	2 797 425	
5	kr. 66,18	7,5%	6 674 128	5 244 321	
6	kr. 68,96	12,5%	11 691 408	8 754 280	
7	kr. 70,68	12,5%	12 043 182	8 593 178	
8	kr. 72,63	7,5%	7 464 027	5 075 102	
9	kr. 75,52	5,0%	5 212 249	3 377 191	
10	kr. 77,36	3,5%	3 792 182	2 341 416	
11	kr. 79,62	3,5%	3 922 786	2 308 038	
12	kr. 80,92	3,5%	3 997 789	2 241 440	
13	kr. 82,57	3,5%	4 092 894	2 186 738	
14	kr. 84,19	3,5%	4 186 836	2 131 627	
15	kr. 85,27	3,5%	4 248 999	2 061 440	
16	kr. 86,55	3,5%	4 322 735	1 998 489	
17	kr. 87,58	3,5%	4 382 228	1 930 621	
18	kr. 89,27	3,5%	4 479 857	1 880 724	
19	kr. 89,46	3,5%	4 491 284	1 796 761	
20	kr. 90,85	3,5%	4 571 173	1 742 635	
21	kr. 93,16	3,5%	4 704 703	1 709 110	
22	kr. 94,28	3,5%	4 769 631	1 651 131	

Viper-kobra					
Waiting option?			No		

Viper-kobra				Value	47 232 076
t	Oljepris	Production	Income	NPV	
2	kr. 59,68	5,3%	3 139 266	2 850 664	
3	kr. 61,30	10,0%	6 084 982	5 265 457	
4	kr. 63,62	16,7%	10 617 338	8 754 904	
5	kr. 66,18	16,7%	11 140 026	8 753 483	
6	kr. 68,96	11,3%	7 961 935	5 961 730	
7	kr. 70,68	6,7%	4 824 409	3 442 364	
8	kr. 72,63	5,3%	3 986 712	2 710 731	
9	kr. 75,52	3,1%	2 435 986	1 578 357	
10	kr. 77,36	3,1%	2 506 292	1 547 466	
11	kr. 79,62	3,1%	2 592 610	1 525 406	
12	kr. 80,92	3,1%	2 642 180	1 481 391	
13	kr. 82,57	3,1%	2 705 036	1 445 238	
14	kr. 84,19	3,1%	2 767 123	1 408 814	
15	kr. 85,27	3,1%	2 808 207	1 362 427	
16	kr. 86,55	3,1%	2 856 940	1 320 822	

Enoch unit	
Waiting option?	No

Enoch unit					Value	2 297 204
t		Oljepris		Production	Income	NPV
	1	kr.	57,36	33,3%	873 840	832 704
	2	kr.	59,68	33,3%	918 223	833 808
	3	kr.	61,30	33,3%	949 244	821 400

Bøyla	
Waiting option?	Yes

0	1	2	3	4	5
$ 118 576 673	$ 140 830 886	$ 167 261 722	$ 198 653 039	$ 235 935 811	$ 280 215 733
	$ 99 839 089	$ 118 576 673	$ 140 830 886	$ 167 261 722	$ 198 653 039
		$ 84 062 434	$ 99 839 089	$ 118 576 673	$ 140 830 886
			$ 70 778 819	$ 84 062 434	$ 99 839 089
				$ 59 594 291	$ 70 778 819
					$ 50 177 152
$ -	$ -	$ 4 527 933	$ 35 919 250	$ 73 202 022	$ 117 481 944
	$ -	$ -	$ -	$ 4 527 933	$ 35 919 250
		$ -	$ -	$ -	$ -
			$ -	$ -	$ -
				$ -	$ -
					$ -
$ 8 726 596	$ 15 525 804	$ 27 103 747	$ 46 122 345	$ 75 688 924	$ 117 481 944
	$ 2 144 779	$ 4 338 791	$ 8 777 177	$ 17 755 834	$ 35 919 250
		$ -	$ -	$ -	$ -
			$ -	$ -	$ -
				$ -	$ -
					$ -

Bøyla					Value	118 576 673
t		Oljepris		Production	Income	NPV
	1	kr.	57,36	5,3%	7 848 352	7 478 895
	2	kr.	59,68	10,0%	15 463 079	14 041 511
	3	kr.	61,30	16,7%	26 642 481	23 054 276
	4	kr.	63,62	14,7%	24 545 106	20 239 542
	5	kr.	66,18	8,0%	14 047 339	11 037 959
	6	kr.	68,96	6,0%	11 073 346	8 291 488
	7	kr.	70,68	3,9%	7 477 610	5 335 503
	8	kr.	72,63	3,9%	7 724 022	5 251 883
	9	kr.	75,52	3,9%	8 090 712	5 242 244
	10	kr.	77,36	3,9%	8 324 221	5 139 643
	11	kr.	79,62	3,9%	8 610 910	5 066 375
	12	kr.	80,92	3,9%	8 775 548	4 920 186
	13	kr.	82,57	3,9%	8 984 313	4 800 109
	14	kr.	84,19	3,9%	9 190 526	4 679 134

Johan Sverdrup						
Waiting option?				Yes		
0	1	2	3	4	5	
$ 1 897 025 859	$ 2 253 055 562	$ 2 675 904 148	$ 3 178 112 041	$ 3 774 573 222	$ 4 482 976 946	
	$ 1 597 256 265	$ 1 897 025 859	$ 2 253 055 562	$ 2 675 904 148	$ 3 178 112 041	
		$ 1 344 856 509	$ 1 597 256 265	$ 1 897 025 859	$ 2 253 055 562	
			$ 1 132 341 171	$ 1 344 856 509	$ 1 597 256 265	
				$ 953 407 683	$ 1 132 341 171	
					$ 802 749 413	
$ 1 356 562 675	$ 1 712 592 378	$ 2 135 440 964	$ 2 637 648 857	$ 3 234 110 038	$ 3 942 513 762	
	$ 1 056 793 081	$ 1 356 562 675	$ 1 712 592 378	$ 2 135 440 964	$ 2 637 648 857	
		$ 804 393 325	$ 1 056 793 081	$ 1 356 562 675	$ 1 712 592 378	
			$ 591 877 988	$ 804 393 325	$ 1 056 793 081	
				$ 412 944 499	$ 591 877 988	
					$ 262 286 229	
$ 1 396 616 481	$ 1 744 880 235	$ 2 159 842 351	$ 2 654 041 382	$ 3 242 369 411	$ 3 942 513 762	
	$ 1 089 080 938	$ 1 380 964 062	$ 1 728 984 904	$ 2 143 700 337	$ 2 637 648 857	
		$ 828 794 712	$ 1 073 185 606	$ 1 364 822 048	$ 1 712 592 378	
			$ 608 270 513	$ 812 652 698	$ 1 056 793 081	
				$ 421 203 872	$ 591 877 988	
					$ 262 286 229	

