Capital Structure Choices in The Shipping Industry

An Analysis of Bulk, LNG, Container Shipping Firms

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Abstract

The thesis examines the capital structure choices of publicly listed bulk, LNG and container firms. The shipping industry is highly cyclical and volatile. Hence one would assume that most shipping companies would be under-levered to secure some degree of financial flexibility when downturns occur. Conversely, previous research on capital structure in shipping has found that shipping companies are twice as levered as the average level for companies located in the G7 countries. Implying that shipping companies’ executives are more inclined to take on financial risk making the industry a prime candidate for research on capital structure.

The paper includes a qualitative analysis based on interviews of representatives from some of the largest shipping companies within their respective segments. The data derived from the interviews are applied to create seven propositions that are tested in a statistical analysis together with the predictions of the pecking order, trade-off, and market Conditions models. The capital structure choices of firms operating in the three segments are examined using three pairs of cross-section regressions which test the different predictions of the pecking order model, trade-off model, and the market conditions models. The regressions are constructed to investigate the split in outside financing between debt and share issues, short-term versus long-term debt financing, and the split of equity financing between equity issuance and retained earnings.

The paper’s findings suggest that the pecking order model’s predictions are most applicable when explaining the capital structure choices of the shipping companies in the three segments. In addition, there is evidence that supports the trade-off theory’s prediction of a target mixture of short- to long-term debt. Moreover, only weak support for the prediction of leverage ratio adjustments where container firms were the only segment reporting equity issuance in response to a leverage ratio exceeding the target ratio. Lastly, the market conditions models’ fail to convincingly explain the behavior of firms operating in the three segments.

Keywords – Capital Structure, Shipping, Fama and French, Panel Data
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1 Introduction

For decades, capital structure has been a topic of interest for both academics and business professionals. Broadly, a company’s capital structure comprises debt and equity. Both the debt and equity portion can comprise layers of different debt and equity instruments amounting to total firm value. Academics have for long attempted to create frameworks and models explaining the capital structure choices firms make, whether certain factors determine leverage ratios, and how to maximize firm value by optimizing the capital structure.

The shipping industry is one of the most capital intensive industries in the world, placing the industry among the top eight percentile (Alexandridis et al., 2020). Moreover, the shipping industry exhibits a great deal of volatility driven by factors on both the demand and supply side of the goods transported, causing fluctuations in demand for and supply of available tonnage. The chosen capital structure must endure fluctuations in earnings stemming from freight rate volatility and prolonged low-freight rate environments. Hence, the considerations surrounding capital structure composition are among the most critical decisions a shipowner makes.

The shipping industry comprises several smaller segments, all catering to specific needs regarding transportation routes, goods transported, and services required. The bulk shipping segment is highly fragmented and homogeneous, caused by the low entry and exit barriers. The large number of smaller companies combined with the homogeneous design of the vessels and poor differentiation possibilities regarding services offered leads to the characterization of being perfectly competitive. On the other hand, the container segment is far more concentrated, where the four largest tonnage owners own approximately 60% of the world fleet (Placek, 2022). Finally, the LNG segment is a part of the specialized shipping segment, characterized by the distinct vessel specifications necessary for handling the goods and the ground handling and infrastructure necessary to transfer the goods. The three segments also differ in the typical contract length, where the bulk market is more spot-oriented and with only shorter time-charter contracts. In contrast, the charter contracts are typically more extended in the container and LNG segment, with the LNG segment exhibiting the most liquid longer time-charter market.
With the characteristics mentioned above in mind, conversely, firms operating in the shipping industry are substantially more levered than U.S. publicly listed companies (Drobetz et al., 2013). The combination of high risk and high leverage, which intuitively does not sound coherent, gives rise to the shipping industry being a prime research topic when analyzing capital structure choices in light of established capital structure theories. Therefore, this paper examines the alignment of the capital structure choices of the bulk, LNG, and container segment to the pecking order, trade-off, and market conditions models.

2 Structure

3 Methodology

3.1 Research design

The paper applies the research design proposed by (Saunders and Thornhill, 2003) as a framework for the methodology of this paper. This paper examines the capital structure
choices of shipping firms through data derived from interviews and quantitative analysis. The combination of qualitative and quantitative analysis leads the research to fall within both exploratory and explanatory research. Shipping company executives are interviewed, shifting the research towards exploratory research. Explaining the relationship between the chosen variables and capital structure choices is also touched upon. The proposed predictions by the theoretical framework and the relationship between the chosen variables can be examined by performing several regressions, all tailored to test the different predictions proposed by the theoretical framework.

Reliability and validity are essential aspects of research such as this. Reliability refers to whether the findings are replicable by pursuing the same data collection techniques and analysis (Saunders and Thornhill, 2003). The data derived from the interviews can be subject to participant bias by tailoring the interviewees’ responses to what they believe will be most beneficial for the paper. However, this issue is not considered severe due to the lack of incentives involved for any participants. Observer error and observer bias are, however, deemed more relevant. It is not easy to determine whether an interviewer with more experience and knowledge would obtain the same information or come to the same understanding and conclusions. Hence, developing a structured interview guide to combat observer error was essential.

Nevertheless, the occurrence of misinterpretation of concepts could yield differing findings. Furthermore, the sample data and quantitative analysis could also be subject to observer error. More experienced statisticians could arrive at different conclusions or highlight relationships between the analyzed variables.

Validity concerns whether the findings are accurate and can be placed in context, i.e. is the observed relationship a causal relationship? The validity of the findings in this paper can be threatened by the current state of the shipping markets for the different segments and, consequently, the financing environment and access to capital. Recency bias can occur due to the current environment, e.g., the answers provided by the interviewees can differ depending on whether the market they are operating in is thriving or not. Regarding the statistical analysis, the recent prolonged downturn in the bulk and container segment can potentially dominate the interactions for the examined variables. Different findings could be found with a sample period derived from an evenly distributed earnings environment. Hence,
the suggested capital structure choices found in this paper might only apply to the firms for that given period and can deviate in the future.

The performance of data triangulation to limit the pitfalls mentioned above was carried out. The combination of quantitative data, past research, and qualitative data from interviews can improve the reliability and validity of the results (Lauri, 2011). The quantitative data is based on data derived from CRSP and Compustat databases, structured as cross-sectional panel data. The applicability and relevance of the paper’s findings and previous empirical research are continuously drawn upon throughout the paper to highlight similarities and differences and place the findings in a broader context.

3.2 Problem Statement

The focus of the thesis will be to uncover the considerations surrounding capital structure choices in the bulk, LNG, and container shipping segments. The paper aims to answer the following research question:

"To what extent can the pecking order, trade-off and market conditions models explain the capital structure choices in the bulk, LNG and container shipping segments?"

3.3 Literature Review

The topic of capital structure theory within corporate finance has been thoroughly researched over the years. The most notable contributions to the determining factors of capital structure have been Modigliani and Miller’s irrelevance theory of 1958, Stewart Myers’ Pecking-order theory of 1984, David Durand’s Trade-off theory of 1952 as well as Baker and Wurgler’s market timing theory (Modigliani and Miller, 1958)(Myers, 1984)(Baker and Wurgler, 2002).

The application of capital structure theories to explain the capital structure determinants, target leverage ratios, and performance has been performed on both country, company, industry, and sub-industry levels. Within the shipping segment, there has been a variety of applied theories and scope, but previous research has mainly focused on determinants within specific countries and segments.
3.3 Literature Review

3.3.1 Capital Structure Determinants

Recent literature has focused on the determining factors of capital structure by examining the effects different variables have on capital structure in publicly listed shipping companies. The most commonly examined factors are tangibility, asset risk, asset structure, profitability, tax benefits, growth, age, ownership concentration, firm size, and macroeconomic environment, see (Arvanitis et al., 2012), (Drobetz et al., 2013), (Marek and Wohlstrand, 2014), (Merika et al., 2015), and (Norevik and Gulbrandsen, 2020). Previous literature has found the predictions of the trade-off model, where a positive relationship between firm size and leverage was found (Frank and Goyal, 2009), (Drobetz et al., 2013), and (Arvanitis et al., 2012) found that determining the pecking order theory could explain factors. A positive relationship between tangible assets and tax benefits against leverage was detected, but a negative relationship between size and profitability against debt. The sample contained a total of 32 listed European shipping companies, but with no distinction between the different segments of the companies (Arvanitis et al., 2012).

3.3.2 Company Locations and Segments

Previous literature has covered the shipping industry as a whole; see (Arvanitis et al., 2012) and (Drobetz et al., 2013) whom both examined determinants for capital structure for globally-listed shipping companies. They argue that because the shipping industry is highly international with a lack of local influences, the capital structure determinants are assumed to be the same across countries (Drobetz et al., 2013). Notwithstanding the previous argument, previous literature has also looked at specific countries. (Norevik and Gulbrandsen, 2020) researched shipping companies listed in Norway, and (Yang et al., 2021) examined capital structure determinants in Korea and Greece, and (Røsholm and Vannebo, 2020) delaminated even further by focusing on dry bulk firms listed in Norway. Furthermore, previous literature has also made distinctions between the different shipping segments, see (Marek and Wohlstrand, 2014) who examined the determining factors of capital structure in bulk shipping companies and its effect on performance.
3.3.3 Determining factors

Previous literature highlights tangibility, profitability, firm size, and performance as the most determining factors of capital structure (Arvanitis et al., 2012) and (Drobetz et al., 2013). However, other factors such as track record and asset risk have also found support when determining capital structure in shipping (Marek and Wohlstrand, 2014).

(Arvanitis et al., 2012) researched the determining factors that affect capital structure in European shipping companies through a panel data set approach as well as looking to identify whether there was an ideal target capital structure in shipping companies. The paper researched the alignment of shipping companies’ capital structure choices to the pecking Order theory and the trade-off theory. The statistical analysis included the following variables; firm size, tangibility, profitability, tax advantages, company growth, liquidity, and firm age. (Drobetz et al., 2013) found that globally listed shipping companies operate with a higher leverage ratio and consequently higher financial risk than average industrial firms located in the G7 countries. Similarly to previous literature and aligned with corporate finance theories, the authors found evidence of a positive correlation between asset tangibility and leverage. Profitability, operating leverage, and asset risk are counter-correlated with leverage (Drobetz et al., 2013).

Similarly to previous literature, (Merika et al., 2015) found that size, tangibility, and corporate performance were the most determining factors of structure, which is consistent with previous literature. Furthermore, a positive relationship between leverage and profitability, as well as leverage and concentrated ownership during the shipping cycle peak of 2007, and a negative relationship among the previously mentioned variables in the other periods of the study (Merika et al., 2015).

(Marek and Wohlstrand, 2014) ’s paper on capital structure determinants in the bulk segment is the only paper which combines a qualitative and quantitative analysis of the shipping industry. Their reasoning to solely examine bulk shipping companies are due to the different economics in terms of supply and demand, which characterizes the segment (Stopford, 2009) and (Marek and Wohlstrand, 2014). Hence, the companies within the bulk segment share commonalities, which enables comparison on a somewhat like-for-like basis. The paper examined the capital structure determinants of bulk shipping companies and how the capital structure choices affected financial performance. Their paper utilized qualitative and
quantitative methods to research the alignment of the shipping companies’ choice of capital structure with capital structure theories by performing qualitative interviews with shipping and bank executives and comparing the findings of these interviews to quantitative analysis. The quantitative analysis covered, similarly to previous literature, analysis using variables such as firm size, age, profitability, and ownership structure (Marek and Wohlstrand, 2014).

To summarize, the common focus of the literature has been to research and analyze the capital structure determinants in shipping companies by looking at the whole industry, where publicly listed companies make up the population sample. Distinctions are generally between geographical locations by focusing on internationally listed firms, European listed firms, or on one segment within the shipping industry, such as in the Marek and Wohlstrand’s paper on bulk shipping. The pecking order model and the trade-off model have been the favoured theories to apply to examine their alignment with practice.

4 Capital Structure Theories

![Image of the structure of the section]

Figure 4.1: Structure of the Section

4.1 Pecking Order Model

Steward Myers’ version of the pecking order theory dates back to 1984. The theory is a modification of Gordon Donaldson’s 1962 paper “Corporate Debt Capacity: A Study of Corporate Debt Policy and the Determination of Corporate Debt Capacity”. Donaldson introduced the notion of a pecking order of financing within firms. The pecking order theory on financing states that 1) firms prefer internal financing, 2) target dividend payout ratios are adapted to investment opportunities, even though dividends are sticky, payout ratios
gradually adjust to changes in investment opportunities, and 3) unpredictable fluctuations in profitability and varying investment opportunities, marketable securities are used after the firm has utilized its cash reserves 4) if external funding is necessary, short-term debt is preferred long-term, before sorting to hybrid securities, e.g., convertible bonds, and equity issuance last. Myers’ version of the pecking order model does not stipulate any target debt-equity ratio due to the difficulty of distinguishing between the internally generated funds and equity issues (Myers, 1984).

