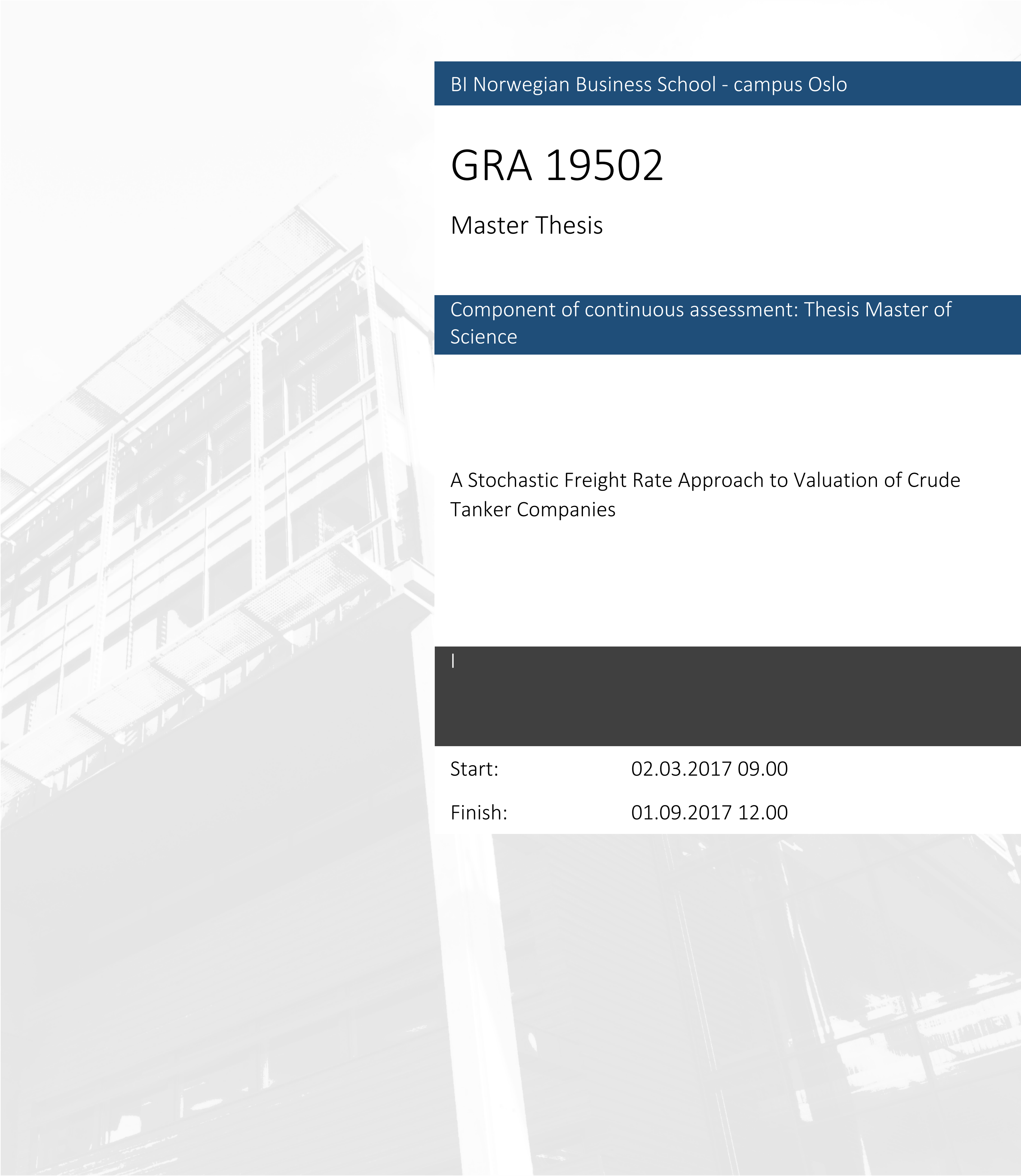

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A Stochastic Freight Rate Approach to Valuation of Crude Tanker Companies

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A Stochastic Freight Rate Approach to Valuation of Crude Tanker Companies

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This thesis is our final work at the MSc in Business program with major in Finance at BI Norwegian Business School. Writing our thesis has been a challenging and educational journey. After months of hard work, we are pleased to present our thesis.

We would like to give special thanks and credit to our eminent and always helpful supervisor Leon Bogdan Stacescu for guidance and discussions during the process. We express our gratefulness for his knowledge.

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Last but not least, we want to dedicate this thesis to our families, in particular our parents, brothers and sisters for endless love, support and encouragement. You all made this process easier by giving us words of motivation and care during the process.

Abstract

This thesis aims to develop a stochastic valuation model for the shipping industry, incorporating an Ornstein-Uhlenbeck process by capturing the mean-reverting dynamics of freight rates. It examines the theoretical foundation underlying the mean-reverting processes, and project revenue by applying the Monte Carlo simulation method to freight rates. We find empirical evidence that historical freight rates are stationary, and literature supporting its mean-reverting properties. The model's validity is tested through a valuation of several shipping companies. We conclude that the results are ambiguous when using the market value as benchmark, due to limitations in the projections of capital structure as illustrated in the sensitivity analysis. The thesis has developed a first step for a new valuation approach of crude oil tankers.

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1. Introduction

1.1 Introduction of the problem

The crude tanker market accounts for a large share of the international shipping industry. This industry is characterized by high volatility and seasonal trends. Earlier studies suggest a mean-reverting process in the freight rates, but these are not applied for valuation purposes. Investors often rely on the opinions of experts' price target derived from a valuation. Bruce (2002) argue that if the expert analyst has much more to gain from issuing one type of recommendation than another, the opinion will be biased and inaccurate. Hence, to achieve unbiased and accurate forecasts, the subjectivity should be minimized.

The purpose of this thesis will consequently aim to develop a new framework for reliable valuation of shipping companies to exclude biased and inaccurate subjective decisions.

1.2 Objectives

To fulfill the purpose outlined above, we aim to exploit the mean-reverting properties of shipping freight rates and its relation to shipping revenues. The freight rates represent the market conditions for shipping transportation services. By building a stochastic freight rate model, which aims to simulate revenues on the notion of freight rates' mean-reverting properties, we hope to develop a valuation method that improves the reliability of the revenue forecast. The result is an equity valuation model for shipping firms in the crude tanker market. We aim to apply the model on several companies, and compare the modelled share price estimate to the market value together with a sensitivity analysis. As a result, the thesis investigates the research issue outlined below.

Aim to develop a reliable valuation model by implementing the mean-reverting stochastic freight rate behavior for crude oil tanker companies.

1.3 Road map

The purpose of this section is to clarify how the thesis is structured. The thesis consists of eight chapters, all of which have in common to solve the research issue. Structurally, the order of the chapters follows the order of our approach.

Following the introduction, we present existing literature that examines both the theoretical intuition behind mean-reversion processes, and how the spot freight rate can be modelled as a Ornstein-Uhlenbeck stochastic differential equation. These findings are underlying in the work we are carrying out, and set the foundation for the model. Chapter three introduces the shipping industry we will work with, and narrow the description down to the crude oil tanker segment, which the model we are building will focus on. Also, the companies we apply the model on are introduced, namely Frontline, DHT, Teekay Tankers and Nordic American Tankers. In the following chapter, we carefully build our valuation approach based on the discounted cash flow method. In chapter five, the freight rate is analysed, the model is built and finally simulating values of the freight rate behaviour for a period of five years. The main results of the valuations are then summarized in chapter six, where initial evaluations of the model begin with a comparison of the estimated share price and at the market price at the end of 2016. Chapter seven evaluates the results in a sensitivity featuring WACC, growth and D/E ratio to further examine the validity of the model. In the final chapter, recommendations for future research are outlined followed by a final conclusion wrapping up the key findings of the thesis.

1.4 Notes

All calculations for the valuation purpose are conducted as of information available at 31st of December, 2016. The forecast period of the freight rate projection starts 30th of November, 2016 as this was the available freight rates when developed.

In the research process, we came across a thesis investigating a shipping valuation using freight rates, which inspired our choice of topic (Rasmussen, 2010).

2. Literature Review of the Mean-Reverting Process in the Shipping Industry

In this chapter, we short and concisely examine earlier and recent research on mean-reverting processes and valuation to obtain the necessary prerequisites for our study. There exist a large number of literatures related to both mean-reverting processes and valuation. The goal of this chapter is to present the dynamics of the mean-reverting processes relevant for our model.

2.1 Mean-reverting processes

This section briefly present background literature related to the mean-reverting process our model is based on. The literature presented is just a handful of what is available. In chapter five, this process is explained in more detail.

In the shipping literature, prior studies have examined stochastic modelling, but not exactly the way we want to implement it. Among others, we have investigated literature related to financial valuation of implied real options within different types of ships and contracts. Our aim is to apply some of this evidence to our model.

Several researches have studied the stochastic properties of freight rates in a discrete-time framework. It appears that careful modelling is necessary, as the freight rate markets experience quite complex stochastic dynamics (Benth & Koekebakker, 2016). Jorgensen and Giovanni (2009) develop a continuous-time approach to a one-factor stochastic mean-reverting model of spot freight rates in consistency with risk management. The model builds on earlier studies by Bjerksund and Ekern (1995), proposing that the instantaneous cash flow generated by an operating ship may be described by the process shown in equation 2.1.

$$D(t)dt = (aX(t) - b)dt \tag{2.1}$$

A natural interpretation of this is that $D(t)$ reflects the generated cash flow, a is the size of cargo, b is the total cash flow rate and $X(t)$ represents the uncertain spot freight rates. Furthermore, Jorgensen and Giovanni (2009) model the spot freight rate as a mean-reverting Ornstein-Uhlenbeck stochastic differential equation as the process shown in equation 2.2.

$$dX(t) = k(\theta - X(t))dt + \sigma dW(t) \tag{2.2}$$

In this process, θ is the constant mean-reverting long-term level, k is the speed of mean reversion, s is the instantaneous volatility of spot freight rates and $W()$ is a standard Wiener process. The Wiener process, also called a Brownian motion process, is a Lèvy process, i.e. a process with stationary independent increments. In simple words, it is a random variable that depends continuously on a distribution with several criteria (see Moehlis, 2001).

In the paper by Tvedt (1997), the commonly proposed idea that freight rate follows an Ornstein-Uhlenbeck process is developed by suggesting a geometric mean-reversion process relating income uncertainty to a mean-reverting process. We find that a variety of literature suggest modelling the stochastic freight rate as a mean-reverting process, which is going to form the building blocks of our analysis.

2.2 Seasonality in the Shipping Industry

Kavussanos and Alizadeh (2001) investigate the seasonal patterns in spot and time charter freight rates. Their findings suggest that there is a significant deterministic seasonality, i.e. regular seasonal patterns. Broadly speaking, the results find that the freight rates increase in the spring and drop sharply in June and July.

3. The Shipping Industry

The objective of this chapter is to dig into the shipping industry to give fundamental understanding for valuation and modelling purposes. The chapter begins with an introduction of the industry, before narrowing the perspective into the chosen segment. Then follows a statement and discussion of the fleet list we use in the model, before the final section where the firms that are valued are presented with key characteristics.

3.1 Perspectives of the Industry

Shipping has played an important role in economic growth, with ships operating for transportation purposes as far as 5,000 years back in time. A large proportion of global transportation has historically occurred by sea, where the most traveled trading routes have remained unchanged for the past thousand years. Therefore, it is reasonable to expect that the current trading routes will be a consistent estimator of future routes. The marine sector is a highly volatile and competitive market, depending on political stability and safe passage (Stopford, 2009). Due to this high uncertainty in the market, projections for the future are conditional on a variety of macroeconomic factors.

Wijnolst and Waals (1999) carefully describe their perspective of the shipping industry in terms of segmentation. The main segments suggested are oil tankers, chemical tankers, gas tankers, dry bulk carriers, containers and reefers. This clear specification is necessary to meet the different needs of services that are required by the global economic society. Given the firms we value, this paper is limited to oil tankers. As a result, this segment is prioritized for further explanation.

In 2015, oil retained their position as the leading fuel, and accounted for one third of global energy consumption (UNCTAD, 2016, p. 14). The tanker segment was the only shipping segment that did not suffer historically low levels of freight rates and weak earnings. A combination of low oil prices, improved refinery margins, ample oil supply and greater stock-building activity led to rise in crude oil volumes. Generally, the shipping market was triggered by weak demand and oversupply of new tonnage, whereas the continuing and exceptional decrease in oil prices caused the tanker market to remain strong. Global seaborne oil trade expanded faster than underlying oil demand, suggesting that end-user oil demand was not the only factor at play. (UNCTAD, 2016).

3.2 Fleet List

In general, vessels are categorized based on both cargo and size, and there exists a large number of differences in vessel size. An explanation of this variation is the Parcel Size Distribution (PSD) of each commodity (Kavussanos & Visvikis, 2006). As some commodities are transported in different parcel size than others, different sizes to meet the needs are sufficient. In addition, the effect from port and seaway restrictions has played a major role. The name of the vessel type is often linked to an attribution, such as the vessel type Panamax, which is dimensioned to be capable to pass through the Panama Canal.

The Oil tankers are, broadly speaking, divided into two categories depending on whether they are capable to carry either refined and unrefined oil, or only refined oil. The process of transporting refined oil clearly requires more detailed specifications for the model to work. For the purpose of our model, some crucial assumptions regarding the fleet list are taken to simplify and enable us to come up with firm value conclusions in the model testing chapter. This section will describe the vessels that are implemented in our model, i.e. how a typical fleet list for crude oil tanker companies looks like.

Oil tankers only capable of carrying unrefined oil, such as Aframax and Suezmax will be assumed to operate as vessels capable of carrying both refined and unrefined oil, and declassified in terms of deadweight tonnage (DWT). This is necessary to obtain as good data as possible for the relevant freight rates. This assumption is crucial, but not deviating from the reality too much, as many oil tankers are capable of carrying both refined and unrefined oil to fulfil the global unrefined oil transportation. After we reviewed the fleet lists from the respective firms we are working with, only Aframax and Suezmax are necessary to be declassified for modelling purposes.

We will assume that Aframax and Suezmax generate the same revenues and costs as Large Range 1 tankers (LR1) and Large Range 2 tankers (LR2) depending on their vessel size. Aframax are by definition smaller than 120,000 DWT, and a maximum beam (width) not greater than 32.31 m to pass through the original Panama Canal. The Suezmax tankers range from 120,000 to 200,000 DWT, and are capable of passing through the Suez Canal. The Aframax and Suezmax tankers are sorted according to a size interval, measured in DWT, to categorize each vessel into either LR1 or LR2. This is a necessary assumption, because the corresponding indices are based on LR1 and LR2.

- **Medium Range Tankers (MR)** are commonly used to transport cargos of refined oil products over relatively short distances. Ranging from 25,000 to 45,000 DWT, these ships can access most ports across the globe (Hamilton, 2014).
- **Large Range Tankers (LR1)** are used to carry both refined products and crude oil, and are therefore the most common global tanker fleet. An LR1's tanker volume ranges between 45,000 to 80,000 DWT and can access most large ports that ship crude oil and petroleum products. (Hamilton, 2014).
- **Large Range 2 Tankers (LR2)** has the same characteristics as LR1, albeit ranging between 80,000 to 160,000 DWT, with the capacity to carry up to 550,000 barrels of light sweet crude oil (Hamilton, 2014).
- **Very Large Crude Carriers (VLCC)** are together with Ultra Large Crude Carriers, the largest operating vessels in the world, ranging between 180.000 and 320,000 DWT. These vessels are primarily used for long-haul crude transportation, and are capable of carrying huge amount of crude oil in one single trip. These ships generally operate around the North Sea, Mediterranean and West Africa as they are capable of passing through the Suez Canal in Egypt (Hamilton, 2014).

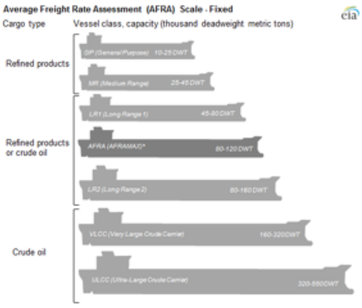


Figure 3.1: Average Freight Rate Assessment (Hamilton, 2014)

3.3 Firm Presentation

This section contains a brief presentation of the firms we will test the model on by implementing an equity valuation. As the presentations shows, all companies operate as one of the biggest players in the crude oil tanker market.

3.3.1 Frontline

FRONTLINE

"World leader in the international seaborne transportation of crude oil."

Frontline was founded in 1985, and are today domiciled in Bermuda and listed on both the Oslo Stock Exchange and New York Stock Exchange (NYSE). The company's primary business is transportation of crude oil. The closing share price was trading at the $7.11 on the 31st of December 2016 (Yahoo Finance). Its history is complex, consisting of several acquisitions, restructurings and re-buildings. Frontline have one of the world's largest fleets of VLCC and Suezmax tankers, supplemented with Aframax and MR tankers. The fleet consists of 56 vessels and 16 upcoming newbuildings (Frontline, 2017).

3.3.2 DHT

DHT Holdings Inc. is an independent crude oil tanker company based in Bermuda. The company was formed and listed on the NYSE in 2005, with closing share price trading at $4.14 the 30th of December 2016 (Yahoo Finance). Today's version of the company is a result of a series of transactions from the original DHT Maritime. DHT's fleet consists of 26 VLCCs, 2 Aframaxes and 4 newbuildings operating internationally. A large part of their revenue stream is generated by chartering-out vessels to Overseas Shipholding Group (OSG), a company that was working as their parent company before a split-off in 2005 (DHT, 2017).

3.3.3 Nordic American Tankers

"Largest independent Suezmax owners in the world"

Nordic American Tankers (NAT) was incorporated in Bermuda 1995 and is listed at NYSE, trading at a closing price of $8.33 at 30th of December 2016 (Yahoo Finance). In 2004, NAT decided to become an actively operating company, and acquired a bunch of firms in the upcoming years. The company focuses on Suezmax crude tankers, where all of their 20 vessels are employed in the spot market (Nordic American Tankers, 2017). Revenue generation comes from seaborne transportation.

3.3.4 Teekay Tankers Ltd.

"Largest operator of midsize tankers"

Teekay Tankers is a publicly traded company at NYSE. Its headquarter lies in Bermuda, and the share price traded at a closing price of $2.26 on the 30th of December 2016 (Yahoo Finance). The company was founded in 2007, as a part of Teekay Ltd, which dates back to 1973. Teekay Corporation operates within marine transportation in the oil industry, diversified by offshore, gas and tankers. The offshore and gas segments are operated by Teekay LNG and Teekay Offshore, whereas Teekay Tankers operates in the tanker industry. With one of the world's largest conventional tanker fleets, their income stream is generated through two segments: conventional tanker and ship-to-ship transfer.

4. Valuation Setup

The purpose of this section is to outline the valuation approach used in the application of the stochastic freight rate model. Structurally, it will simultaneously provide theoretical valuation insight together with an explanation of how the valuation is done in general for the selected companies. The section briefly examines different valuation practices in general and further digs into shipping-specific aspects. It covers a description of the Enterprise Value (EV), and how the model is implemented in practice through free cash flow (FCF). Finally, the last part contains a detailed explanation of how the free cash flows and its corresponding inputs are applied.

4.1 Enterprise Value

The value of a firm is frequently denoted as the Enterprise Value (EV), which is regarded as the theoretical takeover price for a company. Consequently, EV is the sum of the company's market value of equity and debt net of liquid assets, which usually comprises of Cash and Cash Equivalents. The EV can be expressed as in the equation 3 below (Koller, Goedhart & Wessels, 2015). An acquirer of a company must pay for its debt, but can choose to withdraw the cash position, which is why the value of debt is added and the liquid assets like cash are subtracted.

$$\begin{aligned} EV = V_{equity} + V_{debt} + Preferred\ Equity + Minority\ Interest - \\ Cash\ and\ Cash\ Equivalents \end{aligned}$$

	Enterprise Value
-	Value of Debt
+	Value og Cash and Cash Equicalents
=	**Equity Value**

4.1.1 Value of Equity

The market value of equity is the total monetary value of a company's outstanding shares. Hence, what determines the share price is the value of equity per number of outstanding shares. The relationship between equation 3 and the share price, and the way it is calculated in this thesis, is given as follows:

$$Share\ Price = \frac{Equity\ Value}{Shares\ Outstanding} \tag{4.1}$$

The value of equity can be calculated in two ways, either directly as a sum of all equity parts or indirectly as the present value of free cash flows plus liquid assets (usually cash) net of debt. In this thesis, the focus will be on the present value approach through the simulation of revenue. Hence, the main focus of the valuation is estimating the equity value.

4.1.2 Value of Debt

The value of debt is the value of interest-bearing liabilities, which in our case consists of Long-Term Debt and the Current Portion of Long-Term debt. Its value can be extracted from the annual reports, where the companies may state repayment and issuance plans of their debt in combination with the current level and accompanying interest rates.

For the projection of future debt levels, a constant Debt-to-Equity ratio (D/E ratio) is assumed. This is because the free cash flow's discount rate, which will be explained later in the paper, requires a stable capital structure, unless it is re-calculated after every change in equity or debt value. As the equity value is forecasted through revenue simulation, the projected debt levels indirectly follow as a portion of the D/E ratio from the ending balance in the estimation period, accordingly December 31, 2016 in our model. In this respect, it is further assumed that the ratio of long-term to current portion of long-term debt remains constant. Finally, given the stated repayment plans, new issuance of debt are estimated by the goal seek function in Excel to give a value that makes the following equation true:

$$\begin{aligned} Beginning\ Balance + Issuance = \\ End\ Balance\ with\ respect\ to\ constant\ D/E\ ratio \end{aligned}$$

4.2 Discounted Cash Flow Models (DCF)

Damodaran (2009, p. 22) states that"every asset that generates cash flows has an intrinsic value that reflects both its cash flow potential and its risk". The idea is that the best estimate for a company's intrinsic value is the present value of expected cash flows over its life time, discounted for both the riskiness of the cash flows and the time value of money. This is the key aspect of the DCF model, and will be explained more in-depth throughout this subsection.

$$Value\ of\ Business = \sum_{t=1}^{t=\infty} \frac{E[CF_t]}{(1+r)^t} \tag{4.2}$$

In equation 4, r equals the discount rate that accounts for both risk and the time value of money. Just as in statistics, volatility does not affect the expected value, but this is solved through inversely relating today's value to the riskiness of cash flows in terms of the discount rate. As the forecast period increases, so does the difficulty in projecting future cash flows. As a result, it is common to split the forecast into one period where value creation can be calculated with a reasonable degree of certainty called the explicit forecast period. The subsequent period captures all value creation beyond that time frame and is called the Terminal Value (TV). This is shown in equation 5.

$$Value\ of\ Business = \sum_{t=1}^{t=N} \frac{E[CF_t]}{(1+r)^t} + \frac{TV_N}{(1+r)^N} \tag{4.3}$$

One of the key drawbacks with the DCF method is the dependency on stable cash flows and subjectivism. Usually, the revenue stream is forecasted by using a combination of past revenue data and a strategic analysis. In this respect, a common method is to use a constant revenue growth rate in the estimation period. However, in industries like shipping, where the volatility have been very high, the DCF method has come under a lot of scrutiny that has made other valuation methods more widely used. Two of these methods are the Relative Valuation Method, or the Multiples Approach, and the Net Asset Value (NAV) approach.

A key issue is that examining historical revenues may be irrelevant in forecasting future revenues, because a large portion of these revenues are based on a more or less random component (the price of oil). Hence, applying a constant growth rate based on short-sampled historical data on the freight rates may lead to substantially misleading estimates.

Contrary to the intrinsic method, the objective of relative valuation is to "value an asset based on how similar assets are currently priced by the market" (Damodaran 2009, p. 90). This can be thought of as an application of the law of one price (Wiley et al. 2013), where identical assets are priced equal. In relative valuation, one uses a standardized measurement variable, such as $\frac{EV}{EBITDA}$, to value the company according to the market-wide perception of a similar company.

One major obstacle is to find similar assets, or firms, to use for the comparison. The difficulty arises because no firms are identical. In the shipping industry, there are a variety of ways in which two seemingly identical firms can differ enough to make the comparable valuation biased. Specifically, they may differ in their tanker size composition, percentage of spot and TC contracts, how much of the revenue that is derived from storage and finally the type of freight being transported; wet bulk, dry bulk or a combination of the two. Finally, when applying the relative method, there is a risk of inconsistencies of multiples across firms. In a volatile industry like shipping, using multiples means you implicitly rather than explicitly assume the firm's cost of capital without having full control over the underlying drivers. Conversely, the DCF method will more closely align the estimates with the company's intrinsic value if the assumptions and application of data are reasonable.

4.2.1 Our Valuation Approach

With the problems inherent in the Relative Method, the goal of this thesis is to develop an extension to the current DCF framework that removes the subjectivity in revenue estimation and overcomes the issue of non-stable cash flows. By using the mean-reverting properties of freight rates and its relation to revenues, we hope that this method can better capture the underlying trends of revenue generation rather than a short-sampled estimation of past revenue values. As the industry is highly cyclical, the standard DCF approach is dependent on the numbers in the estimation period reflecting future revenue streams, i.e. a stable cash flow. By building a model that better captures the underlying trends, future generated revenue will hopefully lead to fewer over- or underestimations. Finally, since the standard DCF assumes a constant growth rate, liquidity is usually not an issue. With this new framework, however, revenues for the next years may be substantially lower. In such a highly leveraged industry as shipping, we believe this could be very useful.

4.3 Free Cash Flow

FCF is the cash generated by operating activities net of capital expenditures. Hence, it is the cash flow distributable to all security holders in a company, either ownership in stocks (equity), investors entitled to a company's bonds (creditors) or preferred stock holders. Consequently, it is the first step in order to estimate the EV, before discounting the cash flows. Our decomposition FCF following the direct method is as follows:

-	Cost of Goods Sold (COGS)
-	General and Administrative Expenses (SG&A)
-	Other Operating Expenses
-	Depreciation
=	**Operating Profit**
-	Cash Tax
=	**NOPLAT**
+	Depreciation
-	Increase in Net Working Capital (NWC)
-	Investment in CAPEX
=	**Free Cash Flow**

4.3.1 Cost

The cost projection is done by using the revenue simulation as its underlying driver. The first step is taking the average ratio of each cost factor relative to historical values of Total Revenue. Finally, these ratios are multiplied with the forecasted revenues to give the costs for each future year in the forecast period for the respective factors.

4.3.2 Depreciation

The projection of Depreciation rates are done similarly to the costs as explained in last section. The difference lies in the driver that is used. Here, we assume that depreciation depends on the level of fixed assets throughout one year. Hence, the driver is the ratio of depreciation to the average level of fixed assets for the current and past accounting year.

Since depreciation is a tax-deductible non-cash expense, it is added back after NOPLAT. It is included in NOPLAT because it represents wear on capital. In the forecast period, depreciation varies as a percentage of total revenues and the ratio follows the average percentage of revenues from the estimation period. A concluding remark is that we have excluded the amortization post altogether. The reason is that these shipping companies do not give up how amortization and depreciation are split up, so we assume amortization to be zero.

4.3.3 Cash Taxes

Most shipping companies are based in tax havens such as Bermuda and pay little or no tax on EBITA. The domestic tax rate in Bermuda is 0%, and tax costs mainly consist of small proportions relating harbor usage around the world. Cash tax is optimally calculated based on the income tax provision, where an implied marginal tax rate is calculated based on historical tax expenses. In our model, cash tax will equal tax from income provision, as the tax recognition is not possible with the information given in the annual reports. The marginal tax rate is calculated as the average percentage of pre-tax income, and is used to estimate future levels of income tax provision by multiplying operating income.

4.3.4 Increase in Net Working Captial

For the purpose of free cash flow calculation, the net working capital (NWC) is determined by the gap between net receivables together and inventory with accounts payable.

An increase in a current assets like inventory, require cash outflow and is consequently affecting the cash flow negatively. A positive change in the net working capital implies that more cash have flown out of the company in the specific period. Hence, an increase (decrease) in NWC from the previous year is subtracted (added) after NOPLAT on the mission to obtain free cash flow.

The future levels of NWC and ultimately the change in NWC is projected through forecasting each of its components individually. Inventory is estimated by using inventory turnover, which is total cost of revenue divided by the inventory level and the net receivables driver is forecasted by using historical average days to collect cash.

4.3.5 CAPEX

Capital Expenditures reduces the free cash flow as it represents a cash outflow, related to replacing or upgrading machinery, equipment and other fixed assets as vessels. This cash flow is difficult to predict in the shipping industry, as the strategic component of the industry is complex. The shipping industry face clear seasonal trends over a long period, where it is not given that companies reduce their CAPEX in bad times and raise in good times. Even in bad times, a purchase of a vessel could be a strategically smart decision if the prospects for the future are good.

In our model, the projection of the CAPEX is forecasted based on historical percentages of EBITD per year. A “normal” year is defined in each company’s respective valuations, to solve the problems of seasonality. Truly, a more negative EBITD that would give a higher CAPEX does not make sense, and are treated specially if it occurs.

4.3.6 Other

Other subjects include investments in goodwill. However, since the model does not speculate whether any future acquisitions will take place, it assumes no investments in goodwill. However, investors sitting on this type of information may use it to further improve the estimate.

4.3.7 Terminal Value (TV)

As underlined earlier, the value of a company may be split up into two estimation periods. The TV reflects future revenue streams occurring deeply into the future, making them extremely difficult to forecast. Hence, what is commonly used is to assume a growth rate (g) on the FCF from the last forecast period to project the FCF the following year. As the model estimates FCF in the indefinite future, a perpetuity growth model is used. The model is essentially an infinite annuity model that uses the cost of capital as the discount rate and the assumed long-term growth rate (g) as the growth rate. Mathematically, the TV is expressed as follows:

$$TV = FCF_{n+1} * \frac{1+g}{r-g} \tag{4.4}$$

The growth rate is a company-specific assumption about how much the free cash flow will grow on average. As all the companies are within the same industry, a common terminal growth rate of 2.07% is applied, as this is the 5-year Forward Inflation Expectation Rate (St. Louis Fed., 2017). This growth rate assumes no real growth, and operate as the most neutral growth target as possible. The model we are building is only workable in the first five years, and the terminal value follows the normal DCF approach. According to this, we would make the terminal value projection as neutral as possible, and therefore assume the inflation forecast to be an appropriate measure.

4.4 The Discount Rate

This section will present theory and applied practice of the WACC used in our model. In the calculation of EV, the FCF is discounted to account for both the riskiness of operations and the time value of money. The discount rate applied is the Weighted Average Cost of Capital (WACC), and has three components. Those components are the cost of equity, the cost of debt and financial leverage. The discount rate is mathematically expressed as follows:

$$WACC = R_E * \frac{E}{D+E} + R_D * \frac{D}{D+E}(1-t_c) \tag{4.5}$$

In this expression, R_E represents the cost of equity, R_D represents the cost of debt, $(1-t_c)$ is the tax shield on debt, whereas the last parts are the equity (E) and debt (D) ratios respectively. The tax shield is due to the tax-deductible properties of interest expenses. More precisely, "*debt increases the cash flows available to stockholders and bondholders by the amount of the tax reductio*n" (Bodie, Kane & Marcus, 2013) yielding a higher company value. This is what is known as the interest rate tax shield. Contrarily, higher leverage increases a company's distress costs, which are costs incurred due to either the fear of insolvency or that bankruptcy has occurred. Prior to bankruptcy, the interest rates charged (and subsequently cost of debt) will increase for highly leveraged firms. If bankruptcy occurs, additional legal costs and accounting cost will incur.