Johan Sverdrup				Value	1 897 025 859
t	Oljepris	Production	Income	NPV	
5	kr. 66,18	1,7%	55 812 989	43 856 097	
6	kr. 68,96	2,7%	93 859 620	70 280 110	
7	kr. 70,68	5,0%	181 281 921	129 350 191	
8	kr. 72,63	6,0%	224 706 929	152 787 556	
9	kr. 75,52	6,3%	248 451 013	160 979 744	
10	kr. 77,36	6,3%	255 621 651	157 829 085	
11	kr. 79,62	5,0%	208 756 849	122 825 651	
12	kr. 80,92	4,0%	170 198 584	95 425 232	
13	kr. 82,57	3,0%	130 685 631	69 822 285	
14	kr. 84,19	2,7%	118 831 283	60 500 080	
15	kr. 85,27	2,7%	123 466 925	59 901 091	
16	kr. 86,55	2,7%	125 609 545	58 071 853	
17	kr. 87,58	2,7%	127 338 269	56 099 750	
18	kr. 89,27	2,7%	130 175 174	54 649 864	
19	kr. 89,46	2,7%	130 507 209	52 210 081	
20	kr. 90,85	2,7%	132 828 607	50 637 286	
21	kr. 93,16	2,7%	136 708 710	49 663 112	
22	kr. 94,28	2,7%	138 595 377	47 978 363	
23	kr. 95,76	2,7%	141 067 762	46 535 394	
24	kr. 96,42	2,7%	142 188 872	44 697 185	
25	kr. 96,76	2,7%	142 753 603	42 762 253	
26	kr. 98,04	2,7%	144 897 208	41 361 136	
27	kr. 99,33	2,7%	147 063 047	40 003 219	
28	kr. 99,82	2,7%	147 878 484	38 331 456	
29	kr. 100,67	2,7%	149 305 426	36 879 486	
30	kr. 100,29	2,7%	148 668 996	34 993 599	
31	kr. 100,60	2,7%	149 191 126	33 463 406	
32	kr. 100,44	2,7%	148 925 731	31 831 406	
33	kr. 100,30	2,7%	148 695 117	30 285 987	
34	kr. 100,14	2,7%	148 422 581	28 807 392	

	Fulla					
	Waiting option?			Yes		
0	1	2	3	4	5	
$ 37 471 187	$ 44 503 699	$ 52 856 056	$ 62 775 967	$ 74 557 624	$ 88 550 437	
	$ 31 549 959	$ 37 471 187	$ 44 503 699	$ 52 856 056	$ 62 775 967	
		$ 26 564 409	$ 31 549 959	$ 37 471 187	$ 44 503 699	
			$ 22 366 679	$ 26 564 409	$ 31 549 959	
				$ 18 832 278	$ 22 366 679	
					$ 15 856 386	
$ 25 413 024	$ 32 445 536	$ 40 797 893	$ 50 717 804	$ 62 499 461	$ 76 492 274	
	$ 19 491 796	$ 25 413 024	$ 32 445 536	$ 40 797 893	$ 50 717 804	
		$ 14 506 246	$ 19 491 796	$ 25 413 024	$ 32 445 536	
			$ 10 308 516	$ 14 506 246	$ 19 491 796	
				$ 6 774 115	$ 10 308 516	
					$ 3 798 223	
$ 26 306 657	$ 33 165 903	$ 41 342 308	$ 51 083 534	$ 62 683 734	$ 76 492 274	
	$ 20 212 164	$ 25 957 439	$ 32 811 266	$ 40 982 167	$ 50 717 804	
		$ 15 050 660	$ 19 857 527	$ 25 597 298	$ 32 445 536	
			$ 10 674 246	$ 14 690 519	$ 19 491 796	
				$ 6 958 388	$ 10 308 516	
					$ 3 798 223	

Fulla				Value	37 471 187
t	Oljepris	Production	Income	NPV	
6	kr. 68,96	5,3%	3 124 007	2 339 191	
7	kr. 70,68	10,0%	6 033 756	4 305 269	
8	kr. 72,63	16,7%	10 387 647	7 062 992	
9	kr. 75,52	16,7%	10 880 790	7 050 028	
10	kr. 77,36	11,3%	7 612 480	4 700 192	
11	kr. 79,62	6,7%	4 632 151	2 725 405	
12	kr. 80,92	5,3%	3 776 573	2 117 411	
13	kr. 82,57	3,1%	2 255 409	1 205 013	
14	kr. 84,19	3,1%	2 307 176	1 174 643	
15	kr. 85,27	3,1%	2 341 432	1 135 967	
16	kr. 86,55	3,1%	2 382 064	1 101 277	
17	kr. 87,58	3,1%	2 414 848	1 063 878	
18	kr. 89,27	3,1%	2 468 647	1 036 382	
19	kr. 89,46	3,1%	2 474 944	990 114	
20	kr. 90,85	3,1%	2 518 967	960 288	

Frigg Gamma/Delta					
Waiting option?			Yes		
0	1	2	3	4	5
$195 046 050	$231 651 870	$275 127 791	$326 763 178	$388 089 383	$460 925 158
	$164 224 712	$195 046 050	$231 651 870	$275 127 791	$326 763 178
		$138 273 787	$164 224 712	$195 046 050	$231 651 870
			$116 423 649	$138 273 787	$164 224 712
				$98 026 288	$116 423 649
					$82 536 093
$130 217 216	$166 823 036	$210 298 957	$261 934 345	$323 260 550	$396 096 325
	$99 395 878	$130 217 216	$166 823 036	$210 298 957	$261 934 345
		$73 444 954	$99 395 878	$130 217 216	$166 823 036
			$51 594 815	$73 444 954	$99 395 878
				$33 197 454	$51 594 815
					$17 707 259
$135 021 691	$170 695 981	$213 225 916	$263 900 637	$324 251 266	$396 096 325
	$103 268 823	$133 144 175	$168 789 328	$211 289 673	$261 934 345
		$76 371 912	$101 362 170	$131 207 932	$166 823 036
			$53 561 107	$74 435 669	$99 395 878
				$34 188 170	$51 594 815
					$17 707 259

Frigg Gamma/Delta			Value	195 046 050
t	Oljepris	Production	Income	NPV
6	kr. 66,18	5,3%	15 979 955	11 965 454
7	kr. 68,96	10,0%	31 492 008	22 470 510
8	kr. 70,68	16,7%	54 065 912	36 761 655
9	kr. 72,63	16,7%	55 847 567	36 185 512
10	kr. 75,52	11,3%	39 779 231	24 560 985
11	kr. 77,36	6,7%	24 074 891	14 164 872
12	kr. 79,62	5,3%	19 923 230	11 170 356
13	kr. 80,92	3,1%	11 844 092	6 328 022
14	kr. 82,57	3,1%	12 125 856	6 173 587
15	kr. 84,19	3,1%	12 404 175	6 017 997
16	kr. 85,27	3,1%	12 588 342	5 819 847
17	kr. 86,55	3,1%	12 806 798	5 642 123
18	kr. 87,58	3,1%	12 983 054	5 450 518
19	kr. 89,27	3,1%	13 272 297	5 309 651
20	kr. 89,46	3,1%	13 306 150	5 072 607