The Pecking order model assumes asymmetric information between management and the market, which causes a negative signalling effect when firms issue equity. According to the model, the signalling effect is a consequence of the assumptions by market participants that firms choose to issue equity when they regard the firm’s share price as overvalued. Another reason why the pecking order predicts the financing order is because of the transaction costs related to raising funds, where short-term debt is the cheapest form of outside financing in terms of transaction cost, and equity issuance is the most expensive. There is an opposite signalling effect when a firm issues debt as opposed to equity because the management signals that it is confident in the future of the firm and its ability to service the debt (Myers, 1984). When a company faces fluctuations in investment, dividends, and earnings, the model predicts that fluctuations are absorbed by debt rather than equity and short-term debt before long-term debt. Moreover, the model predicts that high \( P/B \) firms tend to favour long-term debt over short-term debt.

The trade-off model predicts that more profitable firms should borrow more due to their strong debt-service capacity. Conversely, the pecking order model predicts that more profitable firms should borrow less because investments can be financed to a greater degree by internally generated funds (Allen et al., 2019).

### 4.2 Trade-off model

The trade-off model states that all firms have an optimal leverage ratio or a target leverage ratio which all firms should strive to reach and maintain. According to Durand, the optimal leverage ratio is where the costs of financial distress and embarrassment stemming from the
increased financial leverage are offset by the benefits of the present-value tax shields derived from interest expenses. The relationship between the costs and benefits of debt and its effect on firm value is illustrated by Figure 4.2 below.

The trade-off model predicts that all firms have an optimal leverage ratio and that a company’s leverage ratio reverts to this supposed optimal target. The model predicts that managers will favor more debt when the leverage surplus becomes negative, i.e. the target leverage ratio exceeds the company’s leverage ratio, and favor less debt when the surplus increases. The Trade-off model also predicts that firms have a target mix of short- and long-term debt and that variations in a company’s cash flows are absorbed by short-term debt. Short-term debt is deemed riskier than long-term, which enhances the incentive of creditors to monitor the company as a result of the increased probability of bankruptcy and expected bankruptcy cost, which according to the model, will discipline managers (Fama and French, 2012). Due to costs and delays of adjusting a company’s capital structure, such as transaction costs, the Trade-off model’s prediction of firms operating at an optimum leverage ratio often falls short. Implications caused by the realities of real-world financial markets hinder companies from adjusting their leverage to events that deviate the company’s leverage ratio from its target. Furthermore, the prediction that managers have an optimal leverage ratio, defined as a pre-defined number, is less likely; instead, they often operate with the desired credit rating Allen et al. (2019).

The trade-off between the costs of financial distress and the benefits of tax shields has been
the subject of many empirical studies attempting to establish merit to Durand’s Trade-off theory. There is empirical evidence that companies rarely change their capital structure to changes in corporate tax rates. Companies today do not operate with a different debt ratio than companies during the early 1900s, even though corporate tax rates have increased dramatically. A higher corporate tax rate would imply an excellent tax shield, incentivizing managers to increase debt ratios to shield more of their interest expenses, yielding higher profits (Allen et al., 2019).

4.3 Market Conditions Models

There are several variations to the Market Conditions Model regarding equity issuance, often referred to as a Market-timing theory. The different variations share the same assumption that firms with a high price-to-book ratio ($P/B$) tend to issue more new shares than firms trading at a lower $P/B$. Whether a firm’s shares are over- or undervalued is based on the behavioral story of a value premium in average stock returns, which argues that firms with a high $P/B$ tend to be overvalued, and vice versa (Fama and French, 2012). Baker and Wurgler first introduced the theory of market-timing in 2002. The gist of the theory is that firms tend to issue equity after the firm’s share price has recently increased than when the share price has decreased. The model relies on the assumption of mispricing. Hence Eugene Fama and Kenneth French coined the model “the mispricing model” in their 2012 paper on capital structure choices (Baker Wurgler, 2002; Fama French, 2012). In the market-timing model, managers attempt to take advantage of the gradual re-pricing of their company’s shares. Baker and Wurgler discovered that so-called growth firms, i.e. firms with a high $P/B$ ratio, tend to prefer equity issuance over debt and retained earnings. In cases of debt issuance, overvalued long-term debt is preferred to short-term debt. However, for firms trading at low $P/B$ ratios, the reverse behavior is observed (Fama and French, 2012).

Several theories predict a positive relation between share issuance and the development of a firm’s $P/B$ ratio. However, the theories differ as to the rationale behind the behavior. According to the irrelevance theory of Modigliani and Miller, a low cost of capital does not suggest that equity is less costly than other forms of financing. If the irrelevance theory holds, managers’ rationale is not supported by modern financial theories when acting as if a high
\( P/B \) implies a low cost of equity. Their rationale can better be explained by so-called neutral mutation, coined by Miller in 1977. A neutral mutation is defined as a behavior depicted by managers or firms that fall into a financing pattern or habit that signals very little about the cost of equity issuance compared to other financing alternatives. Such behavior has little to no effect on firm value (Modigliani and Miller, 1958)(Myers, 1984)(Fama and French, 2012).

5 The Shipping Industry

![Diagram of the Shipping Industry](image)

**Figure 5.1:** Structure of the Section

The shipping industry is vital to the world economy, where approximately 90% of all goods purchased have been on board a vessel (OECD, 2018). Moreover, global sea transport ties the different parts of the world together economically and environmentally friendly. The different shipping segments each cater to different customers, often in different parts of the world, using different ships and transportation routes. (Stopford, 2009).

5.1 Supply and Demand in Shipping

The demand for sea transportation is influenced by changes in the world economy, seaborne commodity trades, the average haul, random shocks, and transport costs. The state of the world economy is the most critical factor because goods that are the necessary inputs for production are shipped; hence a growing world economy translates to increased demand for these inputs and consequently increased demand for transport.
The shipping industry is driven by four interconnected markets: the newbuilding, sale and purchase, freight and demolition market. The freight market serves as the connector between the three previously mentioned markets, where fluctuations in the freight market cause changes in the other three. Freight rates and the value of second-hand vessels are closely correlated, as illustrated by Figure 5.3; as freight rates decrease, the value of older tonnage follows, eventually leading to increased scrapping activity.

The recovery phase is characterized by a stabilization of the supply and demand functions where the spread between supplied and demanded ships tightens, i.e. the difference between the amount of tonnage needed and the available tonnage decreases. Uncertainty still prevails, but there are glimpses of optimism, causing second-hand prices for vessels to increase, as well as the market capitalization for the well-positioned firms (Stopford, 2009).
Figures 5.2 and 5.3 illustrate the characteristics mentioned above of the stages in a shipping cycle, and the corresponding fluctuations in vessel values. In the period leading up to 2000, the world economy experienced strong growth, which laid the ground for a new shipping cycle. From 2000 to 2007, the world economy grew, led by China and the Asian Tigers economies. The demand for tonnage increased due to the shift in trade-pattern caused by the export-oriented strategies of the previously mentioned countries. As a result, the dry bulk market tightened due to the shipping market’s supply-side in-elasticity in the short term. The growth in the world fleet could not cover the increased demand for vessels, causing freight rates to increase substantially. In 2008, the financial crisis and subsequent recession caused an inflexion point, resulting in decreased demand for vessels due to lower economic activity causing freight rates to crash. In the years after the financial crisis, bulk shippers experienced sub-par freight rates due to over-exuberance. They increased orders of newbuildings often caused by periods of high freight rates, illustrated by the Figure 13.2 in Appendix A illustrating the growth in the world fleet. The orders of dry bulk vessels filled the shipyard capacities, which caused a prolonged trough due to the increased supply of vessels in an environment with low economic activity and demand, effectively widening the spread between demanded and supplied tonnage (Wang, 2017). Cyclicality can also be found in the freight rates in both the three segments illustrated by Figures 13.6, 13.5, and 13.7 in Appendix A.

5.2 Ship Finance

As previously mentioned, low entry barriers characterize the shipping industry. As long as investors have sufficient capital to acquire a ship, either through the newbuilding market or second-hand market, they can become shipowners. The industry is highly capital intensive, and shipping companies rely on good relationships with financiers such as shipping banks.

Figure 5.4 illustrates that bank loans are an essential source of funding for shipping companies. Bank loans have been the dominating source of financing among shipping companies for four reasons. (1) Bank loans are typically easier to obtain than other sources of financing, which can prove crucial when having to act swiftly when investment opportunities arise. (2) Bank loans and debt financing generally do not alter the company’s
ownership structure, which is desirable given the traditional family-ownership characteristic of shipping companies and generally concentrated ownership structure. (3) Bank loans do not require public disclosures of the planned usage of the funds, ensuring the company’s lateral movement in terms of strategy and acquisition plans without warning competitors. (4) The availability of bank loans has commonly been dependent on relationship banking, derived from years of developing good rapport between the companies and banks (Alexandridis et al., 2018).

The capital markets have been a less important source of financing for shipping companies due to the combination of the industries’ riskiness and the high number of smaller companies comprising several of the segments. The industries’ riskiness entails that capital providers will require a higher return on their capital to compensate for said risk, which increases the financing costs of shipping firms. Furthermore, the availability of capital provided by shipping banks and their willingness to finance shipping firms have historically made other forms of financing less advantageous because bank loans are cheaper and deemed less risky due to their amortizing nature. On the other hand, Bonds do not regularly have the same steep down-payment structure, meaning that the shipping companies cannot de-risk by paying instalments over the lifetime of the bond. A debt instrument with a lifetime of, e.g. five years is less attractive in a cyclical industry such as shipping, where shipowners have a harder time knowing how the market and consequently their financial position will look when bond obligation reaches maturity. The capital market might also not be feasible for all shipping companies due to the obligations of being a public company. The increased cost levels related to compliance, among other areas, make the public equity markets less feasible for the smaller shipping companies. However, the publicly traded companies are typically larger shipping companies that can sustain the regulatory requirements and costs. Enabling them to take advantage of the capital markets’ offering of a relatively inexpensive and quick way of raising capital (Stopford, 2009).

A recent ongoing trend is the increased use of lease financing. Marine Money, an industry organization tracking financing in the maritime sector, predicts leasing as the new equity. The increased popularity of lease financing is a consequence of the capital markets being unreliable sources of reasonably priced equity and the commercial banks’ increasing reluctance to finance shipping companies. Explained by factors such as the Basel provisions, posing
5.3 Bulk Shipping Industry

The bulk shipping segment divides into three main categories: liquid bulk, the five major bulks, and minor bulks, among other commodities, crude oil and oil products. The size of the vessels used in wet bulk varies from a transportation capacity of only a few thousand tons to half a million tons. The five major bulks cover iron ore, grain, coal, bauxite, and phosphates, where the commonality is the homogenous nature of the goods. Minor bulks cover, among others, steel products, steel scrap, sugar, etc. (Stopford, 2009).

The segment comprises many smaller companies with an insignificant market share. Hence the industry is often characterized as perfectly competitive with low degrees of differentiation. The low level of differentiation stems from a large number of similar vessels competing over new capital and risk management requirements on banks (McCleery, 2021). Industry data support the statements made above and the predictions by Marine Money, illustrated by Table 5.4 above and Table 13.1 in Appendix A. From Table 13.1 one can spot a downward trend in bank lending by the top 40 banks in the period from 2007 to 2020. Table 5.4 shows how debt financing through bonds has been an increasingly used financing instrument over the years. However, bank lending is still the predominantly used source of financing, which will likely continue in the future.

![Figure 5.4: Sources of Financing - Shipping](source)

Source: Author’s illustration based on data from Marine Money
transporting the same cargo (Stopford, 2009). Economies of scale are an important factor in vessel size, but there are not necessarily substantial marginal economies of scale regarding the fleet size. The organization of bulk shipping firms are typically lean, employing few in the management company while outsourcing fleet management, perhaps contributing to the lack of consolidation in the segment (Stopford, 2009).