As for the cost of equity, its relationship between capital structure and ultimately equity beta is as follows:

$$\beta_A = \big(B_D * \frac{D}{D+E}\big) + \big(B_E * \frac{E}{D+E}\big)$$

$$\beta_E = B_A + (B_A - B_D) * \frac{D}{E}$$

$$R_E = R_f + B_E(R_m - R_f)$$

Increased leverage makes the equity investments riskier (β_E increases) and equity holders require a premium in terms of a higher cost of equity (R_E). Hence, it is a trade-off between cost of equity and tax benefits of debt. Consequently, an efficiently driven company is one that optimally balances these aspects to minimize the WACC and ultimately maximizes the present value of the free cash flow. Below follows an explanation of the various components in the WACC equation. The WACC for the various companies are shown in the tables below.

	Cost of E	Cost of D	WACC
Frontline	9.75%	3.21%	7.11%
DHT	9.65%	4.41%	7.00%
NAT	9.34%	4.59%	7.74%
Teekay	11.03%	3.32%	7.67%

Table 4.1: Cost of Equity, Cost of Debt and WACC

The wide gap of Teekay Tankers costs of capital is notable. We can see from the table above, that Teekay clearly has the highest cost of equity, but a low cost of debt relative to the others. This is not theoretically correct, but may arise from favorable loan agreements.

4.4.1 Cost of Equity

The cost of equity is the first input parameter in the WACC, and is the shareholders' required rate of return for holding part of a company's shares. A company can finance its operations in two ways – either through acquiring debt or issuing shares (equity financing). To get an estimate of a fair share price (equity value per share), one need to adjust the present value of free cash flow to compensate the equity investors for their risk. This compensation is a premium above the risk-free rate, is larger than the cost of debt, and may be expressed as follows:

$$R_E = R_f + Risk\ Premium \tag{4.6}$$

There are multiple reasons why equity is considered riskier, and thus costlier, than debt. These factors include fixed debt payments, collateral and first lien before equity in the event of default. Calculating the cost of equity can be done in multiple ways, by which two of the most frequent methods are the dividend discount model and the CAPM. In the next two subsections, we will examine both methods and explain which method that is most suited for our approach and how we calculate the cost of equity.

The dividend discount model is an alternative method for estimating the cost of equity implied by the predicted dividend payouts discounted to present value (Bodie, Kane & Marcus, 2014). The implied cost of equity is calculated as follows:

$$Price_0 = \frac{\sum_{t=1}^{0} Dividend_t}{(1 + R_E)^t} \tag{4.7}$$

$$(1 + R_E)^t = \frac{\sum_{t=1}^{\infty} Dividend_t}{Price_0} \tag{4.8}$$

$$R_E = \sqrt[t]{\frac{\sum_{t=1}^{\infty} Dividend_t}{Price_0}} \tag{4.9}$$

In the dividend discount model, one key issue is the discrepancy between daily price changes and less frequently updated dividend forecasts. Secondly, it is highly dependent on future cash flow estimates (and ultimately $Price_0$). In such a volatile industry as shipping, where we must come up with a lot of assumptions in our revenue simulation, the disadvantage from the reliability on volatile prices may outweigh the benefits from having forward-looking estimates. In addition, one is dependent on the respective firms specifying their dividend policy.

CAPM

According to the CAPM, the cost of equity is calculated as in equation 7 below.

$$R_E = \beta_E * (E[R_m] - r_f) \tag{4.10}$$

Here, is the risk-free rate and in our model corresponds to the return on 5-year US Treasury Bills, as the probability of default is assumed zero, and it coincides with both the dollar denominated return and the US' international reach. β_E , which represents the excess returns of a stock's typical response to changes in the market index's excess return is calculated as $\beta_i = \frac{cov(R_i,R_m)}{Var(R_m)}$. The intuition is that investors require higher risk compensation if the asset do not pay off when the overall market is in a downfall, implying a low diversification benefit and decreasing the expected utility of a risk-averse investor. The market risk premium, $(E[R_m] - r_f)$, indicates that investors expect to earn more when the market is performing well relative to a riskless asset. Underlying the CAPM, there are two assumptions that must be met to estimate R_E (Bodie et al., 2013).

Assumption 1: Markets for securities are perfectly competitive and equally profitable to all investors. This implies frictionless trading, i.e. one investor cannot affect market prices. Secondly, all relevant information is publicly available and all securities are publicly owned and traded. Finally, one assumes no taxes. This last part can be said to be fulfilled, because of the shipping firms' low tax rate. Hereunder is also the assumption of no transaction costs and unlimited lending and borrowing.

Assumption 2: Investors are alike in every way except for initial wealth and risk aversion; hence, they all choose investment portfolios in the same manner.

This means that investors are subject to the same time horizon; they are all rational and have homogenous expectations.

The CAPM has come under a lot of scrutiny with respect to its validity, but remains the key tool for estimating the cost of capital. Obviously, few of these assumptions can be considered fulfilled. However, until a more widely accepted method is available, we consider the CAPM to be a good alternative. Finally, as CAPM is so widely used, it makes our valuation estimate more easily comparable to others'. As a result, since not every company pay dividends at all, and our aim is to build a framework for other investors to use, we choose to use the CAPM method for the cost of equity estimation. Consequently, the cost of equity is calculated using equation 4.10.

Beta

As mentioned previously, Beta is a risk-compensating parameter for investors. When calculating the Beta, one can use either the adjusted or unadjusted (raw) Beta. As the paper by Moonis and Shah suggest that Betas tend to have mean-reverting properties, we apply the adjusted Beta that accounts for this. Its calculation implies that the Beta value lies closer to 1 than the unadjusted Beta. For the estimation of the companies' beta, we applied the Beta calculated by the Bloomberg terminal, estimated using data corresponding to our company sample period.

Market Risk Premium

Calculating the expected market risk premium can be done in multiple ways, two of them being either directly by examining its historical values or implied via the dividend discount model. As we choose not to use the dividend discount model in the FCF calculation, we will here use data on historical return to estimate the premium. The mathematical expression of the market risk premium, R_p, is as follows:

$$Market\ Risk\ Premium = R_m - R_f \tag{4.11}$$

In our estimate of the market risk premium, we apply a market proxy estimated by KPMG, recommend using an equity market risk premium of 6% as per 30 June 2016.

4.4.2 Cost of Debt

As a large part of a company's operations are financed with debt, the present value of free cash flows (EV) will be heavily influenced by the costs related to the debt payments. The companies valued in this thesis have all listed their loan structure in the annual reports. In these reports, they list the interest rates for each loan as a sum of the risk-free rate (LIBOR) plus a risk premium (margin). To estimate the effective interest rate a company pays on its debt, each loan's interest expense is weighted as a percentage of total loan value.

$$
\begin{aligned}
Weighted\ Interest\ Rate\ Loan_j = \\
(US\ Treasury_{5\,year} + Risk\ Premium) * \\
\frac{Total\ Value\ of\ Debt}{Loan\ Value_j}
\end{aligned}
$$

For LIBOR we will use the 5 year Treasury yield, trading at 1,93% at 31 of december, 2016 (U.S. Department of the Treasury). Cost of debt is then calculated as the average weighted interest rate on all loans as mathematically shown in equation 4.12. We are implicitly assuming that all interest-bearing debt carries the same interest rate and equal duration on all loans, because we take the average of interest on all loans. With this assumption, it is irrelevant what type of new interest-bearing debt that is acquired in the future. However, as we project each liability post to vary as a function of total revenues and the debt to equity (D/E) ratio is assumed to remain constant, their relationship will also remain constant. Hence, the company's effective cost of debt is calculated as follows:

$$
R_D = \frac{1}{n} \sum_{i=1}^{n} Weighted\ Interest\ Rate\ Loan_j \tag{4.12}
$$

5. Model Development

In this chapter, we will very carefully construct and simulate the stochastic freight rate model. A step-by-step procedure is applied, where we simultaneously present theory and tests of the sample throughout the chapter, ending up with the simulated values for freight rates and ultimately revenue and cost. This more technical part of the thesis covers the main methodology of our work. Hence, this chapter is essential for answering the research question.

5.1 Operating Revenue Simulation

The purpose of the stochastic freight rate model is to project the future operating revenue from spot and T/C contracts. This section carefully explains how this is implemented both intuitively and mathematically.

In very simple words, a company owning vessels generate revenue from transportation by either operating the vessel in the spot market or chartering it out using T/C contracts. The T/C contracts operate as a hedge for future freight rates, as a fixed agreement between a charter in and charter out determines the revenue and cost. The charterers normally pay for fuel, port charges and other variable costs. The T/C contracts, which function as a fixed revenue for a pre-determined period, are usually stated in the associate company's annual report including both the fixed rates and the contract duration.

By definition, freight rates represent the price charged for providing services through seaborne transportation (Alizadeh & Nomikos 2009). Hence, spot freight rates reflect today's price charged for providing services of seaborne transportation. Spot rates in the shipping business are normally defined as the dollar per day or dollar per ton for a specific voyage trip. Short-term or spot charter rates are thought to be determined by current supply and demand for shipping services, while long-term rates are believed to be determined through agents' expectations about future short-term rates (see Stopford, 1997 and McConville, 1999 for more information).

As the shipping service concerns physical assets, demand and supply will deviate from location to location, and therefore different route-specific rates will occur. Otherwise, this deviation cannot vary too much from the aggregated market, as vessels would move effectively to capture higher freight rates. Therefore, it is common to use specific freight rates as indicators for the market condition, which is what forms the basis of our "Index assumption" that follows in section 5.2.1. Kavussanos and Alizadeh (2002) test the validity of the expectation hypothesis of term structure in the dry bulk shipping markets, which is mathematically expressed as follows:

$$TC_t^n = \theta \sum_{i=0}^{k-1} \Sigma^i E_t FR_{t+im}^m + \Phi, \quad k = \frac{n}{m} \tag{5.1}$$

(See original paper for further explanation). In simplicity, the hypothesis postulate that dollar per day earnings from an n period T/C contract should be equal to the discounted expected earnings from a series of m period spot contract plus a term premium Φ. The paper concludes that the Expectation Hypothesis of the Term Structure is not supported for the period of 1980 to 1997, and explains it with ship owners' perception of risk due to operations in spot or T/C markets. It is suggested that when modelling and forecasting these rates, it is appropriate to incorporate factors that accounts for agents' perception of risk and future market conditions. This modelling approach is a highly resource intensive process, and must be considered beyond the scope of this thesis. Therefore, we will for some simplicity assume that the market is efficient, and that a ship owner would be indifferent between receiving the spot freight rates and the T/C freight rates. This is equal to the last mathematical expression except the risk premium, i.e. assuming that the market is efficient. Therefore, it could be stated that the assumption is justified in the theory, but not in practice. In the case of our model, ongoing T/C contracts will in the future roll over to be operating in the spot market as we assume this to be equal. This implies that the exposed revenue in the model will increase as time goes by.

In reality, firms do not run their ships directly from port-to-port constantly, but optimize their freight routes to the market circumstances. Efficient firms can choose to decrease vessel velocity to reduce fuel consumption and delay docking in bad times. In addition, vessels are not always in operation, but are sometimes off-hire. This is a driver that reduces the operational revenue. In the model, an estimate based on historic number for future off-hire days is assumed. If historical off-hire days are available, an average percentage of days are used for the projection. If no information is given, the model will operate with 5% off-hire days, which is a realistic estimate considering the industry. Consequently, vessel revenues will be reduced by the percentage of off-hire days. Detailed information about historical revenue generation for the companies are difficult to obtain, and should be consequently be evaluated as a negative impact when evaluating the model.

Putting it all together, our model will simulate revenue for each vessel in the spot market by assuming that the vessel earns the daily freight rate corresponding to its index, explained later on. The vessels operating on T/C contracts are expected to earn the same revenue as the spot vessels when the contract has expired.

5.2 Data Sample Collection and Description

This section describes the main data used in our model and how we collected it, including the collection of the financial statement numbers.

5.2.1 Freight Rates

The purpose of the freight rates simulation is to project the future generated revenue stream from operating shipping transportation in a best possible way. Optimally, a model should consider vessel size and remaining lifetime for correct cargo and seagoing, and probability of which route to be run for the specific vessel in order to simulate the relevant freight rate for projection purposes.

According to this paper, this is extremely complicated to implement. In addition, the specific route information and strategy are in general publicly hidden. We will therefore assume that all vessels in the same categories operate in the same route, with correspondingly equal freight rates. Additionally, vessels are assumed to be continuously replaced or renewed when necessary. The routes are chosen with respect to the activity level by the implicit vessel. Further, the route-specific earnings will not deviate too far from the aggregated market discussed in the section 5.1. Hence, we therefore approve some validity in the assumption, although the assumption is obviously a strong simplification. The following routes and freight rates is assumed to act as indices for the model, i.e. as revenue source for the respective vessels:

- **MR:** From Rotterdam to New York corresponding to IFTC2D1M
- **LR1:** From Ras Tanura to Yokohama corresponding to IFTC5D1M
- **LR2:** From UK North Sea to Eur Continent corresponding to IFTD7D1M (80,000mt)
- **VLCC:** From MEG to Japan corresponding to IFTD3D1M (250,000mt)

The numbers are collected from the Bloomberg Database with tickers as stated above, representing Imarex indices. All indices are front one-month, the nearest unexpired contract index delivered, to capture the spot market exposure. We assume that the one-month front contracts equal the spot rate.

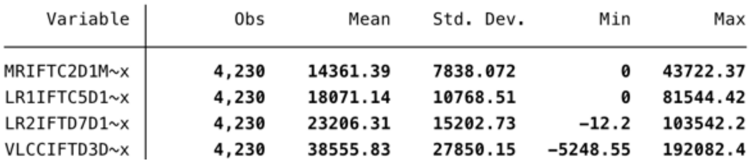
5.2.2 Financial Statement Numbers

All numbers according to the “Income Statement”, “Balance Sheet” and “Cash Flow Statement” for valuation purposes are obtained from the last five years’ annual reports. Personal knowledge is used to reformulate the data to be as appropriate as possible for the valuation. Unfortunately, the financial information given is not as specific as we wanted due to company secrecy. An attempt to retrieve information that is more detailed has been done without success. We must accept the fact that business secrets are a crucial part of the shipping industry.

5.3 Historical Freight Rate Analysis

To obtain an accurate simulation of the freight rate indices, it is essential to perform a historical analysis as well as to prepare the data. This section’s purpose is to do this, and identify if some of the past performances of the freight rate indices could be able to predict the future. The goal of this section is to obtain stationary, mean-reverting data ready for simulation.

A general econometric analysis of the Imarex Indices is retrieved using Stata, to get an introductory overview of what we deal with. Figure 5.1 summaries these findings.



```
    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
MRIFTC2D1M~x |      4,230    14361.39    7838.072          0   43722.37
LR1IFTC5D1~x |      4,230    18071.14    10768.51          0   81544.42
LR2IFTD7D1~x |      4,230    23206.31    15202.73      -12.2   103542.2
VLCCIFTD3D~x |      4,230    38555.83    27850.15   -5248.55   192082.4
```

Figure 5.1: Freight Rates Key Characteristics

We have obtained an exactly equal number of observations for all the variables, solved by carrying over the last value as the new value. We identify great differences in the mean, where the bigger vessel type has higher mean values of freight rates, which makes perfect sense intuitively. As ships size grows, revenue grows as well. We also identify a negative "minimum value" for two of the rates, something that could have been an major obstacle if it involved a larger part of the sample. These negative values are not normal, but are perfectly possible in practice when the market is in a very bad condition. In theory, it does not seem logical, but the factor may be that it occurred in a period where the market had some major challenges. An explanation of these negative values is that companies are willing to take a loss for a route, to position themselves for a better opportunity for future agreements.

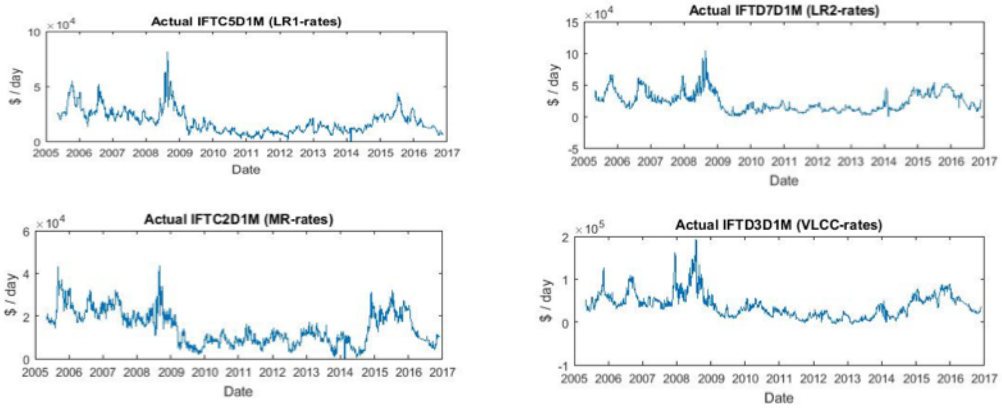


Figure 5.2: Time-Series of Freight Rate Indices

In order to obtain accurate revenue modeling, the data set needs to be stationary. The practical intuition behind stationarity in forecasting is to recognize a factor or trend in the past that could tell something about the future. If everything is different tomorrow than today, it is clearly impossible to forecast, and therefore deal with a non-stationary time series. In a theoretical perspective, a stationary time series is defined as one whose statistical properties such as mean, variance, autocorrelation is all constant over time (Johnsen & Wichern, 2007). This is an important assumption in statistical forecasting models when using historical observations to project the future.

We will assess an Augmented Dickey-Fuller (ADF) test to evaluate whether our time-series follows a stationary process. ADF tests the null hypothesis of whether a unit root is present or not, whereas a unit root implies non-stationarity. Moreover, a unit root indicates a feature that can cause issues in statistical inferences. A technical analysis of the past has to be done to determine if the data is usable. We will carefully go through our steps to create the best possible model for the freight rate indices.

Figure 5.2 shows the historical data obtained, plotted with "Date" in days on the x-axis and "$/day" representing revenue generation on the y-axis. By a first glance at all the time series; we observe that the data appears to be stationary. However, this cannot be evaluated by purely looking at the graphs, but must be thoroughly tested. Moreover, we can identify some large outliers in the early stage of our series, which we have to analyze. Also, we notice that the rates are highly volatile, correlates with each other, and appear to follow a long-term trend. Optionally, the time-series could be converted to differences or log-variables as well as trimmed if the ordinary time-series contain a non-stationary process, but we will firstly analyze the ordinary data.

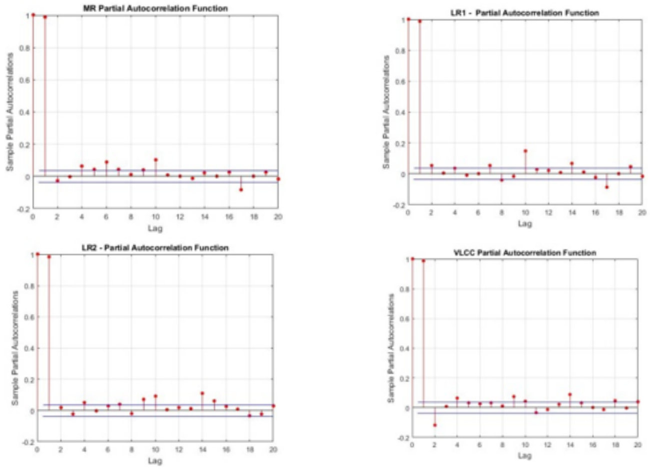


Figure 5.3: Empirical Autocorrelation Function

We firstly examine the empirical partial autocorrelation function shown in figure 5.3. This shows the correlation of the time series with its owned lagged values, when controlling for the values of the time series at all shorter lags (Johnson & Wichern, 2007), we see that an AR (1) or AR (2) model could be appropriate in the stable period. This is investigated in more detail, using information criteria, with command "varsoc" in Stata, suggesting one lag for MR and LR2, and two lags for LR1 and VLCC using BIC. Subsequently, doing a Dickey-Fuller test in Stata to test for a unit root gives the t-statistics obtained in figure 5.1 below.

Interpolated Dickey-Fuller		Critical Values		
	Test Stat	1%	5%	10%
MRIFTC2D1MIndex	-4.522	-3.43	-2.86	-2.57
LR1IFTC5D1MIndex	-3.934	-3.43	-2.86	-2.57
LR2IFTD7D1MIndex	-4.543	-3.43	-2.86	-2.57
VLCCIFTD3D1MIndex	-4.984	-3.43	-2.86	-2.57

Table 5.1: Augmented Dickey-Fuller Test

Hence, we can reject the null hypothesis of a unit root for all freight rates on a 1% significance level, and proceed our analysis with the achievement of stationary time series.

We would like to mention that a lot of tests and different sample adjustments are studied. Combinations of differences and logarithms of the variables are analyzed without improving the model. Also, other tests like the Quandt Likelihood Ratio and Granger causality test have been applied. After analyses we have concluded that the sample is applicable for the process we want to implement.

5.4 Mean-Reverting Ornstein Uhlenbeck Process with Jumps and Seasonality

This section will very carefully describe the process to which we implement and run the simulation of the freight rate indices in Matlab.

As shown in Chapter 2, "Literature Review", several literatures suggest that freight rates behave as a mean-reverting process. We understand that the rates face very high uncertainty, but the process is nevertheless regarded as the best description of the freight rates. The literature review investigation will form the basis of our adaption. In addition to the mean-reverting process, we incorporate seasonality and jumps to the stochastic factor to hopefully improve the model and put our signature on it. We believe that this is a good and sensible approach, as freight rates follow a seasonal trend, and that shocks in demand and supply of services may occur. The framework follows Seifert's (2002), approach to Electricity Prices, adapted by MathWorks (MathWorks, 2017). The four freight rates (FR) will be modeled with two components. The first, $f(t)$, is a deterministic seasonal part and X (t) is the stochastic part. This is mathematically expressed as follows:

$$FR_{t,i} = f(t,i) + X(t,i) \tag{5.2}$$

The seasonal part is modeled as a trigonometric function, mathematically expressed as follows:

$$f(t) = S_1\, sin(2\pi t) + S_2\, cos(2\pi t) + S_3\, cos(4\pi t) + S5 \tag{5.3}$$

Here, S_i are constant parameters calibrated in the model and t represent the time factor. Furthermore, the stochastic part of the model is an Ornstein-Uhlenbeck process with jumps, mathematically expressed as follows:

$$dX(T) = k(\theta - X(t))dt + \sigma dW(t) + J(\mu_j, \sigma_j)d\prod(\lambda) \qquad (5.4)$$

Here, k is the speed of mean reversion, θ is the constant mean-reverting long-term mean, σ is the instantaneous volatility of spot freight rates, $W()$ is a standard Wiener process, $\prod(\lambda)$ is Poisson process and $J(\mu_j, \sigma_j)$is the jump size with normally distributed mean, μ_j, and standard deviation σ_j. Hence, the model expects that the dynamics of the freight rate differentials are a mean-reverting Ornstein-Uhlenbeck process. We have that the solution to eq. 5.4 set aside from the jump diffusion process is:

$$X(t) = e^{-kt}X(0) + \theta(1 - e^{-kt}) + \int_0^t \sigma e^{-k(t-s)}dW(t) \qquad (5.5)$$

Hence, $X(t)$ is normally distributed with finite mean and variance when t approaches infinity, i.e. a stationary process (Sødal, Koekebakker & Aadland, 2008).

This process is implemented in Matlab. The codes in simple words are explained below, whereas the complete codes are enclosed in the appendix.

1. **Calibration** – Two parts. Calibrating seasonal trend and the stochastic part. Seasonal parameters are calibrated with least squares method and extracted from sample. The stochastic part is calibrated using Maximum Likelihood Estimation before it is "stored" for use in next step.

2. **Monte Carlo Simulation** – Using the parameters obtained in step 1, the model, represented with eq. (3), is simulated by a Monte Carlo approach for 5 years with 10,000 trials per day. In the end, we add back the seasonality extracted in the first step.

3. **Data** - To obtain single daily observations, we apply a crude Monte Carlo method, a simple average of all observations generated per day, to represent the freight rates (Holmes, 2004).

5.5 Graphical Vision of the Simulation of the Freight Rate Indices

This section is constructed for graphical purposes. The simulated path for the respective four freight rates is shown in figure 5.4.

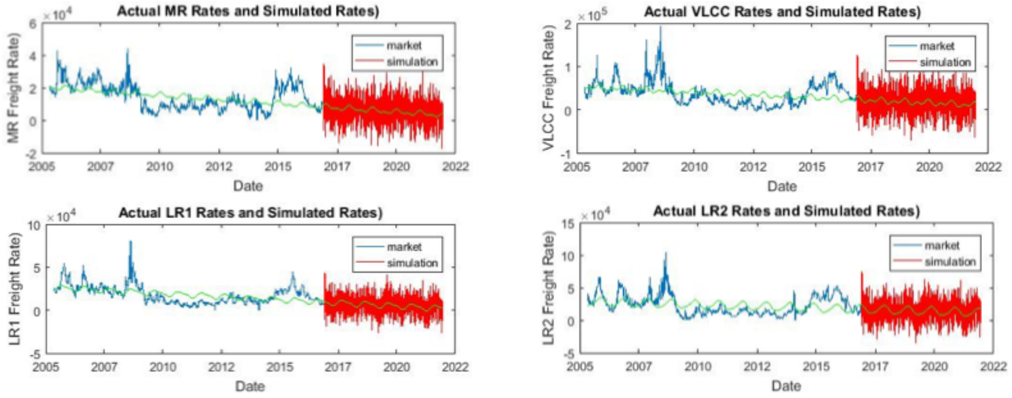


Figure 5.4: Simulated Freight Rates

In figure 5.4, the blue line shows the historical data collected, the green line is the seasonality function, and the red areas are the Monte Carlo simulation five years into the future with the model we are implementing. As can be observed, the simulated variables give a large spread. In practice, our obtained estimates using the crude Monte Carlo method will closely align to the seasonality function. We believe this is a good approach, as this in best manner project future prospects. Everything else is impossible to forecast. Further, the numbers are extracted and used in our valuation for revenue generation to test the validity of the model, by which we will describe in more detail in the following section.

6. Stochastic Valutaion Results and Evaluation

This chapter's purpose is to estimate the equity value of DHT, Frontline, Teekay Tankers and Nordic American Tankers, using the valuation framework and model presented in the previous chapters. The objective is to test the model built and briefly evaluate it, rather than putting a recommendation on whether to buy or sell a certain share. We will firstly present all our resulting share prices and evaluate the numbers according to the market value and P/E multiples. Following, a more detailed presentation of the valuation of Frontline Ltd. will be fully explained. The valuation process is equal for all of the companies less some small individual modifications when necessary; therefore only Frontline will be highlighted. All numbers of interest for all companies are attached in the appendix.

6.1 Main Results and Discussion

	Share Price		
	Actual	Model	Difference
Frontline	6.94	5.56	19.88%
DHT	4.11	0.39	90.56%
NAT	8.51	-1.03	na
Teekay	2.45	2.48	1.22%

Table 6.1: Share Price

Table 6.1 summarizes the results from our model compared to the actual market value. The deviation of the market value is illustrated with respect to our estimates. We identify some variation throughout our sample, where Teekay fits best relative to the market price, while the result of NAT is nonsensical because negative share prices will never occur in the market. In the terms of evaluation, it could be argued that the market value is the best estimate of the company's intrinsic value, but this is in practice not entirely correct as the markets are not perfectly efficient. In detail, Frontline and DHT give lower valuation estimates in the model compared to the market, while Teekay gives a slightly higher but nearly accurate estimate. The main reason for the lower price estimates are probably the negative outlook and trend in the freight rate simulation, causing future revenues to be lower in general than historic. The extreme value of NAT occurred as a problem concerning the capital structure. When receiving the results from the test of NAT, a large doubt of the model occurred. Further investigations shows that the capital structure, and the limited ability of the model to incorporate this, creates nonsense results. We take the problem of capital structure into considerations, and analyze it further in the next chapter.

Disregarding NAT, the model gives fairly good estimates of the company's value compared to actual share price, and should be accepted as valid in that circumstances of a reliable market. From this, we conclude that the model requires a certain mechanism that enables the D/E ratio to remain approximately stable. The trailing P/E ratios are calculated based on the past 12 months' earnings, and is thus a measure of the company's actual historical performance. Conversely, the forward-looking P/E ratios are estimated by using estimates of the companies' future performance. By referring to the comparison between estimated share prices in the model and the prevalent market prices, we manage to obtain a similar pattern with respect to the P/E ratios.

	Market P/E Ratios	
	Trailing	Forward
Frontline	14.18	11.8
DHT	-45.41	10.72
NAT	-11.79	65.79
Teekay	8.82	5.73

Table 6.2: Market P/E Ratios

DHT and Nordic are the firms whose valuation estimates are the lowest. This corresponds well with the trailing P/E estimates. As the model only incorporates past values of freight rates, it fits well that the trailing P/E ratios are negative for both firms. For Frontline and Teekay, the pattern also remains the same, where our estimates are quite high with a correspondingly high trailing P/E ratio. This could imply that for DHT and Nordic, investors have a different subjective view about the firms' outlook or sit on information about the company which is beyond the model's comprehension.

6.2 Frontline Ltd. for further investigation

The valuation of Frontline seems to work well by the results shown in the previous section. This section will show a more detailed outline of the valuation process of Frontline.

The revenue generated from the model is derived from a combination of owned fleet revenues (Spot) and fixed rate revenues (T/C). The decomposition of fixed and variable freight rate revenues is shown in table 1 and 2. Table 1 explicitly shows the fixed rate for each vessel and its corresponding contract duration. In Table A.1 in the appendix, the quarterly exposed revenues are outlined, showing how the revenue is distributed between the various vessel classes. The generation of the exposed revenues is dependent on the number of vessels assumed to be tied to spot freight rate agreements. For supplementary information regarding the fleet list, comprehensive tables showing the number of vessels and its correspondence to the various asset classes, are shown appendix A. Ultimately, the total revenue is dependent on the proportion of vessels tied to T/C contracts and exposed to spot rate. This is a major drawback with the model, but forecasting future contract agreements is beyond the scope of this thesis. Following the discussion from section 4.2, multiples clearly have its limitations, where part of the problem arise due to the dependency of correctly valued peers. For example, if the peers are estimates in times of a bubble, the estimate may be severely misvalued. Additionally, it may be considered as a too static measure of performance, because it captures the state of the company at a particular point in time.