Krafla					
Waiting option?					Yes

0	1	2	3	4	5
$ 118 002 860	$ 140 149 381	$ 166 452 313	$ 197 691 723	$ 234 794 077	$ 278 859 721
	$ 99 355 951	$ 118 002 860	$ 140 149 381	$ 166 452 313	$ 197 691 723
		$ 83 655 641	$ 99 355 951	$ 118 002 860	$ 140 149 381
			$ 70 436 308	$ 83 655 641	$ 99 355 951
				$ 59 305 904	$ 70 436 308
					$ 49 934 336
$ 78 781 416	$ 100 927 937	$ 127 230 869	$ 158 470 279	$ 195 572 633	$ 239 638 276
	$ 60 134 506	$ 78 781 416	$ 100 927 937	$ 127 230 869	$ 158 470 279
		$ 44 434 197	$ 60 134 506	$ 78 781 416	$ 100 927 937
			$ 31 214 863	$ 44 434 197	$ 60 134 506
				$ 20 084 460	$ 31 214 863
					$ 10 712 892
$ 81 688 123	$ 103 271 069	$ 129 001 679	$ 159 659 885	$ 196 172 016	$ 239 638 276
	$ 62 477 638	$ 80 552 226	$ 102 117 543	$ 127 830 252	$ 158 470 279
		$ 46 205 007	$ 61 324 113	$ 79 380 799	$ 100 927 937
			$ 32 404 470	$ 45 033 580	$ 60 134 506
				$ 20 683 843	$ 31 214 863
					$ 10 712 892

Krafla				Value	118 002 860
t	Oljepris	Production	Income	NPV	
6	kr.	66,18	5,3%	9 667 873	7 239 100
7	kr.	68,96	10,0%	19 052 665	13 594 659
8	kr.	70,68	16,7%	32 709 877	22 240 801
9	kr.	72,63	16,7%	33 787 778	21 892 234
10	kr.	75,52	11,3%	24 066 435	14 859 396
11	kr.	77,36	6,7%	14 565 309	8 569 748
12	kr.	79,62	5,3%	12 053 554	6 758 066
13	kr.	80,92	3,1%	7 165 676	3 828 453
14	kr.	82,57	3,1%	7 336 143	3 735 020
15	kr.	84,19	3,1%	7 504 526	3 640 888
16	kr.	85,27	3,1%	7 615 947	3 521 008
17	kr.	86,55	3,1%	7 748 113	3 413 484
18	kr.	87,58	3,1%	7 854 748	3 297 563
19	kr.	89,27	3,1%	8 029 740	3 212 339
20	kr.	89,46	3,1%	8 050 221	3 068 927

	Storklakken					
	Waiting option?			Yes		
0	1	2	3	4	5	
$ 70 216 578	$ 83 394 673	$ 99 046 005	$ 117 634 744	$ 139 712 178	$ 165 933 057	
	$ 59 120 896	$ 70 216 578	$ 83 394 673	$ 99 046 005	$ 117 634 744	
		$ 49 778 563	$ 59 120 896	$ 70 216 578	$ 83 394 673	
			$ 41 912 514	$ 49 778 563	$ 59 120 896	
				$ 35 289 464	$ 41 912 514	
					$ 29 712 993	
$ 46 878 198	$ 60 056 293	$ 75 707 625	$ 94 296 364	$ 116 373 798	$ 142 594 677	
	$ 35 782 516	$ 46 878 198	$ 60 056 293	$ 75 707 625	$ 94 296 364	
		$ 26 440 183	$ 35 782 516	$ 46 878 198	$ 60 056 293	
			$ 18 574 134	$ 26 440 183	$ 35 782 516	
				$ 11 951 083	$ 18 574 134	
					$ 6 374 613	
$ 48 607 809	$ 61 450 553	$ 76 761 330	$ 95 004 229	$ 116 730 456	$ 142 594 677	
	$ 37 176 776	$ 47 931 903	$ 60 764 158	$ 76 064 282	$ 94 296 364	
		$ 27 493 888	$ 36 490 381	$ 47 234 856	$ 60 056 293	
			$ 19 281 999	$ 26 796 841	$ 35 782 516	
				$ 12 307 741	$ 18 574 134	
					$ 6 374 613	

	Storklakken				Value	70 216 578
	t	Oljepris	Production	Income	NPV	
15	6	kr. 66,18	5,3%	5 752 784	4 307 564	
	7	kr. 68,96	10,0%	11 337 123	8 089 384	
	8	kr. 70,68	16,7%	19 463 728	13 234 196	
	9	kr. 72,63	16,7%	20 105 124	13 026 784	
	10	kr. 75,52	11,3%	14 320 523	8 841 955	
	11	kr. 77,36	6,7%	8 666 961	5 099 354	
	12	kr. 79,62	5,3%	7 172 363	4 021 328	
	13	kr. 80,92	3,1%	4 263 873	2 278 088	
	14	kr. 82,57	3,1%	4 365 308	2 222 491	
	15	kr. 84,19	3,1%	4 465 503	2 166 479	
	16	kr. 85,27	3,1%	4 531 803	2 095 145	
	17	kr. 86,55	3,1%	4 610 447	2 031 164	
	18	kr. 87,58	3,1%	4 673 899	1 962 186	
	19	kr. 89,27	3,1%	4 778 027	1 911 474	
	20	kr. 89,46	3,1%	4 790 214	1 826 139	

Appendix 37: Valuation of "other fields with oil"

Field	Garantiana	Gotha	Trell	Grevling
Licens No	PL 554 B PL 554	PL 492	PL 102 F	PL 038 D
Ownership	20,0 %	40,0 %	10,0 %	30,0 %
Type	Immature	Immature	Mature	Mature
Ex. Drilling	Yes	Yes	Yes	Yes
Oil	Yes	Yes	Yes	Yes
Apprasial drilling	Yes	Yes	Yes	Yes
Devlopment planned	Hold	Hold	Hold	Hold
Approved for development	-	-	-	-
Production	-	-	-	-
Size	10 000 000	74 400 000	200 000	7 800
Years in production	15	15	15	15
Start	0	-	-	0
Years untill production	6	6	6	6
Waiting option	Yes	Yes	Yes	Yes
Development costs	$ 300 000 000,00	$ 2 232 000 000,00	$ 1 800 000,00	$ 70 200,00
Abandonment costs	$ 9 298 913,60	$ 69 183 917,17	$ 185 978,27	$ 7 253,15
Total value	$ 12 872 051,86	$ 78 396 468,83	$ 1 131 469,10	$ 44 127,30
PV Development costs	$ 86 438 444,52	$ 643 102 027,24	$ 518 630,67	$ 20 226,60
Waiting option value	$ 18 727 297,60	$ 148 278 519,74	$ 38 435,79	$ 1 499,00