The bulk segment, especially the market for crude oil tankers, has increased activity and exposure to the spot market. The industry has changed from being more industrial-oriented, where an independent bulk fleet was commonly chartered on time-charters, to large producers of bulks, e.g., oil companies. This market dynamic changed when the oil producers decided that oil transportation was not an integral part of their operations and reduced their exposure to it. This decision ultimately shifted a large portion of the tanker fleet to the spot market, effectively increasing the shipowner’s exposure to more volatility and less predictable earnings (Stopford, 2009). The dry bulk companies are commonly characterized as more short-term oriented, where time-charters usually have lasted 6-12 months. Previous research has shown that both shipowners operating in the wet and dry bulk segment are more inclined to charter out their vessels on voyage charters, i.e., in the spot market than on time-charters (Adland and Prochazka, 2021) and (Nwokedi, 2017).

5.4 The Container Shipping Industry

The container shipping industry is the largest shipping segment measured in the total value of the cargo transported, accounting for 60 % of the goods transported at sea in terms of value (Placek, 2022). Container vessels range in carrying capacity from the smallest feeder vessels of about 1 000 tonne equivalent units (TEUs) to the ultra-large container vessels (ULCV) with a carrying capacity of over 23 000 TEUs. One differentiates between liner shipping and tramp shipping. Liner shipping operates on a fixed route with pre-determined departures, a published price list, and the inclusion of regular services. Tramp shipping does not operate on a fixed schedule or fixed route. Historically, the tramp shippers have assisted the large liner companies with services such as running feeders that transport cargo from the large liner vessels to the ports. Feeders are smaller container vessels with a carrying capacity of only a few thousand TEUs (Stopford, 2009).
The container fleet is comprised of vessels owned by the liner companies and vessels owned by independent shipowners who charter their vessels out to the liner companies. Historically, the liner companies owned vessels until the late 1990s, when one saw an increase in fleet ownership shifting from the liners to the independent shipowners. This shift was especially prominent within tramp shipping, where opportunistic businessmen replaced the tramp operators who had previously provided the liner companies with tonnage. As a result, the charter market in container shipping was established, which created a dilemma for liner companies whether to own their vessels or charter them (Stopford, 2009).

A delimitation of the scope of the thesis is that only capital structure choices of tonnage providers, i.e., the independent shipowners that charter their vessels out to the liner companies, will be examined. Nevertheless, a short introduction to liner shipping follows since the container vessel tonnage providers are exposed to the industry’s risk through counterparty risk.

The characterization of liner shipping is that few and large companies dominate the market due to a period of consolidation. The five largest liner companies own 65.2% of the world liner fleet as of February 2022. The ten largest companies accounted for 85% of container capacity as of primo 2021 (Finance, 2021)(Placek, 2022).

The tonnage providers charter their vessels out to liner companies and regional carriers for a fixed period on time-charter contracts, ranging from a couple of months to more extended duration contracts lasting for several years. The duration of the contracts depends on the market outlook, where both the supply and demand for vessels play a significant role. There has been a significant shift in the container shipping market in the last couple of years. The amount of more extended contracts has increased substantially due to the macroeconomic shift caused by the pandemic. The pandemic caused a reallocation of capital from services to consumables, which caused de-stocking of inventories and subsequently increased ordering from Asia to re-stock. Increased orders from Asia caused an increased demand for container vessels, effectively increasing freight rates due to the inelasticity of the supply of ships in the short term. The increased traffic from Asia to the U.S. caused congestion in the ports, where vessels lay for weeks outside the ports waiting to unload cargo. This congestion caused
a decrease in the available tonnage to be chartered, providing further upward pressure on freight rates, which caused charterers to scramble for tonnage, locking in the available vessels on long-term contracts to ensure transport capacity to meet demand. Unlike bulk shipping, container shipping does not have an active spot market, and charter voyages are extremely rare. A short-term contract in container shipping is commonly six to twelve months. The average duration for charter contracts was 24 months in 2007 and 13 months in 2017. However, the Covid-19 fundamentally altered the industry, increasing the new norm for time-charter contracts for up to four years (Cariou, 2013)(Shin et al., 2018)(Lademan et al., 2021).

5.5 The LNG Shipping Industry

The specialized shipping segment covers the transport of a wide range of specialized cargo, ranging from cars, forest products, and refrigerated produce to chemicals. The common denominator is the need to ship large parcels of non-homogeneous cargo, i.e. there is demand for specially designed ships that can safely transport the goods while ensuring efficiency and economies of scale. The specialized shipping segment is located somewhat in between the bulk and container shipping segment in terms of types of goods traded, where goods such as motor cars and chemicals are transported in bulk. However, there is a need for specific configurations for the ships, such as LNG vessels’ large chemical tanks that can maintain a low temperature. (Stopford, 2009).

One of the areas in which specialized shipping differs from the two previously mentioned segments regarding service demanded and service providers due to transporting more specialized cargo and poor differentiation possibilities regarding service from their competitors. In addition, there is often a pressure from cargo owners on the quality and level of the distribution chains. Hence the service providers offer higher service levels compared to bulk shipping (Stopford, 2009).

The LNG carriers connect the LNG value chain by transporting the cargo from the natural gas production and liquefaction plant to the receiving terminal, where the gas is re-distributed to the natural gas distribution network, industrial use, or for power generation (Office of Oil and Natural Gas, 2020). The LNG is typically transported from the Middle East, North America, and Oceania to Europe and Asia (Bresciani et al., 2020).
LNG carriers have traditionally been project-linked, i.e. meant to serve a project for the entirety of the vessel’s lifetime. The duration of these project-linked charter contracts typically reached 20 years, often with options to extend the total duration by up to 30 years. However, in the recent 20 years, there has been an increase in independent shipowners becoming tonnage providers to the LNG producers. The new era of shipowners within the segment has proven to be more willing to take on market exposure, reflected in an increase in shorter-term charters (Calnan and Ødeskaug, 2017). These contracts still have a long duration of three to seven years with the option to extend, compared to the typical contracts in the bulk and container segment. Furthermore, the segment has been through a commoditization phase which has created a spot market for LNG carriers due to the increased activity of trading houses such as Trafigura (Corbeau and Ledesma, 2016).

6 Debt Levels in the Shipping Industry

6.1 Sample Data

The following section provides an overview of the debt levels in both the shipping industry as a whole and the three shipping segments and the characteristics of the industry that argue for and against the reported debt levels. The data sample is the aggregate of the sample data used for the statistical analysis, which follows in Section 8, and a description of the sample can be found in subsection 8.1. The data sample covering U.S. firms contains the data of all companies listed on the New York Stock Exchange in the period 2000-2021. Both financial firms (SICs 6000-6999) and regulated utility firms (SICs 4900-4999) have been excluded from the sample to reduce distortion due to the industry-specific regulatory requirements regarding leverage and solvency these industries are exposed to (Ferris et al., 2017).

6.2 Discussion of Leverage in the Shipping Industry

The shipping industry is, as previously mentioned, highly capital intensive. The industry is one of the most capital intensives when measuring capital intensity in terms of CAPEX-to-
20 6.2 Discussion of Leverage in the Shipping Industry

<table>
<thead>
<tr>
<th>Tangibility</th>
<th>Shipping Industry</th>
<th>Pecking order theory</th>
<th>Trade-off theory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profitability</td>
<td>Volatile</td>
<td>−/+)</td>
<td>+/−</td>
</tr>
<tr>
<td>Asset risk</td>
<td>High</td>
<td>+</td>
<td>−</td>
</tr>
<tr>
<td>Operating leverage</td>
<td>Strategy dependent</td>
<td>−</td>
<td>−</td>
</tr>
<tr>
<td>Taxes</td>
<td>Low</td>
<td>+/−</td>
<td>−</td>
</tr>
<tr>
<td>Dividend</td>
<td>Common</td>
<td>+/−</td>
<td>−</td>
</tr>
</tbody>
</table>

**Table 6.1:** Comparison of shipping industry characteristics and capital structure theory predictions

Assets ratio, placing the sector among the top 8th percentile of all sectors (Alexandridis et al., 2020). Furthermore, the majority of capital investments are related to acquisitions of vessels and are financed predominantly by debt, exceeding the capital employed by average firms by 40% (Drobetz et al., 2013).

Asset tangibility which refers to the ratio of a firm’s fixed assets to total assets, and the equity risk environment are two reasons why shipping companies are financed with a majority of debt (Allen et al., 2019). The equity risk environment stems from the shipping industry’s "high risk, high reward" characteristic, where shipowners have been known to place large bets on upswings in the market. Peter Anker, a well-renowned shipbroker and former head of shipbroker Platou RS coined this risk tolerant or even risk-seeking behavior of shipowners. Mr Anker referred to a study he performed in Business School, researching the behavior of shipowners regarding project risk stating the following:

"The average shipowner, if presented with two equal projects with an equal return, preferred the more risky one.\textsuperscript{1} (Anker, 2011)"

– Peter Anker CEO, Platou RS

Shipping firms possess high asset tangibility, which is positively correlated with leverage according to the trade-off model (Alexandridis et al., 2020), (Allen et al., 2019), and (Rajan and Zingales, 2016). The correlation between asset tangibility and a high leverage ratio is due to the real-asset-heavy firms’ ability to provide their lenders with collateral against the principal. In case of breach of covenants and defaults, the banks can transfer ownership of pre-determined assets. With the possibility of lending against its balance sheet, shipping

\textsuperscript{1}The statement was made during a panel at a NOR-Shipping conference in Oslo in 2011
companies can decrease the riskiness of the loan in the eyes of the banks, enabling them to take on more debt than a company with lower asset tangibility, such as tech companies (Drobetz et al., 2013).

The cyclicality of freight rates and asset values can create significant uncertainty regarding future profitability and sustainable earnings. As the trade-off model predicts that profitable firms borrow more because they have a larger debt-service capacity and more income to shield through interest-rate tax shields, one would assume that the inverse relationship would be applicable for shipping firms. Namely, the lack of predictability would result in management behaving more prudently with lower leverage ratios resulting in more manageable interest expenses in case of market downturns (Allen et al., 2019). Furthermore, the shipping industry is often benefiting from industry-specific tax regulations stemming from the registration of companies in shipping tax haven countries or so-called flags of convenience states such as Libya, Bahamas and Norway. By utilizing these industry loopholes, the shipping industry can enable either complete exemption from corporate taxation or at least a low tax exposure (Allen et al., 2019)(Marlow and Mitroussi, 2008). A low tax rate implies that shipping companies cannot utilize tax shields on their interest expenses, which should be reflected in a low leverage ratio according to the trade-off model.

Albeit, shipping firms are relatively highly levered than industrial firms in the G7 countries, exhibiting a mean leverage ratio of 41% compared to the G7 industrial firms’ 25% (Drobetz et al., 2013). The shipping industries’ fondness for leverage is also illustrated by Figure 6.1.

Figure 6.1 above illustrates the shipping industries’ inclination to utilize leverage, more so than the average publicly listed company in the U.S., a fact supported by (Drobetz et al., 2013). Shipping firms’ leverage ratio also appears to be more volatile than the average U.S. public firm. The market leverage is again more volatile than book leverage, which is expected due to the fluctuations in market capitalization.

Previous papers have explained the volatility in both book and market leverage, but especially book leverage due to the fluctuation in asset values, i.e. both increases and decreases in second-hand prices of vessels. However, fluctuations in leverage ratios from one year to the next due to asset value fluctuations are not likely, due to the accounting treatment
publicly listed companies must follow. The accounting principles the majority of the firms in this sample follow are U.S. GAAP’s fair value accounting. U.S. GAAP does not allow fixed assets to be revalued upwards, only written down through periodical impairment tests. However, the international accounting standard (IAS) 16 allows for a periodical revaluation of fixed assets. However, this provision is seldom used due to the scrutiny of auditors due to managers’ arbitrary use of the method to manipulate accounting numbers (Wang, 2011).

The periodical impairment tests estimate whether the carrying value of an asset exceeds its fair value. The fair value is determined through discounted cash flow models and third-party independent appraisals. Suppose the carrying value exceeds the fair value. In that case, an impairment charge is recognized, reported as a credit to a fixed asset, and an impairment loss is recognized in the income statement. Hence, the book value of assets is adjusted due to impairment tests, but only downward.

The risk associated with changes in market values of vessels is of utmost importance, just behind the volatility in freight rates, not only to shipping companies but all stakeholders of the shipping industry. The shipping banks analyze the development when deciding on terms for loans and collateral values. Shipyards monitor to regulate their capacities better, e.g., an increase in the second-hand value of Capesize vessels would incentivize the
shipyards to ensure production capacity for Capesize newbuildings, and asset players, i.e. investment managers monitor prices for investment opportunities. The risk stems from the previously mentioned impairment charges, which can significantly impact a shipping company’s results in a given period. However, more importantly, the decrease in an asset’s book value can impact accounting measures used in the calculation of debt covenants, e.g. loan-to-value (LTV), where an impairment cost could leave a company in breach of the loan terms (Albertijn et al., 2011).