Table 1 (In thousand USD)

daily rate, $	# of ships	Vessel	2017Q1	2017Q2	2017Q3	2017Q4	2018Q1
27,50	1	LR2	2 509	2 509	0	0	0
33,50	1	LR2	3 057	0	0	0	0
27,60	5	LR2	12 593	12 593	12 593	12 593	12 593
var. fixed	1	LR2	2 738	2 738	2 738	2 738	2 738
46,75	1	VLCC	4 266	0	0	0	0
28,75	1	VLCC	2 623	2 623	0	0	0
28,00	1	VLCC	2 555	2 555	2 555	0	0

USD	2017	2018
Total fixed revenue	86 573,44	12 592,50

Table 2

Revenue	Generation
2017	363 217
2018	424 293
2019	390 265
2020	351 160
2021	308 365

The stochastic freight rate simulation gives the distribution of revenue as shown in table 3. The duration of the T/C contracts are stated in the annual reports and, and no contracts are assumed to replace the outgoing agreements. Hence, the distribution clearly shows a decrease in the locked-in T/C revenues, and an increasing ratio of exposed revenues. As our model stipulates, more vessels will be exposed to the spot freight rates when the fixed contracts expire.

Table 3

USD '000	2017	2018	2019	2020	2021
Time Charter Revenues (Fixed)	86 573	12 593	0	0	0
Owned Fleet Revenues (Exposed)	363 217	424 293	390 265	351 160	310 523

Following the generation of revenues, the next step involves projecting the company's income statement, balance sheet and cash flow statement. For this projection, the key drivers are explained in section 3.3, but complete presentations of the drivers are shown in appendix 2. After generating the value drivers, the financial statement is projected and shown in table 4. Following the completion of the financial statements, the necessary information in order to construct the stochastic DCF shown in table 4 is fulfilled.

Table 4

USD '000	2017	2018	2019	2020	2021	TV
Operating Income	155 026	146 967	121 092	99 705	76 742	
Cash Tax	151	144	119	99	78	
NOPLAT	154 875	146 823	120 973	99 606	76 664	
Depreciation	87 043	88 157	88 941	89 282	89 214	
Increase in WC	-24 104	-2 408	-8 700	-7 298	-7 986	
Investments in CAPEX	119 232	115 812	103 453	93 087	81 743	
FCF	146 789	121 577	115 161	103 099	92 122	1 866 403
Discount Factor	0,93	0,87	0,81	0,76	0,71	0,66
PV	137 048	105 976	93 722	78 337	65 351	1 236 159

For the cash tax, the estimation follows the general approach from section 3.3.3 and assumes only provisional income tax due to a stated corporate income tax of 0%. Equally, the NWC follows the approach from section 3.3.4 and is specifically shown in table 5. The value of the firm is then the discounted FCF from table 4 using the WACC estimated and presented in table 6, following the same approach as in section 3.4.1. Ultimately, the equity value is calculated following the intuition from section 3.1 and its results and correspondingly estimated share price are presented in table 7.

Table 5

USD '000	2017	2018	2019	2020	2021
Net receivables	73 844,96	71 726,34	64 072,36	57 652,24	50 626,27
Inventory	87 068,30	84 570,30	75 545,73	67 975,96	59 691,87
Accounts Payable	76 974,63	74 766,22	66 787,86	60 095,63	52 771,90
Net Working cap.	83 938,63	81 530,42	72 830,24	65 532,57	57 546,24
Increase in NWC	-24 104,37	-2 408,21	-8 700,18	-7 297,67	-7 986,33

Table 6

Cost of Equity	
Risk-free rate	1,93 %
Equity Beta	1,304
Market Risk Premium	6,00 %
Cost of Equity	9,75 %
Cost of Debt	
Cost of Debt	3,21 %
Marginal Tax Rate	0 %
After-tax Cost of Debt	3,21 %
Target financial leverage ($M)	
Debt	992 631
Equity	1 499 769,00
Target market value weights	
Equity ratio	0,60173688
Debt ratio	0,39826312
Estimated WACC	
WACC	7,11 %

Table 7

Value of the Firm	1 716 593,15
Debt	992 631,00
Cash Equivalents	220 575,00
Value of Equity	944 537,15
Ord. Shares Outstanding	169 809,32
Est. Share Price	5,56

7. Sensitivity Analysis

A key aspect involved in an equity valuation is a sensitivity analysis testing the crucial assumptions behind the model. The estimated share price from chapter 6 is heavily dependent on these assumptions. Consequently, for the evaluation to be credible, these assumptions must be examined in detail. Hence, the following two subsections will cover two of these key assumptions, namely "WACC and Growth" and "D/E Ratio & Depreciation".

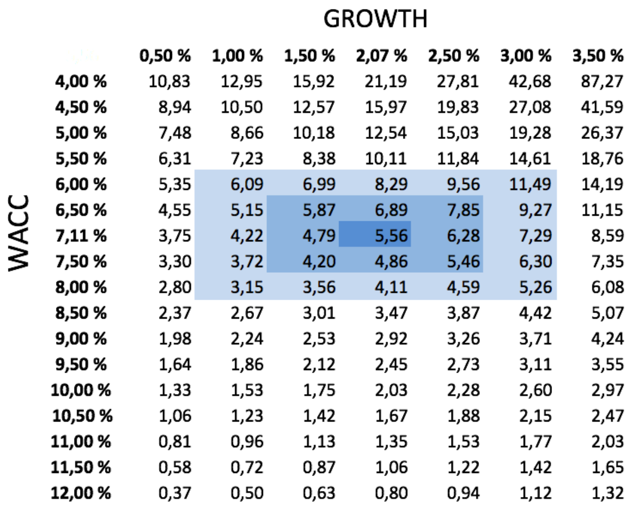
WACC and Growth:

A key assumption in the model is the assumption of a constant D/E ratio. As thoroughly explained previously in the paper, this assumption is made to avoid re-calculating the discount rate continuously. However, the inherent cyclicality in the shipping industry, leads to large fluctuations in what are highly leveraged companies. This assumption must therefore be examined to ensure that the model's sensitivity to leverage is not too high.

As the industry is highly cyclical, we test the share price's sensitivity to the best and worst years in the freight rate sample. The best year for freight rates was in 2008, where the maximum freight rate occurred (Frontline Annual Report 2008). In this year, the debt was $908.147M and the equity totalled $702.214M, giving a D/E ratio of 1.293. This again implies, by implementing the ratio on the forecast from 31.12.2016 a WACC of 6.01%, which from table 8 gives a share price of $8.13. In 2013, the worst year, total debt was $506.008 and equity was $-18.051M. This gives a WACC of 2.86%, giving an unreasonably high share price. This gives a clear indication that the cyclicality of the industry strongly influences the share price estimate. This causes a problem because the cyclical trend is captured in the revenue generation, but not in the short-sampled data for financial statements, We see that both in the best in the worst-case and best-case scenario, the firm is highly leveraged. The firm have now been through a period of low leverage, but are used to be more leveraged. Consequently, the firm may be expected to increase its future leverage and thus experience a higher share price in the future. This shows that the model is highly sensitive to the D/E assumption and this needs further work for the model to work perfectly. Essentially, this may be the key factor in why the share price is deviating for Frontline and the other firms respectively. Given the validity of the revenue simulation thoroughly examined in previous chapters to be credible, it seems as the problem may lie more in the assumptions regarding cost of capital than the model itself. In other words, it appears to be critical which year that is chosen as the base year for the WACC because the cyclicality is not captured in the financial statement projections.

Secondly, we assume in our model that the long-term growth in the terminal value to follow the 5-year forward expected inflation rate. This means that we assume no real growth, which is assumed because the dynamics of the mean-reverting process implies a decreasing trend. However, only the years up to 2021 is relevant, because the model does not simulate the earnings used in the terminal value, but instead a growth rate is assumed. By reducing the growth rate to 1.50%, which is lower than the risk-free rate assumed in the model, the change in share price is only from \$5.58 to \$4.79 – a reduction of only \$0.79 per share. In reality, it would be unreasonable to assume such a low growth rate and thus it appears that the model is not as dependent on the growth rate assumptions. This relationship can be examined through Table 8 by keeping the WACC constant at 7.11% and increasing the growth rate.

Table 8



		GROWTH						
		0,50 %	**1,00 %**	**1,50 %**	**2,07 %**	**2,50 %**	**3,00 %**	**3,50 %**
WACC	**4,00 %**	10,83	12,95	15,92	21,19	27,81	42,68	87,27
	4,50 %	8,94	10,50	12,57	15,97	19,83	27,08	41,59
	5,00 %	7,48	8,66	10,18	12,54	15,03	19,28	26,37
	5,50 %	6,31	7,23	8,38	10,11	11,84	14,61	18,76
	6,00 %	5,35	6,09	6,99	8,29	9,56	11,49	14,19
	6,50 %	4,55	5,15	5,87	6,89	7,85	9,27	11,15
	7,11 %	3,75	4,22	4,79	5,56	6,28	7,29	8,59
	7,50 %	3,30	3,72	4,20	4,86	5,46	6,30	7,35
	8,00 %	2,80	3,15	3,56	4,11	4,59	5,26	6,08
	8,50 %	2,37	2,67	3,01	3,47	3,87	4,42	5,07
	9,00 %	1,98	2,24	2,53	2,92	3,26	3,71	4,24
	9,50 %	1,64	1,86	2,12	2,45	2,73	3,11	3,55
	10,00 %	1,33	1,53	1,75	2,03	2,28	2,60	2,97
	10,50 %	1,06	1,23	1,42	1,67	1,88	2,15	2,47
	11,00 %	0,81	0,96	1,13	1,35	1,53	1,77	2,03
	11,50 %	0,58	0,72	0,87	1,06	1,22	1,42	1,65
	12,00 %	0,37	0,50	0,63	0,80	0,94	1,12	1,32

8. Reccomendations for Future Research

After the assessment of the model's limitations in chapter six, this final chapter begins with a selection of our personal recommendations for further improvement of the model. Subsequently, a closing section will wrap up the key aspects and findings in a final conclusion.

8.1 Recommendations for further study

Even a comprehensive study like this thesis, is still unable to incorporate all the aspects that may better capture the dynamics of the shipping industry. Hence, we will devote this section to that particular aspect. Not only will it serve as a guideline for other researchers and graduate students to enhance the model, but also to underline its inherent weaknesses.

In the revenue simulation, a strong assumption made in the model is that there is no re-entering into agreements for T/C contracts once they expire. As a result, the revenue stream is to a greater extent exposed to spot freight rates, leaving the company less able to hedge against future freight rate exposure. One such contract is a purchase option (Giovanni & Jørgensen, 2008), called a time charter purchase option (T/C-POPs). Embedded in T/C contracts are often the option to either buy the ship or an extendable lease. From the same paper by Giovanni and Jørgensen, an American- or Bermudan style real option is applied. Consequently, the model may be better able to capture the dynamics of these TC contracts if such an option structure can be modelled. This will, if successful, make the model more realistic by being able to keep part of the revenues fixed also in the future.

As the model is almost entirely based on the output of the revenue simulation, the costs are implied through generated revenue. It is, however, reasonable to assume a non-constant relationship between cost and revenue. More specifically, costs are usually divided into fixed, variable and overhead costs (Gkonis & Psaraftis, Page 3). The variable costs are by definition dependent on the companies' production output and should thus be expected to vary with respect to revenues. Examples of variable costs of container shipping are cargo-related costs and navigation expenses. Fixed costs include crew expenses, vessel expenses, depreciations and amortizations.

It is not reasonable to assume that fixed costs like wages pensions, insurance and infrastructure maintenance vary as a percentage of production and revenue, but variable costs like fuel, canal fees and docking fees do. In this respect, further researches that are able to both divide the costs appropriately can make the cost structure less fluctuating and more realistic. This is important, because even though the model may predict a strong decrease in revenues, this will not necessarily imply a radical reduction in the cost structure and vice versa for revenue increases.

According to the paper by Adland & Koekebakker (2007), "the three most important factors affecting the value of a ship are freight rate, age and size". So far, the model only incorporates freight rates. Conversely, vessel age is completely neglected as it too comprehensive to include in this paper. All vessels are categorized as equally large if their size falls within the interval corresponding to the index used to forecast future freight rates. For ships ranging between 80,000 and 159,999 deadweight tonnage, they are all subject to the LR2 category and thus the model does not take into account whether all vessels are slightly larger than 80,000 or close to 160,000. Intuitively, a vessel able to carry more freight should earn more and thus its freight rate should be higher. As a result, an extension of the model where these differences can be incorporated will increase the validity of the model.

9. Conclusion

In this chapter, we will present the conclusion and key takeaways from the process of solving our research issue. The thesis aimed to develop a new valuation approach using heavily technical econometric modeling. This is implemented successfully on several relevant companies. The model generates future revenue for companies by summing up individual vessels' revenue stream distributed in terms of vessels operating in the spot market or tied to T/C contracts. This revenue is projected by a crude Monte Carlo simulation, based on a mean-reverting Ornstein-Uhlenbeck process for the freight rates. The results of the mean-reverting process of all the freight rates give a decreasing trend and respectively lower freight rate levels than the prevalent. These results are purely technical in nature and consider only historical analyzes. These findings give lower future revenue prospects for the crude tanker industry as a whole. As a direct consequence, our valuation estimates are bound to be lower than the market price, because investors truly have more a positive outlook for the future.

We obtained share price estimates, by applying the self-made stochastic DCF model to several crude tanker companies. In general, the results gave fairly good estimates when a constant capital structure made sense with respect to the data in the projection period. The model expectorated share prices of \$5.56, \$0.39, \$-1.03 and \$2.48 for Frontline, DHT, NAT and Teekay respectively. Frontline, DHT and Teekay all gave fairly reasonable estimates compared to market prices and P/E ratios. Through the valuation estimate of NAT, we conclude that the model require a certain mechanism enables the D/E ratio to remain approximately stable. NAT give a negative cash flow the first year, but do not have sufficient capital available, which is what causes problems with the model. We argue that the model works well, but deviates in certain circumstances. When the deviation occurs, it appears very obvious. Therefore, we conclude that the model built is a long and good step towards a new valuation framework for crude tanker companies.

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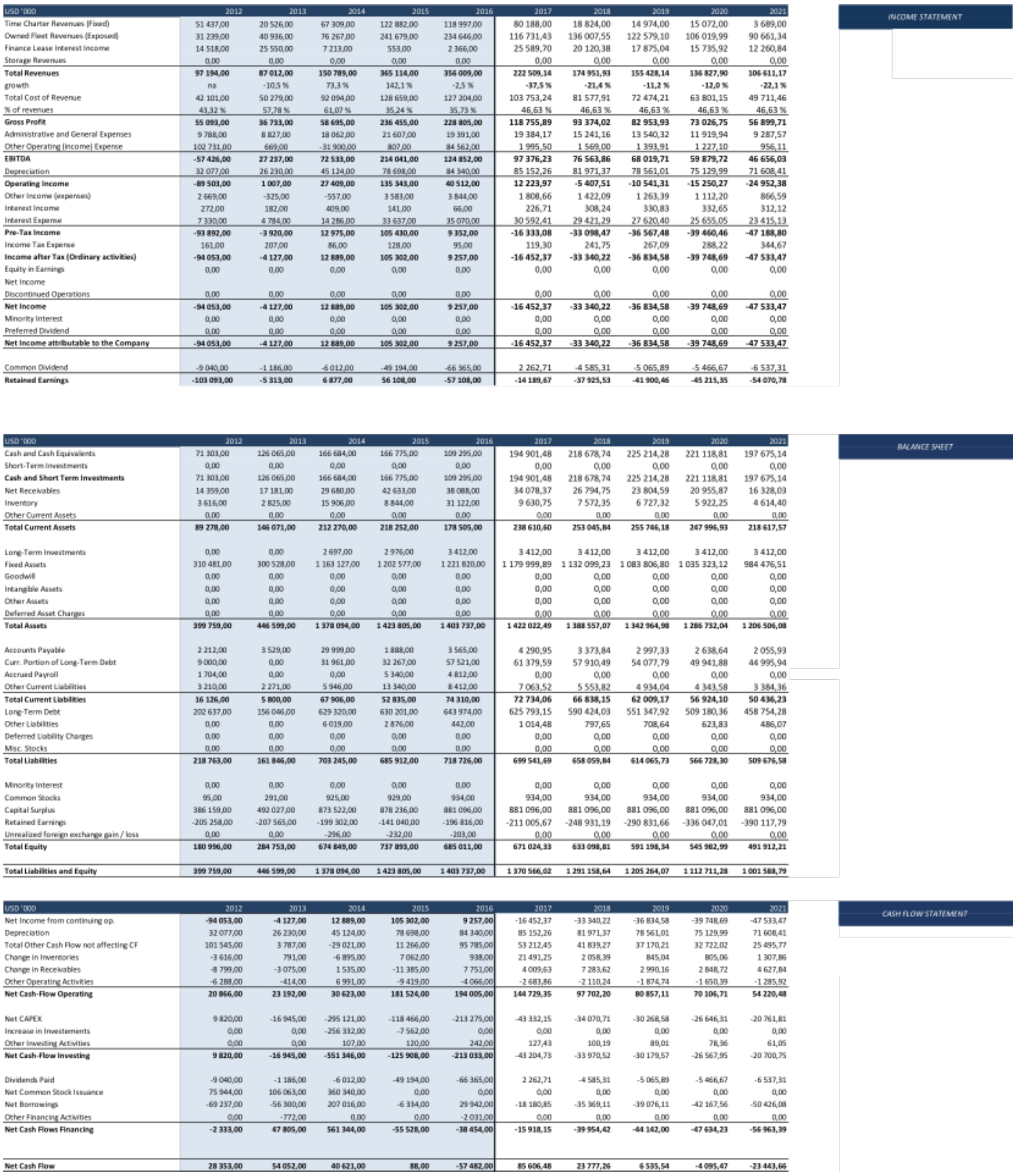
A. Appendix: Figures

A.1 DHT



INCOME STATEMENT

USD '000	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Time Charter Revenues (Fixed)	51 437,00	20 526,00	67 309,00	122 882,00	118 997,00	80 188,00	18 824,00	14 974,00	15 072,00	3 689,00
Owned Fleet Revenues (Exposed)	31 239,00	40 936,00	76 267,00	241 679,00	234 646,00	116 731,43	136 007,55	122 579,10	106 019,99	90 661,34
Finance Lease Interest Income	14 518,00	25 550,00	7 213,00	553,00	2 366,00	25 589,70	20 120,38	17 875,04	15 735,92	12 260,84
Storage Revenues	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Total Revenues	**97 194,00**	**87 012,00**	**150 789,00**	**365 114,00**	**356 009,00**	**222 509,14**	**174 951,93**	**155 428,14**	**136 827,90**	**106 611,17**
growth	na	-10,5 %	73,3 %	142,1 %	-2,5 %	**-37,5 %**	**-21,4 %**	**-11,2 %**	**-12,0 %**	**-22,1 %**
Total Cost of Revenue	42 101,00	50 279,00	92 094,00	128 659,00	127 204,00	103 753,24	81 577,91	72 474,21	63 801,15	49 711,46
% of revenues	43,32 %	57,78 %	61,07 %	35,24 %	35,73 %	46,63 %	46,63 %	46,63 %	46,63 %	46,63 %
Gross Profit	**55 093,00**	**36 733,00**	**58 695,00**	**236 455,00**	**228 805,00**	**118 755,89**	**93 374,02**	**82 953,93**	**73 026,75**	**56 899,71**
Administrative and General Expenses	9 788,00	8 827,00	18 062,00	21 607,00	19 391,00	19 384,17	15 241,16	13 540,32	11 919,94	9 287,57
Other Operating (Income) Expense	102 731,00	669,00	-31 900,00	807,00	84 562,00	1 995,50	1 569,00	1 393,91	1 227,10	956,11
EBITDA	**-57 426,00**	**27 237,00**	**72 533,00**	**214 041,00**	**124 852,00**	**97 376,23**	**76 563,86**	**68 019,71**	**59 879,72**	**46 656,03**
Depreciation	32 077,00	26 230,00	45 124,00	78 698,00	84 340,00	85 152,26	81 971,37	78 561,01	75 129,99	71 608,41
Operating Income	**-89 503,00**	**1 007,00**	**27 409,00**	**135 343,00**	**40 512,00**	**12 223,97**	**-5 407,51**	**-10 541,31**	**-15 250,27**	**-24 952,38**
Other Income (expenses)	2 669,00	-325,00	-557,00	3 583,00	3 844,00	1 808,66	1 422,09	1 263,39	1 112,20	866,59
Interest Income	272,00	182,00	409,00	141,00	66,00	226,71	308,24	330,83	332,65	312,12
Interest Expense	7 330,00	4 784,00	14 286,00	33 637,00	35 070,00	30 592,41	29 421,29	27 620,40	25 655,05	23 415,13
Pre-Tax Income	**-93 892,00**	**-3 920,00**	**12 975,00**	**105 430,00**	**9 352,00**	**-16 333,08**	**-33 098,47**	**-36 567,48**	**-39 460,46**	**-47 188,80**
Income Tax Expense	161,00	207,00	86,00	128,00	95,00	119,30	241,75	267,09	288,22	344,67
Income after Tax (Ordinary activities)	**-94 053,00**	**-4 127,00**	**12 889,00**	**105 302,00**	**9 257,00**	**-16 452,37**	**-33 340,22**	**-36 834,58**	**-39 748,69**	**-47 533,47**
Equity in Earnings	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Net Income										
Discontinued Operations	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Net Income	**-94 053,00**	**-4 127,00**	**12 889,00**	**105 302,00**	**9 257,00**	**-16 452,37**	**-33 340,22**	**-36 834,58**	**-39 748,69**	**-47 533,47**
Minority Interest	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Preferred Dividend	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Net Income attributable to the Company	**-94 053,00**	**-4 127,00**	**12 889,00**	**105 302,00**	**9 257,00**	**-16 452,37**	**-33 340,22**	**-36 834,58**	**-39 748,69**	**-47 533,47**
Common Dividend	-9 040,00	-1 186,00	-6 012,00	-49 194,00	-66 365,00	2 262,71	-4 585,31	-5 065,89	-5 466,67	-6 537,31
Retained Earnings	**-103 093,00**	**-5 313,00**	**6 877,00**	**56 108,00**	**-57 108,00**	**-14 189,67**	**-37 925,53**	**-41 900,46**	**-45 215,35**	**-54 070,78**

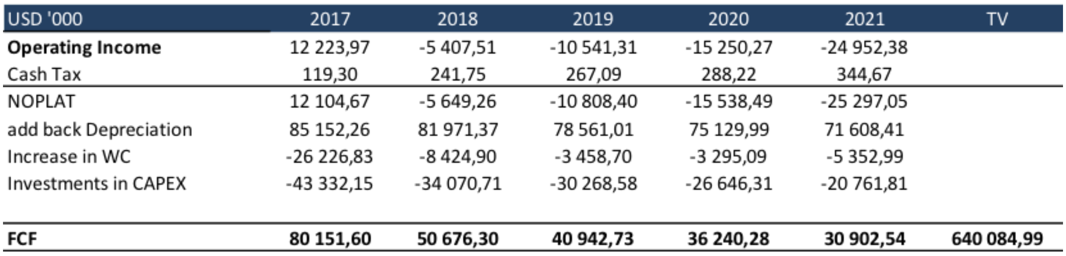
BALANCE SHEET

USD '000	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Cash and Cash Equivalents	71 303,00	126 065,00	166 684,00	166 775,00	109 295,00	194 901,48	218 678,74	225 214,28	221 118,81	197 675,14
Short-Term Investments	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Cash and Short Term Investments	71 303,00	126 065,00	166 684,00	166 775,00	109 295,00	194 901,48	218 678,74	225 214,28	221 118,81	197 675,14
Net Receivables	14 359,00	17 181,00	29 680,00	42 633,00	38 088,00	34 078,37	26 794,75	23 804,59	20 955,87	16 328,03
Inventory	3 616,00	2 825,00	15 906,00	8 844,00	31 122,00	9 630,75	7 572,35	6 727,32	5 922,25	4 614,40
Other Current Assets	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Total Current Assets	**89 278,00**	**146 071,00**	**212 270,00**	**218 252,00**	**178 505,00**	**238 610,60**	**253 045,84**	**255 746,18**	**247 996,93**	**218 617,57**
Long-Term Investments	0,00	0,00	2 697,00	2 976,00	3 412,00	3 412,00	3 412,00	3 412,00	3 412,00	3 412,00
Fixed Assets	310 481,00	300 528,00	1 163 127,00	1 202 577,00	1 221 820,00	1 179 999,89	1 132 099,23	1 083 806,80	1 035 323,12	984 476,51
Goodwill	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Intangible Assets	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Other Assets	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Deferred Asset Charges	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Total Assets	**399 759,00**	**446 599,00**	**1 378 094,00**	**1 423 805,00**	**1 403 737,00**	**1 422 022,49**	**1 388 557,07**	**1 342 964,98**	**1 286 732,04**	**1 206 506,08**
Accounts Payable	2 212,00	3 529,00	29 999,00	1 888,00	3 565,00	4 290,95	3 373,84	2 997,33	2 638,64	2 055,93
Curr. Portion of Long-Term Debt	9 000,00	0,00	31 961,00	32 267,00	57 521,00	61 379,59	57 910,49	54 077,79	49 941,88	44 995,94
Accrued Payroll	1 704,00	0,00	0,00	5 340,00	4 812,00	0,00	0,00	0,00	0,00	0,00
Other Current Liabilities	3 210,00	2 271,00	5 946,00	13 340,00	8 412,00	7 063,52	5 553,82	4 934,04	4 343,58	3 384,36
Total Current Liabilities	**16 126,00**	**5 800,00**	**67 906,00**	**52 835,00**	**74 310,00**	**72 734,06**	**66 838,15**	**62 009,17**	**56 924,10**	**50 436,23**
Long-Term Debt	202 637,00	156 046,00	629 320,00	630 201,00	643 974,00	625 793,15	590 424,03	551 347,92	509 180,36	458 754,28
Other Liabilities	0,00	0,00	6 019,00	2 876,00	442,00	1 014,48	797,65	708,64	623,83	486,07
Deferred Liability Charges	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Misc. Stocks	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Total Liabilities	**218 763,00**	**161 846,00**	**703 245,00**	**685 912,00**	**718 726,00**	**699 541,69**	**658 059,84**	**614 065,73**	**566 728,30**	**509 676,58**
Minority Interest	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Common Stocks	95,00	291,00	925,00	929,00	934,00	934,00	934,00	934,00	934,00	934,00
Capital Surplus	386 159,00	492 027,00	873 522,00	878 236,00	881 096,00	881 096,00	881 096,00	881 096,00	881 096,00	881 096,00
Retained Earnings	-205 258,00	-207 565,00	-199 302,00	-141 040,00	-196 816,00	-211 005,67	-248 931,19	-290 831,66	-336 047,01	-390 117,79
Unrealized foreign exchange gain / loss	0,00	0,00	-296,00	-232,00	-203,00	0,00	0,00	0,00	0,00	0,00
Total Equity	**180 996,00**	**284 753,00**	**674 849,00**	**737 893,00**	**685 011,00**	**671 024,33**	**633 098,81**	**591 198,34**	**545 982,99**	**491 912,21**
Total Liabilities and Equity	**399 759,00**	**446 599,00**	**1 378 094,00**	**1 423 805,00**	**1 403 737,00**	**1 370 566,02**	**1 291 158,64**	**1 205 264,07**	**1 112 711,28**	**1 001 588,79**

CASH FLOW STATEMENT

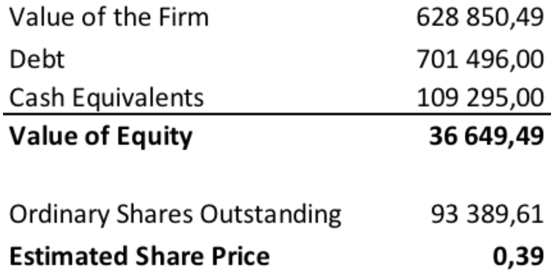
USD '000	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Net Income from continuing op.	**-94 053,00**	**-4 127,00**	**12 889,00**	**105 302,00**	**9 257,00**	-16 452,37	-33 340,22	-36 834,58	-39 748,69	-47 533,47
Depreciation	32 077,00	26 230,00	45 124,00	78 698,00	84 340,00	85 152,26	81 971,37	78 561,01	75 129,99	71 608,41
Total Other Cash Flow not affecting CF	101 545,00	3 787,00	-29 021,00	11 266,00	95 785,00	53 212,45	41 839,27	37 170,21	32 722,02	25 495,77
Change in Inventories	-3 616,00	791,00	-6 895,00	7 062,00	938,00	21 491,25	2 058,39	845,04	805,06	1 307,86
Change in Receivables	-8 799,00	-3 075,00	1 535,00	-11 385,00	7 751,00	4 009,63	7 283,62	2 990,16	2 848,72	4 627,84
Other Operating Activities	-6 288,00	-414,00	6 991,00	-9 419,00	-4 066,00	-2 683,86	-2 110,24	-1 874,74	-1 650,39	-1 285,92
Net Cash-Flow Operating	**20 866,00**	**23 192,00**	**30 623,00**	**181 524,00**	**194 005,00**	**144 729,35**	**97 702,20**	**80 857,11**	**70 106,71**	**54 220,48**
Net CAPEX	9 820,00	-16 945,00	-295 121,00	-118 466,00	-213 275,00	-43 332,15	-34 070,71	-30 268,58	-26 646,31	-20 761,81
Increase in Investements	0,00	0,00	-256 332,00	-7 562,00	0,00	0,00	0,00	0,00	0,00	0,00
Other Investing Activities	0,00	0,00	107,00	120,00	242,00	127,43	100,19	89,01	78,36	61,05
Net Cash-Flow Investing	**9 820,00**	**-16 945,00**	**-551 346,00**	**-125 908,00**	**-213 033,00**	-43 204,73	-33 970,52	-30 179,57	-26 567,95	-20 700,75
Dividends Paid	-9 040,00	-1 186,00	-6 012,00	-49 194,00	-66 365,00	2 262,71	-4 585,31	-5 065,89	-5 466,67	-6 537,31
Net Common Stock Issuance	75 944,00	106 063,00	360 340,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Net Borrowings	-69 237,00	-56 300,00	207 016,00	-6 334,00	29 942,00	-18 180,85	-35 369,11	-39 076,11	-42 167,56	-50 426,08
Other Financing Activities	0,00	-772,00	0,00	0,00	-2 031,00	0,00	0,00	0,00	0,00	0,00
Net Cash Flows Financing	**-2 333,00**	**47 805,00**	**561 344,00**	**-55 528,00**	**-38 454,00**	**-15 918,15**	**-39 954,42**	**-44 142,00**	**-47 634,23**	**-56 963,39**
Net Cash Flow	**28 353,00**	**54 052,00**	**40 621,00**	**88,00**	**-57 482,00**	**85 606,48**	**23 777,26**	**6 535,54**	**-4 095,47**	**-23 443,66**