Garantiana					
Waiting option?			Yes		
0	1	2	3	4	5
$ 80 583 199	$ 95 706 879	$ 113 668 939	$ 135 002 079	$ 160 338 976	$ 190 431 048
	$ 67 849 375	$ 80 583 199	$ 95 706 879	$ 113 668 939	$ 135 002 079
		$ 57 127 761	$ 67 849 375	$ 80 583 199	$ 95 706 879
			$ 48 100 385	$ 57 127 761	$ 67 849 375
				$ 40 499 522	$ 48 100 385
					$ 34 099 754
$ -	$ 9 268 434	$ 27 230 494	$ 48 563 634	$ 73 900 532	$ 103 992 603
	$ -	$ -	$ 9 268 434	$ 27 230 494	$ 48 563 634
		$ -	$ -	$ -	$ 9 268 434
			$ -	$ -	$ -
				$ -	$ -
					$ -
$ 12 872 052	$ 20 984 261	$ 33 325 338	$ 51 185 356	$ 75 221 486	$ 103 992 603
	$ 5 095 882	$ 9 198 091	$ 16 360 529	$ 28 551 449	$ 48 563 634
		$ 1 119 561	$ 2 264 822	$ 4 581 632	$ 9 268 434
			$ -	$ -	$ -
				$ -	$ -
					$ -

Garantiana				Value	80 583 199
t	Oljepris		Production	Income	NPV
6	kr.	68,96	5,3%	6 718 295	5 030 518
7	kr.	70,68	10,0%	12 975 819	9 258 643
8	kr.	72,63	16,7%	22 339 027	15 189 230
9	kr.	75,52	16,7%	23 399 547	15 161 352
10	kr.	77,36	11,3%	16 370 926	10 107 940
11	kr.	79,62	6,7%	9 961 615	5 861 086
12	kr.	80,92	5,3%	8 121 663	4 553 572
13	kr.	82,57	3,1%	4 850 342	2 591 425
14	kr.	84,19	3,1%	4 961 670	2 526 114
15	kr.	85,27	3,1%	5 035 337	2 442 939
16	kr.	86,55	3,1%	5 122 719	2 368 338
17	kr.	87,58	3,1%	5 193 222	2 287 909
18	kr.	89,27	3,1%	5 308 919	2 228 779
19	kr.	89,46	3,1%	5 322 460	2 129 278
20	kr.	90,85	3,1%	5 417 133	2 065 134

Gotha						
Waiting option?				Yes		
0	1	2	3	4	5	
$ 573 219 976	$ 680 800 659	$ 808 571 852	$ 960 322 865	$ 1 140 554 180	$ 1 354 610 917	
	$ 482 639 282	$ 573 219 976	$ 680 800 659	$ 808 571 852	$ 960 322 865	
		$ 406 372 223	$ 482 639 282	$ 573 219 976	$ 680 800 659	
			$ 342 156 949	$ 406 372 223	$ 482 639 282	
				$ 288 089 025	$ 342 156 949	
					$ 242 564 959	
$ -	$ 37 698 632	$ 165 469 825	$ 317 220 838	$ 497 452 153	$ 711 508 890	
	$ -	$ -	$ 37 698 632	$ 165 469 825	$ 317 220 838	
		$ -	$ -	$ -	$ 37 698 632	
			$ -	$ -	$ -	
				$ -	$ -	
					$ -	
$ 78 396 469	$ 130 940 345	$ 213 428 832	$ 336 726 452	$ 507 280 055	$ 711 508 890	
	$ 27 874 050	$ 51 870 465	$ 95 792 952	$ 175 297 727	$ 317 220 838	
		$ 4 553 727	$ 9 211 985	$ 18 635 429	$ 37 698 632	
			$ -	$ -	$ -	
				$ -	$ -	
					$ -	

Gotha				Value	573 219 976
t	Oljepris		Production	Income	NPV
6	kr.	68,96	2,7%	24 992 057	18 713 527
7	kr.	70,68	5,3%	51 488 049	36 738 297
8	kr.	72,63	10,0%	99 721 415	67 804 724
9	kr.	75,52	11,3%	118 382 991	76 704 310
10	kr.	77,36	11,3%	121 799 687	75 203 070
11	kr.	79,62	10,7%	118 583 065	69 770 368
12	kr.	80,92	8,0%	90 637 759	50 817 868
13	kr.	82,57	4,5%	52 411 413	28 002 196
14	kr.	84,19	4,5%	53 614 386	27 296 471
15	kr.	85,27	4,5%	54 410 413	26 397 702
16	kr.	86,55	4,5%	55 354 640	25 591 578
17	kr.	87,58	4,5%	56 116 468	24 722 496
18	kr.	89,27	4,5%	57 366 659	24 083 549
19	kr.	89,46	4,5%	57 512 983	23 008 365
20	kr.	90,85	4,5%	58 535 995	22 315 253

Trell						
Waiting option?				Yes		
0	1	2	3	4	5	
$ 1 611 664	$ 1 914 138	$ 2 273 379	$ 2 700 042	$ 3 206 780	$ 3 808 621	
	$ 1 356 988	$ 1 611 664	$ 1 914 138	$ 2 273 379	$ 2 700 042	
		$ 1 142 555	$ 1 356 988	$ 1 611 664	$ 1 914 138	
			$ 962 008	$ 1 142 555	$ 1 356 988	
				$ 809 990	$ 962 008	
					$ 681 995	
$ 1 093 033	$ 1 395 507	$ 1 754 748	$ 2 181 411	$ 2 688 149	$ 3 289 990	
	$ 838 357	$ 1 093 033	$ 1 395 507	$ 1 754 748	$ 2 181 411	
		$ 623 925	$ 838 357	$ 1 093 033	$ 1 395 507	
			$ 443 377	$ 623 925	$ 838 357	
				$ 291 360	$ 443 377	
					$ 163 364	
$ 1 131 469	$ 1 426 490	$ 1 778 164	$ 2 197 141	$ 2 696 075	$ 3 289 990	
	$ 869 340	$ 1 116 449	$ 1 411 237	$ 1 762 674	$ 2 181 411	
		$ 647 340	$ 854 087	$ 1 100 959	$ 1 395 507	
			$ 459 107	$ 631 850	$ 838 357	
				$ 299 286	$ 443 377	
					$ 163 364	