Figure 6.2 illustrates the development in book leverage in the three segments, hereunder Bulk, LNG and Container Shipping, which are the focus of this paper. The data implies that LNG shipping firms are relatively more levered than bulk and container shipping firms. A reason for this, which is supported by the trade-off model as well as (Drobetz et al., 2011), might be the greater visibility and predictability of cash flows stemming from the longer time-charter contracts available compared to the shorter contracts in the container segment, especially bulk. As mentioned in the shipping theory section, the LNG segment has long been characterized as having project-linked vessels, where vessels are either owned by the gas companies themselves or chartered in on long time-charter contracts of up to 15 years. This predictability of future cash flows can allow LNG shipping companies higher leverage because of the predictable future cash flows and debt service capability. Furthermore, the LNG segment is one of the most capital intensive segments due to the
high cost of LNG tanker vessels, where a newbuilding amounts to approximately USD 225 million (Stopford, 2009). A caveat to be aware of is the relatively small data sample on LNG shipping firms. The Compustat database only included two companies that reported numbers in 2007 and 2008, where there was a significant increase in the leverage ratio. This feature limits the explanatory power of the findings in the above graph, but the rationale behind the observation persists. Bulk and container shipping appears to have similar leverage ratios throughout the sample period, a level that is more aligned with the shipping industry’s average when compared with the average leverage ratio in shipping in 6.1.

7 Qualitative Analysis

The following section includes an analysis of the content gathered by interviewing three CFOs and two Vice-presidents of publicly listed shipping companies operating in bulk, LNG, and container segments. Their insights will provide a better understanding surrounding the decision-making process of shipping company executives and what they deem to be the most important factors influencing their capital structure choices.

Figure 7.1: Structure of the Qualitative Analysis

7.1 Interview Guide

The following section will introduce the framework of the interviews, a framework divided into five steps. The five steps cover the reasoning for conducting the interviews, why the
respective interviewees are chosen, the alignment of the interview questions with the research question, the data collection process, analysis of the data, and the reflections surrounding the result and potential caveats.

Before introducing the framework of the interviews, the potential pitfalls of qualitative data sampling and interviews in an academic setting need to be addressed. When including interviews as a part of a research project, there are various aspects one must consider to avoid problems that can hurt the result of the research and, subsequently, the reliability of the findings. The potential pitfalls to the data collection are criterion sampling, which relates to the importance of asking the right people, asking too narrow questions, how the data is processed and handled from collection to analysis, the attempt to quantify the interviewees’ voice, and writing findings based on voices rather than categories (Oplatka, 2021)). It is essential to be aware of these pitfalls to limit their impact by taking precautionary measures.

**Step 1: The applicability of interviews in the paper**

The main objective of the interviews is to obtain valuable insights concerning the reasoning and decision-making process of shipping companies when pursuing investment opportunities and the subsequent choice of financing.

**Step 2: Determining whom to interview and the sample size**

CFOs were initially targeted as interview objects to reduce the possibility of including interviews of people without the expertise necessary to gain relevant insights, reducing the impact of the first pitfall mentioned above. It is important to note that the statements made by the interviewees can reflect only their personal opinions and that an interview process containing a larger sample size, or a different sample, could yield different results. Hence, an attempt to quantify the collected data and apply the statements made by the participants from each segment as the general beliefs and position of all market participants would be a mistake. The data collected and subsequent analysis does not serve as statistical proof but rather as interpretive data which is relevant and interesting.

**Step 3: Align interview questions with research question**

An interview guide was developed specifying the structure and questions of the interview. The guide was created to ensure objectivity and attempt to overcome expectation bias.
Expectation bias is defined as the event in which "an individual’s expectations about an outcome influence perception of one’s own or others’ behavior" (J.B et al., 2012). Every interview was to follow the same structure, and each interview should cover similar topics. As a result, the data collected should be of the same structure to compare the participants’ answers. The questions were constructed to cover the different predictions of the capital structure theories and the answers to be tested in the quantitative section, which follows later in the paper.

Moreover, the structure of the questions was constructed to welcome broader answers from the interviewees, which reduces the possibility of pitfall number two mentioned above. By reducing the number of questions that could be asked in a binary way, the desired outcome was to obtain exciting insights. The questions asked during the interviews can be found in Figure 14.1 Appendix B.

**Step 4: Data Sampling Process**

The sampling process was conducted through semi-structured interviews where the interview guide created the initial boundaries of the interview. The interview guide served as a guide for which topics the interview should cover. The difficulty of maintaining the predetermined structure became apparent. The interviews themselves did not follow the chronological order of the questions in the guide because the conversations took different directions depending on the interviewees’ answers. Nevertheless, all relevant topics were covered in each interview, even though some specific questions were not always asked, regarding the third pitfall of focusing on data collection without concurrently analyzing the data. The data sampling process was performed together with the analysis, which allowed for continuous improvement of the interviews. An overview of the interviewees can be found in Table 7.1 below.

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Company</th>
<th>Segment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andreas Næss</td>
<td>Vice President</td>
<td>Golden Ocean Group</td>
<td>Bulk</td>
</tr>
<tr>
<td>Benjamin Pfeifer</td>
<td>CFO</td>
<td>MPC Container Ships</td>
<td>Container</td>
</tr>
<tr>
<td>Knut Traaholt</td>
<td>CFO</td>
<td>Flex LNG</td>
<td>LNG</td>
</tr>
<tr>
<td>Lars M. Brynilsrud</td>
<td>CFO</td>
<td>Hunter Group ASA</td>
<td>Bulk</td>
</tr>
<tr>
<td>Yngve Gram</td>
<td>Vice President</td>
<td>Belships ASA</td>
<td>Bulk</td>
</tr>
</tbody>
</table>

**Table 7.1: Overview of Interviewees**
7.2 Analysis of the Interviews

The fifth step in the guide contains the analysis of the interviews. The section divides into three subsections where the interviewees’ statements relevant to the three capital structure theories are discussed. By dividing the sections into three subsections, and subsequent subsections, the final pitfall is accounted for, namely writing findings based on voices rather than categories. Without dividing the content into sections, the interviewees’ statements could potentially drive the discussion and themes covered instead of the opposite.

7.2.1 Pecking Order Model

The first prediction of the pecking order model is that firms prefer internally generated funds to finance investments. When asked about the preference order of financing alternatives, neither of the interviewees mentioned cash as their most-preferred source of financing. Cash was mentioned as the third most preferred source of financing in one of the interviews. Market participants favor bank loans over cash, where leasing appears to be an increasingly popular financing alternative. An important reason for this order of preference appears to derive from the clear consensus among the market participants to maximize leverage exhibited by the LTV to maximize the potential return on equity (ROE) obtained on an investment. It appears that the amount of debt applied depends on what the banks will allow rather than what the company themselves desire(Interview: Brynilordsrud, 2022; Dr. Pfeifer, 2022; Gram, 2022).

Figure 7.2: Impact of Leverage on Return
Source: Author’s own illustrations

An example of the effects leverage has on ROE is depicted in the above figure 7.2. Consider
a company which, in year 0, during a downturn of the freight market, acquires a fleet of second-hand vessels and finances the investment with 60% equity and 40% debt. In year 1, the second-hand value of the vessels increases by 20%, where the equity portion of the investment receives the entirety of the appreciation while the debt portion remains fixed. If the company sold the fleet acquired in year 0, the yielded ROE would amount to 33%, compared to an ROE of 50% had the initial investment been funded using 40% equity and 60% debt. Applying leverage on investments in real asset industries such as shipping is an efficient tool to increase the potential return where the difference between the return obtained by a levered and unlevered firm is referred to as a return premium (Kane et al. 1985).

Moreover, the capital intensity of the shipping industry hinders the sole use of internally generated funds when investing, especially if a company commits to ordering a more extensive new building series. The choice of entering into a large newbuilding series contract is one of the more significant capital and strategic commitments a shipping company can make. Due to the capital intensity, financing the total investment using internally generated funds is less likely, than for a smaller order. However, the financing of newbuildings is constructed so that the shipping companies pay in five increments. 10% is due when the contract is signed, 10% is due when the steel is cut, 10% is due when the hull is installed, 10 percent when the vessel is launched, and the final 60% is due when the vessel is transferred to the buyer. This payment structure allows for the use of internally generated funds on the first four increments, where external financing, or a combination of equity and external financing, is typically used on the remaining 60 percent, where bank loans are the preferred debt instrument (Interview: Brynildsrud, 2022). From this, it appears that the pecking order’s prediction regarding the preference of financing investments with internally generated funds hold to a certain degree. Shipping firms do draw upon internally generated funds to finance investments, but the prediction that firms only draw upon debt financing when cash is depleted seems highly unlikely. The investment would not have been solely funded using cash, even if the company had the financial strength to do so. This notion is supported by the statements made by the market participants, stating that they would always apply some debt in a transaction because of the importance of applying leverage to increase return and maintain dividend distribution capabilities (Interview: Brynildsrud, 2022; Gram, 2022; Næss, 2022; Pfeifer; 2020)
Aforementioned, the shipping industry differs from many other industries regarding cyclical
and capital intensity. It appears that there is a desire in several of the shipping companies
interviewed to return the majority of excess cash to their shareholders through dividends.
Knut Traaholt, the CFO of Flex LNG, communicated that Flex has an objective to pay out
100% of net income over the cycle, and Andreas Næss, the Vice President of Golden Ocean,
Benjamin Pfeifer, Lars Brynildsrud, and Yngve Gram communicated that their companies
have a desire to return a substantial amount to their shareholders (Interview: Brynildsrud,
2022; Pfeifer, 2022; Gram, 2022; Næss, 2022; Traaholt, 2022).

An interesting point was made by Mr. Gram, where he communicated the following on the
importance of a stable dividend policy:

"We are very conscious of delivering on our dividend policy and cautious when
considering investment opportunities that might affect our dividend capacity. We
would, therefore, in most cases, not pursue an investment that would prevent us
from regular dividend payouts."  

– Yngve Gram VP, Belships ASA

The quote above contradicts the pecking order prediction that dividend policies are adjusted
to investment opportunities. Shipping companies are more inclined to use a majority of
excess cash to pay out dividends instead of funding investments, which is logical considering
how asset prices are closely correlated with freight rates, the main driver of shipping profits.
Hence, when shipping companies are performing well, reflected in high free cash flows, there
is often a lack of suitable opportunities due to higher asset prices and positive sentiment in
the market. Tor Olav Trøim, the majority owner of the bulk shipping firm 2020 Bulkers,
recently made a statement supporting the importance of removing chips from the table, i.e.,
distributing dividends where times are good rather than re-invest:

"You invest, you earn a lot of cash, you re-invest, and go bankrupt."  

– Tor Olav Trøim Investor, Magni Partners

The above statement relates to how re-investments are destroying cyclical industries
because it leads to over-capacity when the demand peaks, eventually leading to longer
periods of troughs. Figure 5.3 illustrates the correlation between freight rates and the

\[ \text{footnote}{The statement was made at the DNB Invest 2022 Conference in Oslo (Trøim, 2022)} \]
30 7.2 Analysis of the Interviews

second-hand value of vessels. It appears as a more sound capital employment strategy to
distribute cash to shareholders when freight rates and second-hand values are high instead
of investing the proceeds at a point in the cycle where asset prices are historically high.
Additionally, the corporate governance problems that have plagued parts of the shipping
industry can explain the importance of a clear dividend policy. Related party transactions,
overly generous compensation packages, and tendencies of empire building have been
prominent in some parts of the industry and most prevalent among bulk shipping firms.
These governance issues have led to a lack of excess capital distributed to shareholders.
Owners have instead shifted profits between companies through related party transactions,
detrimental newbuilding orders, or buying and selling of vessels during the cycle to maintain
the demanding compensation packages (Andrikopoulos et al., 2021); Interview: Gram,
2022). Hence, a shipping company’s ability to distribute excess cash to shareholders can be
viewed as an attempt to communicate an alignment of managers’ and shareholders’ interests
and the desire to dislocate a company’s valuation from NAV towards a dividend yield valuation.

Not all of the market participants share the statements made by the representative from
Belships above, as shown by the statement made by the CFO of MPC Container ships beneath:

"The recurring dividend is meant to be somewhat stable. We want to pay out a
quarterly dividend. If the market is really strong, the dividend can be higher, and if
it’s bad, it can be lower. We will adjust that to a level that enables us to keep some
excess cash for bad times or to strategically invest"

– Dr. Benjamin Pfeifer CFO, MPC Container Ships

The majority of the interviewees state that adjusting dividend payouts to capital obligations
such as investment opportunities, debt commitments, and seasonal volatility is crucial
(Interview: Brynildsrud; Næss, 2022). The statement made by Mr. Gram above does not
necessarily imply that Belships does not adjust its dividend policy to great investment
opportunities if they arise. However, the statement indicates an apparent reluctance to
pursue opportunities that would impact their ability to distribute dividends.