Figure A.1: Financial Statements



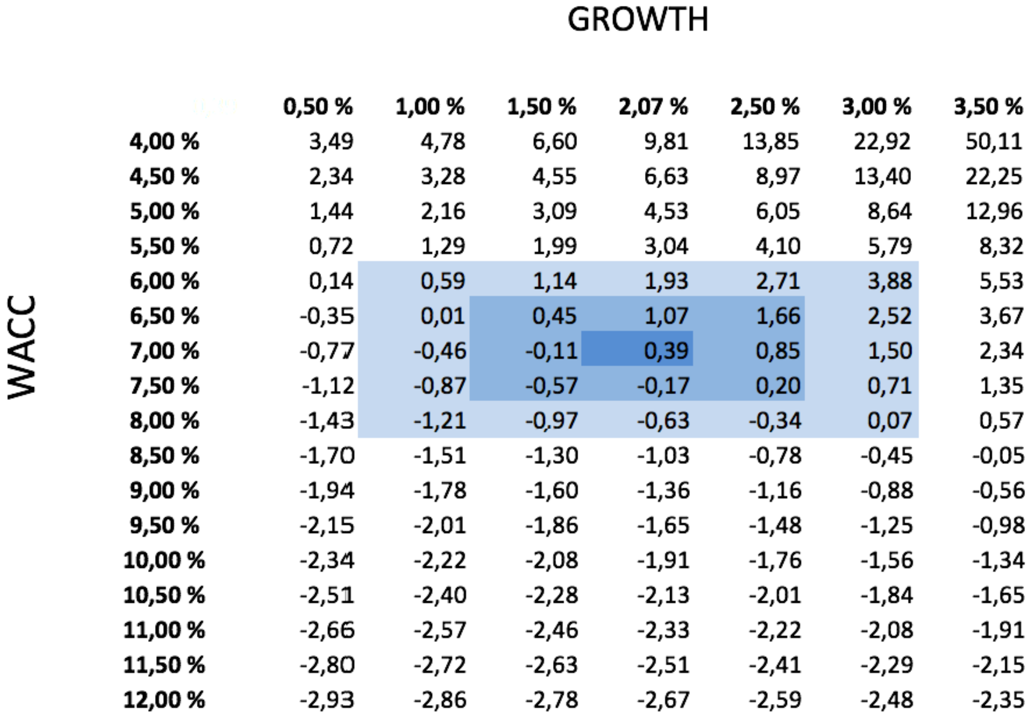
USD '000	2017	2018	2019	2020	2021	TV
Operating Income	12 223,97	-5 407,51	-10 541,31	-15 250,27	-24 952,38	
Cash Tax	119,30	241,75	267,09	288,22	344,67	
NOPLAT	12 104,67	-5 649,26	-10 808,40	-15 538,49	-25 297,05	
add back Depreciation	85 152,26	81 971,37	78 561,01	75 129,99	71 608,41	
Increase in WC	-26 226,83	-8 424,90	-3 458,70	-3 295,09	-5 352,99	
Investments in CAPEX	-43 332,15	-34 070,71	-30 268,58	-26 646,31	-20 761,81	
FCF	**80 151,60**	**50 676,30**	**40 942,73**	**36 240,28**	**30 902,54**	**640 084,99**

Figure A.2: FCF



Value of the Firm	628 850,49
Debt	701 496,00
Cash Equivalents	109 295,00
Value of Equity	**36 649,49**
Ordinary Shares Outstanding	93 389,61
Estimated Share Price	**0,39**

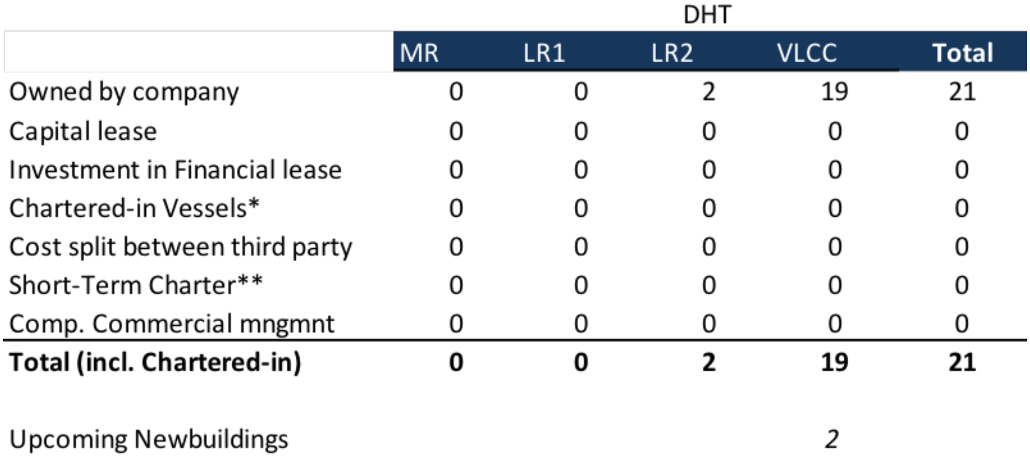
Figure A.3: Share Price



GROWTH

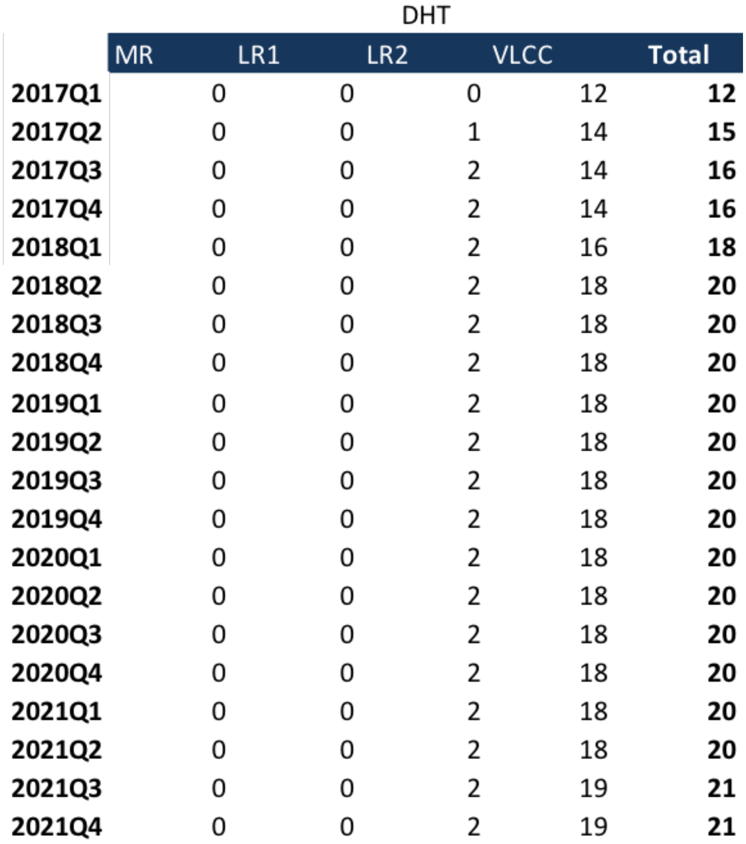
WACC	**0,50 %**	**1,00 %**	**1,50 %**	**2,07 %**	**2,50 %**	**3,00 %**	**3,50 %**
4,00 %	3,49	4,78	6,60	9,81	13,85	22,92	50,11
4,50 %	2,34	3,28	4,55	6,63	8,97	13,40	22,25
5,00 %	1,44	2,16	3,09	4,53	6,05	8,64	12,96
5,50 %	0,72	1,29	1,99	3,04	4,10	5,79	8,32
6,00 %	0,14	0,59	1,14	1,93	2,71	3,88	5,53
6,50 %	-0,35	0,01	0,45	1,07	1,66	2,52	3,67
7,00 %	-0,77	-0,46	-0,11	0,39	0,85	1,50	2,34
7,50 %	-1,12	-0,87	-0,57	-0,17	0,20	0,71	1,35
8,00 %	-1,43	-1,21	-0,97	-0,63	-0,34	0,07	0,57
8,50 %	-1,70	-1,51	-1,30	-1,03	-0,78	-0,45	-0,05
9,00 %	-1,94	-1,78	-1,60	-1,36	-1,16	-0,88	-0,56
9,50 %	-2,15	-2,01	-1,86	-1,65	-1,48	-1,25	-0,98
10,00 %	-2,34	-2,22	-2,08	-1,91	-1,76	-1,56	-1,34
10,50 %	-2,51	-2,40	-2,28	-2,13	-2,01	-1,84	-1,65
11,00 %	-2,66	-2,57	-2,46	-2,33	-2,22	-2,08	-1,91
11,50 %	-2,80	-2,72	-2,63	-2,51	-2,41	-2,29	-2,15
12,00 %	-2,93	-2,86	-2,78	-2,67	-2,59	-2,48	-2,35

Figure A.4: Sensitivity



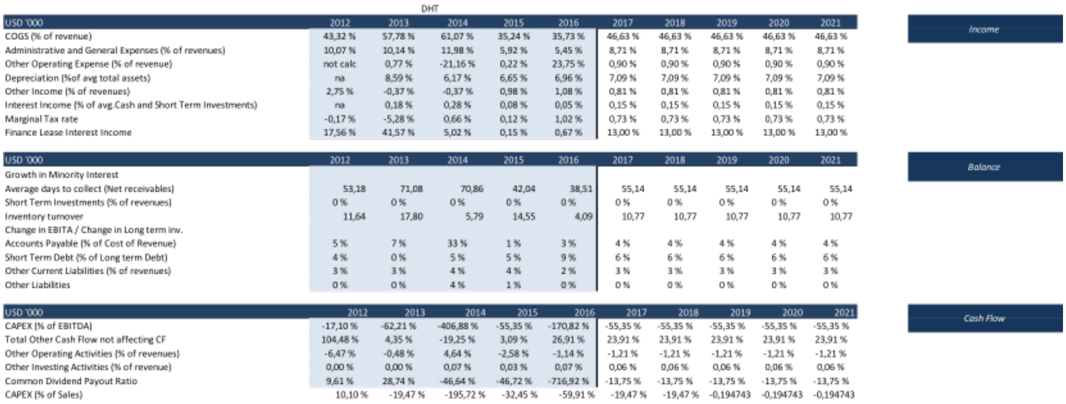
	DHT				
	MR	LR1	LR2	VLCC	**Total**
Owned by company	0	0	2	19	21
Capital lease	0	0	0	0	0
Investment in Financial lease	0	0	0	0	0
Chartered-in Vessels*	0	0	0	0	0
Cost split between third party	0	0	0	0	0
Short-Term Charter**	0	0	0	0	0
Comp. Commercial mngmnt	0	0	0	0	0
Total (incl. Chartered-in)	**0**	**0**	**2**	**19**	**21**
Upcoming Newbuildings				*2*	

Figure A.5: Fleet List



	DHT				
	MR	LR1	LR2	VLCC	**Total**
2017Q1	0	0	0	12	**12**
2017Q2	0	0	1	14	**15**
2017Q3	0	0	2	14	**16**
2017Q4	0	0	2	14	**16**
2018Q1	0	0	2	16	**18**
2018Q2	0	0	2	18	**20**
2018Q3	0	0	2	18	**20**
2018Q4	0	0	2	18	**20**
2019Q1	0	0	2	18	**20**
2019Q2	0	0	2	18	**20**
2019Q3	0	0	2	18	**20**
2019Q4	0	0	2	18	**20**
2020Q1	0	0	2	18	**20**
2020Q2	0	0	2	18	**20**
2020Q3	0	0	2	18	**20**
2020Q4	0	0	2	18	**20**
2021Q1	0	0	2	18	**20**
2021Q2	0	0	2	18	**20**
2021Q3	0	0	2	19	**21**
2021Q4	0	0	2	19	**21**

Figure A.6: Fleet Composition



DHT

USD '000	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
COGS (% of revenue)	43,32 %	57,78 %	61,07 %	35,24 %	35,73 %	46,63 %	46,63 %	46,63 %	46,63 %	46,63 %
Administrative and General Expenses (% of revenues)	10,07 %	10,14 %	11,98 %	5,92 %	5,45 %	8,71 %	8,71 %	8,71 %	8,71 %	8,71 %
Other Operating Expense (% of revenue)	not calc	0,77 %	-21,16 %	0,22 %	23,75 %	0,90 %	0,90 %	0,90 %	0,90 %	0,90 %
Depreciation (%of avg total assets)	na	8,59 %	6,17 %	6,65 %	6,96 %	7,09 %	7,09 %	7,09 %	7,09 %	7,09 %
Other Income (% of revenues)	2,75 %	-0,37 %	-0,37 %	0,98 %	1,08 %	0,81 %	0,81 %	0,81 %	0,81 %	0,81 %
Interest Income (% of avg.Cash and Short Term Investments)	na	0,18 %	0,28 %	0,08 %	0,05 %	0,15 %	0,15 %	0,15 %	0,15 %	0,15 %
Marginal Tax rate	-0,17 %	-5,28 %	0,66 %	0,12 %	1,02 %	0,73 %	0,73 %	0,73 %	0,73 %	0,73 %
Finance Lease Interest Income	17,56 %	41,57 %	5,02 %	0,15 %	0,67 %	13,00 %	13,00 %	13,00 %	13,00 %	13,00 %

Income

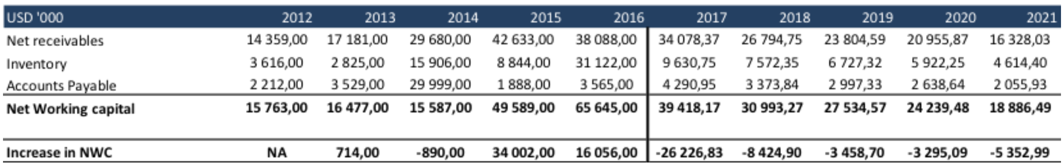
USD '000	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Growth in Minority Interest										
Average days to collect (Net receivables)	53,18	71,08	70,86	42,04	38,51	55,14	55,14	55,14	55,14	55,14
Short Term Investments (% of revenues)	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %
Inventory turnover	11,64	17,80	5,79	14,55	4,09	10,77	10,77	10,77	10,77	10,77
Change in EBITA / Change in Long term inv.										
Accounts Payable (% of Cost of Revenue)	5 %	7 %	33 %	1 %	3 %	4 %	4 %	4 %	4 %	4 %
Short Term Debt (% of Long term Debt)	4 %	0 %	5 %	5 %	9 %	6 %	6 %	6 %	6 %	6 %
Other Current Liabilities (% of revenues)	3 %	3 %	4 %	4 %	2 %	3 %	3 %	3 %	3 %	3 %
Other Liabilities	0 %	0 %	4 %	1 %	0 %	0 %	0 %	0 %	0 %	0 %

Balance

USD '000	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
CAPEX (% of EBITDA)	-17,10 %	-62,21 %	-406,88 %	-55,35 %	-170,82 %	-55,35 %	-55,35 %	-55,35 %	-55,35 %	-55,35 %
Total Other Cash Flow not affecting CF	104,48 %	4,35 %	-19,25 %	3,09 %	26,91 %	23,91 %	23,91 %	23,91 %	23,91 %	23,91 %
Other Operating Activities (% of revenues)	-6,47 %	-0,48 %	4,64 %	-2,58 %	-1,14 %	-1,21 %	-1,21 %	-1,21 %	-1,21 %	-1,21 %
Other Investing Activities (% of revenue)	0,00 %	0,00 %	0,07 %	0,03 %	0,07 %	0,06 %	0,06 %	0,06 %	0,06 %	0,06 %
Common Dividend Payout Ratio	9,61 %	28,74 %	-46,64 %	-46,72 %	-716,92 %	-13,75 %	-13,75 %	-13,75 %	-13,75 %	-13,75 %
CAPEX (% of Sales)	10,10 %	-19,47 %	-195,72 %	-32,45 %	-59,91 %	-19,47 %	-19,47 %	-0,194743	-0,194743	-0,194743

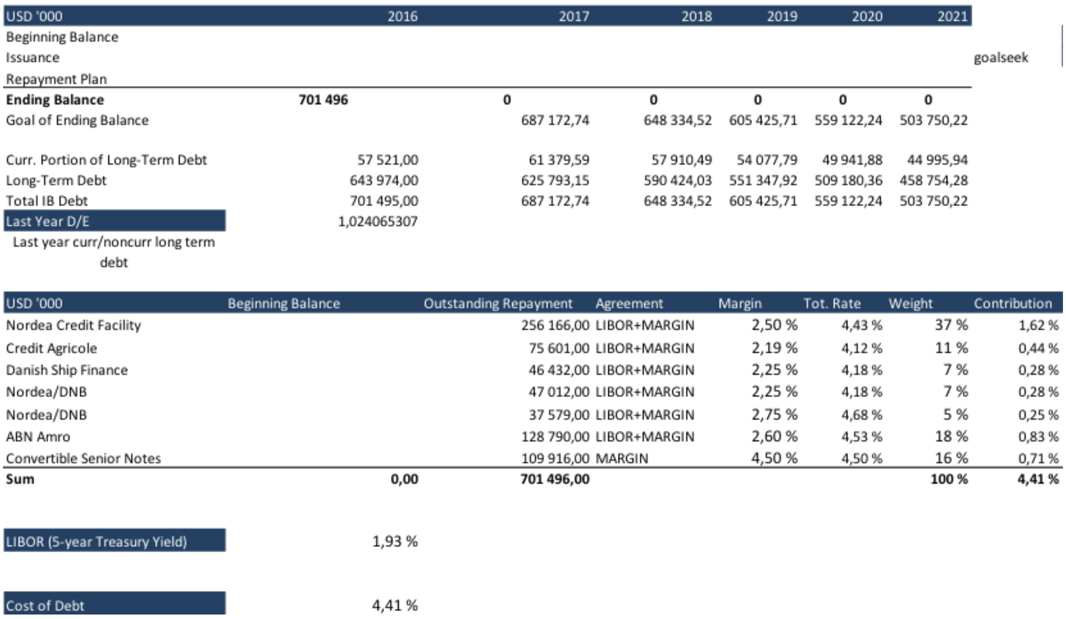
Cash Flow

Figure A.7: Drivers



USD '000	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Net receivables	14 359,00	17 181,00	29 680,00	42 633,00	38 088,00	34 078,37	26 794,75	23 804,59	20 955,87	16 328,03
Inventory	3 616,00	2 825,00	15 906,00	8 844,00	31 122,00	9 630,75	7 572,35	6 727,32	5 922,25	4 614,40
Accounts Payable	2 212,00	3 529,00	29 999,00	1 888,00	3 565,00	4 290,95	3 373,84	2 997,33	2 638,64	2 055,93
Net Working capital	**15 763,00**	**16 477,00**	**15 587,00**	**49 589,00**	**65 645,00**	**39 418,17**	**30 993,27**	**27 534,57**	**24 239,48**	**18 886,49**
Increase in NWC	**NA**	**714,00**	**-890,00**	**34 002,00**	**16 056,00**	**-26 226,83**	**-8 424,90**	**-3 458,70**	**-3 295,09**	**-5 352,99**

Figure A.8: Net Working Capital

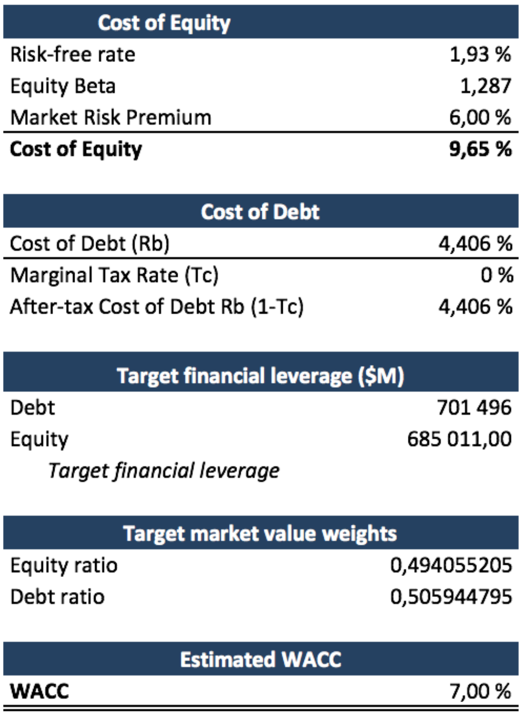


USD '000	2016	2017	2018	2019	2020	2021	
Beginning Balance							
Issuance							goalseek
Repayment Plan							
Ending Balance	**701 496**	**0**	**0**	**0**	**0**	**0**	
Goal of Ending Balance		687 172,74	648 334,52	605 425,71	559 122,24	503 750,22	
Curr. Portion of Long-Term Debt	57 521,00	61 379,59	57 910,49	54 077,79	49 941,88	44 995,94	
Long-Term Debt	643 974,00	625 793,15	590 424,03	551 347,92	509 180,36	458 754,28	
Total IB Debt	701 495,00	687 172,74	648 334,52	605 425,71	559 122,24	503 750,22	
Last Year D/E	1,024065307						
Last year curr/noncurr long term debt							

USD '000	Beginning Balance	Outstanding Repayment	Agreement	Margin	Tot. Rate	Weight	Contribution
Nordea Credit Facility		256 166,00	LIBOR+MARGIN	2,50 %	4,43 %	37 %	1,62 %
Credit Agricole		75 601,00	LIBOR+MARGIN	2,19 %	4,12 %	11 %	0,44 %
Danish Ship Finance		46 432,00	LIBOR+MARGIN	2,25 %	4,18 %	7 %	0,28 %
Nordea/DNB		47 012,00	LIBOR+MARGIN	2,25 %	4,18 %	7 %	0,28 %
Nordea/DNB		37 579,00	LIBOR+MARGIN	2,75 %	4,68 %	5 %	0,25 %
ABN Amro		128 790,00	LIBOR+MARGIN	2,60 %	4,53 %	18 %	0,83 %
Convertible Senior Notes		109 916,00	MARGIN	4,50 %	4,50 %	16 %	0,71 %
Sum	**0,00**	**701 496,00**				**100 %**	**4,41 %**

LIBOR (5-year Treasury Yield)	1,93 %
Cost of Debt	4,41 %

Figure A.9: Cost of Debt



Cost of Equity	
Risk-free rate	1,93 %
Equity Beta	1,287
Market Risk Premium	6,00 %
Cost of Equity	**9,65 %**

Cost of Debt	
Cost of Debt (Rb)	4,406 %
Marginal Tax Rate (Tc)	0 %
After-tax Cost of Debt Rb (1-Tc)	4,406 %

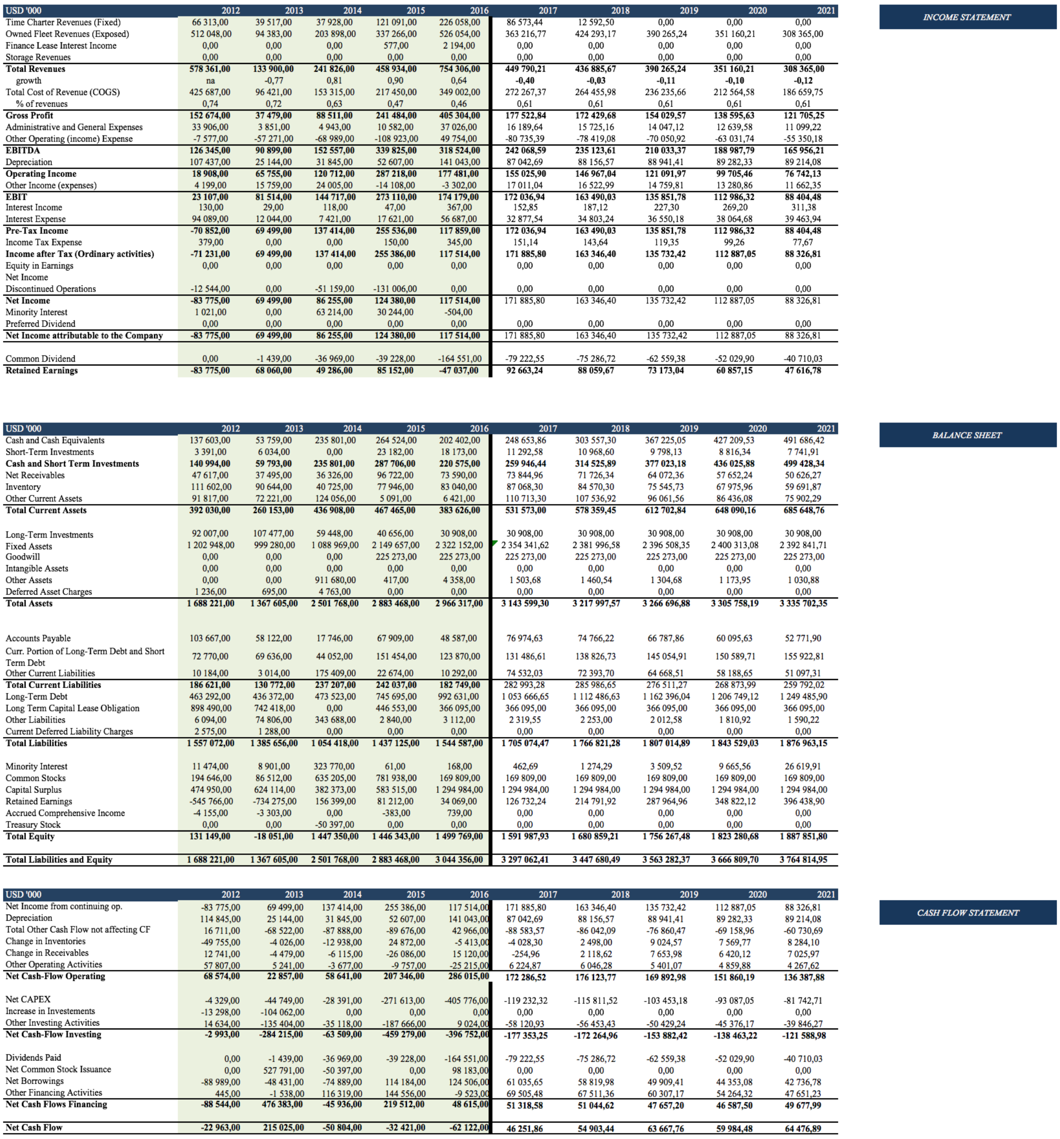
Target financial leverage ($M)	
Debt	701 496
Equity	685 011,00
Target financial leverage	

Target market value weights	
Equity ratio	0,494055205
Debt ratio	0,505944795

Estimated WACC	
WACC	7,00 %

Figure A.10: Key Metrics

A.2 Frontline



INCOME STATEMENT

USD '000	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Time Charter Revenues (Fixed)	66 313,00	39 517,00	37 928,00	121 091,00	226 058,00	86 573,44	12 592,50	0,00	0,00	0,00
Owned Fleet Revenues (Exposed)	512 048,00	94 383,00	203 898,00	337 266,00	526 054,00	363 216,77	424 293,17	390 265,24	351 160,21	308 365,00
Finance Lease Interest Income	0,00	0,00	0,00	577,00	2 194,00	0,00	0,00	0,00	0,00	0,00
Storage Revenues	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Total Revenues	**578 361,00**	**133 900,00**	**241 826,00**	**458 934,00**	**754 306,00**	**449 790,21**	**436 885,67**	**390 265,24**	**351 160,21**	**308 365,00**
growth	na	-0,77	0,81	0,90	0,64	**-0,40**	**-0,03**	**-0,11**	**-0,10**	**-0,12**
Total Cost of Revenue (COGS)	425 687,00	96 421,00	153 315,00	217 450,00	349 002,00	272 267,37	264 455,98	236 235,66	212 564,58	186 659,75
% of revenues	0,74	0,72	0,63	0,47	0,46	0,61	0,61	0,61	0,61	0,61
Gross Profit	**152 674,00**	**37 479,00**	**88 511,00**	**241 484,00**	**405 304,00**	**177 522,84**	**172 429,68**	**154 029,57**	**138 595,63**	**121 705,25**
Administrative and General Expenses	33 906,00	3 851,00	4 943,00	10 582,00	37 026,00	16 189,64	15 725,16	14 047,12	12 639,58	11 099,22
Other Operating (income) Expense	-7 577,00	-57 271,00	-68 989,00	-108 923,00	49 754,00	-80 735,39	-78 419,08	-70 050,92	-63 031,74	-55 350,18
EBITDA	**126 345,00**	**90 899,00**	**152 557,00**	**339 825,00**	**318 524,00**	**242 068,59**	**235 123,61**	**210 033,37**	**188 987,79**	**165 956,21**
Depreciation	107 437,00	25 144,00	31 845,00	52 607,00	141 043,00	87 042,69	88 156,57	88 941,41	89 282,33	89 214,08
Operating Income	**18 908,00**	**65 755,00**	**120 712,00**	**287 218,00**	**177 481,00**	**155 025,90**	**146 967,04**	**121 091,97**	**99 705,46**	**76 742,13**
Other Income (expenses)	4 199,00	15 759,00	24 005,00	-14 108,00	-3 302,00	17 011,04	16 522,99	14 759,81	13 280,86	11 662,35
EBIT	**23 107,00**	**81 514,00**	**144 717,00**	**273 110,00**	**174 179,00**	**172 036,94**	**163 490,03**	**135 851,78**	**112 986,32**	**88 404,48**
Interest Income	130,00	29,00	118,00	47,00	367,00	152,85	187,12	227,30	269,20	311,38
Interest Expense	94 089,00	12 044,00	7 421,00	17 621,00	56 687,00	32 877,54	34 803,24	36 550,18	38 064,68	39 463,94
Pre-Tax Income	**-70 852,00**	**69 499,00**	**137 414,00**	**255 536,00**	**117 859,00**	**172 036,94**	**163 490,03**	**135 851,78**	**112 986,32**	**88 404,48**
Income Tax Expense	379,00	0,00	0,00	150,00	345,00	151,14	143,64	119,35	99,26	77,67
Income after Tax (Ordinary activities)	**-71 231,00**	**69 499,00**	**137 414,00**	**255 386,00**	**117 514,00**	**171 885,80**	**163 346,40**	**135 732,42**	**112 887,05**	**88 326,81**
Equity in Earnings	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Net Income										
Discontinued Operations	-12 544,00	0,00	-51 159,00	-131 006,00	0,00	0,00	0,00	0,00	0,00	0,00
Net Income	**-83 775,00**	**69 499,00**	**86 255,00**	**124 380,00**	**117 514,00**	171 885,80	163 346,40	135 732,42	112 887,05	88 326,81
Minority Interest	1 021,00	0,00	63 214,00	30 244,00	-504,00					
Preferred Dividend	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Net Income attributable to the Company	**-83 775,00**	**69 499,00**	**86 255,00**	**124 380,00**	**117 514,00**	171 885,80	163 346,40	135 732,42	112 887,05	88 326,81
Common Dividend	0,00	-1 439,00	-36 969,00	-39 228,00	-164 551,00	-79 222,55	-75 286,72	-62 559,38	-52 029,90	-40 710,03
Retained Earnings	**-83 775,00**	**68 060,00**	**49 286,00**	**85 152,00**	**-47 037,00**	**92 663,24**	**88 059,67**	**73 173,04**	**60 857,15**	**47 616,78**