Trell				Value	1 611 664
t	Oljepris		Production	Income	NPV
6	kr.	68,96	5,3%	134 366	100 610
7	kr.	70,68	10,0%	259 516	185 173
8	kr.	72,63	16,7%	446 781	303 785
9	kr.	75,52	16,7%	467 991	303 227
10	kr.	77,36	11,3%	327 419	202 159
11	kr.	79,62	6,7%	199 232	117 222
12	kr.	80,92	5,3%	162 433	91 071
13	kr.	82,57	3,1%	97 007	51 828
14	kr.	84,19	3,1%	99 233	50 522
15	kr.	85,27	3,1%	100 707	48 859
16	kr.	86,55	3,1%	102 454	47 367
17	kr.	87,58	3,1%	103 864	45 758
18	kr.	89,27	3,1%	106 178	44 576
19	kr.	89,46	3,1%	106 449	42 586
20	kr.	90,85	3,1%	108 343	41 303

Grevling					
Waiting option?			Yes		
0	1	2	3	4	5
$ 62 855	$ 74 651	$ 88 662	$ 105 302	$ 125 064	$ 148 536
	$ 52 923	$ 62 855	$ 74 651	$ 88 662	$ 105 302
		$ 44 560	$ 52 923	$ 62 855	$ 74 651
			$ 37 518	$ 44 560	$ 52 923
				$ 31 590	$ 37 518
					$ 26 598
$ 42 628	$ 54 425	$ 68 435	$ 85 075	$ 104 838	$ 128 310
	$ 32 696	$ 42 628	$ 54 425	$ 68 435	$ 85 075
		$ 24 333	$ 32 696	$ 42 628	$ 54 425
			$ 17 292	$ 24 333	$ 32 696
				$ 11 363	$ 17 292
					$ 6 371
$ 44 127	$ 55 633	$ 69 348	$ 85 689	$ 105 147	$ 128 310
	$ 33 904	$ 43 542	$ 55 038	$ 68 744	$ 85 075
		$ 25 246	$ 33 309	$ 42 937	$ 54 425
			$ 17 905	$ 24 642	$ 32 696
				$ 11 672	$ 17 292
					$ 6 371

				Value	62 855
t		Oljepris	Production	Income	NPV
6	kr.	68,96	5,3%	5 240	3 924
7	kr.	70,68	10,0%	10 121	7 222
8	kr.	72,63	16,7%	17 424	11 848
9	kr.	75,52	16,7%	18 252	11 826
10	kr.	77,36	11,3%	12 769	7 884
11	kr.	79,62	6,7%	7 770	4 572
12	kr.	80,92	5,3%	6 335	3 552
13	kr.	82,57	3,1%	3 783	2 021
14	kr.	84,19	3,1%	3 870	1 970
15	kr.	85,27	3,1%	3 928	1 905
16	kr.	86,55	3,1%	3 996	1 847
17	kr.	87,58	3,1%	4 051	1 785
18	kr.	89,27	3,1%	4 141	1 738
19	kr.	89,46	3,1%	4 152	1 661
20	kr.	90,85	3,1%	4 225	1 611

Appendix 38 –Valuation of Mature licenses

Mature licenses, production phase				Value	395 910 386
t	Oljepris		Production	Income	NPV
7	kr.	70,68	5,3%	34 602 184	24 689 716
8	kr.	72,63	10,0%	67 017 080	45 567 691
9	kr.	75,52	16,7%	116 997 737	75 806 758
10	kr.	77,36	16,7%	120 374 453	74 323 085
11	kr.	79,62	11,3%	84 673 727	49 819 231
12	kr.	80,92	6,7%	50 760 393	28 459 827
13	kr.	82,57	5,3%	41 574 363	22 212 213
14	kr.	84,19	3,1%	24 808 349	12 630 572
15	kr.	85,27	3,1%	25 176 685	12 214 696
16	kr.	86,55	3,1%	25 613 596	11 841 688
17	kr.	87,58	3,1%	25 966 108	11 439 547
18	kr.	89,27	3,1%	26 544 593	11 143 895
19	kr.	89,46	3,1%	26 612 300	10 646 388
20	kr.	90,85	3,1%	27 085 667	10 325 672
21	kr.	93,16	3,1%	27 876 876	10 127 024

Mature licenses, phase 3

Waiting option? Yes

0	1	2	3	4	5
$ 395 910 386	$ 470 213 990	$ 558 462 733	$ 663 273 808	$ 787 755 600	$ 935 599 864
	$ 333 348 300	$ 395 910 386	$ 470 213 990	$ 558 462 733	$ 663 273 808
		$ 280 672 326	$ 333 348 300	$ 395 910 386	$ 470 213 990
			$ 236 320 253	$ 280 672 326	$ 333 348 300
				$ 198 976 731	$ 236 320 253
					$ 167 534 264
$ -	$ 20 213 990	$ 108 462 733	$ 213 273 808	$ 337 755 600	$ 786 109 864
	$ -	$ -	$ 20 213 990	$ 108 462 733	$ 513 783 808
		$ -	$ -	$ -	$ 320 723 990
			$ -	$ -	$ 183 858 300
				$ -	$ 86 830 253
					$ 18 044 264
$ 257 499 112	$ 329 654 685	$ 415 722 061	$ 518 317 917	$ 640 550 110	$ 786 109 864
	$ 192 788 995	$ 253 169 715	$ 325 258 098	$ 411 257 243	$ 513 783 808
		$ 137 931 654	$ 188 392 408	$ 248 704 897	$ 320 723 990
			$ 91 364 361	$ 133 466 836	$ 183 858 300
				$ 51 771 241	$ 86 830 253
					$ 18 044 264

Mature licenses, phase 2

Waiting option? Yes

0	1	2	3
$ 257 499 112	$ 305 825 988	$ 363 222 746	$ 431 391 604
	$ 216 808 890	$ 257 499 112	$ 305 825 988
		$ 182 548 570	$ 216 808 890
			$ 153 702 094
$ 207 499 112	$ 255 825 988	$ 313 222 746	$ 420 391 604
	$ 166 808 890	$ 207 499 112	$ 294 825 988
		$ 132 548 570	$ 205 808 890
			$ 142 702 094
$ 246 995 752	$ 295 159 623	$ 352 390 849	$ 420 391 604
	$ 206 142 525	$ 246 667 215	$ 294 825 988
		$ 171 716 672	$ 205 808 890
			$ 142 702 094