The accumulated data derived from the interviews point to a clear consensus among the
interviewees on the importance of a dividend policy. The adjustments mentioned above to payout ratios are necessary to ensure financial flexibility. However, there is a distinct desire to distribute dividends, where sticky dividends would be the norm if the freight market allowed it. None of the interviewed market participants operates with a fixed target dividend payout ratio due to the difficulty of maintaining a dividend policy in markets exposed to seasonal fluctuations and earnings volatility, but all emphasize the importance of dividends.

The distinct seasonal fluctuations in spot freight rates in the bulk segment is captured by Figure 7.3. The figure shows that Q1 is historically a period with low obtainable freight rates, where spot rates typically see an increase in March and April before periods of lower activity in the summer months until the harvesting period in the autumn months results in increased demand for tonnage and surging freight rates (Kavussanos and Alizadeh-M, 2001). The below graph supports the notion of the difficulty of maintaining a stable quarterly dividend policy in segments where freight rates and earnings vary significantly throughout the year.

![Figure 7.3: Freight rates for Handysize, Panamax and Capesize vessels 1980-1996](image)

Source: (Kavussanos and Alizadeh-M, 2001)

Sticky dividends depend on earnings visibility, which is one of the areas in which the three segments differ. The representatives operating in the bulk segment both communicated the difficulty of providing their shareholders with regular dividends due to the short-term-oriented market combined with the seasonal fluctuations mentioned above. When asked about whether Hunter Group has, or would consider a more frequent and stable dividend policy than their current event-driven policy driven by asset sales, Hunter Group CFO, Lars
Brynildsrud conveyed the following:

"«We have thought about it, but it doesn’t really fit our current operating model with the majority of our vessels in the spot market or on short term T.C.s. If we for instance chartered out our vessels on long term T.C.s, where we would have predictable cash flows from many years, it would be something else. But the market for long term T.C.s is not very liquid, and you shouldn’t expect a rate giving you more than around 8 percent return based on "normal" newbuilding parity pricing."

– Lars Brynildsrud CFO, Hunter Group ASA

Mr Brynildrud’s statement is supported by Andreas Næss from Golden Ocean, who also noted that the bulk shipping industry is more short-term oriented with a less liquid market for longer time-charter contracts. Contrary to the bulk segment, the LNG shipping segment is traditionally characterized as less spot-oriented, even though the segment has become more commoditized in recent years. On the question of Flex LNG’s dividend payout policy and whether the company intended to distribute a dividend based on a predetermined dividend ratio, Knut Traaholt stated:

"The potentially distributed dividend amounts are dependent on how we, among a number of factors, view the market outlook, capex commitments and earnings visibility. We have during 2021 reduced our operational leverage with entering into long term contracts for a large part of our fleet resulting in increased earnings visibility. The reduced operational leverage allows us to increase our financial leverage matching our contract backlog resulting in a larger cash balance. With a sound cash position and increased earnings visibility, we are in position to maintain a stable and attractive dividend level." ³

– Knut Traaholt CFO, Flex LNG

The differing market dynamics were also communicated by the CFO of MPC Container ships, where previously, a good charter in the container segment had a duration of nine to twelve

³Flex has taken delivery of its entire fleet of 13 vessels over the last three to four years
months. Nowadays, they are chartering their vessels at good rates for three years or longer (Interview: Pfeifer, 2022). MPC C owns small- to medium-sized vessels catering to the feeder segment. In contrast, the larger container vessels can be chartered out for a substantially longer duration to the liner companies such as Evergreen, providing even greater earnings visibility.

The preceding statements, which unveil the different opportunities for increased earnings visibility of the segments and how they affect possibilities surrounding sticky dividends, introduce the first proposition to test in the quantitative section, which follows.

**Proposition 1:** Sticky dividends are more prevalent in the LNG and Container segment than in the bulk segment.

The fourth and final prediction of the theory states that if external funding is necessary, the least risky debt is preferred to the more risky, followed by hybrid securities and equity issuance as a final resort. The consensus among the interviewed shipping company representatives supports this prediction. According to the participants, financing choice depends on other factors than price and risk, such as the availability of capital. The availability of capital can vary significantly with the shipping cycle, where some companies are less likely to obtain bank financing during periods of poor market performance. The banks’ willingness to provide financing is dependent on many factors, often communicated through a matrix used when deciding whether to provide a loan and to what terms. The matrix covers topics such as the company’s track record, i.e. what were the company’s financial results last reporting year. Banks are more likely to provide a loan if the company recently reported good results, which is counter-intuitive in the cyclical world of shipping. A good year in shipping is more likely to be followed by a poor year than a continuation of the good trend, where such a lending policy effectively leads banks to lend at the top than at the bottom of cycles ((Albertijn et al., 2011); Interview: Brynilsrud, 2022; Interview: Gram, 2022). Furthermore, the company’s track record and the owner and the type of assets are all crucial factors in the eyes of the banks when determining whom to provide financing. Banking continues to be a relationship business where companies are owned by credible
investors such as John Fredriksen. He has a reputation for supporting the companies he owns when times are tough.⁴

The factors mentioned above can contribute to differences in the financial instruments used by different companies to fund their investments, not necessarily because their preferences are different but because the available options differ. This is especially relevant in the downward cycles, where companies with inferior track records or less reputable owners have more difficulty obtaining traditional bank financing. Instead, they have to sort to other types of financing through riskier or more expensive instruments such as bonds, hybrid instruments, or equity. An excellent example of how the market conditions and availability of capital affects financing choices is the restructuring of MPC C at the beginning of 2020. When asked about the preference order of financing, Dr. Benjamin Pfeifer, the CFO of MPC Container Ships, said the following

"It depends on what is available to you. In 2020, you just took what you could get. For a bank, your risk profile was too high. You had to go to the junk bond market and raise money there, but for an elevated margin. The debt market also turned, making the debt market difficult for MPCC in 2020 and 2021. Now, when things are good, more financing options are available."

– Dr. Benjamin Pfeifer CFO, MPC Container Ships

From the above sections, the pecking order model’s predictions successfully explain the financing behavior of publicly listed shipping companies. Internally generated funds are employed for investment purposes, often in combination with debt financing, where bank financing is the predominantly utilized source of debt. Equity raises are seldomly used as a source of financing, and if applied, it is because the company has exhausted all other options. The availability of capital, especially bank loans, depends on investor credibility, company strategy, company track record, and past and future market performance. These factors can contribute to different applications of financing instruments among companies. Furthermore, the observation of sticky dividends should be more prevalent in companies whose strategy

⁴Mr. Fredriksen is the majority owner of Flex LNG and Golden Ocean Management.
or market characteristics yield greater earnings visibility. Hence, both the container and LNG segment’s fundamentals argue for stickier dividends than the more illiquid time-charter market in bulk shipping.

**Proposition 2:** Bulk, LNG, and Container shipping companies prefer debt financing to equity, as predicted by the Pecking-order theory.

**Proposition 3:** Larger companies are more inclined to finance investment with long-term debt than smaller firms.

### 7.2.2 Trade-off model

A short recap of the trade-off model’s main prediction is that all firms have an optimal leverage ratio, which they actively manage to maximize firm value. According to the model, the trade-off is between the cost of financial distress and the present value of future tax shields. From the get-go, the trade-off model’s applicability to the shipping industry seems implausible due to the lack of any actual effective tax rate in the industry, as previously mentioned. Shipping companies are exposed to a tonnage tax instead of the regular tax regime other firms must adhere to. Under a tonnage tax regime, a company’s tax liability is only dependent on the deadweight tonnage of its fleet. This tax liability amount is fixed and does not depend on the company’s financial results. Consequently, the tonnage tax regime does not incentivize high leverage, effectively discarding the main prediction of the trade-off model. The interviews confirmed the irrelevance of tax benefits when determining the leverage ratio (Interview: Brynildsrud, 2022; Interview: Pfeifer, 2022).

### Capital Structure and Strategy

There is, however, a strategic trade-off that influences a company’s leverage ratio, which can help explain the varying debt levels within segments and across. The strategic trade-off regards the trade-off between operational and financial risk depicted by Figure 7.4, where a disproportionate balance can cause both direct and indirect costs and potential financial distress. The operational or market risk stems from the exposure a company has to the
fluctuations in the freight market. As previously explained, there are several ways in which a company can adjust its operational risk through, for example, chartering strategy and the use of derivatives such as freight forwarding agreements. Companies with more time-charter exposure have lower operational risk than firms with most of their fleet operating in the spot market. It can be argued that increased earnings visibility and lower profit volatility ensured through time-charter contracts causes a lower probability of bankruptcy which translates to a lower cost of debt and expected higher leverage ratios (Frank and Goyal, 2009), (Fama and French, 2012), (Merika et al., 2015). Hence, the trade-off model predicts that companies with low operational risk can increase their financial risk through increased leverage due to their increased earnings visibility. As a result, a higher leverage ratio would be expected from firms operating in the LNG and container segment, especially companies who charter out large container vessels to liner companies on long time-charter contracts, but as depicted by figure 6.2, the expectation only holds for firms operating in the LNG segment (Interview: Brynildsrud, 2022; Interview: Gram, 2022; Interview: Pfeifer, 2022).

The market participants communicated the importance of balancing the amount of leverage with the chartering strategy. One of the parameters that measure the degree of financial risk is the company’s cash break-even (Interview: Traaholt, 2022). A company’s cash break-even consists of a company’s capital expenditure, operational expenditure, and general administrative costs, which form the cost level the freight rates have to exceed for the company to earn a profit. A higher leverage ratio translates to increased

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**Figure 7.4:** Trade-off between operational and financial risk  
Source: Author’s own illustrations.
financing costs, increasing the cash break-even of a company and lowering the company’s operational flexibility. A vessel, or fleet, with a low cash break-even, can be of utmost importance to firms. It allows the company to operate their vessels in low freight-rate environments where firms with higher cash break-even are forced to lay up their vessels. In high freight-rate environments, they out-earn their competitors with higher cash break-even.

**Financial Flexibility and Timing**

Another important aspect regarding the costs of financial distress is reduced financial flexibility. According to the interviewees, there is no optimal leverage structure applicable in all situations. If there is one, an optimal leverage ratio is dependent on the place in the cycle and the company’s exposure to operational risk. Golden Ocean Vice President Andreas Næss provided some color on the importance of knowing where you are in the cycle:

> "Generally, we are reluctant to lever up high when we are high in the cycle, and asset values are high from a historical perspective. Shipping is volatile; hence if the market turns and asset values fall, we can risk a situation where we are too levered."

– Andreas Næss, VP, Golden Ocean Management

Mr. Næss elaborates on the importance of timing and having financial flexibility:

> "Having financial flexibility and the muscle is important to take advantage of "good" market conditions or opportunistically opportunities. However, as important is to have the industry expertise to know when these conditions arise."

– Andreas Næss, VP, Golden Ocean Management

The decisions surrounding when to invest in vessels, i.e., timing, is the most critical decision a shipowner makes (Kulshresth Sengar, 2016) Figure 7.5 above illustrates the difference between applying 70 percent leverage on a 5-year-old Capesize vessel at the bottom of the cycle in 2002, and at the top of the last supercycle at the end of 2007. The downside risk increases immensely when applying substantial amounts of debt on historically high asset prices. When investing at the bottom of the market, the downside risk is low, both from a
market risk perspective and an asset value perspective. To explain the limited downside market-wise, recall from the introduction of the shipping industry, a market trough, e.g., the bottom in 2002, is typically characterized by vessels earning at or below their cash break-even levels. Older vessels are removed from operations and laid-up up to reduce costs in hopes of a market recovery. Demand and supply begin to tighten as many vessels are removed from the market, and recovery can begin. The limited downside of asset values stems from the lacking continuation of decreasing freight rates, which affects asset values, and the scrap value of the vessel. When buying vessels at or close to scrap value, the asset’s residual value or residual risk is somewhat capped. The most one can lose the delta between the price and the value of the actual steel of the vessels (Interview: Pfeifer, 2022).