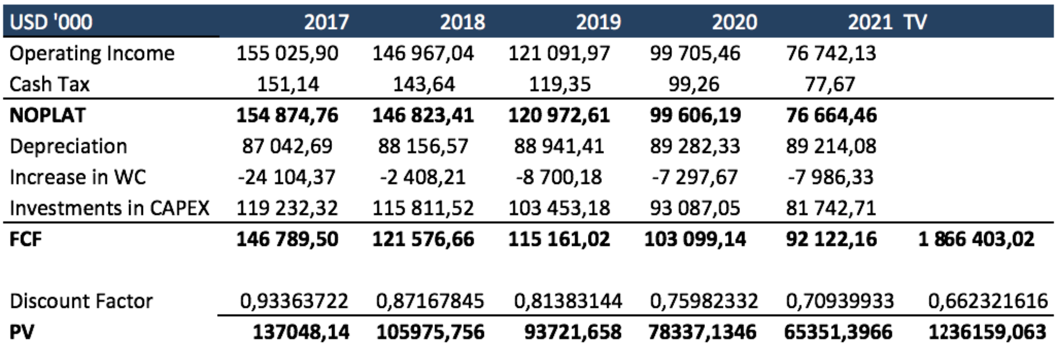
BALANCE SHEET

USD '000	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Cash and Cash Equivalents	137 603,00	53 759,00	235 801,00	264 524,00	202 402,00	248 653,86	303 557,30	367 225,05	427 209,53	491 686,42
Short-Term Investments	3 391,00	6 034,00	0,00	23 182,00	18 173,00	11 292,58	10 968,60	9 798,13	8 816,34	7 741,91
Cash and Short Term Investments	**140 994,00**	**59 793,00**	**235 801,00**	**287 706,00**	**220 575,00**	**259 946,44**	**314 525,89**	**377 023,18**	**436 025,88**	**499 428,34**
Net Receivables	47 617,00	37 495,00	36 326,00	96 722,00	73 590,00	73 844,96	71 726,34	64 072,36	57 652,24	50 626,27
Inventory	111 602,00	90 644,00	40 725,00	77 946,00	83 040,00	87 068,30	84 570,30	75 545,73	67 975,96	59 691,87
Other Current Assets	91 817,00	72 221,00	124 056,00	5 091,00	6 421,00	110 713,30	107 536,92	96 061,56	86 436,08	75 902,29
Total Current Assets	**392 030,00**	**260 153,00**	**436 908,00**	**467 465,00**	**383 626,00**	**531 573,00**	**578 359,45**	**612 702,84**	**648 090,16**	**685 648,76**
Long-Term Investments	92 007,00	107 477,00	59 448,00	40 656,00	30 908,00	30 908,00	30 908,00	30 908,00	30 908,00	30 908,00
Fixed Assets	1 202 948,00	999 280,00	1 088 969,00	2 149 657,00	2 322 152,00	2 354 341,62	2 381 996,58	2 396 508,35	2 400 313,08	2 392 841,71
Goodwill	0,00	0,00	0,00	225 273,00	225 273,00	225 273,00	225 273,00	225 273,00	225 273,00	225 273,00
Intangible Assets	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Other Assets	0,00	0,00	911 680,00	417,00	4 358,00	1 503,68	1 460,54	1 304,68	1 173,95	1 030,88
Deferred Asset Charges	1 236,00	695,00	4 763,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Total Assets	**1 688 221,00**	**1 367 605,00**	**2 501 768,00**	**2 883 468,00**	**2 966 317,00**	**3 143 599,30**	**3 217 997,57**	**3 266 696,88**	**3 305 758,19**	**3 335 702,35**
Accounts Payable	103 667,00	58 122,00	17 746,00	67 909,00	48 587,00	76 974,63	74 766,22	66 787,86	60 095,63	52 771,90
Curr. Portion of Long-Term Debt and Short Term Debt	72 770,00	69 636,00	44 052,00	151 454,00	123 870,00	131 486,61	138 826,73	145 054,91	150 589,71	155 922,81
Other Current Liabilities	10 184,00	3 014,00	175 409,00	22 674,00	10 292,00	74 532,03	72 393,70	64 668,51	58 188,65	51 097,31
Total Current Liabilities	**186 621,00**	**130 772,00**	**237 207,00**	**242 037,00**	**182 749,00**	282 993,28	285 986,65	276 511,27	268 873,99	259 792,02
Long-Term Debt	463 292,00	436 372,00	473 523,00	745 695,00	992 631,00	1 053 666,65	1 112 486,63	1 162 396,04	1 206 749,12	1 249 485,90
Long Term Capital Lease Obligation	898 490,00	742 418,00	0,00	446 553,00	366 095,00	366 095,00	366 095,00	366 095,00	366 095,00	366 095,00
Other Liabilities	6 094,00	74 806,00	343 688,00	2 840,00	3 112,00	2 319,55	2 253,00	2 012,58	1 810,92	1 590,22
Current Deferred Liability Charges	2 575,00	1 288,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Total Liabilities	**1 557 072,00**	**1 385 656,00**	**1 054 418,00**	**1 437 125,00**	**1 544 587,00**	**1 705 074,47**	**1 766 821,28**	**1 807 014,89**	**1 843 529,03**	**1 876 963,15**
Minority Interest	11 474,00	8 901,00	323 770,00	61,00	168,00	462,69	1 274,29	3 509,52	9 665,56	26 619,91
Common Stocks	194 646,00	86 512,00	635 205,00	781 938,00	169 809,00	169 809,00	169 809,00	169 809,00	169 809,00	169 809,00
Capital Surplus	474 950,00	624 114,00	382 373,00	583 515,00	1 294 984,00	1 294 984,00	1 294 984,00	1 294 984,00	1 294 984,00	1 294 984,00
Retained Earnings	-545 766,00	-734 275,00	156 399,00	81 212,00	34 069,00	126 732,24	214 791,92	287 964,96	348 822,12	396 438,90
Accrued Comprehensive Income	-4 155,00	-3 303,00	0,00	-383,00	739,00	0,00	0,00	0,00	0,00	0,00
Treasury Stock	0,00	0,00	-50 397,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Total Equity	**131 149,00**	**-18 051,00**	**1 447 350,00**	**1 446 343,00**	**1 499 769,00**	**1 591 987,93**	**1 680 859,21**	**1 756 267,48**	**1 823 280,68**	**1 887 851,80**
Total Liabilities and Equity	**1 688 221,00**	**1 367 605,00**	**2 501 768,00**	**2 883 468,00**	**3 044 356,00**	**3 297 062,41**	**3 447 680,49**	**3 563 282,37**	**3 666 809,70**	**3 764 814,95**

CASH FLOW STATEMENT

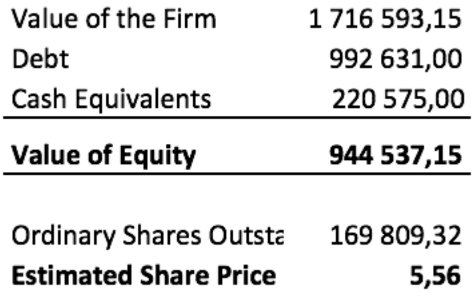
USD '000	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Net Income from continuing op.	-83 775,00	69 499,00	137 414,00	255 386,00	117 514,00	171 885,80	163 346,40	135 732,42	112 887,05	88 326,81
Depreciation	114 845,00	25 144,00	31 845,00	52 607,00	141 043,00	87 042,69	88 156,57	88 941,41	89 282,33	89 214,08
Total Other Cash Flow not affecting CF	16 711,00	-68 522,00	-87 888,00	-89 676,00	42 966,00	-88 583,57	-86 042,09	-76 860,47	-69 158,96	-60 730,69
Change in Inventories	-49 755,00	-4 026,00	-12 938,00	24 872,00	-5 413,00	-4 028,30	2 498,00	9 024,57	7 569,77	8 284,10
Change in Receivables	12 741,00	-4 479,00	-6 115,00	-26 086,00	15 120,00	-254,96	2 118,62	7 653,98	6 420,12	7 025,97
Other Operating Activities	57 807,00	5 241,00	-3 677,00	-9 757,00	-25 215,00	6 224,87	6 046,28	5 401,07	4 859,88	4 267,62
Net Cash-Flow Operating	**68 574,00**	**22 857,00**	**58 641,00**	**207 346,00**	**286 015,00**	**172 286,52**	**176 123,77**	**169 892,98**	**151 860,19**	**136 387,88**
Net CAPEX	-4 329,00	-44 749,00	-28 391,00	-271 613,00	-405 776,00	-119 232,32	-115 811,52	-103 453,18	-93 087,05	-81 742,71
Increase in Investements	-13 298,00	-104 062,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Other Investing Activities	14 634,00	-135 404,00	-35 118,00	-187 666,00	9 024,00	-58 120,93	-56 453,43	-50 429,24	-45 376,17	-39 846,27
Net Cash-Flow Investing	**-2 993,00**	**-284 215,00**	**-63 509,00**	**-459 279,00**	**-396 752,00**	**-177 353,25**	**-172 264,96**	**-153 882,42**	**-138 463,22**	**-121 588,98**
Dividends Paid	0,00	-1 439,00	-36 969,00	-39 228,00	-164 551,00	-79 222,55	-75 286,72	-62 559,38	-52 029,90	-40 710,03
Net Common Stock Issuance	0,00	527 791,00	-50 397,00	0,00	98 183,00	0,00	0,00	0,00	0,00	0,00
Net Borrowings	-88 989,00	-48 431,00	-74 889,00	114 184,00	124 506,00	61 035,65	58 819,98	49 909,41	44 353,08	42 736,78
Other Financing Activities	445,00	-1 538,00	116 319,00	144 556,00	-9 523,00	69 505,48	67 511,36	60 307,17	54 264,32	47 651,23
Net Cash Flows Financing	**-88 544,00**	**476 383,00**	**-45 936,00**	**219 512,00**	**48 615,00**	**51 318,58**	**51 044,62**	**47 657,20**	**46 587,50**	**49 677,99**
Net Cash Flow	**-22 963,00**	**215 025,00**	**-50 804,00**	**-32 421,00**	**-62 122,00**	**46 251,86**	**54 903,44**	**63 667,76**	**59 984,48**	**64 476,89**

Figure A.11: Financial Statements



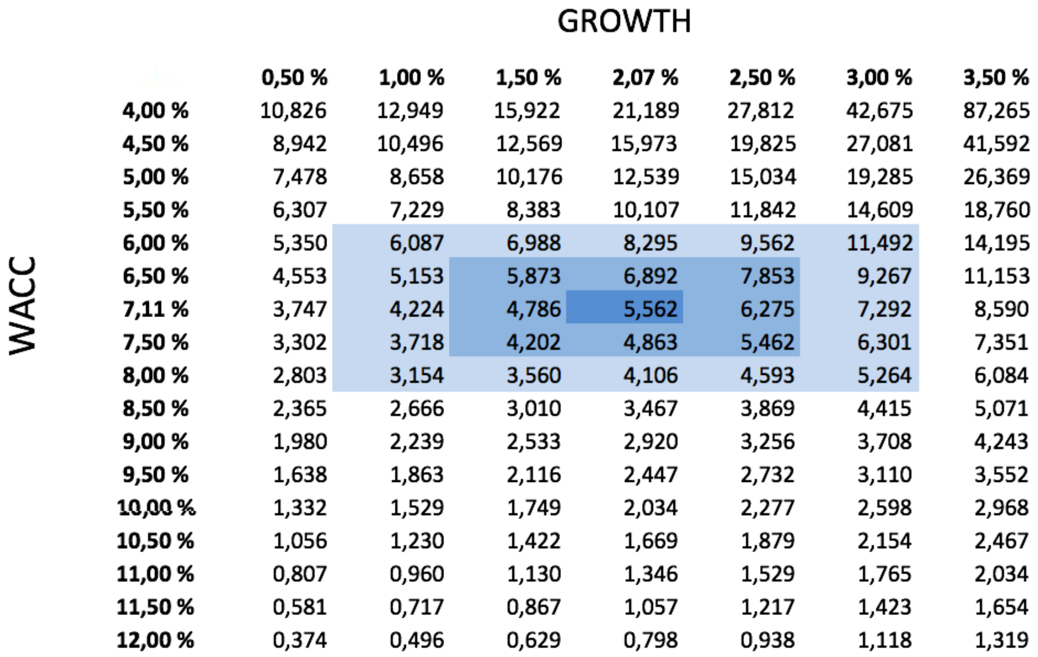
USD '000	2017	2018	2019	2020	2021	TV
Operating Income	155 025,90	146 967,04	121 091,97	99 705,46	76 742,13	
Cash Tax	151,14	143,64	119,35	99,26	77,67	
NOPLAT	**154 874,76**	**146 823,41**	**120 972,61**	**99 606,19**	**76 664,46**	
Depreciation	87 042,69	88 156,57	88 941,41	89 282,33	89 214,08	
Increase in WC	-24 104,37	-2 408,21	-8 700,18	-7 297,67	-7 986,33	
Investments in CAPEX	119 232,32	115 811,52	103 453,18	93 087,05	81 742,71	
FCF	**146 789,50**	**121 576,66**	**115 161,02**	**103 099,14**	**92 122,16**	**1 866 403,02**
Discount Factor	0,93363722	0,87167845	0,81383144	0,75982332	0,70939933	0,662321616
PV	**137048,14**	**105975,756**	**93721,658**	**78337,1346**	**65351,3966**	**1236159,063**

Figure A.12: FCF



Value of the Firm	1 716 593,15
Debt	992 631,00
Cash Equivalents	220 575,00
Value of Equity	**944 537,15**
Ordinary Shares Outsta	169 809,32
Estimated Share Price	**5,56**

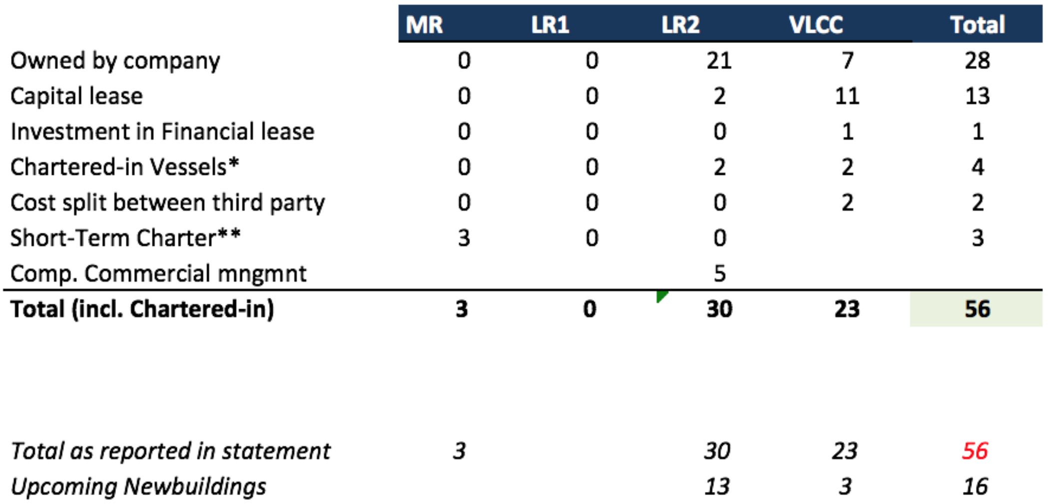
Figure A.13: Share Price



GROWTH

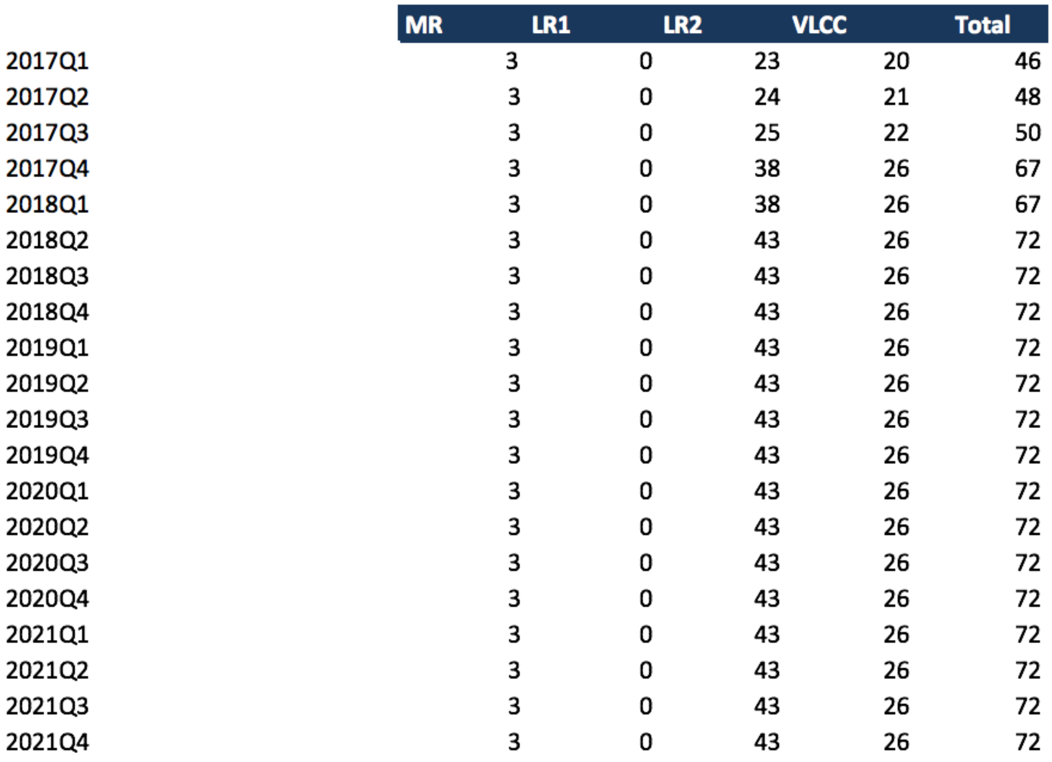
WACC	**0,50 %**	**1,00 %**	**1,50 %**	**2,07 %**	**2,50 %**	**3,00 %**	**3,50 %**
4,00 %	10,826	12,949	15,922	21,189	27,812	42,675	87,265
4,50 %	8,942	10,496	12,569	15,973	19,825	27,081	41,592
5,00 %	7,478	8,658	10,176	12,539	15,034	19,285	26,369
5,50 %	6,307	7,229	8,383	10,107	11,842	14,609	18,760
6,00 %	5,350	6,087	6,988	8,295	9,562	11,492	14,195
6,50 %	4,553	5,153	5,873	6,892	7,853	9,267	11,153
7,11 %	3,747	4,224	4,786	5,562	6,275	7,292	8,590
7,50 %	3,302	3,718	4,202	4,863	5,462	6,301	7,351
8,00 %	2,803	3,154	3,560	4,106	4,593	5,264	6,084
8,50 %	2,365	2,666	3,010	3,467	3,869	4,415	5,071
9,00 %	1,980	2,239	2,533	2,920	3,256	3,708	4,243
9,50 %	1,638	1,863	2,116	2,447	2,732	3,110	3,552
10,00 %	1,332	1,529	1,749	2,034	2,277	2,598	2,968
10,50 %	1,056	1,230	1,422	1,669	1,879	2,154	2,467
11,00 %	0,807	0,960	1,130	1,346	1,529	1,765	2,034
11,50 %	0,581	0,717	0,867	1,057	1,217	1,423	1,654
12,00 %	0,374	0,496	0,629	0,798	0,938	1,118	1,319

Figure A.14: Sensitivity



	MR	LR1	LR2	VLCC	Total
Owned by company	0	0	21	7	28
Capital lease	0	0	2	11	13
Investment in Financial lease	0	0	0	1	1
Chartered-in Vessels*	0	0	2	2	4
Cost split between third party	0	0	0	2	2
Short-Term Charter**	3	0	0		3
Comp. Commercial mngmnt			5		
Total (incl. Chartered-in)	**3**	**0**	**30**	**23**	**56**
Total as reported in statement	*3*		*30*	*23*	*56*
Upcoming Newbuildings			*13*	*3*	*16*

Figure A.15: Fleet List

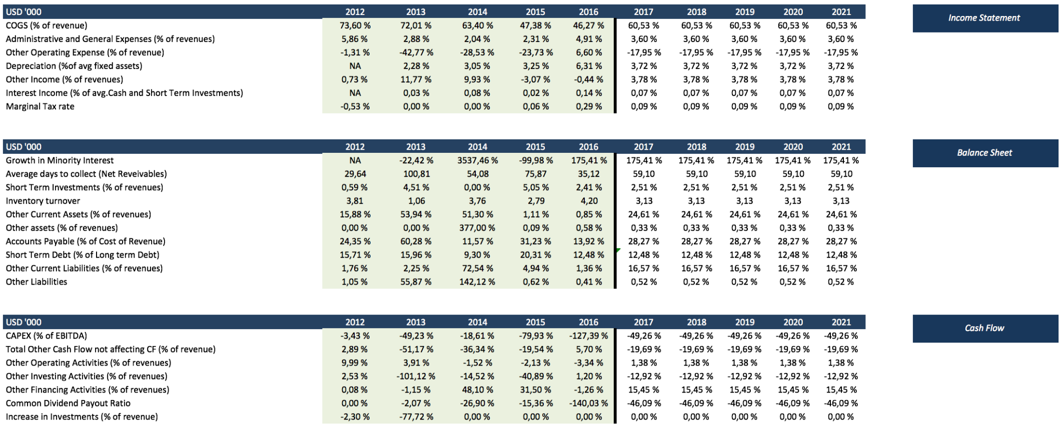


	MR	LR1	LR2	VLCC	Total
2017Q1	3	0	23	20	46
2017Q2	3	0	24	21	48
2017Q3	3	0	25	22	50
2017Q4	3	0	38	26	67
2018Q1	3	0	38	26	67
2018Q2	3	0	43	26	72
2018Q3	3	0	43	26	72
2018Q4	3	0	43	26	72
2019Q1	3	0	43	26	72
2019Q2	3	0	43	26	72
2019Q3	3	0	43	26	72
2019Q4	3	0	43	26	72
2020Q1	3	0	43	26	72
2020Q2	3	0	43	26	72
2020Q3	3	0	43	26	72
2020Q4	3	0	43	26	72
2021Q1	3	0	43	26	72
2021Q2	3	0	43	26	72
2021Q3	3	0	43	26	72
2021Q4	3	0	43	26	72

Figure A.16: Fleet Composition

Table A.1: Revenue Generation

	MR	LR2	VLCC	SUM
2017Q1	6 064 105	32 111 568	40 427 365	78 603
2017Q2	1 987 225	24 558 453	37 233 677	63 779
2017Q3	1 847 019	36 592 214	40 944 274	79 384
2017Q4	2 178 405	76 871 341	62 401 129	141 451
2018Q1	2 166 882	49 540 366	46 699 281	98 407
2018Q2	1 707 903	40 004 838	40 204 465	81 917
2018Q3	1 564 738	58 902 166	42 432 929	102 900
2018Q4	1 892 612	82 846 564	56 330 420	141 070
2019Q1	1 892 002	52 147 339	40 914 432	94 954
2019Q2	1 434 917	36 195 070	34 518 384	72 148
2019Q3	1 282 483	54 866 503	36 478 547	92 628
2019Q4	1 606 236	78 689 918	50 239 405	130 536
2020Q1	1 629 570	48 555 718	35 332 898	85 518
2020Q2	1 155 538	32 281 655	28 794 097	62 231
2020Q3	999 891	51 223 399	30 554 657	82 778
2020Q4	1 334 871	74 732 685	44 565 227	120 633
2021Q1	1 329 976	43 765 174	28 841 653	73 937
2021Q2	871 540	28 148 639	22 745 444	51 766
2021Q3	712 726	47 043 618	24 438 177	72 195
2021Q4	1 060 068	70 728 282	38 679 697	110 468

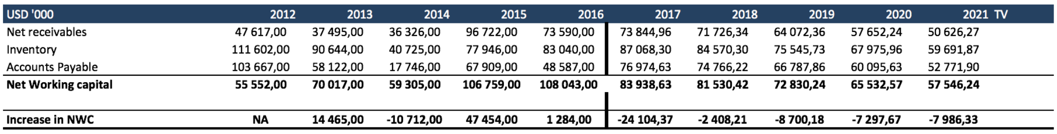


USD '000	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
COGS (% of revenue)	73,60 %	72,01 %	63,40 %	47,38 %	46,27 %	60,53 %	60,53 %	60,53 %	60,53 %	60,53 %
Administrative and General Expenses (% of revenues)	5,86 %	2,88 %	2,04 %	2,31 %	4,91 %	3,60 %	3,60 %	3,60 %	3,60 %	3,60 %
Other Operating Expense (% of revenue)	-1,31 %	-42,77 %	-28,53 %	-23,73 %	6,60 %	-17,95 %	-17,95 %	-17,95 %	-17,95 %	-17,95 %
Depreciation (%of avg fixed assets)	NA	2,28 %	3,05 %	3,25 %	6,31 %	3,72 %	3,72 %	3,72 %	3,72 %	3,72 %
Other Income (% of revenues)	0,73 %	11,77 %	9,93 %	-3,07 %	-0,44 %	3,78 %	3,78 %	3,78 %	3,78 %	3,78 %
Interest Income (% of avg.Cash and Short Term Investments)	NA	0,03 %	0,08 %	0,02 %	0,14 %	0,07 %	0,07 %	0,07 %	0,07 %	0,07 %
Marginal Tax rate	-0,53 %	0,00 %	0,00 %	0,06 %	0,29 %	0,09 %	0,09 %	0,09 %	0,09 %	0,09 %

USD '000	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Growth in Minority Interest	NA	-22,42 %	3537,46 %	-99,98 %	175,41 %	175,41 %	175,41 %	175,41 %	175,41 %	175,41 %
Average days to collect (Net Reveivables)	29,64	100,81	54,08	75,87	35,12	59,10	59,10	59,10	59,10	59,10
Short Term Investments (% of revenues)	0,59 %	4,51 %	0,00 %	5,05 %	2,41 %	2,51 %	2,51 %	2,51 %	2,51 %	2,51 %
Inventory turnover	3,81	1,06	3,76	2,79	4,20	3,13	3,13	3,13	3,13	3,13
Other Current Assets (% of revenues)	15,88 %	53,94 %	51,30 %	1,11 %	0,85 %	24,61 %	24,61 %	24,61 %	24,61 %	24,61 %
Other assets (% of revenues)	0,00 %	0,00 %	377,00 %	0,09 %	0,58 %	0,33 %	0,33 %	0,33 %	0,33 %	0,33 %
Accounts Payable (% of Cost of Revenue)	24,35 %	60,28 %	11,57 %	31,23 %	13,92 %	28,27 %	28,27 %	28,27 %	28,27 %	28,27 %
Short Term Debt (% of Long term Debt)	15,71 %	15,96 %	9,30 %	20,31 %	12,48 %	12,48 %	12,48 %	12,48 %	12,48 %	12,48 %
Other Current Liabilities (% of revenues)	1,76 %	2,25 %	72,54 %	4,94 %	1,36 %	16,57 %	16,57 %	16,57 %	16,57 %	16,57 %
Other Liabilities	1,05 %	55,87 %	142,12 %	0,62 %	0,41 %	0,52 %	0,52 %	0,52 %	0,52 %	0,52 %

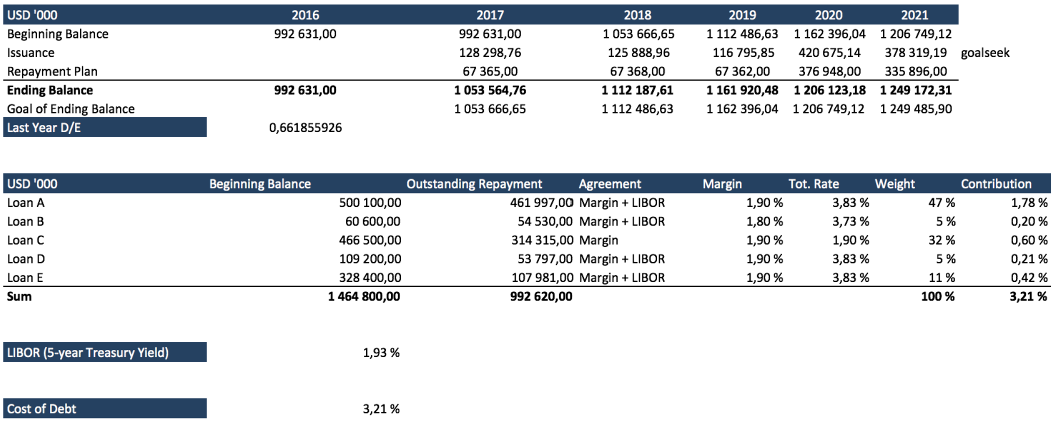
USD '000	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
CAPEX (% of EBITDA)	-3,43 %	-49,23 %	-18,61 %	-79,93 %	-127,39 %	-49,26 %	-49,26 %	-49,26 %	-49,26 %	-49,26 %
Total Other Cash Flow not affecting CF (% of revenue)	2,89 %	-51,17 %	-36,34 %	-19,54 %	5,70 %	-19,69 %	-19,69 %	-19,69 %	-19,69 %	-19,69 %
Other Operating Activities (% of revenues)	9,99 %	3,91 %	-1,52 %	-2,13 %	-3,34 %	1,38 %	1,38 %	1,38 %	1,38 %	1,38 %
Other Investing Activities (% of revenues)	2,53 %	-101,12 %	-14,52 %	-40,89 %	1,20 %	-12,92 %	-12,92 %	-12,92 %	-12,92 %	-12,92 %
Other Financing Activities (% of revenues)	0,08 %	-1,15 %	48,10 %	31,50 %	-1,26 %	15,45 %	15,45 %	15,45 %	15,45 %	15,45 %
Common Dividend Payout Ratio	0,00 %	-2,07 %	-26,90 %	-15,36 %	-140,03 %	-46,09 %	-46,09 %	-46,09 %	-46,09 %	-46,09 %
Increase in Investments (% of revenue)	-2,30 %	-77,72 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %

Figure A.17: Drivers



USD '000	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	TV
Net receivables	47 617,00	37 495,00	36 326,00	96 722,00	73 590,00	73 844,96	71 726,34	64 072,36	57 652,24	50 626,27	
Inventory	111 602,00	90 644,00	40 725,00	77 946,00	83 040,00	87 068,30	84 570,30	75 545,73	67 975,96	59 691,87	
Accounts Payable	103 667,00	58 122,00	17 746,00	67 909,00	48 587,00	76 974,63	74 766,22	66 787,86	60 095,63	52 771,90	
Net Working capital	**55 552,00**	**70 017,00**	**59 305,00**	**106 759,00**	**108 043,00**	**83 938,63**	**81 530,42**	**72 830,24**	**65 532,57**	**57 546,24**	
Increase in NWC	**NA**	**14 465,00**	**-10 712,00**	**47 454,00**	**1 284,00**	**-24 104,37**	**-2 408,21**	**-8 700,18**	**-7 297,67**	**-7 986,33**	