Mature licenses, phase 1								
Waiting option?				Yes				
0	1	2	3	4	5	6	7	
$ 172 897 026	$ 205 345 965	$ 243 884 851	$ 289 656 632	$ 344 018 761	$ 408 583 456	$ 485 265 514	$ 576 339 094	
	$ 145 575 695	$ 172 897 026	$ 205 345 965	$ 243 884 851	$ 289 656 632	$ 344 018 761	$ 408 583 456	
		$ 122 571 703	$ 145 575 695	$ 172 897 026	$ 205 345 965	$ 243 884 851	$ 289 656 632	
			$ 103 202 821	$ 122 571 703	$ 145 575 695	$ 172 897 026	$ 205 345 965	
				$ 86 894 626	$ 103 202 821	$ 122 571 703	$ 145 575 695	
					$ 73 163 466	$ 86 894 626	$ 103 202 821	
						$ 61 602 114	$ 73 163 466	
							$ 51 867 697	
$ 191 897 026	$ 224 345 965	$ 262 884 851	$ 308 656 632	$ 363 018 761	$ 427 583 456	$ 504 265 514	$ 554 339 094	
	$ 164 575 695	$ 191 897 026	$ 224 345 965	$ 262 884 851	$ 308 656 632	$ 363 018 761	$ 386 583 456	
		$ 141 571 703	$ 164 575 695	$ 191 897 026	$ 224 345 965	$ 262 884 851	$ 267 656 632	
			$ 122 202 821	$ 141 571 703	$ 164 575 695	$ 191 897 026	$ 183 345 965	
				$ 105 894 626	$ 122 202 821	$ 141 571 703	$ 123 575 695	
					$ 92 163 466	$ 105 894 626	$ 81 202 821	
						$ 80 602 114	$ 51 163 466	
							$ 29 867 697	
$ 191 897 026	$ 224 345 965	$ 262 884 851	$ 308 656 632	$ 363 018 761	$ 427 583 456	$ 504 265 514	$ 554 339 094	
	$ 164 575 695	$ 191 897 026	$ 224 345 965	$ 262 884 851	$ 308 656 632	$ 363 018 761	$ 386 583 456	
		$ 141 571 703	$ 164 575 695	$ 191 897 026	$ 224 345 965	$ 262 884 851	$ 267 656 632	
			$ 122 202 821	$ 141 571 703	$ 164 575 695	$ 191 897 026	$ 183 345 965	
				$ 105 894 626	$ 122 202 821	$ 141 571 703	$ 123 575 695	
					$ 92 163 466	$ 105 894 626	$ 81 202 821	
						$ 80 602 114	$ 51 163 466	
							$ 29 867 697	

Licence value	**$ 95 948 513**	**Value no real options**	**$ 8 992 289**	**Option value**	**$ 86 956 224**

Field	Licens No	Ownership	Type	Total value	Option value
Terne	PL 558	10,00 %	Mature	$ -	$ -
Celsius	PL 653	30,00 %	Mature	$ 28 784 553,91	$ 26 086 867,22
Langfjellet	PL 026 B	62,13 %	Mature	$ 59 612 811,15	$ 54 025 902,01
Eitri, Iving	PL 027 ES	40,00 %	Mature	$ 38 379 405,22	$ 34 782 489,63
Volund West	PL 150 B	65,00 %	Mature	$ 62 366 533,48	$ 56 521 545,64
Thorshammer	PL 494	30,00 %	Mature	$ -	$ -
Heimdalshø	PL 494 C	30,00 %	Mature	$ -	$ -
Kvitola	PL 553	40,00 %	Mature	$ -	$ -
Rovarkula	PL 626	50,00 %	Mature	$ 47 974 256,52	$ 43 478 112,03
Skåla	PL 663	30,00 %	Mature	$ 28 784 553,91	$ 26 086 867,22
Hyrokkin	PL 677	60,00 %	Mature	$ 57 569 107,83	$ 52 173 734,44
Ymmelstind	PL 724	40,00 %	Mature	$ 38 379 405,22	$ 34 782 489,63
Ty	PL 736 S	65,00 %	Mature	$ 62 366 533,48	$ 56 521 545,64
Huva	PL 748	40,00 %	Mature	$ 38 379 405,22	$ 34 782 489,63
Kark	PL 019 C	30,00 %	Mature	$ 28 784 553,91	$ 26 086 867,22
Kark	PL 019 D	30,00 %	Mature	$ 28 784 553,91	$ 26 086 867,22
Krafla	PL 035 C	25,00 %	Mature	$ 23 987 128,26	$ 21 739 056,02
Oter	PL 038 E	5,00 %	Mature	$ 4 797 425,65	$ 4 347 811,20
Glitne	PL 048 B	10,00 %	Mature	$ -	$ -
Angeya	PL 102 D	10,00 %	Mature	$ 9 594 851,30	$ 8 695 622,41
Trell (2)	PL 102 G	10,00 %	Mature	$ 9 594 851,30	$ 8 695 622,41
Clapton	PL 440 S	10,00 %	Mature	$ -	$ -
Gotama	PL 550	10,00 %	Mature	$ 9 594 851,30	$ 8 695 622,41
Mantra	PL 551	20,00 %	Mature	$ 19 189 702,61	$ 17 391 244,81
Garantiana	PL 554 C	10,00 %	Mature	$ 9 594 851,30	$ 8 695 622,41
Freki	PL 567	40,00 %	Mature	$ 38 379 405,22	$ 34 782 489,63
Kolsås	PL 574	10,00 %	Mature	$ 9 594 851,30	$ 8 695 622,41
Færing	PL 619	30,00 %	Mature	$ 28 784 553,91	$ 26 086 867,22
Snømus	PL 672	25,00 %	Mature	$ 23 987 128,26	$ 21 739 056,02
Dama	PL 676 S	10,00 %	Mature	$ 9 594 851,30	$ 8 695 622,41
Båtfjellet	PL 6678 BS	25,00 %	Mature	$ 23 987 128,26	$ 21 739 056,02
Båtfjellet (2)	PL 678S	25,00 %	Mature	$ 23 987 128,26	$ 21 739 056,02
Kuro	PL 681	16,00 %	Mature	$ 15 351 762,09	$ 13 912 995,85
Fannaråken	PL 730	30,00 %	Mature	$ 28 784 553,91	$ 26 086 867,22
				$ 808 970 698,02	**$ 733 154 011,96**

Appendix 39 –Valuation of immature licenses

Immature licenses, production phase				Value	1 583 641 546
t	Oljepris		Production	Income	NPV
7	kr.	70,68	5,3%	138 408 734	98 758 862
8	kr.	72,63	10,0%	268 068 320	182 270 764
9	kr.	75,52	16,7%	467 990 949	303 227 032
10	kr.	77,36	16,7%	481 497 812	297 292 340
11	kr.	79,62	11,3%	338 694 910	199 276 924
12	kr.	80,92	6,7%	203 041 574	113 839 309
13	kr.	82,57	5,3%	166 297 450	88 848 850
14	kr.	84,19	3,1%	99 233 396	50 522 289
15	kr.	85,27	3,1%	100 706 740	48 858 782
16	kr.	86,55	3,1%	102 454 384	47 366 750
17	kr.	87,58	3,1%	103 864 431	45 758 189
18	kr.	89,27	3,1%	106 178 374	44 575 579
19	kr.	89,46	3,1%	106 449 201	42 585 551
20	kr.	90,85	3,1%	108 342 667	41 302 689
21	kr.	93,16	3,1%	111 507 503	40 508 096