Suppose a company acquires vessels on historically high levels, on the other hand, as in 2007. A downturn in the cycle can have detrimental consequences for the company and its financial flexibility. Decreasing asset values on highly leveraged investments can lead to companies breaching covenants and failing to meet financial obligations. High financing costs stemming from loan repayments and interest expenses and the dangers of breaching lending covenants due to decreasing asset values can endanger a company’s ability to exploit profitable opportunities. In low freight rate environments, competing companies with an unsustainable leverage ratio might fail to meet their financial obligations, defaulting. In these instances, opportunities can arise, stemming from such companies failing to meet capital...
obligations on newbuilding contracts, or failing to meet financial obligations causing banks to take possession of their assets and sell them at distressed prices.

![Figure 7.6: Second-hand prices for fixed age vessels](image)

**Figure 7.6:** Second-hand prices for fixed age vessels  
Source: Author’s own illustration based on data from VesselValue

Lars Brynildsrud, the CFO of Hunter Group, provided a generalized comment on how to succeed in shipping stating that:

"Many shipowners involved in commodity shipping operate according to a value cycle approach. This means that the real capital is made from buying and selling ships at the right time in the industry cycle, while potential profits from operating the vessels are viewed as a bonus. Hunter Group’s initial investment thesis was similar to this strategy."

– Lars Brynildsrud, CFO, Hunter Group ASA

Mr. Brynildsrud’s comment above emphasizes the importance of having financial flexibility and market knowledge to take advantage of the fluctuations in asset values. The immense cyclicality in asset values is illustrated by the below Figure 7.6, containing the second-hand prices for Capesize, LNG, and container vessels. For example, the second-hand value of a Capesize vessel decreased by 43% from the top in 2008 to 2009, while the value of a feeder container vessel decreased by 55%. A company with a prudent capital structure and better financial flexibility than their more levered competitors can take advantage of
such volatility by acquiring cheaper vessels or whole companies. In addition, by actively adjusting its capital structure, decreasing leverage during good market conditions allows companies to lever up again when downward trends occur. On the other hand, a highly levered company can have difficulty meeting its financial obligations and staying within its overall debt covenants imposed by the banks, e.g., debt-to-equity. Hence, a stark decrease in asset values, which have to be recognized as an impairment loss as per U.S. GAAP, can effectively leave companies in breach of the covenants, further increasing their costs of financial distress (Albertijn et al., 2011).

**Capital Structure Adjustments**

Furthermore, shipping companies actively manage their leverage ratios during the cycle to take advantage of opportunities. Having foresight regarding where the market is heading, which somewhat coincides with the previous section on knowing where one is in the cycle, is essential. Timing is crucial in knowing when to invest, when to sell vessels, and how to utilize the cash proceeds from operations best. In the above section on the pecking order theory, shipping firms’ tendency to use excess cash to distribute dividends rather than invest in new vessels was discussed. Cash also provides an excellent tool for adjusting a company’s leverage ratio. In good times, companies tend to lower their leverage ratio to increase financial flexibility to take advantage of possible opportunities (Interview: Brynildsrud, 2022; Pfeifer, 2022). From the aggregated data derived from the interviews, it also appeared that a revolving credit facility (RCF) is widely used among shipping companies to strengthen financial flexibility further and reduce financial distress. An RCF also called a revolver, is a revolving credit line with a predetermined duration that companies can draw upon when needed and pay off when their cash balances allow for it. RCFs allow companies to increase their flexibility and reduce financing costs by restructuring cash balances as RCFs, which can be used for both investment purposes and operational purposes (Dennis et al. 2000).

To summarize the findings of the above sections. The trade-off theory’s prediction that companies have an optimal leverage ratio stemming from the trade-off between costs of financial distress and tax shield benefits gains little support to explain the debt levels and financing actions carried out by the management of shipping companies. Moreover, the previously mentioned characteristic of the shipping cycles, that a good year tends to be
followed by a less good year earnings-wise, argues, according to the trade-off model’s view on 
financial distress, lower industry leverage ratios, and fewer investments when asset prices are 
soaring. When looking at Figure 6.2, the book leverage of the bulk and container segment is 
increasing with the freight rates, illustrated by figure 13.6 and figure 13.7 in Appendix A. 
This observation further strengthens the notion that the trade-off model fails to explain the 
financing behavior of the companies in the three segments. However, there is a trade-off 
between financial and operational flexibility. The operational flexibility stems from having 
the financial structure that allows the company to charter out its vessels as they see fit. 
More extended duration contracts with excellent earnings visibility allow for higher leverage 
ratios but lower the potential return resulting from not being able to participate in the spot 
market where the freight rate spikes typically are present. Having a capital structure that 
allows for total operational flexibility is paramount for a company wanting to maximize its 
earnings potential. Furthermore, shipping companies actively manage their leverage ratios to 
take advantage of the opportunities when freight rates and asset values fluctuate with the 
shipping cycles.

**Proposition 4:** The companies comprising the three shipping segments actively manage 
their leverage ratio to where they are in the cycle, i.e., the companies tend to gravitate 
toward an optimal leverage ratio.

**Proposition 5:** The companies comprising the three shipping segments do not have a target 
mixture of short-term and long-term debt.

### 7.2.3 Market Conditions Model

The market conditions models predict that companies utilize equity financing in response to 
changes in market valuation. According to the models, managers are more inclined to issue 
shares when their $P/B$ ratio is high than when it is low and more inclined to issue shares 
when their share price has just increased than when it has decreased. The model applies the 
$P/B$ ratio as an indicator or proxy of mispricing between a company’s market value and its 
book value. In shipping, the net asset value, or NAV, is a more relevant metric for measuring 
discrepancies between the market value of a company and the value of its assets. NAV is
defined as the market-adjusted value of assets net of liabilities and often serves as an essential metric when evaluating a company, i.e., is the company valued above, at, or below its NAV (Stopford, 2009). If a company is trading at $P/NAV$ less than 1, which is the share price divided by the company’s NAV per share, the company is trading at a discount to NAV, and if the company’s $P/NAV$ is above 1, it is trading at a premium to NAV. In an asset-heavy industry such as shipping, the majority of the company’s value is derived from assets whose values are highly volatile. A ratio that reflects changes in market values is favored over a static ratio such as $P/B$, which fails to capture the asset value volatility. Unfortunately, the $P/B$ ratio of the company must suffice as a proxy for $P/NAV$ in this paper due to the lack of data available on the market values of vessels, which typically only is available through shipbrokers.

From the aggregated information derived from the interviews, it is apparent that the company’s valuation is critical when deciding whether to issue equity when raising capital to finance investments. Issuing equity when the company is priced above NAV is accretive, and equity issuance when the company is priced below is diluting. It is positive from a company perspective to raise money at higher valuations than what the company’s assets are worth, while issuing equity when the company is priced below NAV is negative because you allow investors a piece of the company for less its "fair value" (Andrikopoulos et al., 2021). All the market participants communicated a great reluctance towards raising equity when the company is priced below NAV, stating reasons such as shareholder dilution and its effect on the share price as the main motivation against doing so. However, there are situations such as imminent financial distress and investment opportunities where companies have to seriously consider issuing equity, even though they are priced below NAV. An example of an equity issuance where a company is priced below NAV is in the case of MPC Container Ships at the beginning of 2020, just before the Covid outbreak, where the company issued equity through a private placement. A portion of the private placement served as an instant influx into the company’s operations as a liquidity measure (Interview: Pfeifer, 2022). Aforesaid, the shipping industry differs from many other industries because of the high volatility and correlation between freight rates and asset values. Companies are typically trading at or above NAV when the market’s outlook is good, consequently limiting the opportunities to utilize these pricing situations because most investment alternatives are also highly-priced. There is a trade-off between what is a good deal in terms of the price of the target and a good deal in terms of financing costs. If one is priced well above NAV and one can obtain
cheaper financing, it can be sustainable to invest at a somewhat higher point in the cycle. The consideration is surrounding where one is priced, elaborated with the quote below.

"The equity market can be a good source of equity capital in case of acquisitions or newbuild orders. Ideally you would like these issues to be accretive to the share price, hence raise money if the share price is above NAV. It has to be the right thing to do in the eyes of the shareholders"

– Andreas Næss VP, Golden Ocean Management

If the company’s stock is not desirably priced when the management wants to invest in new vessels, the management tends to draw upon other forms of financing, such as lease financing. By applying lease financing, the company can increase its leverage to a higher point than it could if it used bank loans, implying a lower required equity portion and a potential for higher returns.

The third reason shipping firms raise equity, apart from liquidity and investment purposes, is to refinance by using the proceeds to pay off more expensive debt, such as a bond. Firms tend to raise debt through bond issuance when one should not raise equity, i.e., P/NAV<1, and when the share price increases to above NAV, raise equity to pay off the bond. However, due to the increased credit profile resulting from a good market outlook, firms opt to issue another bond on better terms rather than issue equity to pay off the old bond. The downside of this approach is that the company enters a spiral where it is always dependent on an active capital market when its bond maturity is approaching, which is not always the case (Interview: Traaholt, 2022). Firms may, however, issue equity when their share price is below NAV for other reasons than an immediate influx of liquidity, e.g., in the case of a highly desirably priced investment. If a vessel is priced at a greater dislocation between what a company deems its fair value to be than the company’s discount to NAV, the investment may still be accretive and should be pursued (Interview: Gram, 2022).

From the above sections, the companies comprising the three shipping segments generally follow the market condition model predictions regarding the timing of equity issuance. The market participants hold equity issuance below NAV in low regard to the diluting effect on the company’s existing shareholders and consequently how costly the equity
raise is. Furthermore, equity issuance does occur when companies are priced below NAV, but it is rare and is most likely caused by financial distress.

**Proposition 6:** Firms in the three shipping segments tend to follow the market condition model’s prediction of equity issuance, that a company is more inclined to issue equity when the $P/B$ ratio is high than when it is low.

**Proposition 7:** Firms in the three shipping segments prefer to finance investments using long-term over short-term debt when $P/B$ is low.

### 7.3 Discussion of Findings

The sections above connecting the information gathered by the market participants to the three capital structure theories provided the thesis with valuable insights, culminating in seven propositions to be tested in the quantitative section.

The main findings of the section covering the pecking order model align with the theory’s prediction and previous research, namely that firms tend to prefer debt to equity financing. This prediction holds well with the statements retrieved by the interviewees and is logical given the costs and riskiness associated with the different instruments. Similarly to (Drobetz et al., 2013) and (Merika et al., 2015)’s findings, the consensus among the interviewees was also to act counter cyclical, emphasizing the importance of timing and having the financial flexibility to take advantage of opportunities. Interestingly, according to the majority of the interviewees, the information asymmetry between managers, shareholders, and lenders is lower when a reputable investor owns the company. Past research has discovered that concentrated ownership leads to reduced agency costs between shareholders and managers, allowing for easier equity issuance, see (Tsionas et al., 2012) and (Andrikopoulos et al., 2021). However, the interviewees communicated that they believed a robust owner structure was not sufficient to have easy and cheap access to capital, pointing to the owner’s reputation as a more critical factor. Furthermore, (Merika et al., 2015) discovered that firms with a dispersed ownership structure tend to favor riskier projects because, in the event of a default, the creditors are sustaining the majority of the losses. Conversely, companies with a concentrated ownership structure should hold less debt because they incur more losses in case of bankruptcy. The leverage ratio of companies with concentrated versus dispersed
ownership structures is not the scope of this paper. Nevertheless, it seems less plausible that firms with reputable owners hold less debt when they have greater access to reasonably priced debt-financing than other firms, according to the statements made by the market participants. This difference might be that previous literature has not distinguished the type of large shareholders, e.g., reputable shipowners and financial institutions such as private equity. Alternatively, because all the statements specifically mentioned the effect of having Mr. Fredriksen as an owner, the feature might be only relevant to companies where he holds a significant ownership stake.

It appears that the importance of being counter-cyclical is shared among the interviewees. It is essential to know where one is in the cycle and act accordingly to adjust leverage and not be smitten by the hubris and over-exuberance prevalent among shipowners. This finding is aligned with both theoretical predictions in (Halling et al., 2016) and (Hackbarth et al., 2006) and previous research on capital structure in the shipping industry in (Drobetz et al., 2011) and (Merika et al., 2015). Furthermore, the findings related to a trade-off between market risk, dependent on the chosen chartering strategy, and the financial risk stemming from the chosen leverage ratio is aligned with previous research on the risk trade-off hypothesis introduced in (Drobetz et al., 2022)). However, (Drobetz et al., 2022)’s prediction regarding spot market-oriented companies is not provided support by the market participants. Their hypothesis predicts that companies with high operational risk exhibited by a spot-oriented strategy should assume low financial risk by maintaining their capital structure debt-free (Drobetz et al., 2022). Several of the companies represented in the interviews above are spot-oriented companies, but none of the companies are debt-free. This deviation from their hypothesis might be rooted in the very nature of academic theories. Academics often create simplified environments in which their model takes place to explain a particular behavior, such as Modigliani and Miller’s (1958) irrelevance theorem in a world without transaction costs, taxes, and asymmetric information. According to academic theory on financial risk management, the assumption that a company that is exposed to peak market risk has no financial risk might prevail. In practice, however, the leverage ratio of companies with excellent spot exposure might be explained by using other risk management tools such as freight forwarding derivatives which can lower their exposure to market risk. Alternatively, a high leverage ratio coupled with high spot-market exposure can be explained by irrational behavior by shipowners with an unjustifiable risk appetite. This argument can be supported
by the quote above made by Peter Anker regarding shipowners’ inclination to take risks. Moreover, the peculiar relationship the shipping industry has with financial risk has been highlighted in previous research, namely that the industry exhibits a disproportionate relationship between operational and financial risk (Visvikis and Kavussanos, 2006).