Figure A.18: Net Working Capital

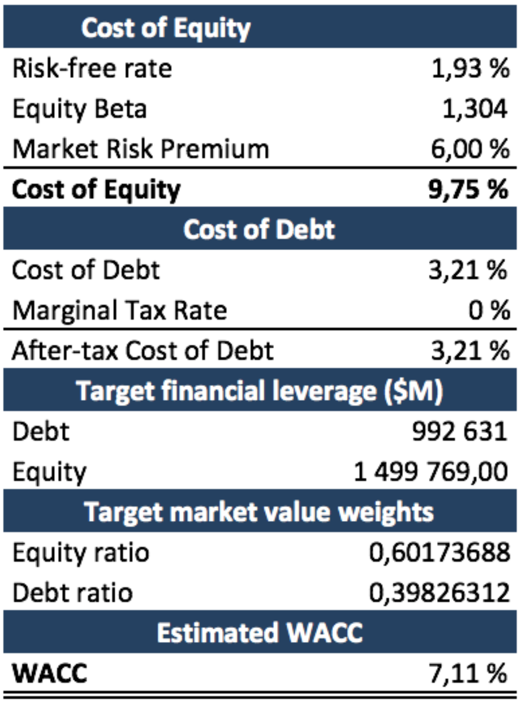


USD '000	2016	2017	2018	2019	2020	2021	
Beginning Balance	992 631,00	992 631,00	1 053 666,65	1 112 486,63	1 162 396,04	1 206 749,12	
Issuance		128 298,76	125 888,96	116 795,85	420 675,14	378 319,19	goalseek
Repayment Plan		67 365,00	67 368,00	67 362,00	376 948,00	335 896,00	
Ending Balance	**992 631,00**	**1 053 564,76**	**1 112 187,61**	**1 161 920,48**	**1 206 123,18**	**1 249 172,31**	
Goal of Ending Balance		1 053 666,65	1 112 486,63	1 162 396,04	1 206 749,12	1 249 485,90	
Last Year D/E	0,661855926						

USD '000	Beginning Balance	Outstanding Repayment	Agreement	Margin	Tot. Rate	Weight	Contribution
Loan A	500 100,00	461 997,00	Margin + LIBOR	1,90 %	3,83 %	47 %	1,78 %
Loan B	60 600,00	54 530,00	Margin + LIBOR	1,80 %	3,73 %	5 %	0,20 %
Loan C	466 500,00	314 315,00	Margin	1,90 %	1,90 %	32 %	0,60 %
Loan D	109 200,00	53 797,00	Margin + LIBOR	1,90 %	3,83 %	5 %	0,21 %
Loan E	328 400,00	107 981,00	Margin + LIBOR	1,90 %	3,83 %	11 %	0,42 %
Sum	**1 464 800,00**	**992 620,00**				**100 %**	**3,21 %**

LIBOR (5-year Treasury Yield)	1,93 %
Cost of Debt	3,21 %

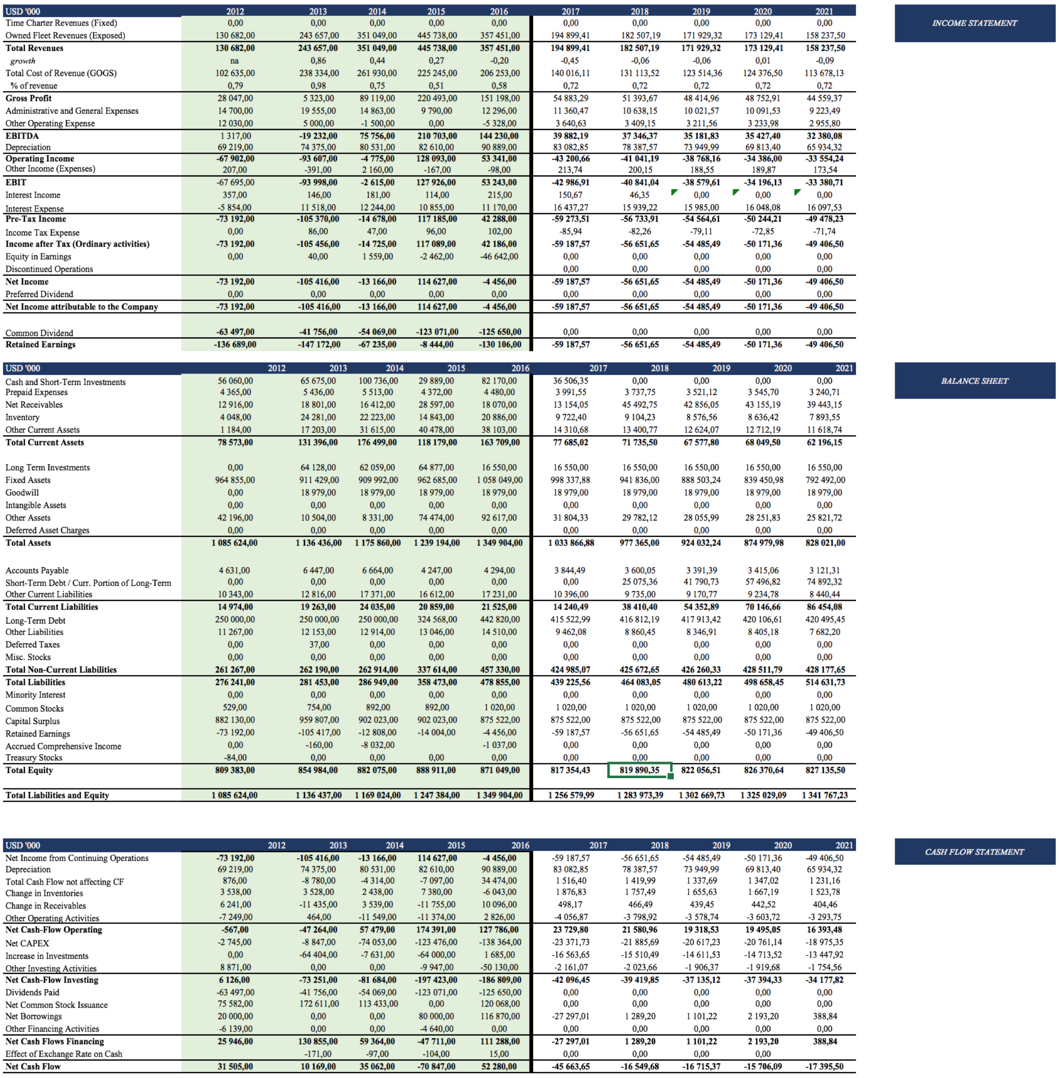
Figure A.19: Cost of Debt



Cost of Equity	
Risk-free rate	1,93 %
Equity Beta	1,304
Market Risk Premium	6,00 %
Cost of Equity	**9,75 %**
Cost of Debt	
Cost of Debt	3,21 %
Marginal Tax Rate	0 %
After-tax Cost of Debt	3,21 %
Target financial leverage ($M)	
Debt	992 631
Equity	1 499 769,00
Target market value weights	
Equity ratio	0,60173688
Debt ratio	0,39826312
Estimated WACC	
WACC	7,11 %

Figure A.20: Key Metrics

A.3 NAT

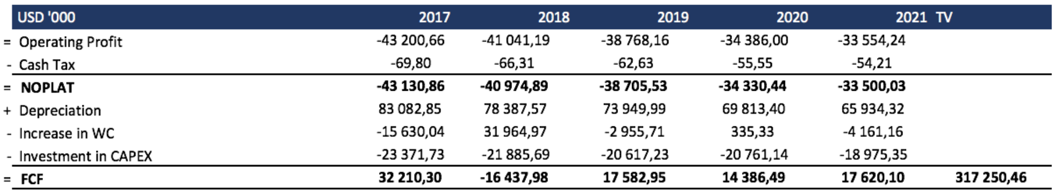


USD '000	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Time Charter Revenues (Fixed)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Owned Fleet Revenues (Exposed)	130 682,00	243 657,00	351 049,00	445 738,00	357 451,00	194 899,41	182 507,19	171 929,32	173 129,41	158 237,50
Total Revenues	**130 682,00**	**243 657,00**	**351 049,00**	**445 738,00**	**357 451,00**	**194 899,41**	**182 507,19**	**171 929,32**	**173 129,41**	**158 237,50**
growth	na	0,86	0,44	0,27	-0,20	-0,45	-0,06	-0,06	0,01	-0,09
Total Cost of Revenue (GOGS)	102 635,00	238 334,00	261 930,00	225 245,00	206 253,00	140 016,11	131 113,52	123 514,36	124 376,50	113 678,13
% of revenue	0,79	0,98	0,75	0,51	0,58	0,72	0,72	0,72	0,72	0,72
Gross Profit	28 047,00	5 323,00	89 119,00	220 493,00	151 198,00	54 883,29	51 393,67	48 414,96	48 752,91	44 559,37
Administrative and General Expenses	14 700,00	19 555,00	14 863,00	9 790,00	12 296,00	11 360,47	10 638,15	10 021,57	10 091,53	9 223,49
Other Operating Expense	12 030,00	5 000,00	-1 500,00	0,00	-5 328,00	3 640,63	3 409,15	3 211,56	3 233,98	2 955,80
EBITDA	1 317,00	**-19 232,00**	**75 756,00**	**210 703,00**	**144 230,00**	**39 882,19**	**37 346,37**	**35 181,83**	**35 427,40**	**32 380,08**
Depreciation	69 219,00	74 375,00	80 531,00	82 610,00	90 889,00	83 082,85	78 387,57	73 949,99	69 813,40	65 934,32
Operating Income	**-67 902,00**	**-93 607,00**	**-4 775,00**	**128 093,00**	**53 341,00**	**-43 200,66**	**-41 041,19**	**-38 768,16**	**-34 386,00**	**-33 554,24**
Other Income (Expenses)	207,00	-391,00	2 160,00	-167,00	-98,00	213,74	200,15	188,55	189,87	173,54
EBIT	-67 695,00	**-93 998,00**	**-2 615,00**	**127 926,00**	**53 243,00**	**-42 986,91**	**-40 841,04**	**-38 579,61**	**-34 196,13**	**-33 380,71**
Interest Income	357,00	146,00	181,00	114,00	215,00	150,67	46,35	0,00	0,00	0,00
Interest Expense	-5 854,00	11 518,00	12 244,00	10 855,00	11 170,00	16 437,27	15 939,22	15 985,00	16 048,08	16 097,53
Pre-Tax Income	**-73 192,00**	**-105 370,00**	**-14 678,00**	**117 185,00**	**42 288,00**	**-59 273,51**	**-56 733,91**	**-54 564,61**	**-50 244,21**	**-49 478,23**
Income Tax Expense	0,00	86,00	47,00	96,00	102,00	-85,94	-82,26	-79,11	-72,85	-71,74
Income after Tax (Ordinary activities)	**-73 192,00**	**-105 456,00**	**-14 725,00**	**117 089,00**	**42 186,00**	**-59 187,57**	**-56 651,65**	**-54 485,49**	**-50 171,36**	**-49 406,50**
Equity in Earnings	0,00	40,00	1 559,00	-2 462,00	-46 642,00	0,00	0,00	0,00	0,00	0,00
Discontinued Operations						0,00	0,00	0,00	0,00	0,00
Net Income	**-73 192,00**	**-105 416,00**	**-13 166,00**	**114 627,00**	**-4 456,00**	**-59 187,57**	**-56 651,65**	**-54 485,49**	**-50 171,36**	**-49 406,50**
Preferred Dividend	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Net Income attributable to the Company	**-73 192,00**	**-105 416,00**	**-13 166,00**	**114 627,00**	**-4 456,00**	**-59 187,57**	**-56 651,65**	**-54 485,49**	**-50 171,36**	**-49 406,50**
Common Dividend	**-63 497,00**	**-41 756,00**	**-54 069,00**	**-123 071,00**	**-125 650,00**	0,00	0,00	0,00	0,00	0,00
Retained Earnings	**-136 689,00**	**-147 172,00**	**-67 235,00**	**-8 444,00**	**-130 106,00**	**-59 187,57**	**-56 651,65**	**-54 485,49**	**-50 171,36**	**-49 406,50**

USD '000	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Cash and Short-Term Investments	56 060,00	65 675,00	100 736,00	29 889,00	82 170,00	36 506,35	0,00	0,00	0,00	0,00
Prepaid Expenses	4 365,00	5 436,00	5 513,00	4 372,00	4 480,00	3 991,55	3 737,75	3 521,12	3 545,70	3 240,71
Net Receivables	12 916,00	18 801,00	16 412,00	28 597,00	18 070,00	13 154,05	45 492,75	42 856,05	43 155,19	39 443,15
Inventory	4 048,00	24 281,00	22 223,00	14 843,00	20 886,00	9 722,40	9 104,23	8 576,56	8 636,42	7 893,55
Other Current Assets	1 184,00	17 203,00	31 615,00	40 478,00	38 103,00	14 310,68	13 400,77	12 624,07	12 712,19	11 618,74
Total Current Assets	**78 573,00**	**131 396,00**	**176 499,00**	**118 179,00**	**163 709,00**	**77 685,02**	**71 735,50**	**67 577,80**	**68 049,50**	**62 196,15**
Long Term Investments	0,00	64 128,00	62 059,00	64 877,00	16 550,00	16 550,00	16 550,00	16 550,00	16 550,00	16 550,00
Fixed Assets	964 855,00	911 429,00	909 992,00	962 685,00	1 058 049,00	998 337,88	941 836,00	888 503,24	839 450,98	792 492,00
Goodwill	0,00	18 979,00	18 979,00	18 979,00	18 979,00	18 979,00	18 979,00	18 979,00	18 979,00	18 979,00
Intangible Assets	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Other Assets	42 196,00	10 504,00	8 331,00	74 474,00	92 617,00	31 804,33	29 782,12	28 055,99	28 251,83	25 821,72
Deferred Asset Charges	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Total Assets	**1 085 624,00**	**1 136 436,00**	**1 175 860,00**	**1 239 194,00**	**1 349 904,00**	**1 033 866,88**	**977 365,00**	**924 032,24**	**874 979,98**	**828 021,00**
Accounts Payable	4 631,00	6 447,00	6 664,00	4 247,00	4 294,00	3 844,49	3 600,05	3 391,39	3 415,06	3 121,31
Short-Term Debt / Curr. Portion of Long-Term	0,00	0,00	0,00	0,00	0,00	0,00	25 075,36	41 790,73	57 496,82	74 892,32
Other Current Liabilities	10 343,00	12 816,00	17 371,00	16 612,00	17 231,00	10 396,00	9 735,00	9 170,77	9 234,78	8 440,44
Total Current Liabilities	**14 974,00**	**19 263,00**	**24 035,00**	**20 859,00**	**21 525,00**	**14 240,49**	**38 410,40**	**54 352,89**	**70 146,66**	**86 454,08**
Long-Term Debt	250 000,00	250 000,00	250 000,00	324 568,00	442 820,00	415 522,99	416 812,19	417 913,42	420 106,61	420 495,45
Other Liabilities	11 267,00	12 153,00	12 914,00	13 046,00	14 510,00	9 462,08	8 860,45	8 346,91	8 405,18	7 682,20
Deferred Taxes	0,00	37,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Misc. Stocks	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Total Non-Current Liabilities	**261 267,00**	**262 190,00**	**262 914,00**	**337 614,00**	**457 330,00**	**424 985,07**	**425 672,65**	**426 260,33**	**428 511,79**	**428 177,65**
Total Liabilities	**276 241,00**	**281 453,00**	**286 949,00**	**358 473,00**	**478 855,00**	**439 225,56**	**464 083,05**	**480 613,22**	**498 658,45**	**514 631,73**
Minority Interest	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Common Stocks	529,00	754,00	892,00	892,00	1 020,00	1 020,00	1 020,00	1 020,00	1 020,00	1 020,00
Capital Surplus	882 130,00	959 807,00	902 023,00	902 023,00	875 522,00	875 522,00	875 522,00	875 522,00	875 522,00	875 522,00
Retained Earnings	-73 192,00	-105 417,00	-12 808,00	-14 004,00	-4 456,00	-59 187,57	-56 651,65	-54 485,49	-50 171,36	-49 406,50
Accrued Comprehensive Income	0,00	-160,00	-8 032,00		-1 037,00	0,00	0,00	0,00	0,00	0,00
Treasury Stocks	-84,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Total Equity	**809 383,00**	**854 984,00**	**882 075,00**	**888 911,00**	**871 049,00**	**817 354,43**	**819 890,35**	**822 056,51**	**826 370,64**	**827 135,50**
Total Liabilities and Equity	**1 085 624,00**	**1 136 437,00**	**1 169 024,00**	**1 247 384,00**	**1 349 904,00**	**1 256 579,99**	**1 283 973,39**	**1 302 669,73**	**1 325 029,09**	**1 341 767,23**

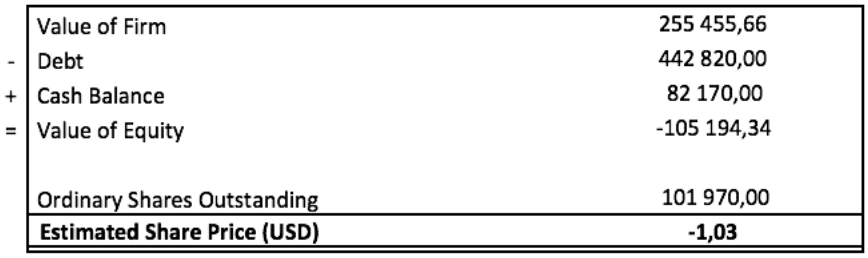
USD '000	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Net Income from Continuing Operations	**-73 192,00**	**-105 416,00**	**-13 166,00**	**114 627,00**	**-4 456,00**	-59 187,57	-56 651,65	-54 485,49	-50 171,36	-49 406,50
Depreciation	69 219,00	74 375,00	80 531,00	82 610,00	90 889,00	83 082,85	78 387,57	73 949,99	69 813,40	65 934,32
Total Cash Flow not affecting CF	876,00	-8 780,00	-4 314,00	-7 097,00	34 474,00	1 516,40	1 419,99	1 337,69	1 347,02	1 231,16
Change in Inventories	3 538,00	3 528,00	2 438,00	7 380,00	-6 043,00	1 876,83	1 757,49	1 655,63	1 667,19	1 523,78
Change in Receivables	6 241,00	-11 435,00	3 539,00	-11 755,00	10 096,00	498,17	466,49	439,45	442,52	404,46
Other Operating Activities	-7 249,00	464,00	-11 549,00	-11 374,00	2 826,00	-4 056,87	-3 798,92	-3 578,74	-3 603,72	-3 293,75
Net Cash-Flow Operating	**-567,00**	**-47 264,00**	**57 479,00**	**174 391,00**	**127 786,00**	**23 729,80**	**21 580,96**	**19 318,53**	**19 495,05**	**16 393,48**
Net CAPEX	-2 745,00	-8 847,00	-74 053,00	-123 476,00	-138 364,00	-23 371,73	-21 885,69	-20 617,23	-20 761,14	-18 975,35
Increase in Investments	0,00	-64 404,00	-7 631,00	-64 000,00	1 685,00	-16 563,65	-15 510,49	-14 611,53	-14 713,52	-13 447,92
Other Investing Activities	8 871,00	0,00	0,00	-9 947,00	-50 130,00	-2 161,07	-2 023,66	-1 906,37	-1 919,68	-1 754,56
Net Cash-Flow Investing	**6 126,00**	**-73 251,00**	**-81 684,00**	**-197 423,00**	**-186 809,00**	**-42 096,45**	**-39 419,85**	**-37 135,12**	**-37 394,33**	**-34 177,82**
Dividends Paid	-63 497,00	-41 756,00	-54 069,00	-123 071,00	-125 650,00	0,00	0,00	0,00	0,00	0,00
Net Common Stock Issuance	75 582,00	172 611,00	113 433,00	0,00	120 068,00	0,00	0,00	0,00	0,00	0,00
Net Borrowings	20 000,00	0,00	0,00	80 000,00	116 870,00	-27 297,01	1 289,20	1 101,22	2 193,20	388,84
Other Financing Activities	-6 139,00	0,00	0,00	-4 640,00	0,00	0,00	0,00	0,00	0,00	0,00
Net Cash Flows Financing	**25 946,00**	**130 855,00**	**59 364,00**	**-47 711,00**	**111 288,00**	**-27 297,01**	**1 289,20**	**1 101,22**	**2 193,20**	**388,84**
Effect of Exchange Rate on Cash		-171,00	-97,00	-104,00	15,00	0,00	0,00	0,00	0,00	
Net Cash Flow	**31 505,00**	**10 169,00**	**35 062,00**	**-70 847,00**	**52 280,00**	**-45 663,65**	**-16 549,68**	**-16 715,37**	**-15 706,09**	**-17 395,50**

Figure A.21: Financial Statements



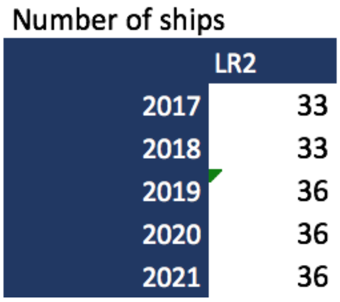
	USD '000	2017	2018	2019	2020	2021	TV
=	Operating Profit	-43 200,66	-41 041,19	-38 768,16	-34 386,00	-33 554,24	
-	Cash Tax	-69,80	-66,31	-62,63	-55,55	-54,21	
=	**NOPLAT**	**-43 130,86**	**-40 974,89**	**-38 705,53**	**-34 330,44**	**-33 500,03**	
+	Depreciation	83 082,85	78 387,57	73 949,99	69 813,40	65 934,32	
-	Increase in WC	-15 630,04	31 964,97	-2 955,71	335,33	-4 161,16	
-	Investment in CAPEX	-23 371,73	-21 885,69	-20 617,23	-20 761,14	-18 975,35	
=	**FCF**	**32 210,30**	**-16 437,98**	**17 582,95**	**14 386,49**	**17 620,10**	**317 250,46**

Figure A.22: FCF



	Value of Firm	255 455,66
-	Debt	442 820,00
+	Cash Balance	82 170,00
=	Value of Equity	-105 194,34
	Ordinary Shares Outstanding	101 970,00
	Estimated Share Price (USD)	**-1,03**

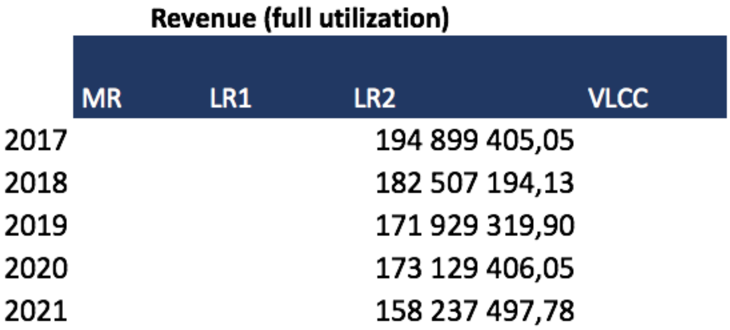
Figure A.23: Share Price



Number of ships

	LR2
2017	33
2018	33
2019	36
2020	36
2021	36

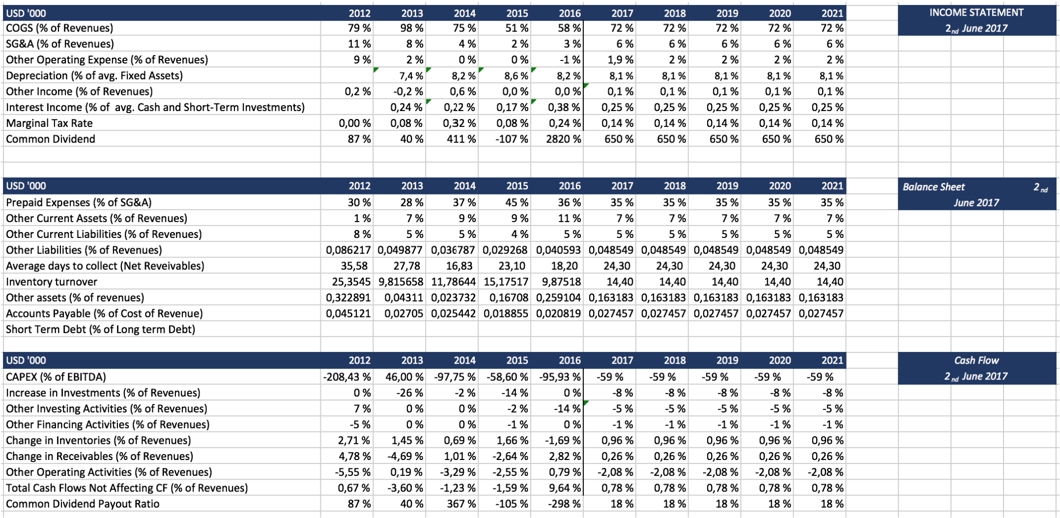
Figure A.24: Fleet List



Revenue (full utilization)

	MR	LR1	LR2	VLCC
2017			194 899 405,05	
2018			182 507 194,13	
2019			171 929 319,90	
2020			173 129 406,05	
2021			158 237 497,78	

Figure A.25: Fleet Composition



USD '000	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
COGS (% of Revenues)	79 %	98 %	75 %	51 %	58 %	72 %	72 %	72 %	72 %	72 %
SG&A (% of Revenues)	11 %	8 %	4 %	2 %	3 %	6 %	6 %	6 %	6 %	6 %
Other Operating Expense (% of Revenues)	9 %	2 %	0 %	0 %	-1 %	1,9 %	2 %	2 %	2 %	2 %
Depreciation (% of avg. Fixed Assets)		7,4 %	8,2 %	8,6 %	8,2 %	8,1 %	8,1 %	8,1 %	8,1 %	8,1 %
Other Income (% of Revenues)	0,2 %	-0,2 %	0,6 %	0,0 %	0,0 %	0,1 %	0,1 %	0,1 %	0,1 %	0,1 %
Interest Income (% of avg. Cash and Short-Term Investments)		0,24 %	0,22 %	0,17 %	0,38 %	0,25 %	0,25 %	0,25 %	0,25 %	0,25 %
Marginal Tax Rate	0,00 %	0,08 %	0,32 %	0,08 %	0,24 %	0,14 %	0,14 %	0,14 %	0,14 %	0,14 %
Common Dividend	87 %	40 %	411 %	-107 %	2820 %	650 %	650 %	650 %	650 %	650 %

INCOME STATEMENT
2nd June 2017

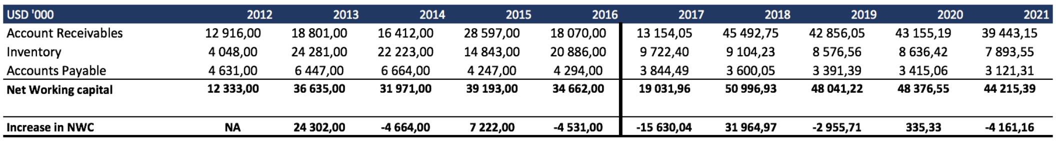
USD '000	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Prepaid Expenses (% of SG&A)	30 %	28 %	37 %	45 %	36 %	35 %	35 %	35 %	35 %	35 %
Other Current Assets (% of Revenues)	1 %	7 %	9 %	9 %	11 %	7 %	7 %	7 %	7 %	7 %
Other Current Liabilities (% of Revenues)	8 %	5 %	5 %	4 %	5 %	5 %	5 %	5 %	5 %	5 %
Other Liabilities (% of Revenues)	0,086217	0,049877	0,036787	0,029268	0,040593	0,048549	0,048549	0,048549	0,048549	0,048549
Average days to collect (Net Reveivables)	35,58	27,78	16,83	23,10	18,20	24,30	24,30	24,30	24,30	24,30
Inventory turnover	25,3545	9,815658	11,78644	15,17517	9,87518	14,40	14,40	14,40	14,40	14,40
Other assets (% of revenues)	0,322891	0,04311	0,023732	0,16708	0,259104	0,163183	0,163183	0,163183	0,163183	0,163183
Accounts Payable (% of Cost of Revenue)	0,045121	0,02705	0,025442	0,018855	0,020819	0,027457	0,027457	0,027457	0,027457	0,027457
Short Term Debt (% of Long term Debt)										

Balance Sheet 2nd
June 2017

USD '000	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
CAPEX (% of EBITDA)	-208,43 %	46,00 %	-97,75 %	-58,60 %	-95,93 %	-59 %	-59 %	-59 %	-59 %	-59 %
Increase in Investments (% of Revenues)	0 %	-26 %	-2 %	-14 %	0 %	-8 %	-8 %	-8 %	-8 %	-8 %
Other Investing Activities (% of Revenues)	7 %	0 %	0 %	-2 %	-14 %	-5 %	-5 %	-5 %	-5 %	-5 %
Other Financing Activities (% of Revenues)	-5 %	0 %	0 %	-1 %	0 %	-1 %	-1 %	-1 %	-1 %	-1 %
Change in Inventories (% of Revenues)	2,71 %	1,45 %	0,69 %	1,66 %	-1,69 %	0,96 %	0,96 %	0,96 %	0,96 %	0,96 %
Change in Receivables (% of Revenues)	4,78 %	-4,69 %	1,01 %	-2,64 %	2,82 %	0,26 %	0,26 %	0,26 %	0,26 %	0,26 %
Other Operating Activities (% of Revenues)	-5,55 %	0,19 %	-3,29 %	-2,55 %	0,79 %	-2,08 %	-2,08 %	-2,08 %	-2,08 %	-2,08 %
Total Cash Flows Not Affecting CF (% of Revenues)	0,67 %	-3,60 %	-1,23 %	-1,59 %	9,64 %	0,78 %	0,78 %	0,78 %	0,78 %	0,78 %
Common Dividend Payout Ratio	87 %	40 %	367 %	-105 %	-298 %	18 %	18 %	18 %	18 %	18 %

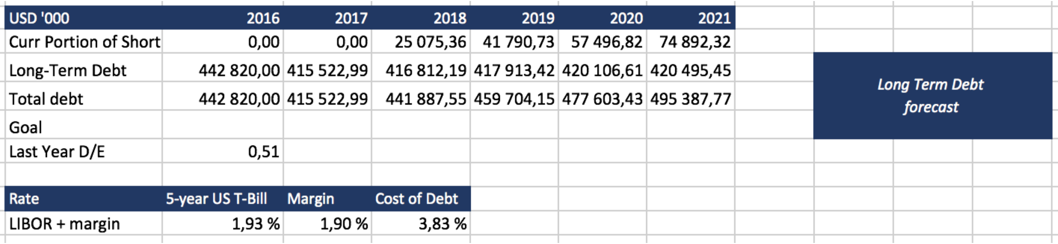
Cash Flow
2nd June 2017

Figure A.26: Drivers



USD '000	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Account Receivables	12 916,00	18 801,00	16 412,00	28 597,00	18 070,00	13 154,05	45 492,75	42 856,05	43 155,19	39 443,15
Inventory	4 048,00	24 281,00	22 223,00	14 843,00	20 886,00	9 722,40	9 104,23	8 576,56	8 636,42	7 893,55
Accounts Payable	4 631,00	6 447,00	6 664,00	4 247,00	4 294,00	3 844,49	3 600,05	3 391,39	3 415,06	3 121,31
Net Working capital	**12 333,00**	**36 635,00**	**31 971,00**	**39 193,00**	**34 662,00**	**19 031,96**	**50 996,93**	**48 041,22**	**48 376,55**	**44 215,39**
Increase in NWC	**NA**	**24 302,00**	**-4 664,00**	**7 222,00**	**-4 531,00**	**-15 630,04**	**31 964,97**	**-2 955,71**	**335,33**	**-4 161,16**