immature licenses, phase 3

Waiting option? Yes

0	1	2	3	4	5
$ 1 583 641 546	$ 1 880 855 960	$ 2 233 850 931	$ 2 653 095 233	$ 3 151 022 398	$ 3 742 399 454
	$ 1 333 393 199	$ 1 583 641 546	$ 1 880 855 960	$ 2 233 850 931	$ 2 653 095 233
		$ 1 122 689 304	$ 1 333 393 199	$ 1 583 641 546	$ 1 880 855 960
			$ 945 281 012	$ 1 122 689 304	$ 1 333 393 199
				$ 795 906 924	$ 945 281 012
					$ 670 137 054
$ -	$ -	$ -	$ -	$ -	$ 1 749 199 454
	$ -	$ -	$ -	$ -	$ 659 895 233
		$ -	$ -	$ -	$ -
			$ -	$ -	$ -
				$ -	$ -
					$ -
$ 148 245 444	$ 260 804 406	$ 448 519 377	$ 747 366 943	$ 1 188 282 533	$ 1 749 199 454
	$ 39 403 084	$ 79 710 661	$ 161 251 070	$ 326 203 636	$ 659 895 233
		$ -	$ -	$ -	$ -
			$ -	$ -	$ -
				$ -	$ -
					$ -

immature licenses, phase 2

Waiting option? Yes

0	1	2	3
$ 148 245 444	$ 176 067 828	$ 209 111 857	$ 248 357 517
	$ 124 819 577	$ 148 245 444	$ 176 067 828
		$ 105 095 484	$ 124 819 577
			$ 88 488 209
$ 98 245 444	$ 126 067 828	$ 159 111 857	$ 237 357 517
	$ 74 819 577	$ 98 245 444	$ 165 067 828
		$ 55 095 484	$ 113 819 577
			$ 77 488 209
$ 137 742 084	$ 165 401 464	$ 198 279 959	$ 237 357 517
	$ 114 153 212	$ 137 413 547	$ 165 067 828
		$ 94 263 586	$ 113 819 577
			$ 77 488 209

immature licenses, phase 1								
Waiting option?				Yes				
0	1	2	3	4	5	6	7	
$ 96 419 458	$ 114 515 254	$ 136 007 228	$ 161 532 770	$ 191 848 890	$ 227 854 674	$ 270 617 946	$ 321 406 936	
	$ 81 183 176	$ 96 419 458	$ 114 515 254	$ 136 007 228	$ 161 532 770	$ 191 848 890	$ 227 854 674	
		$ 68 354 543	$ 81 183 176	$ 96 419 458	$ 114 515 254	$ 136 007 228	$ 161 532 770	
			$ 57 553 102	$ 68 354 543	$ 81 183 176	$ 96 419 458	$ 114 515 254	
				$ 48 458 513	$ 57 553 102	$ 68 354 543	$ 81 183 176	
					$ 40 801 059	$ 48 458 513	$ 57 553 102	
						$ 34 353 642	$ 40 801 059	
							$ 28 925 051	
$ 111 019 458	$ 129 115 254	$ 150 607 228	$ 176 132 770	$ 206 448 890	$ 242 454 674	$ 285 217 946	$ 299 406 936	
	$ 95 783 176	$ 111 019 458	$ 129 115 254	$ 150 607 228	$ 176 132 770	$ 206 448 890	$ 205 854 674	
		$ 82 954 543	$ 95 783 176	$ 111 019 458	$ 129 115 254	$ 150 607 228	$ 139 532 770	
			$ 72 153 102	$ 82 954 543	$ 95 783 176	$ 111 019 458	$ 92 515 254	
				$ 63 058 513	$ 72 153 102	$ 82 954 543	$ 59 183 176	
					$ 55 401 059	$ 63 058 513	$ 35 553 102	
						$ 48 953 642	$ 18 801 059	
							$ 6 925 051	
$ 111 019 458	$ 129 115 254	$ 150 607 228	$ 176 132 770	$ 206 448 890	$ 242 454 674	$ 285 217 946	$ 299 406 936	
	$ 95 783 176	$ 111 019 458	$ 129 115 254	$ 150 607 228	$ 176 132 770	$ 206 448 890	$ 205 854 674	
		$ 82 954 543	$ 95 783 176	$ 111 019 458	$ 129 115 254	$ 150 607 228	$ 139 532 770	
			$ 72 153 102	$ 82 954 543	$ 95 783 176	$ 111 019 458	$ 92 515 254	
				$ 63 058 513	$ 72 153 102	$ 82 954 543	$ 59 183 176	
					$ 55 401 059	$ 63 058 513	$ 35 553 102	
						$ 48 953 642	$ 18 801 059	
							$ 6 925 051	

Licence value	**$ 33 305 837,55**	**Value**	**$ -23 986 674,75**	**Option value**	**$ 57 292 512,30**

Field	Licens No	Ownership	Type	Option value	Total value
Svanefjellet	PL 659	20,00 %	Immature	-	-
Arenaria	PL 709	40,00 %	Immature	22 917 004,92	22 917 004,92
Åtind	PL 715	40,00 %	immature	22 917 004,92	22 917 004,92
Komse	PL 438	10,00 %	Immature	5 729 251,23	5 729 251,23
Salina	PL 533	20,00 %	immature	-	-
Fafner	PL 613	20,00 %	Immature	11 458 502,46	6 661 167,51
Eiktunet	PL 706	20,00 %	Immature	11 458 502,46	6 661 167,51
Total immature				**74 480 265,99**	**64 885 596,09**

Appendix 40 –Value of all of DETNOR´s licenses

Name	License	Ownership	Value
Alvheim	PL 088 BS PL 203 PL 036 C	65,00 %	$ 779 192 552
Vilje	PL 036 D	46,90 %	$ 95 802 714
Volund	PL 150	65,00 %	$ 105 703 310
Atla	PL 102 C	10,00 %	$ 1 140 490
Jette	PL 027 D PL 169 C PL 504	70,00 %	$ 7 941 485
Jotun	PL 027 B PL 103 B	7,00 %	$ 549 795
Varg	PL 038	5,00 %	$ 13 963 051
Ivar Aasen	PL 001 B PL 028 B PL 242 PL 457	34,79 %	$ 186 153 722
Gina Krog	PL 029 B	3,30 %	$ 54 598 342
Viper-kobra	PL 203	65,00 %	$ 31 716 876
Enoch unit	PL 048 D	10,00 %	$ 2 297 204
Bøyla	340 BS PL 340	65,00 %	$ 8 726 596
Johan Sverdrup	PL 265 PL 502	11,89 %	$1 396 616 481
Frøy	PL 364	50,00 %	$ -
Fulla	PL 035 B PL 362	15,00 %	$ 26 306 657
Frigg Gamma/Delta	PL 442	20,00 %	$ 135 021 691
Krafla	PL 272 PL 035	25,00 %	$ 81 688 123
Storklakken	PL 460	100,00 %	$ 48 607 809
Garantiana	PL 554 B PL 554	20,00 %	$ 12 872 052
Gotha	PL 492	40,00 %	$ 78 396 469
Trell	PL 102 F	10,00 %	$ 1 131 469
Grevling	PL 038 D	30,00 %	$ 44 127
Svanefjellet	PL 659	20,00 %	$ -
Arenaria	PL 709	40,00 %	$13 322 335,02