Regarding the statements made concerning equity issuance and timing, there is a great reluctance among the representatives to issue equity when the company’s market valuation is not appealing. This behavior is aligned with the prediction of the different market-timing models, (Miller, 1977) and (Baker and Wurgler, 2002), as well as the market conditions models introduced in (Fama and French, 2012). However, there is not a clear desire among the interviewees to issue equity based on the company’s market valuation alone. The decision is based on multiple factors where. The most important appear to be investment opportunities. There is a reluctance among the participants to raise equity without a distinct purpose. This feature somewhat connects the predictions of the pecking order model, predicting that tangibility reduces information asymmetry (Merika et al., 2015). An equity issuance by a shipping company with high tangibility can be more detrimental to its share price if it is performed when investment opportunities, e.g., second-hand vessels, newbuildings, or acquisition targets’ valuation, is high in a historical comparison. The lower information asymmetry means that shareholders have good market insights and understanding of a reasonable investment based on timing and price, enabling them to more intelligently critique the decision by not participating in the issuance or selling of shares. This is a bigger problem among shipping companies with high tangibility than tech companies, where information asymmetry is more present.

7.4 Reflections and Caveats

The previously mentioned pitfall concerning the quantification of interviewees’ voices is essential to highlight. The aggregated information derived from the interviews cannot necessarily be applied to the thinking of the entire shipping industry or the thinking of all market participants within each segment. Even though there were signs of saturation, i.e., the lack of differing information and statements provided by each interviewed person, it is too early to conclude that the results can be quantified and applied generally or if such a situation is even achievable. Moreover, the statements made by the interviewees might be a
simplified version of a more technical and advanced rationale supporting the decisions they make. The simplification could be caused by the interviewees’ tight schedule or an attempt to explain terms and processes in what they believe to be a more easily understood format for the listener. Moreover, the statements made could also be based on what the interviewees think is beneficial to hear and to help with obtaining the data (Watson, 2010). However, this is unlikely considering the lack of incentive the interviewees would have for doing so.

8 Quantitative Analysis

Figure 8.1: Structure of the Quantitative Analysis

8.1 Sample Data

The data set is constructed as panel data and is derived from the CRSP and Compustat databases using the standard classification identification number 4412. Financial data on 43 bulk shipping firms, 10 LNG, and 11 container shipping firms from 2000 to 2021 are examined. The companies included in the data sets for each segment must obtain their primary source of revenue from shipping activities in the given segment.

8.1.1 Panel Data

Panel data sets are sets that combine cross-sectional and time series data. Panel data consists of several observations for each observed entity, e.g., firms, over a period of time (Gujarati,
By constructing data as panel data, one can enhance the reliability by obtaining a more accurate interpretation of the relationships of the examined objects (Hsiao, 2011). Panel data can be balanced or unbalanced, depending on whether missing values are present in the data. The sample data drawn upon in this thesis is unbalanced due to the inclusion of firms entering and exiting the segment during the sample period.

### 8.1.2 Trending

The cyclical nature of shipping can result in trends in the panel data. The trend can be caused by either an upward or downward trend in the segment, which causes either increases or decreases in the balance sheet items over time. The majority of the dependent and independent variables are variables derived from the evolution or changes in balance sheet items from one year to another. The relevant variables were tested for trending using the Cuzick (1985) test in Stata, and the tests found no significant trending.

### 8.1.3 Heterogeneity

One of the issues with cross-sectional data is heterogeneity which refers to the variability of an item in the data, which can occur in the instances where the sample data contains different sized firms (Li and Reynolds, 1995). The majority of the variables have been divided by the company’s total assets at time t for the output to be assessed more appropriately and avoid heterogeneity. A more detailed description of the variables can be found in Table 14.1 in Appendix B.

### 8.1.4 Stationarity

Stationarity or unit roots explain the behavior of how a variable’s mean or variance evolves. In contrast, a static variable is a variable whose mean or variance does not vary over time. A variable that contains unit roots varies over time, and the variation can be described as non-predictable, or that it follows a random walk (Giulietti et al., 2006). The Levin-Lin-Chu test determined that the variable dSt was unit-rooted. By regressing a panel that contains unit roots, the regressions can result in a spurious or nonsense regression phenomena. The consequence of the nonsense regression can be unnaturally high, and coefficients for some or all of the variables are deemed significant by applying the
usual t and f-tests. This is a problem because it can create uncertainty surrounding the reliability of the results. Nevertheless, the issues surrounding unit-rooted panel data and, consequently, the nonsense regression phenomenon can be canceled out by the variables being cointegrated. When variables are cointegrated, there is a stable long-term relationship between them, which can result in the regressions not necessarily having to be spurious (Gujarati, 2009). The panel data has been tested for cointegration by performing Kao (1999), Pedroni (1999; 2004), and Westerlund (2007) cointegration tests. The panel set was deemed cointegrating by all three tests. Hence, the previously feared nonsense regression does not necessarily hold, and the regression results can be deemed reliable (Gujarati, 2009, p. 207).

8.1.5 Fixed or Random Effects

The xtreg regression model in Stata is applied when performing the below-described regressions. The model fits regression models to panel data and allows for the option of applying random or fixed effects. The fixed effect model was deemed most appropriate by the Hausman test. Hence all regressions hold model parameters fixed. The fixed effect model is an efficient regression method to calculate models to reduce or control for differences between units that could distort the relevant estimates, hereunder the beta coefficients. The accuracy provided by the fixed effect model is derived from the absorption of unit-fixed effects within the transformation. The firm-level effects are absorbed by the within transformation, where the unit effects are included in the model (McCaffrey et al., 2012).

8.2 Cash Flow Constraints

Equation 8.1 is a basic cash flow constraint illustrated below. The equation tells us that the book value of shares issued \((dS_t)\) plus the change in total liabilities \((dL_t)\) equals the amount a firm invests, defined as the change in total assets during the fiscal year \((dA_t)\) plus dividend paid \((D_t)\) minus earnings \((Y_t)\). Simplified, the total new outside financing must cover the demand for funding from investment and dividends minus the proceeds from earnings (Fama and French, 2012).
Equation 8.2 is the second constraint where total new debt, i.e. change in short-term debt \((dSTD_t)\) plus the change in long-term debt \((dLTD_t)\) equals the demand from investment \((dA_t)\) and dividends \(D_t\) less financing from earnings \(Y_t\) and stock issues \(dS_t\) (Fama and French, 2012).

\[
dSTD_t + dLTD_t = dA_t + D_t - Y_t - dS_t \quad (8.2)
\]

The final equation 8.3 concerns the split of equity financing between issued shares and retained earnings. Again, Fama and French assume earnings as given, meaning firms change their retained earnings by modifying dividends.

\[
dS_t - D_t = dA_t - Y_t - dL_t \quad (8.3)
\]

The rationale behind equation 8.3 is that the proceeds from equity issuance not used to distribute dividends or perform share buybacks, \(dS_t\) will appear in \(dA_t\), i.e., the change in total assets, the proxy for investments.

8.3 Share Issuance Versus Debt Financing

\(dA_t + D_t - Y_t\) are three of the explanatory variables gathered from the cash flow constraint in Equation 8.1. Two additional explanatory variables are the lagged price-to-book ratio, \(P/B_{t-1}\) and the lagged leverage surplus, \(LS_{t-1}\). Lagged price-to-book ratio is defined as a company’s share price multiplied by shares outstanding in \(t-1\) divided by the book value of equity in \(t-1\). The lagged leverage surplus is defined as the difference between a company’s leverage and the target leverage ratio for all companies within the same shipping segment. The leverage ratio is defined as total liabilities plus preferred stock divided by total assets in \(t-1\). All firms’ leverage ratio has been weighted against their total assets when calculating the average leverage ratio to ensure an accurate result.
The two regressions 8.4 and 8.5 described in the above section are illustrated below.

\[ dS_t = a_t + b_1dA_t + b_2D_t + b_3Y_t + b_4P/B_{t-1} + b_5LS_{t-1} + e_t \]  
(8.4)

\[ dL_t = -a_t + (1 - b_1)dA_t + (1 - b_2)D_t - (1 + b_3)Y_t - b_4P/B_{t-1} - b_5LS_{t,t} - e_t \]  
(8.5)

\( LS_{t-1} \) is used to test the trade-off model’s prediction of a target leverage ratio, and \( LS_{t-1} \) is used to estimate shipping companies’ reversion to a target leverage ratio. The trade-off model predicts that firms with higher leverage than their target ratio tend to shift funding preference from debt toward equity. \( P/B_{t-1} \) is incorporated to test the market conditions or market-timing model, which predicts that firms with a higher \( P/B \) ratio tend to issue more equity than firms with a low \( P/B \), because a higher \( P/B \) signals that the cost of equity is low relative to for example debt financing (Fama and French, 2012).

The two first regressions are based on the cash flow constraint equation 8.1 which concerns how companies divide external financing between debt and share issuance, where \( dF_t \) in below regression 8.6 is either \( dS_t \) and \( dL_t \).

\[ dF_t = a_t + b_1dA_t + b_2NegY_t + b_3PosY_t + b_4NoD_t + b_5D_t + b_6MC_t + b_7NegB_{t-1} + b_8P/B_{t-1} + b_9LS_{t,t} + e_t. \]  
(8.6)

8.4 Regression Results I

Pecking order model

When comparing the results of the first pair of regressions, 8.4 and 8.5 tested using regression 8.6 in Tables 14.3 and 14.4. The pecking order model’s prediction that new investments are financed by debt rather than equity fairs well for all segments. From the slopes for investments, container shipping companies are more inclined to finance new investments by issuing equity than LNG and Bulk shipping firms, where firms within the LNG segment are most inclined to use debt financing. An interesting detail to highlight is that by looking at the summary statistics in 14.2, the average values for proceeds from book value share issues
for bulk firms during the period exceed the container and LNG companies’ share issues by approximately three times. Implying that bulk firms raise significantly more equity than firms in the other two segments. Furthermore, the flow variables for bulk shipping companies in Table 14.2, e.g., share issues, debt issues, and investments, are all negative, which coincides with the downward trend in the bulk segment displayed in Figure 13.6 previously highlighted, which appears to have caused the companies comprising the bulk segment to invest less, and fund operations using equity issues. The proceeds from debt financing $dL_t$ are almost double the average for proceeds from equity, further strengthening the notion that firms prefer debt financing to equity. Thus supporting proposition two, firms in all three segments prefer to fund new investments using debt financing rather than equity issuance.

The relationship between earnings and share issuance illustrated in Table 14.3 is peculiar. Share issuance and the variable for negative earnings, $NegY$ are negatively related for all three segments. In contrast, positive earnings are positively correlated with share issuance for bulk shipping firms but negative for LNG and container firms. This suggests that share issuance is not performed as a response to changes in earnings for these two segments, contrary to the bulk segment, where it appears that share issuance is performed more often when companies report positive earnings. Hence, one can argue that share issues are performed more often in response to investment opportunities instead of liquidity purposes. Regarding dividend-paying firms, firms operating in the bulk segment are more inclined to issue equity when not distributing dividends. In contrast, the opposite relationship is apparent for LNG and container shipping companies. The incremental response in share issuance for non-dividend paying firms is large for bulk firms, where they average 8.57 percent of assets per year. Consequently, due to the cash flow constraint 8.1, the opposite relationship is evident for debt financing. Non-dividend-paying companies in the LNG and container segment tend to raise more debt financing than non-dividend-paying companies in bulk, where the relationship is negatively related.

Moreover, the relationship between market capitalization ($MC_t$), measured using the log of the companies’ $MC_t$, and share issuance and debt financing fairs poorly for bulk and container companies where an insignificant relationship is apparent. This relationship fairs somewhat better for LNG firms, where larger firms tend to issue more equity and less debt. However, these features are statistically insignificant for all firms in both
regressions, reporting low explanatory power for all segments, especially in bulk and LNG. These findings suggest that firm size does not significantly affect either debt or equity financing.