Figure A.27: Net Working Capital

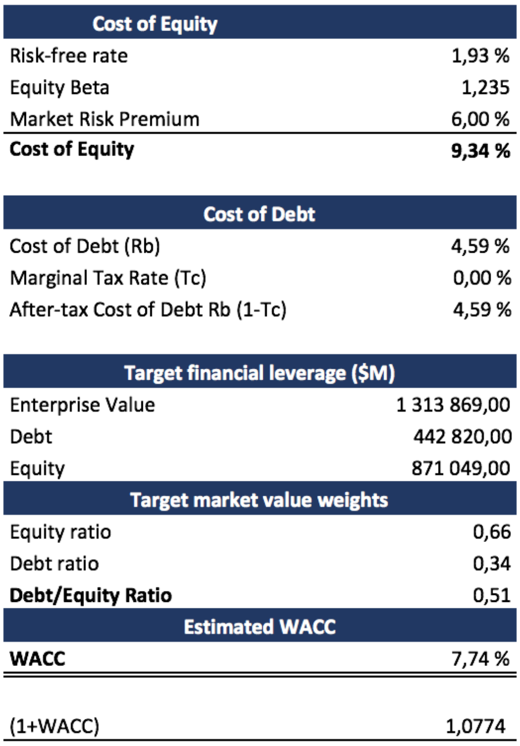


USD '000	2016	2017	2018	2019	2020	2021
Curr Portion of Short	0,00	0,00	25 075,36	41 790,73	57 496,82	74 892,32
Long-Term Debt	442 820,00	415 522,99	416 812,19	417 913,42	420 106,61	420 495,45
Total debt	442 820,00	415 522,99	441 887,55	459 704,15	477 603,43	495 387,77
Goal						
Last Year D/E	0,51					

Long Term Debt forecast

Rate	5-year US T-Bill	Margin	Cost of Debt
LIBOR + margin	1,93 %	1,90 %	3,83 %

Figure A.28: Cost of Debt



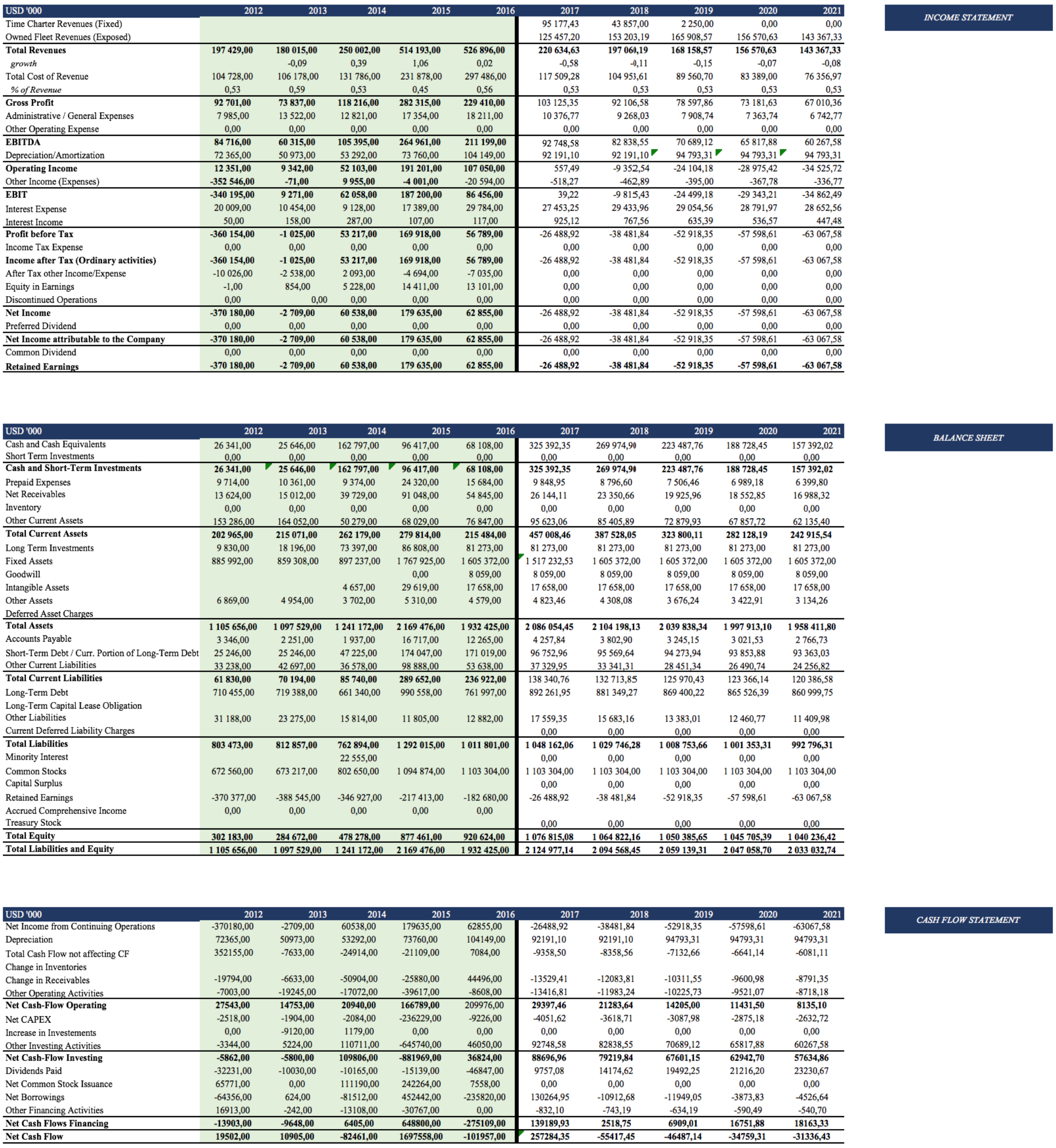
Cost of Equity	
Risk-free rate	1,93 %
Equity Beta	1,235
Market Risk Premium	6,00 %
Cost of Equity	**9,34 %**

Cost of Debt	
Cost of Debt (Rb)	4,59 %
Marginal Tax Rate (Tc)	0,00 %
After-tax Cost of Debt Rb (1-Tc)	4,59 %

Target financial leverage ($M)	
Enterprise Value	1 313 869,00
Debt	442 820,00
Equity	871 049,00
Target market value weights	
Equity ratio	0,66
Debt ratio	0,34
Debt/Equity Ratio	0,51
Estimated WACC	
WACC	7,74 %
(1+WACC)	1,0774

Figure A.29: Key Metrics

A.4 Teekay



INCOME STATEMENT

USD '000	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Time Charter Revenues (Fixed)						95 177,43	43 857,00	2 250,00	0,00	0,00
Owned Fleet Revenues (Exposed)						125 457,20	153 203,19	165 908,57	156 570,63	143 367,33
Total Revenues	**197 429,00**	**180 015,00**	**250 002,00**	**514 193,00**	**526 896,00**	**220 634,63**	**197 060,19**	**168 158,57**	**156 570,63**	**143 367,33**
growth		-0,09	0,39	1,06	0,02	-0,58	-0,11	-0,15	-0,07	-0,08
Total Cost of Revenue	104 728,00	106 178,00	131 786,00	231 878,00	297 486,00	117 509,28	104 953,61	89 560,70	83 389,00	76 356,97
% of Revenue	0,53	0,59	0,53	0,45	0,56	0,53	0,53	0,53	0,53	0,53
Gross Profit	**92 701,00**	**73 837,00**	**118 216,00**	**282 315,00**	**229 410,00**	103 125,35	92 106,58	78 597,86	73 181,63	67 010,36
Administrative / General Expenses	7 985,00	13 522,00	12 821,00	17 354,00	18 211,00	10 376,77	9 268,03	7 908,74	7 363,74	6 742,77
Other Operating Expense	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
EBITDA	**84 716,00**	**60 315,00**	**105 395,00**	**264 961,00**	**211 199,00**	92 748,58	82 838,55	70 689,12	65 817,88	60 267,58
Depreciation/Amortization	72 365,00	50 973,00	53 292,00	73 760,00	104 149,00	92 191,10	92 191,10	94 793,31	94 793,31	94 793,31
Operating Income	**12 351,00**	**9 342,00**	**52 103,00**	**191 201,00**	**107 050,00**	557,49	-9 352,54	-24 104,18	-28 975,42	-34 525,72
Other Income (Expenses)	**-352 546,00**	**-71,00**	**9 955,00**	**-4 001,00**	-20 594,00	-518,27	-462,89	-395,00	-367,78	-336,77
EBIT	**-340 195,00**	**9 271,00**	**62 058,00**	**187 200,00**	**86 456,00**	39,22	-9 815,43	-24 499,18	-29 343,21	-34 862,49
Interest Expense	20 009,00	10 454,00	9 128,00	17 389,00	29 784,00	27 453,25	29 433,96	29 054,56	28 791,97	28 652,56
Interest Income	50,00	158,00	287,00	107,00	117,00	925,12	767,56	635,39	536,57	447,48
Profit before Tax	**-360 154,00**	**-1 025,00**	**53 217,00**	**169 918,00**	**56 789,00**	-26 488,92	-38 481,84	-52 918,35	-57 598,61	-63 067,58
Income Tax Expense	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Income after Tax (Ordinary activities)	**-360 154,00**	**-1 025,00**	**53 217,00**	**169 918,00**	**56 789,00**	-26 488,92	-38 481,84	-52 918,35	-57 598,61	-63 067,58
After Tax other Income/Expense	-10 026,00	-2 538,00	2 093,00	-4 694,00	-7 035,00	0,00	0,00	0,00	0,00	0,00
Equity in Earnings	-1,00	854,00	5 228,00	14 411,00	13 101,00	0,00	0,00	0,00	0,00	0,00
Discontinued Operations	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Net Income	**-370 180,00**	**-2 709,00**	**60 538,00**	**179 635,00**	**62 855,00**	-26 488,92	-38 481,84	-52 918,35	-57 598,61	-63 067,58
Preferred Dividend	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Net Income attributable to the Company	**-370 180,00**	**-2 709,00**	**60 538,00**	**179 635,00**	**62 855,00**	-26 488,92	-38 481,84	-52 918,35	-57 598,61	-63 067,58
Common Dividend	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Retained Earnings	**-370 180,00**	**-2 709,00**	**60 538,00**	**179 635,00**	**62 855,00**	**-26 488,92**	**-38 481,84**	**-52 918,35**	**-57 598,61**	**-63 067,58**

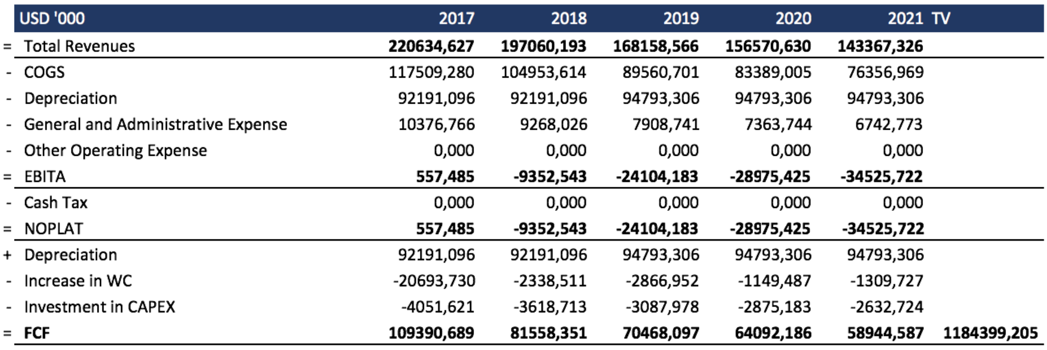
BALANCE SHEET

USD '000	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Cash and Cash Equivalents	26 341,00	25 646,00	162 797,00	96 417,00	68 108,00	325 392,35	269 974,90	223 487,76	188 728,45	157 392,02
Short Term Investments	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Cash and Short-Term Investments	**26 341,00**	**25 646,00**	**162 797,00**	**96 417,00**	**68 108,00**	**325 392,35**	**269 974,90**	**223 487,76**	**188 728,45**	**157 392,02**
Prepaid Expenses	9 714,00	10 361,00	9 374,00	24 320,00	15 684,00	9 848,95	8 796,60	7 506,46	6 989,18	6 399,80
Net Receivables	13 624,00	15 012,00	39 729,00	91 048,00	54 845,00	26 144,11	23 350,66	19 925,96	18 552,85	16 988,32
Inventory	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Other Current Assets	153 286,00	164 052,00	50 279,00	68 029,00	76 847,00	95 623,06	85 405,89	72 879,93	67 857,72	62 135,40
Total Current Assets	**202 965,00**	**215 071,00**	**262 179,00**	**279 814,00**	**215 484,00**	**457 008,46**	**387 528,05**	**323 800,11**	**282 128,19**	**242 915,54**
Long Term Investments	9 830,00	18 196,00	73 397,00	86 808,00	81 273,00	81 273,00	81 273,00	81 273,00	81 273,00	81 273,00
Fixed Assets	885 992,00	859 308,00	897 237,00	1 767 925,00	1 605 372,00	1 517 232,53	1 605 372,00	1 605 372,00	1 605 372,00	1 605 372,00
Goodwill				0,00	8 059,00	8 059,00	8 059,00	8 059,00	8 059,00	8 059,00
Intangible Assets			4 657,00	29 619,00	17 658,00	17 658,00	17 658,00	17 658,00	17 658,00	17 658,00
Other Assets	6 869,00	4 954,00	3 702,00	5 310,00	4 579,00	4 823,46	4 308,08	3 676,24	3 422,91	3 134,26
Deferred Asset Charges										
Total Assets	**1 105 656,00**	**1 097 529,00**	**1 241 172,00**	**2 169 476,00**	**1 932 425,00**	**2 086 054,45**	**2 104 198,13**	**2 039 838,34**	**1 997 913,10**	**1 958 411,80**
Accounts Payable	3 346,00	2 251,00	1 937,00	16 717,00	12 265,00	4 257,84	3 802,90	3 245,15	3 021,53	2 766,73
Short-Term Debt / Curr. Portion of Long-Term Debt	25 246,00	25 246,00	47 225,00	174 047,00	171 019,00	96 752,96	95 569,64	94 273,94	93 853,88	93 363,03
Other Current Liabilities	33 238,00	42 697,00	36 578,00	98 888,00	53 638,00	37 329,95	33 341,31	28 451,34	26 490,74	24 256,82
Total Current Liabilities	**61 830,00**	**70 194,00**	**85 740,00**	**289 652,00**	**236 922,00**	138 340,76	132 713,85	125 970,43	123 366,14	120 386,58
Long-Term Debt	710 455,00	719 388,00	661 340,00	990 558,00	761 997,00	892 261,95	881 349,27	869 400,22	865 526,39	860 999,75
Long-Term Capital Lease Obligation										
Other Liabilities	31 188,00	23 275,00	15 814,00	11 805,00	12 882,00	17 559,35	15 683,16	13 383,01	12 460,77	11 409,98
Current Deferred Liability Charges						0,00	0,00	0,00	0,00	0,00
Total Liabilities	**803 473,00**	**812 857,00**	**762 894,00**	**1 292 015,00**	**1 011 801,00**	**1 048 162,06**	**1 029 746,28**	**1 008 753,66**	**1 001 353,31**	**992 796,31**
Minority Interest			22 555,00			0,00	0,00	0,00	0,00	0,00
Common Stocks	672 560,00	673 217,00	802 650,00	1 094 874,00	1 103 304,00	1 103 304,00	1 103 304,00	1 103 304,00	1 103 304,00	1 103 304,00
Capital Surplus						0,00	0,00	0,00	0,00	0,00
Retained Earnings	-370 377,00	-388 545,00	-346 927,00	-217 413,00	-182 680,00	-26 488,92	-38 481,84	-52 918,35	-57 598,61	-63 067,58
Accrued Comprehensive Income	0,00	0,00	0,00	0,00	0,00					
Treasury Stock						0,00	0,00	0,00	0,00	0,00
Total Equity	**302 183,00**	**284 672,00**	**478 278,00**	**877 461,00**	**920 624,00**	**1 076 815,08**	**1 064 822,16**	**1 050 385,65**	**1 045 705,39**	**1 040 236,42**
Total Liabilities and Equity	**1 105 656,00**	**1 097 529,00**	**1 241 172,00**	**2 169 476,00**	**1 932 425,00**	**2 124 977,14**	**2 094 568,45**	**2 059 139,31**	**2 047 058,70**	**2 033 032,74**

CASH FLOW STATEMENT

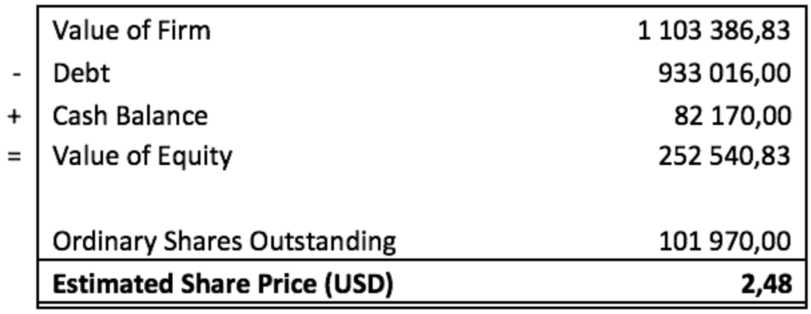
USD '000	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Net Income from Continuing Operations	-370180,00	-2709,00	60538,00	179635,00	62855,00	-26488,92	-38481,84	-52918,35	-57598,61	-63067,58
Depreciation	72365,00	50973,00	53292,00	73760,00	104149,00	92191,10	92191,10	94793,31	94793,31	94793,31
Total Cash Flow not affecting CF	352155,00	-7633,00	-24914,00	-21109,00	7084,00	-9358,50	-8358,56	-7132,66	-6641,14	-6081,11
Change in Inventories										
Change in Receivables	-19794,00	-6633,00	-50904,00	-25880,00	44496,00	-13529,41	-12083,81	-10311,55	-9600,98	-8791,35
Other Operating Activities	-7003,00	-19245,00	-17072,00	-39617,00	-8608,00	-13416,81	-11983,24	-10225,73	-9521,07	-8718,18
Net Cash-Flow Operating	**27543,00**	**14753,00**	**20940,00**	**166789,00**	209976,00	**29397,46**	**21283,64**	**14205,00**	**11431,50**	**8135,10**
Net CAPEX	-2518,00	-1904,00	-2084,00	-236229,00	-9226,00	-4051,62	-3618,71	-3087,98	-2875,18	-2632,72
Increase in Investements	0,00	-9120,00	1179,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Other Investing Activities	-3344,00	5224,00	110711,00	-645740,00	46050,00	92748,58	82838,55	70689,12	65817,88	60267,58
Net Cash-Flow Investing	**-5862,00**	**-5800,00**	**109806,00**	**-881969,00**	**36824,00**	**88696,96**	**79219,84**	**67601,15**	**62942,70**	**57634,86**
Dividends Paid	-32231,00	-10030,00	-10165,00	-15139,00	-46847,00	9757,08	14174,62	19492,25	21216,20	23230,67
Net Common Stock Issuance	65771,00	0,00	111190,00	242264,00	7558,00	0,00	0,00	0,00	0,00	0,00
Net Borrowings	-64356,00	624,00	-81512,00	452442,00	-235820,00	130264,95	-10912,68	-11949,05	-3873,83	-4526,64
Other Financing Activities	16913,00	-242,00	-13108,00	-30767,00	0,00	-832,10	-743,19	-634,19	-590,49	-540,70
Net Cash Flows Financing	**-13903,00**	**-9648,00**	**6405,00**	**648800,00**	**-275109,00**	**139189,93**	**2518,75**	**6909,01**	**16751,88**	**18163,33**
Net Cash Flow	**19502,00**	**10905,00**	**-82461,00**	**1697558,00**	**-101957,00**	**257284,35**	**-55417,45**	**-46487,14**	**-34759,31**	**-31336,43**

Figure A.30: Financial Statements



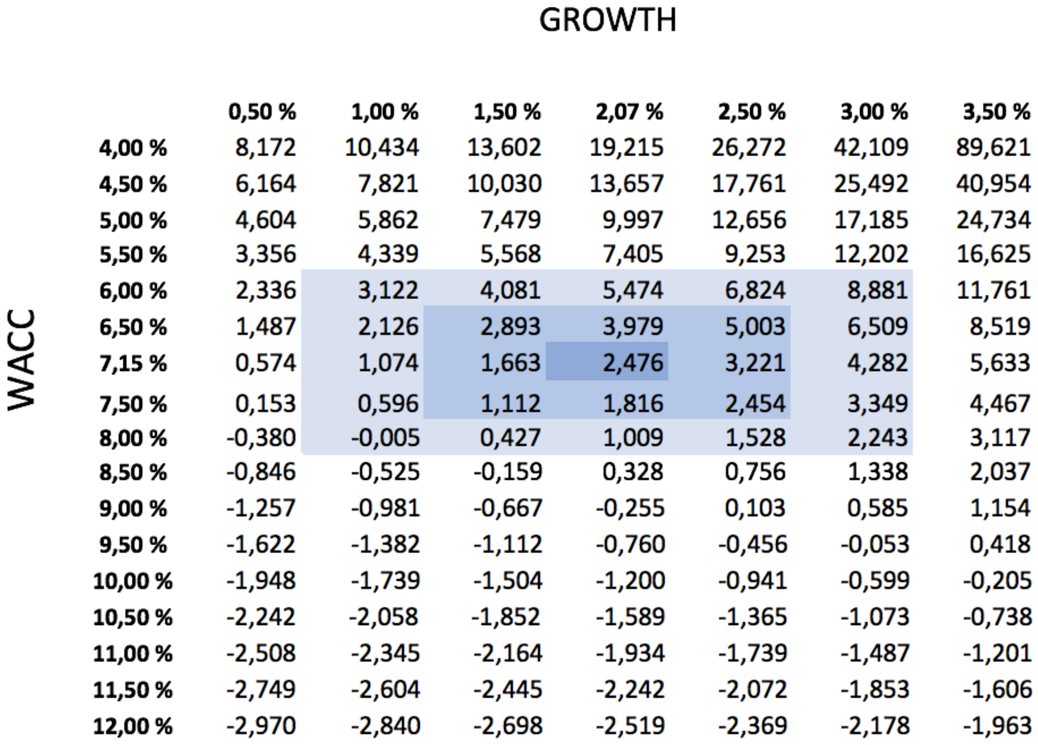
	USD '000	2017	2018	2019	2020	2021	TV
=	**Total Revenues**	**220634,627**	**197060,193**	**168158,566**	**156570,630**	**143367,326**	
-	COGS	117509,280	104953,614	89560,701	83389,005	76356,969	
-	Depreciation	92191,096	92191,096	94793,306	94793,306	94793,306	
-	General and Administrative Expense	10376,766	9268,026	7908,741	7363,744	6742,773	
-	Other Operating Expense	0,000	0,000	0,000	0,000	0,000	
=	EBITA	**557,485**	**-9352,543**	**-24104,183**	**-28975,425**	**-34525,722**	
-	Cash Tax	0,000	0,000	0,000	0,000	0,000	
=	NOPLAT	**557,485**	**-9352,543**	**-24104,183**	**-28975,425**	**-34525,722**	
+	Depreciation	92191,096	92191,096	94793,306	94793,306	94793,306	
-	Increase in WC	-20693,730	-2338,511	-2866,952	-1149,487	-1309,727	
-	Investment in CAPEX	-4051,621	-3618,713	-3087,978	-2875,183	-2632,724	
=	**FCF**	**109390,689**	**81558,351**	**70468,097**	**64092,186**	**58944,587**	**1184399,205**

Figure A.31: FCF



	Value of Firm	1 103 386,83
-	Debt	933 016,00
+	Cash Balance	82 170,00
=	Value of Equity	252 540,83
	Ordinary Shares Outstanding	101 970,00
	Estimated Share Price (USD)	**2,48**

Figure A.32: Share Price

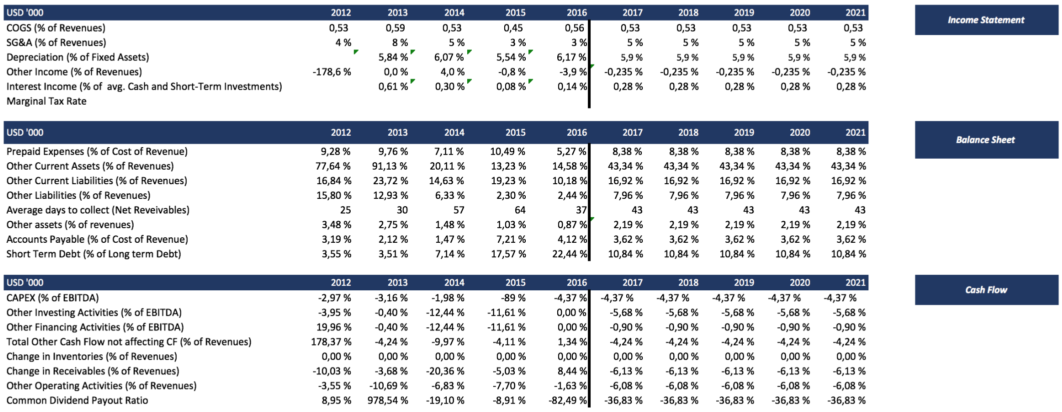


GROWTH

WACC

	0,50 %	**1,00 %**	**1,50 %**	**2,07 %**	**2,50 %**	**3,00 %**	**3,50 %**
4,00 %	8,172	10,434	13,602	19,215	26,272	42,109	89,621
4,50 %	6,164	7,821	10,030	13,657	17,761	25,492	40,954
5,00 %	4,604	5,862	7,479	9,997	12,656	17,185	24,734
5,50 %	3,356	4,339	5,568	7,405	9,253	12,202	16,625
6,00 %	2,336	3,122	4,081	5,474	6,824	8,881	11,761
6,50 %	1,487	2,126	2,893	3,979	5,003	6,509	8,519
7,15 %	0,574	1,074	1,663	2,476	3,221	4,282	5,633
7,50 %	0,153	0,596	1,112	1,816	2,454	3,349	4,467
8,00 %	-0,380	-0,005	0,427	1,009	1,528	2,243	3,117
8,50 %	-0,846	-0,525	-0,159	0,328	0,756	1,338	2,037
9,00 %	-1,257	-0,981	-0,667	-0,255	0,103	0,585	1,154
9,50 %	-1,622	-1,382	-1,112	-0,760	-0,456	-0,053	0,418
10,00 %	-1,948	-1,739	-1,504	-1,200	-0,941	-0,599	-0,205
10,50 %	-2,242	-2,058	-1,852	-1,589	-1,365	-1,073	-0,738
11,00 %	-2,508	-2,345	-2,164	-1,934	-1,739	-1,487	-1,201
11,50 %	-2,749	-2,604	-2,445	-2,242	-2,072	-1,853	-1,606
12,00 %	-2,970	-2,840	-2,698	-2,519	-2,369	-2,178	-1,963

Figure A.33: Sensitivity

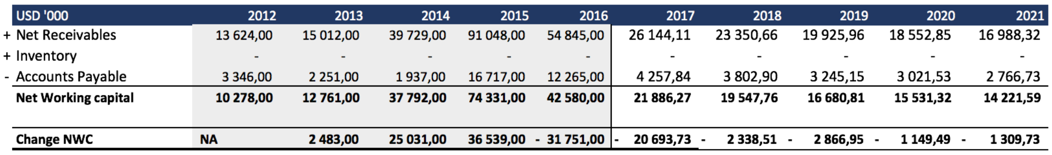


USD '000	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
COGS (% of Revenues)	0,53	0,59	0,53	0,45	0,56	0,53	0,53	0,53	0,53	0,53
SG&A (% of Revenues)	4 %	8 %	5 %	3 %	3 %	5 %	5 %	5 %	5 %	5 %
Depreciation (% of Fixed Assets)		5,84 %	6,07 %	5,54 %	6,17 %	5,9 %	5,9 %	5,9 %	5,9 %	5,9 %
Other Income (% of Revenues)	-178,6 %	0,0 %	4,0 %	-0,8 %	-3,9 %	-0,235 %	-0,235 %	-0,235 %	-0,235 %	-0,235 %
Interest Income (% of avg. Cash and Short-Term Investments)		0,61 %	0,30 %	0,08 %	0,14 %	0,28 %	0,28 %	0,28 %	0,28 %	0,28 %
Marginal Tax Rate										

USD '000	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Prepaid Expenses (% of Cost of Revenue)	9,28 %	9,76 %	7,11 %	10,49 %	5,27 %	8,38 %	8,38 %	8,38 %	8,38 %	8,38 %
Other Current Assets (% of Revenues)	77,64 %	91,13 %	20,11 %	13,23 %	14,58 %	43,34 %	43,34 %	43,34 %	43,34 %	43,34 %
Other Current Liabilities (% of Revenues)	16,84 %	23,72 %	14,63 %	19,23 %	10,18 %	16,92 %	16,92 %	16,92 %	16,92 %	16,92 %
Other Liabilities (% of Revenues)	15,80 %	12,93 %	6,33 %	2,30 %	2,44 %	7,96 %	7,96 %	7,96 %	7,96 %	7,96 %
Average days to collect (Net Reveivables)	25	30	57	64	37	43	43	43	43	43
Other assets (% of revenues)	3,48 %	2,75 %	1,48 %	1,03 %	0,87 %	2,19 %	2,19 %	2,19 %	2,19 %	2,19 %
Accounts Payable (% of Cost of Revenue)	3,19 %	2,12 %	1,47 %	7,21 %	4,12 %	3,62 %	3,62 %	3,62 %	3,62 %	3,62 %
Short Term Debt (% of Long term Debt)	3,55 %	3,51 %	7,14 %	17,57 %	22,44 %	10,84 %	10,84 %	10,84 %	10,84 %	10,84 %