Name	License	Ownership	Value
Åtind	PL 715	40,00 %	$13 322 335,02
Komse	PL 438	10,00 %	$ 3 330 583,75
Salina	PL 533	20,00 %	$ -
Fafner	PL 613	20,00 %	$ 6 661 167,51
Eiktunet	PL 706	20,00 %	$ 6 661 167,51
Celsius	PL 653	30,00 %	$28 784 553,91
Langfjellet	PL 026 B	62,13 %	$59 612 811,15
Eitri, Iving	PL 027 ES	40,00 %	$38 379 405,22
Volund West	PL 150 B	65,00 %	$62 366 533,48
Thorshammer	PL 494	30,00 %	$ -
Heimdalshø	PL 494 C	30,00 %	$ -
Kvitola	PL 553	40,00 %	$ -
Rovarkula	PL 626	50,00 %	$47 974 256,52
Skåla	PL 663	30,00 %	$28 784 553,91
Hyrokkin	PL 677	60,00 %	$57 569 107,83
Ymmelstind	PL 724	40,00 %	$38 379 405,22
Ty	PL 736 S	65,00 %	$62 366 533,48
Huva	PL 748	40,00 %	$38 379 405,22
Kark	PL 019 C	30,00 %	$28 784 553,91
Kark	PL 019 D	30,00 %	$28 784 553,91
Krafla	PL 035 C	25,00 %	$23 987 128,26
Oter	PL 038 E	5,00 %	$ 4 797 425,65
Glitne	PL 048 B	10,00 %	$ -
Angeya	PL 102 D	10,00 %	$ 9 594 851,30
Trell (2)	PL 102 G	10,00 %	$ 9 594 851,30
Clapton	PL 440 S	10,00 %	$ -
Gotama	PL 550	10,00 %	$ 9 594 851,30
Mantra	PL 551	20,00 %	$19 189 702,61
Garantiana	PL 554 C	10,00 %	$ 9 594 851,30
Freki	PL 567	40,00 %	$38 379 405,22
Kolsås	PL 574	10,00 %	$ 9 594 851,30
Færing	PL 619	30,00 %	$28 784 553,91
Snømus	PL 672	25,00 %	$23 987 128,26
Dama	PL 676 S	10,00 %	$ 9 594 851,30
Båtfjellet	PL 6678 BS	25,00 %	$23 987 128,26
Båtfjellet (2)	PL 678S	25,00 %	$23 987 128,26
Kuro	PL 681	16,00 %	$15 351 762,09
Fannaråken	PL 730	30,00 %	$28 784 553,91
Total value			**$3 920 739 302**

Appendix 41: DETNOR´s value under different scenarios

Stochastic modeeling

Value of DETNOR´s licenses	**kr.**	**29 077 378 884,58**
Overhead costs in perpetuity	kr.	1 624 749 192,27
Enterprise Value	**kr.**	**27 452 629 692,31**
Net Interest Bearing Debt (NIBD)	kr.	17 356 359 347,35
Equity Value	kr.	10 096 270 344,96
No of Shares outstanding		202 618 602
Estimates Share price	**kr.**	**49,83**

Breakdown of firm value			
Producing fields	kr.	7 448 141 127,53	25,6%
Devloped fields	kr.	14 622 967 155,75	50,3%
Other fields with oil	kr.	685 593 305,63	2,4%
Mature licenses	kr.	5 999 569 387,74	20,6%
Immature licenses	kr.	321 107 907,93	1,1%

Real Option value	kr.	7 925 694 722,02
Part of EV		**27,26 %**

Low scenario

Value of DETNOR´s licenses	**kr.**	**3 505 952 295,31**
Overhead costs in perpetuity	kr.	1 570 696 870,80
Enterprise Value	**kr.**	**1 935 255 424,51**
Net Interest Bearing Debt (NIBD)	kr.	17 356 359 347,35
Equity Value	kr.	-15 421 103 922,83
No of Shares outstanding		202 618 602
Estimates Share price	**kr.**	**-76,11**

Breakdown of firm value			
Producing fields	kr.	2 900 020 540,14	82,7%
Devloped fields	kr.	-98 967 705,42	-2,8%
Other fields with oil	kr.	828 074,57	0,0%
Mature licenses	kr.	661 842 973,82	18,9%
Immature licenses	kr.	42 228 412,20	1,2%

Real Option value	kr.	6 465 942 817,99
Part of EV		**184,43 %**

Base Scenario

Value of DETNOR´s licenses	**kr.**	**17 787 798 348,60**
Overhead costs in perpetuity	kr.	1 570 696 870,80
Enterprise Value	**kr.**	**16 217 101 477,80**
Net Interest Bearing Debt (NIBD)	kr.	17 356 359 347,35
Equity Value	kr.	-1 139 257 869,55
No of Shares outstanding		202 618 602
Estimates Share price	**kr.**	**-5,62**

Breakdown of firm value			
Producing fields	kr.	6 396 158 611,84	36,0%
Devloped fields	kr.	7 818 175 960,55	44,0%
Other fields with oil	kr.	120 994 964,58	0,7%
Mature licenses	kr.	3 394 641 825,35	19,1%
Immature licenses	kr.	57 826 986,27	0,3%

Real Option value	kr.	6 325 765 560,07
Part of EV		**35,56 %**

High Scenario

Value of DETNOR´s licenses	**kr.**	**51 968 821 402,63**
Overhead costs in perpetuity	kr.	1 570 696 870,80
Enterprise Value	**kr.**	**50 398 124 531,83**
Net Interest Bearing Debt (NIBD)	kr.	17 356 359 347,35
Equity Value	kr.	33 041 765 184,48
No of Shares outstanding		202 618 602
Estimates Share price	**kr.**	**163,07**

Breakdown of firm value			
Producing fields	kr.	13 388 434 755,23	25,8%
Devloped fields	kr.	25 065 059 266,03	48,2%
Other fields with oil	kr.	2 331 278 729,18	4,5%
Mature licenses	kr.	9 961 076 982,90	19,2%
Immature licenses	kr.	1 222 971 669,29	2,4%

Real Option value	kr.	11 662 741 991,68
Part of EV		**22,44 %**

Method	Share price	
Monte Carlo	kr.	49,83
Low Scenario	kr.	-76,11
Base Scenario	kr.	-5,62
High Scenario	kr.	163,07
Scenario Moddeling	kr	27,11