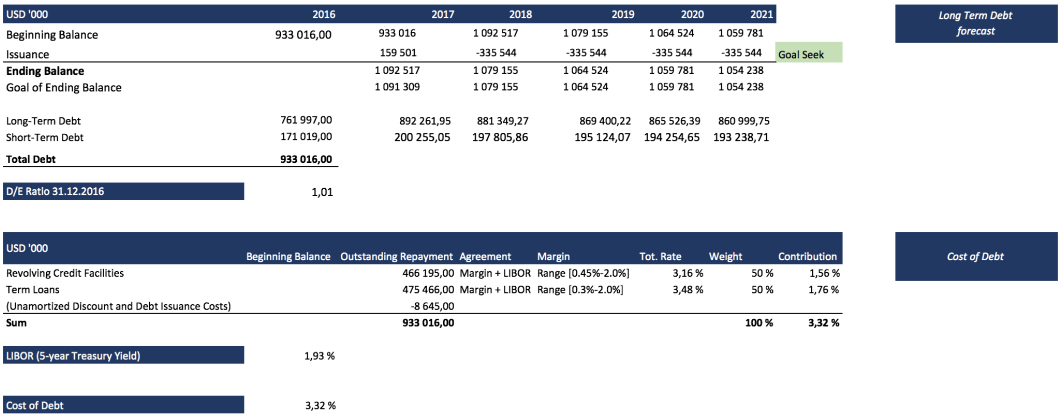
USD '000	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
CAPEX (% of EBITDA)	-2,97 %	-3,16 %	-1,98 %	-89 %	-4,37 %	-4,37 %	-4,37 %	-4,37 %	-4,37 %	-4,37 %
Other Investing Activities (% of EBITDA)	-3,95 %	-0,40 %	-12,44 %	-11,61 %	0,00 %	-5,68 %	-5,68 %	-5,68 %	-5,68 %	-5,68 %
Other Financing Activities (% of EBITDA)	19,96 %	-0,40 %	-12,44 %	-11,61 %	0,00 %	-0,90 %	-0,90 %	-0,90 %	-0,90 %	-0,90 %
Total Other Cash Flow not affecting CF (% of Revenues)	178,37 %	-4,24 %	-9,97 %	-4,11 %	1,34 %	-4,24 %	-4,24 %	-4,24 %	-4,24 %	-4,24 %
Change in Inventories (% of Revenues)	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Change in Receivables (% of Revenues)	-10,03 %	-3,68 %	-20,36 %	-5,03 %	8,44 %	-6,13 %	-6,13 %	-6,13 %	-6,13 %	-6,13 %
Other Operating Activities (% of Revenues)	-3,55 %	-10,69 %	-6,83 %	-7,70 %	-1,63 %	-6,08 %	-6,08 %	-6,08 %	-6,08 %	-6,08 %
Common Dividend Payout Ratio	8,95 %	978,54 %	-19,10 %	-8,91 %	-82,49 %	-36,83 %	-36,83 %	-36,83 %	-36,83 %	-36,83 %

Figure A.34: Drivers



	USD '000	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
+	Net Receivables	13 624,00	15 012,00	39 729,00	91 048,00	54 845,00	26 144,11	23 350,66	19 925,96	18 552,85	16 988,32
+	Inventory	-	-	-	-	-	-	-	-	-	-
-	Accounts Payable	3 346,00	2 251,00	1 937,00	16 717,00	12 265,00	4 257,84	3 802,90	3 245,15	3 021,53	2 766,73
	Net Working capital	**10 278,00**	**12 761,00**	**37 792,00**	**74 331,00**	**42 580,00**	**21 886,27**	**19 547,76**	**16 680,81**	**15 531,32**	**14 221,59**
	Change NWC	**NA**	**2 483,00**	**25 031,00**	**36 539,00**	**- 31 751,00**	**- 20 693,73**	**- 2 338,51**	**- 2 866,95**	**- 1 149,49**	**- 1 309,73**

Figure A.35: Net Working Capital



USD '000	2016	2017	2018	2019	2020	2021	
Beginning Balance	933 016,00	933 016	1 092 517	1 079 155	1 064 524	1 059 781	
Issuance		159 501	-335 544	-335 544	-335 544	-335 544	Goal Seek
Ending Balance		1 092 517	1 079 155	1 064 524	1 059 781	1 054 238	
Goal of Ending Balance		1 091 309	1 079 155	1 064 524	1 059 781	1 054 238	
Long-Term Debt	761 997,00	892 261,95	881 349,27	869 400,22	865 526,39	860 999,75	
Short-Term Debt	171 019,00	200 255,05	197 805,86	195 124,07	194 254,65	193 238,71	
Total Debt	**933 016,00**						

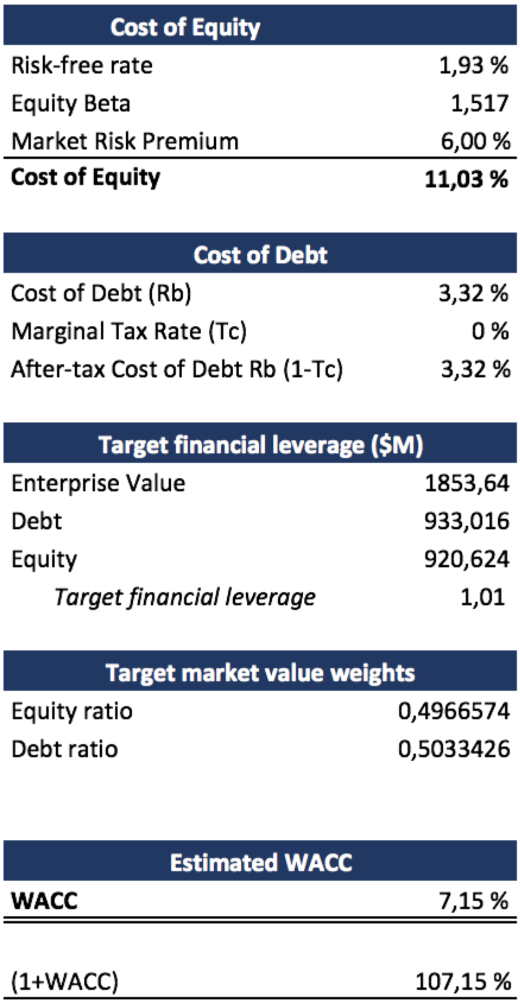
D/E Ratio 31.12.2016	1,01

USD '000	Beginning Balance	Outstanding Repayment	Agreement	Margin	Tot. Rate	Weight	Contribution
Revolving Credit Facilities		466 195,00	Margin + LIBOR	Range [0.45%-2.0%]	3,16 %	50 %	1,56 %
Term Loans		475 466,00	Margin + LIBOR	Range [0.3%-2.0%]	3,48 %	50 %	1,76 %
(Unamortized Discount and Debt Issuance Costs)		-8 645,00					
Sum		**933 016,00**				**100 %**	**3,32 %**

LIBOR (5-year Treasury Yield)	1,93 %

Cost of Debt	3,32 %

Figure A.36: Cost of Debt



Cost of Equity	
Risk-free rate	1,93 %
Equity Beta	1,517
Market Risk Premium	6,00 %
Cost of Equity	**11,03 %**

Cost of Debt	
Cost of Debt (Rb)	3,32 %
Marginal Tax Rate (Tc)	0 %
After-tax Cost of Debt Rb (1-Tc)	3,32 %

Target financial leverage ($M)	
Enterprise Value	1853,64
Debt	933,016
Equity	920,624
Target financial leverage	1,01

Target market value weights	
Equity ratio	0,4966574
Debt ratio	0,5033426

Estimated WACC	
WACC	7,15 %
(1+WACC)	107,15 %

Figure A.37: Key Metrics

B. Appendix: Coding

B.1 MathLab

Historically plots of freight rates:

```
figure;
subplot(2,1,1);
plot(Dates,MR);
datetick();
title('Actual IFTC2D1M (MR-rates)');
xlabel('Date');
ylabel('$ / day');

figure;
subplot(2,1,1);
plot(Dates,LR1):
datetick();
title('Actual IFTC5D1M (LR1-rates)');
xlabel('Date');
ylabel('$ / day');

figure;
subplot(2,1,1);
plot(Dates,LR2);
datetick();
title('Actual IFTD7D1M (LR2-rates)');
xlabel('Date');
ylabel('$ / day');

figure;
subplot(2,1,1);
plot(Dates,VLCC):
datetick();
title('Actual IFTD3D1M (LR1-rates)');
```

```
xlabel('Date');
ylabel('$ / day');
```

Autocorrelation of freight rates

```
Autocorr(MR);
Parcorr(MR);

Autocorr (LR1);
Parcorr (LR1);

Autocorr (LR2);
Parcorr (LR2);

Autocorr (VLCC);
Parcorr (VLCC);
```

Simulating Freight rates – Ou process

Simulation of VLCCIFTD3D1INDEX. Procedure for simulations of the other parameters is identical only change of the respectively sample.

```
PriceDates = Dates;
PriceTimes = yearfrac(PriceDates(1), PriceDates);

%CALIBRATION
seasonMatrix = @(t) [sin(2.*pi.*t) cos(2.*pi.*t) sin(4.*pi.*t) ...
    cos(4.*pi.*t) t ones(size(t, 1), 1)];
C = seasonMatrix(PriceTimes);
seasonParam = C\VLCC;

X = VLCC-C*seasonParam;

% Prices at t, X(t)
Pt = X(2:end);

% Prices at t-1, X(t-1)
Pt_1 = X(1:end-1);

% Discretization for daily prices
dt = 1/250;

% PDF for discretized model
mrjpdf = @(Pt, a, phi, mu_J, sigmaSq, sigmaSq_J, lambda) ...
    lambda.*exp((-(Pt-a-phi.*Pt_1-mu_J).^2)./ ...
```

```
    (2.*(sigmaSq+sigmaSq_J))).* (1/sqrt(2.*pi.*(sigmaSq+sigmaSq_J))) + ...
    (1-lambda).*exp((-(Pt-a-phi.*Pt_1).^2)/(2.*sigmaSq)).* ...
    (1/sqrt(2.*pi.*sigmaSq));

% Constraints:
% phi < 1 (k > 0)
% sigmaSq > 0
% sigmaSq_J > 0
% 0 <= lambda <= 1
lb = [-Inf -Inf -Inf 0 0 0];
ub = [Inf 1 Inf Inf Inf 1];

% Initial values
x0 = [0 0 0 var(X) var(X) 0.5];

% Solve maximum likelihood
params = mle(Pt,'pdf',mrjpdf,'start',x0,'lowerbound',lb,'upperbound',ub,...
    'optimfun','fmincon');

% Obtain calibrated parameters
alpha = params(1)/dt
kappa = params(2)/dt
mu_J = params(3)
si
gma = sqrt(params(4)/dt)
sigma_J = sqrt(params(5))
lambda = params(6)/dt

rng default;
% Simulate for about 5 years
nPeriods = 365*5+40;
nTrials = 10000;
n1 = randn(nPeriods,nTrials);
n2 = randn(nPeriods, nTrials);
j = binornd(1, lambda*dt, nPeriods, nTrials);
SimPrices = zeros(nPeriods, nTrials);
SimPrices(1,:) = X(end);
for i=2:nPeriods
    SimPrices(i,:) = alpha*dt + (1-kappa*dt)*SimPrices(i-1,:) + ...
                sigma*sqrt(dt)*n1(i,:) + j(i,:).*(mu_J+sigma_J*n2(i,:));
end
```

```

% Add back seasonality
SimPriceDates = daysadd(PriceDates(end),0:nPeriods-1);
SimPriceTimes = yearfrac(PriceDates(1), SimPriceDates);
CSim = seasonMatrix(SimPriceTimes);
VLCCSimPrices = SimPrices + repmat(CSim*seasonParam,1,nTrials);

% Plot VLCC Rates and simulated Rates
figure;
subplot(2, 1, 1);
plot(PriceDates, VLCC);
hold on;
plot(SimPriceDates(2:end), VLCCSimPrices(2:end,1), 'red');
seasonLine = seasonMatrix([PriceTimes; SimPriceTimes(2:end)])*
    seasonParam;
plot([PriceDates; SimPriceDates(2:end)], seasonLine, 'green');
hold off;
datetick();
title('Actual VLCC Rates and Simulated Rates)');
xlabel('Date');
ylabel('VLCC Freight Rate)');
legend('market', 'simulation');

VLCCINDEX=mean(VLCCSimPrices,2)
```

B.2 STATA

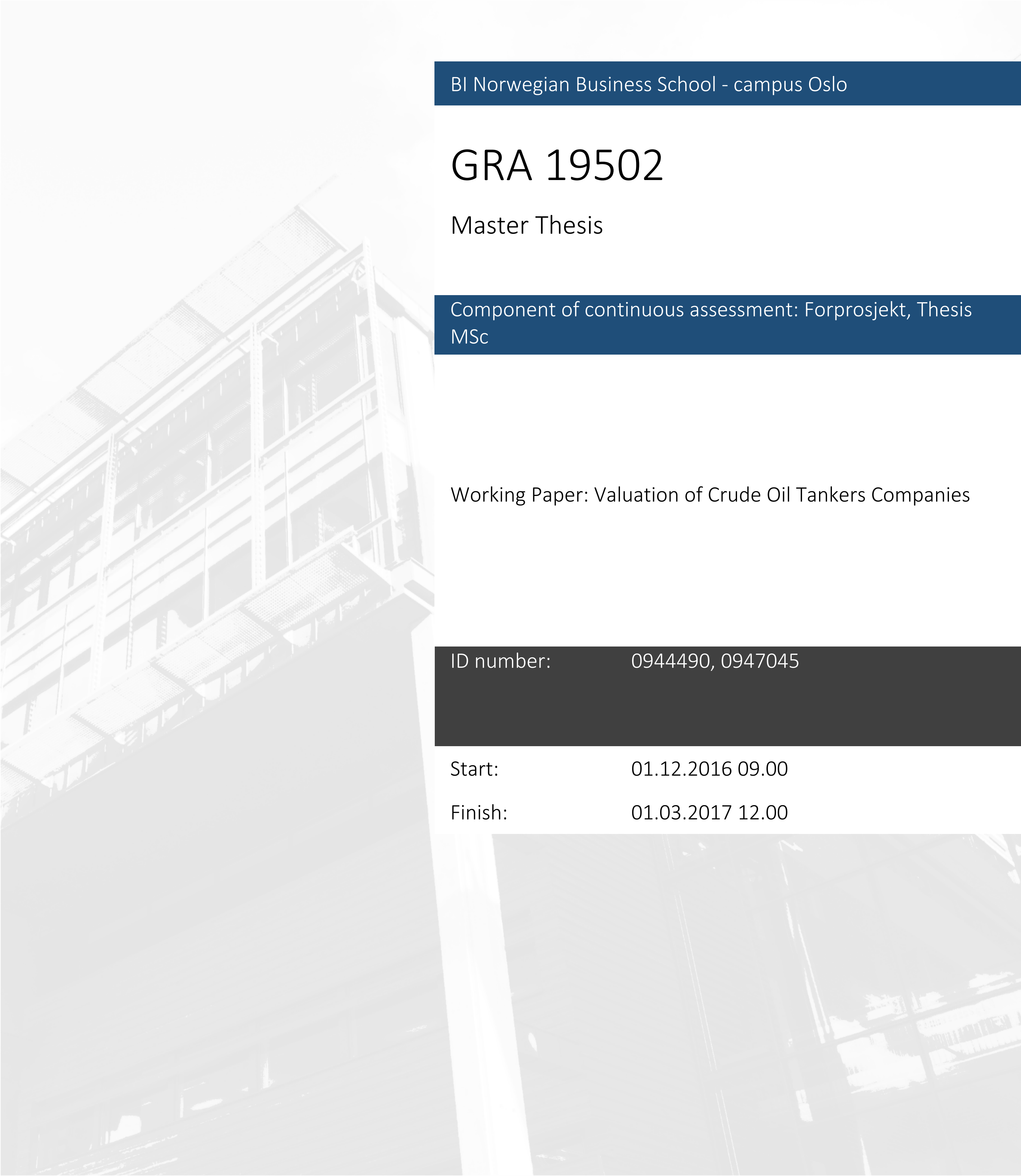
```
summarize MRIFTC2D1MIndex LR1IFTC5D1MIndex LR2IFTD7D1MIndex
    VLCCIFTD3D1MIndex\\

pac MRIFTC2D1MIndex
pac LR1IFTC5D1MIndex
pac LR2IFTD7D1MIndex
pac VLCCIFTD3D1MIndex

Varsoc MRIFTC2D1MIndex, maxlag(30)
Varsoc LR1IFTC5D1MIndex, maxlag(30)
Varsoc LR2IFTD7D1MIndex, maxlag(30)
Varsoc VLCCIFTD3D1MIndex, maxlag(30)

dfuller MRIFTC2D1MIndex, lags(1)
dfuller LR1IFTC5D1MIndex, lags(2)
dfuller LR2IFTD7D1MIndex, lags(1)
```

```
dfuller VLCCIFTD3D1MIndex, lags(2)
```



BI Norwegian Business School - campus Oslo

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Working Paper: Valuation of Crude Oil Tankers Companies

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Table of Contents

1.0 INTRODUCTION

This paper is an introductory working paper for our final Master Thesis. As a result, the aim of this paper is to show which direction it is heading. Consequently, parts of the paper may be removed or changed in the process.

1.1 Topic Specification

The purpose of this paper is to determine the fundamental value of shipping firms operating in transportation of crude oil, and analyze the effect of oil price on these shipping firms. More specific, a carefully analysis of the VLCC should determine a possible future income flow for the valuation purpose. To do so, a model based on the DCF approach is to be developed. The model will simulate income for a shipping company under a freight rate scenario implied by oil price rates and world trade activity. The aim is to develop a shipping valuation model that can project a possible valuation of the firm. Respectively, the (working) research question is:

"How do correlation between stochastic freight rates and oil prices affect valuation of shipping companies and what is the influence for their fundamental value?"

1.2 Choice of Topic

Our main purpose of writing a master thesis is to add value to our understanding of business and finance. Evidentially apply as much of theory learned throughout the study with focus to achieve expert knowledge within a precisely defined topic.

In today's world, we are fully dependent of oil as an energy resource to live the life we live. It is therefore truly a situation where the modern world is dependent of cheap energy as oil and other unrecoverable sources. Lately, we have experienced a great downfall in the price of crude oil, which makes this energy source even more productive. To sustain the modern world as we live today, we are very reliant on the distribution of oil worldwide. This operation is mainly providing by crude oil tankers. Sovereign of high or low price this product has to be distributed whatever. Subsequently, this paper is going to examine the influence of the oil price on the related shipping market.

The valuation of shipping companies is a complex operation and concern high level of uncertainty. The main obstacles are to predict the cash flow into the infinite future, as the shipping industry is highly volatile, and the market is heavily fluctuated. Due to the complexity of the industry, a valuation analysis as suggested, not only gain higher understanding of the shipping industry but will as well be applicable to gain a better understanding of valuation of other industries. The key motivational part is improving statistical knowledge, modelling, complex valuation and industry insight into a key part of Norwegian economy.

1.3 Contribution

This thesis will investigate the effectiveness of correlation between oil and freight rate for valuation of shipping firms' dependent on the freight rate. As far as we know, this are not analyzed earlier and will be a benefit for supplementary valuation research.

1.4 Guideline

- Step 1: Build a stochastic model by combining existing models to value a VLCC for revenue purpose.
- Step 2: Investigate the correlation between vessel values determined by the model built and oil prices as well as risk (sensitivity analysis).
- Step 3: Valuation of companies operating only in VLCC segment.

1.5 Limitations

The model that is to be developed will only be suitable for valuing shipping companies as defined. The revenue of the shipping company in this case will rely on a one-factor model, where oil prices modelled with stochastic volatility derive the projected future cash flow for each vessel. To obtain validity of our final valuation result, it is required to assume that bunker, interest and foreign exchange speculation do not occur and are perfectly hedged. Otherwise, this will influence the projected cash flow positive or negative as well as the risk distribution.

2.0 BACKROUND AND LITERATURE

This section is dedicated to clarify and present the most fundamental information according to valuation in the shipping industry from literature. First a very briefly section presents the shipping industry. Further, stochastic modelling is discussed and gives an indication for scale of investigation in this paper.

2.1 Shipping Industry

2.1.1 Segments

Wijnolst and Waals (1999) carefully describe their perspective of the shipping industry. The main segments suggested are oil tanker, chemical tanker, gas tanker, dry bulk carrier, container and reefer. This clearly specification is necessary to meet the different needs of services. As this paper is limited to oil tankers, this segment gets further explanation.

Oil tankers consist of crude tankers and product tankers, applicable to unrefined or refined oil. There exists a large diversity of differences in vessel size. Examples of tankers classification is Handymax, Panamax, Aframax, Suezmax and VLCC. An explanation of the large diversity is the Parcel Size Distribution (PSD) of each commodity (Kavussanos and Visvikis 2006). As some commodities are transported in different parcel size than others, this distribution describes the range of different parcel sizes. In addition, the effect from port and seaway restrictions has developed the different vessels sizes. This paper will focus on Very Large Crude Carriers (VLCC).

2.1.2 Freight Rates

By definition, freight rates represent the price charged for providing services by seaborne transportation (Alizadeh and Nomikos 2009). Respectively, spot freight rates reflect today's price charged for providing services of seaborne transportation.

In the papers by Adland and Koekebakker (2007) and Kavussanos and Visvikis (2006), they document high correlation between freight rates and ship prices. This gives fundamental for valuation purposes of freight rates modelling. Due to high uncertainty of freight rates, shipping companies encounter high volatility. Therefore, the choice of model is essential for the result concerning a valuation process.

2.2 Freight rate modelling

In the shipping literature, prior studies have examined valuation from different perspectives. In the case of stochastic modelling in shipping, much of the literature done relates to financial valuation of implied real options within different types of ships and contracts. Subsequently, this has to be transformed an applied in our paper.

Several researches have studied the stochastic properties of freight rates in a discrete-time framework. It appears that carefully modelling is necessary as the freight rate markets experience quite complex stochastic dynamics (Benth and Koekebakker 2016). Jorgensen and Giovanni (2009) develop a continuous time approach to a one factor stochastic mean-reverting model of spot freight rates in consistency with risk management. The model builds on earlier studies by Bjerksund and Ekern (1997) which propose that the instantaneous cash flow generated by an operating ship may be described by the process:

$$D(t)dt = (aX(t) - b)dt$$

A natural interpretation of this is that D (t) reflects the generated cash flow, a is the size of cargo, b is the total cash flow rate and X (t) represents the uncertain spot freight rates. Furthermore, Jorgensen and Giovanni (2009) model the spot freight rate as a mean-reverting Gaussian Ornstein-Uhlenbeck stochastic differential equation as the following process:

$$dX(t) = k\big(\theta - X(t)\big)dt + \sigma dW(t)$$

In this process θ is the constant mean-reverting long-term level, k is the speed of mean reversion, s is the instantaneous volatility of spot freight rates and W ( ) is a standard Wiener process.

In the paper by Tvedt (1997) the common proposed idea that freight rate follows an Ornstein-Uhlenbeck process is developed by suggesting a geometric mean reversion process relating income uncertainty with a mean-reverting process.

Kavussanos (1996) find that oil prices are negatively correlated to tanker prices, and positive correlated to their volatilities, whereas small vessels are less volatile than larger ones. This relation is to be tested for and hopefully used to predict the unhedged cash flow related to revenues for shipping firms.

We see that a variety of literature suggest to model the stochastic freight rate process as a mean-reverting process. This is going to be the building blocks of our analysis. We also want to take advantage of the correlated tanker prices to oil prices in our analysis.

3.0 THEORY

3.1 Valuation

The value of a company consists of the value of its debt and equity. It exists a variety of different types of debt and equity, with the most prominent debt types being loans, leasing agreements, preferred stock and common equity. Hence, in order to calculate company value, one must be able to find feasible estimates of these types of capital financing that together make up the company's total assets. For examining debt value, the most usual method is using the market value of debt. More generally, there are three different approaches to value a company, namely the asset approach, the market approach and the income approach

3.2 Asset-Based Approach

3.2.1 Idea

In the asset-based approach, the principle is that company value is create through utilization of its assets and liabilities. In other words, it aims to determine the value in terms of the costs required to create another company able to produce an equivalent return for its owners. Hence, one needs to assess the fair value of the company's total assets. This value, the book value of assets, is calculated by subtracting the company's liabilities from its assets, by exclusively looking at the balance sheet.

3.2.2 Disadvantages

The major obstacle lies in terms of attaining fair value of intangible assets, which are non-physical assets such as human capital, brand value and internally developed products. The bottom line is that these are not expensed and consequently does not appear as a cost on the balance sheet, implying that the future value of those assets may be uncorrelated to those costs. Hence, mispricing of intangible assets may substantially over- or underestimate the company value.

3.2.3 Advantages

In situations of high uncertainty and limited information, it may be difficult to assess future cash flows and thus ultimately creating a highly uncertain estimate of company value. In addition, examining the book value of assets makes economic sense in cases where the company has a high concentration of intangible assets that makes it difficult to obtain a market value of assets.

3.3 Market-Based Approach

3.3.1 Idea

The market approach is similar to the asset approach, but it consists of pricing assets in terms of the recent sales price of comparable assets. The idea is that the market price will reflect a fair value of the assets since it is the price that the buyers and sellers are willing to accept, based on their assessments of the overall market condition and all other relevant aspects of the asset's value.

3.3.2 Disadvantages

The market approach requires finding comparable companies and asset transactions. One pitfall is that it may be difficult to both identify such assets or transactions to compare with, but also that the company's assets are so fundamentally different to what is traded that one either does not find the price on each asset or that this difference lead to mispricing. In addition, there is the case of information asymmetry between buyer and seller that can cause biasness of the asset value. Finally, the multiples used for this kind of comparable valuation are often short term because it focuses mainly on historical data and short-term forecasts.

3.1.3 Advantages:

The advantage of the market approach lies in its simplicity, which helps the user to avoid imprecise valuations of more advanced methods because of, e.g., high uncertainty or high amount of intangible assets. It uses publicly available, real data and is free of subjectivism in terms of asset value forecasting.

3.4 Income-Based Approach

3.4.1 Idea

The income approach examines the cash flows of the company. The aim is to identify the future economic benefits generated and comparing them with a required rate of return.

3.4.2 Disadvantages

One of the main disadvantages of the income approach is its sensibility to cash flow uncertainty. Unlike historical data, the income approach attempts to project future revenues (and costs), which has some obvious limitations. Another key difference between the income approach and the two other valuation approaches is that it is a valuation of assets that are yet to appear on the balance sheet. Hence, there is a risk that they will never obtain these assets. Firstly, these projections will always be somewhat subjective and hypothetical in nature. Secondly, it takes a lot of assumptions related to, e.g., the revenue growth rate and its discount rate.

3.4.3 Advantages

One key advantage is that it overcomes the issue of directly pricing intangible assets (as is a key issue in asset-based valuation). Instead, it assesses the profit potential of the company as a whole on a long-term basis. Additionally, it allows more easily creating a range of possible value estimates through sensitivity analysis changing the growth and discount rate assumptions. Where the market approach is very simple, the income approach is extensive and forward-looking

4.0 METHODOLOGY

This section will cover the details of the research objectives, its scope and the tool and technique for valuation and modelling. In this version, only some of the aspects are covered. This section will be finalised during the building process of the model.

4.1 Appropriate Valuation Method

We believe the asset approach faces a huge risk of potentially yielding a too imprecise valuation outcome due to its inability to appropriately measure the asset side of the company. The inherent volatility in the shipping industry makes it extremely difficult to use a standard DCF valuation method, mainly because the assumptions related to revenue growth and discount rate demand stable rates. None of these three methods works perfectly, and a way to overcome this is to change the standard DCF method such that it takes part of this uncertainty into account (in our case the oil price and world GDP). Hence, we will try to project future free cash flows by developing a stochastic discount model and ultimately end up with a range of possible values.

4.1.1 DCF

The enterprise discounted cash flow model (DCF) relies solely on the flow of cash in and out of the company (Koller et al.). In order to apply the DCF model correctly, the key aspect is the ability to project future cash flows. In the shipping industry, this is a particularly difficult task.

The DCF model discounts free cash flow, meaning the cash flow available to all investors – equity holders, debt holders and any other non-equity investors (Koller et al.) In projecting the FCF, one must make assumption about the revenue growth rate, which for the terminal value (TV) is required to be stable. Estimating the correct discount rate is crucial, because it can in combination with the long-time horizon cause substantial over- or underestimation of company value.

4.1.2 FCF

The free cash flows used to estimate company value is as follows (Koller and Wessels 2010):

EBITA (EBIT before goodwill amortization)
+ Depreciation
+ Amortization of other intangible assets
- Replacement CAPEX
- Replacement investment in other intangible assets
= Cash operating profit (CBIT)
- Cash taxes
-/+ Changes in other provisions
= Cash flow before new investments (CBNI)
- Investment in CAPEX
+/- Changes in working capital
- Investment in goodwill
= Free cash flow from operations

Comments:

- **Depreciation and amortization** are not expense items and consequently does not lead to neither a reduction nor increase in the company's cash position. The items are included in EBITA because of tax deductions, and are therefore added back in the calculation of FCF.
- **CAPEX** are funds used by a company to acquire or upgrade physical assets. As a result, it requires cash to replace new physical capital and replacement CAPEX are subsequently deducted from cash operating profit. CAPEX investments on the other hand, are deducted from CBNI because it is not a part of the company's core operations.
- **Cash taxes** are deducted from the operating profit.
- **Changes in provisions** are deducted (negative changes are added) because they represent a present liability from past events, which is expected to cause cash outflows (or inflows).
- **Changes in working capital** are added when the changes are positive, because it represents a cash inflow.

- **Investments in goodwill** are deducted, because they represent net cash outflow.

4.1.3 WACC

The discount rate that we aim to estimate is as follows:

$$WACC = \frac{Value\ of\ Equity}{Value\ of\ Firm} * R_{equity} + \frac{Value\ of\ Debt}{Value\ of\ Firm} * R_{debt} * (1 - Tax\ Rate)$$

4.1.4 Cost of Equity and Cost of Debt

For the cost of equity, we will use the CAPM formula:

$$R_{equity} = R_f + \beta_{equity} * (R_{market} - R_f)$$

For the cost of debt, we will use either the bond yield on outstanding debt or use the market rate of equivalent bond issues.

4.1.5 Growth Rates

Growth rates are usually split into two types. The first are the growth rates assumed in the forecast period and the second is the one used in estimating the terminal value (TV).

The shorter term growth rate used in the forecast period is usually based on a combination of historical data adjusted for market and company expectations over the forecast period. This growth rates (or different growth rates throughout the period) are usually higher than the long-term growth rates used in estimating TV, because it cannot grow faster than the overall economy in the infinite future.

4.2 Stochastic Freight Rate Model

As suggested earlier, a stochastic freight rate model is going to be built for usage of valuation. The final methodology will take place in the full version of the master thesis later this semester. As changes will occur during the process, this paper only broadly discuss the direction of the tool. We know from literature that oil prices and vessels value correlate. The vessel value will depend on the certain and uncertain freight rate at a specific time. We hope to capture this effect in the same model.

4.2.1 Historical Analysis

An investigation of the history in the VLCC freight rate in context of oil prices is of high importunacy to identify drivers for the future and develop the model. First we have to test for stationarity to identify if the usable for further analysis. If so, the building process will start. Broadly speaking, we will build a model that in best way will reflect the future value of the freight rate.

4.2.2 Building Blocks

4.2.2.1 Random Walk

By using the so-called Wiener process, a simulation of the freight rate over time could be determined. This process will reflect the stochastic process. Using this we could create a model with the idea that the best estimate of tomorrow's price is the price today plus some variation. This is the essence of random walk. Furthermore, it is distinguished between with and without drift. Mathematically, the process is as following:

$$dX_t = \mu_t + \sigma dW_t$$

4.2.2.2 Mean-Reversion Model

Another approach, and very relevant as seen from the literature discussed above, is a mean-reversion model. This model requires that the freight rate are stationary with no drift. The model proposed by Jorgensen and Giovanni (2009) discussed in 2.2 is of interest to be tested for. Further theoretically aspects will be given when the model is developed.

4.2.2.3 Correlation

This block should encounter the freight rates correlation to oil prices (and probably world trade) and try to incorporate this to get the best model. Also other correlation factors relating to risk management should be interpreted.

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