The Trade-off Model
The trade-off model predicts that firms operate with an optimal leverage ratio, a ratio they tend to revert back to. Aforementioned, the variable for lagged leverage surplus, $LS_{t-1}$ serves as a predictor to explain the trade-off model’s prediction that a positive leverage surplus should lead to more equity issuance and less debt. For this prediction to be true, there should be a positive relationship, i.e., a positive slope for the variable $LS_{t-1}$ in the regression to explain share issuance in Table 14.5. The finding suggests that only container firms tend to revert leverage to their target, and the opposite is observed for bulk and LNG firms. However, the results for LNG and bulk firms hold low explanatory power. Interestingly, from the summary statistics in Table 14.2, both container and bulk shipping firms’ average lagged leverage surplus is significantly larger than LNG firms. This observation can suggest that LNG firms have a more prominent target leverage ratio that firms rarely deviate from than the two other segments. This feature can be explained by the typically longer-duration time-charter contracts prevalent in the LNG segment, causing fewer earnings fluctuations and less need to adjust leverage. The results mentioned above lean towards a rejection of proposition four, and the trade-off model’s prediction of a target capital structure ratio fails to explain the changes in leverage ratio for two of the three segments. The reversion to target is economically weak for container firms, but there is a reversion with statistical significance.

The Market Conditions Models
The market conditions models predict that firms with a higher $P/B$ ratio tend to issue more equity than firms with a low $P/B$. Companies whose stock has just increased tend to issue equity more often than if the stock price has decreased. The variable for the lagged $P/B$ ratio, $P/B_{t-1}$ is at the center of testing this prediction. The slopes for $P/B_{t-1}$ are positive for the bulk and LNG segments but not for container firms displayed by Table 14.5. It implies a positive relationship between a company’s valuation and managers’ inclination to raise equity for bulk and LNG firms, but not for firms within the container segment. However, the observation is statistically weak for both bulk and container firms and stronger
for LNG companies. Proposition six fails to explain a positive relationship between equity issuance and $P/B_{t-1}$ for all three segments. The relationship is only present for LNG and bulk firms but not container firms. Nevertheless, the results indicate a larger propensity for issuing equity than debt when there is a positive development in company valuation relative to book values, implying that the market timing prediction of the market conditions models holds some truth.

### 8.5 Short-Term Versus Long-Term Debt

The second pair of regressions are incorporated to test the predictions that the trade-off, pecking-order, and market conditions models have on debt financing. First, cash flow constraint 8.2, which says that the sum of changes in short- and long-term debt financing must cover financing demand, investment, and dividend minus proceeds from share issuance, is applied to create regressions that test the split between short-term and long-term debt financing. The two regressions below include the variables on the left-hand side of cash flow constraint 8.2 and also include the variable $dS_t$ to control for the total required new debt instead of the total required outside financing to enable the model to make a distinction between short- and long-term debt.

\[
dSTD_t = a_t + b_1 dA_t + b_2 D_t + b_3 Y_t + b_4 dS_t + b_5 P/B_{t-1} + b_6 STS_{t-1} + e_t \tag{8.7}
\]

\[
dLTD_t = -a_t + (1 - b_1) dA_t + (1 - b_2) D_t - (1 + b_3) Y_t - (1 + b_4) dS_t - b_5 P/B_{t-1} - b_6 STS_{t-1} - e_t \tag{8.8}
\]

$dSTD_t$ is defined as the change in short-term debt during the fiscal year $t$, calculated as the change in current liabilities. $dLTD_t$ is defined as the change in long-term debt during fiscal year $t$ and is calculated as the change in total liabilities less change in current liabilities during the fiscal year $t$.

The explanatory cash flow variables and their slopes explain how the shipping companies, on average, shift between short- and long-term debt financing due to variations in earnings,
investment, share issues, and dividends.

Regression 8.9 below is the regression derived from regression 8.8 and 8.7, and is the regression that is performed, where \( dF_t \) is either \( dSTD_t \) or \( dLTD_t \).

\[
dF_t = a_t + b_1dA_t + b_2NegY_t + b_3PosY_t + b_4dS_t + b_5NoD_t + b_6D_t + b_7MC_t + b_8NegB_{t-1} + b_9P/B_{t-1} + b_{10}STS_{t-1} + \epsilon_t
\]

(8.9)

### 8.6 Regression Results II

According to the market conditions models and the pecking order model, firms with a high \( P/B \) ratio tend to prefer long-term to short-term debt. Like equity, long-term debt is viewed as undervalued or less costly for high \( P/B \) firms than low \( P/B \) firms. The regressions performed to explain the shipping companies’ short-term versus long-term debt preference do not convincingly prove this prediction. There is a weak economic and somewhat weak statistical relationship between companies’ \( P/B \) ratio and preference for long-term to short-term debt for bulk and LNG companies illustrated by Tables 14.6 and 14.5. For container shipping companies, firms with higher \( P/B \) ratios tend to utilize short-term debt over long-term debt.

### The Pecking Order Model

The pecking order model predicts that firms tend to prefer short- to long-term debt due to variations in cash flow and investment opportunities. This prediction is best for bulk shipping companies, where long-term debt absorbs more variations stemming from positive and negative earnings than short-term debt but absorbs fewer variations in investments. These results provide strong statistical support. For LNG and container shipping firms, on the other hand, the prediction fairs worse, yielding inconclusive results. From this, the pecking order’s prediction of the problems surrounding asymmetric information does not significantly impact the debt financing choices in shipping. However, the results displayed in Tables 14.5 and 14.6 suggest that all firms operating in the three segments tend to finance investments using long-term debt.
The Trade-off Model

The trade-off model predicts that firms have a target debt mixture of short- and long-term debt. The lagged short-term surplus variable $STS_{t-1}$ attempts to capture the relationship between the average short-term leverage ratio of the industry, i.e., target ratio, and the firm’s own short-term to long-term ratio. Similar to $LS_{t-1}$, the regression to explain $dLTD_t$ should yield a positive coefficient for $STS_{t-1}$ if the sampled firms tend to revert to a target mixture of short- and long-term debt. This prediction fairs well for all segments where a strong economic relationship is reflected by high slopes and is statistically significant for the bulk and container segments. Naturally, the slopes for lagged short-term surplus are negative in the regressions to explain $dSTD_t$ in Table 14.6.

The trade-off impact for firms in all three segments is considerable. The average slopes for the beta coefficients are 18.24, 17.64, and 63.90, and average standard deviations of 0.24, 0.05, and 0.01 for the bulk, LNG, and container firms, respectively. Thus, the results from the statistical analysis contradict the prediction of proposition six that neither of the firms comprising the three segments has an optimal mix of short- and long-term debt. The proposition was based on the information gathered from the interviews of market participants stating that short-term debt is a commonly applied source of financing. Hence, the result is surprising and will be examined more thoroughly in the discussion section below.

The results derived from regression 8.9 provide inconsistent results on the applicability of the capital structure theories for the three segments. The pecking order and market conditions models’ prediction that high P/B firms tend to favor long-term to short-term debt tend to explain the behavior of LNG firms, but the findings are statistically insignificant. Moreover, the pecking order model’s prediction that firms favor short-term debt over long-term debt and the trade-off model’s prediction that firms have a target mixture of short- and long-term debt yields similar results for the three segments. Hence, the results of regression 8.9 suggest that the predictions of the theories can explain the financing behavior and preferences of the three segments. Furthermore, proposition seven fairs well for firms operating in the bulk and LNG segments regarding a positive relationship between long-term debt and company valuation over short-term debt. Proposition four states that larger firms tend to use more long-term debt financing than smaller firms also fairs poorly for container firms, depicted by
the negative slope for $MC_T$. Contrary to firms operating in the container segment, firm size and long-term debt financing positively relate to LNG and bulk companies.

8.7 Share Issuance and Dividends

Finally, to test the pecking order and market condition models’ predictions on dividends and equity issuance, a re-arranged version of equation 8.1 is introduced in equation 8.3.

$$dS_t = a_t + b_1 dA_t + b_2 Y_t + b_3 dL_t + b_4 P/B_{t-1} + e_t \quad (8.10)$$

The re-arranged cash flow constraint 8.3 tells us that investments that are not funded by earnings or debt must equal the equity issued during fiscal year $t$ minus dividends. The above equation also implies that when investment, earnings, and new debt is fixed, a change in equity issuance must equal a similar change in dividends. This relationship is the basis of the last two paired regressions below.

$$D_t = a_t + (b_1 - 1) dA_t + (b_2 + l) Y_t + (b_3 + l) dL_t + b_4 P/B_{t-1} + e_t. \quad (8.11)$$

The above regressions 8.10 and 8.11 represents the constraints on the coefficients inferred by equation 8.3. As with the previously introduced paired regressions, a third and final regression equation captures the notion of the paired regressions.

$$dF_t = a_t + b_1 dA_t + b_2 NegY_t + b_3 PosY_t + b_4 dL_t + b_5 MC_t + b_6 NegB_{t-1} + b_7 P/B_{t-1} + b_8 D_{t-1} + e_t \quad (8.12)$$

In the Regression 8.12, $dF_t$ is either tested with the dependent variable $dS_t$ or $D_t$. 
8.8 Regression Results III

Similarly to Fama and French (2011), the independent variable for lagged dividends, $D_{t-1}$ is included in regression 8.12 to test whether dividends are sticky in the three segments, as predicted by the pecking order model.

The persistence of dividends fairs poorly for all three segments, shown in Table 14.7. The average slopes for $D_{t-1}$ in the regression to explain $D_t$ are economically weak for all three segments, and the tendency of sticky dividends is most prevalent for LNG companies, with an average slope for lagged dividends of only 0.35. When looking at the effect of the two dummy variables for positive and negative earnings have on dividends in Table 14.7, $D_t$ has a positive relationship with $PosY_t$ for the LNG and container segment during the period, but a negative relationship for Bulk shipping firms. However, the regressions to explain $D_t$ report an $R^2$ of 1% for bulk firms compared to 44% and 27 % for the LNG and container companies regressions, and little explanatory power for all variables. Hence, the results derived from this regression for bulk shipping companies should be treated with caution and alternatively discarded. Nevertheless, as depicted by Table 14.7, dividends are more affected by positive earnings than negative earnings for the regressions yielding statistically significant results. The cash flow constraint 8.3 says that share issues fewer dividends must cover investment, fewer earnings less debt issuance. Hence, keeping new debt and investment fixed and increased earnings leads to lower share issuance and increased dividends for LNG and container firms. Negative earnings lead to more share issuance instead of decreased dividends.

Moreover, when remembering the cash flow constraint 8.3, the slopes for investment in the regressions to explain share issuance and dividends displayed by Tables 14.7 and 14.8, variations in investments are almost exclusively funded by changes in share issuance rather than dividend changes. This observation supports the prediction that dividends are sticky and are rarely adjusted for investment opportunities, fluctuating earnings, or debt issuance. However, the explanatory power of $dA_t$ in Table 14.7 is weak. Hence, the magnitude of the stickiness of dividends cannot be established with certainty. The above findings suggest that there is no strong link between earnings and dividend policy fluctuations for either of the three segments, depicted by the economically weak slopes between positive and
negative earnings and dividends. Dividends are sticky concerning fluctuations in earnings and investments for all segments, and a reluctance to change dividend amounts from year to year has only weak support for firms in the three segments.

For the regressions to explain $D_t$, most of the explanatory power is derived from lagged dividends, lagged price-to-book ratio, and positive earnings for LNG and container firms. $D_{t-1}$ and $P/B_{t-1}$ provide most of the explanatory power yielding average t-statistics of 3.83 and 11.91 for lagged dividends for LNG and container firms, respectively and average t-statistics of -2.34 and 4.06 for $P/B_{t-1}$ for the two segments. The low $R^2$ for the regression to explain $D_t$ in bulk shipping firms yield little to no explanatory power for all variables. The market conditions models’ prediction that firms with higher P/B ratio tend to have higher dividends and issue shares fairs well for firms operating in the bulk and container segments, yielding positive slopes in both regressions. The slopes are, however, economically insignificant for container firms.

The prevalence of sticky dividends observed by the regression results and noted above find weak support for the pecking order model’s prediction that firms adapt dividend policies to investment outlay, earnings, and debt issues. However, (Myers, 1984) acknowledges that sticky dividends are treated as exogenous and that the forces influencing companies’ apparent fixed dividend policies have a stronger pull than the factors which the model predicts should cause adjustments in dividends (Fama and French, 2012). Moreover, proposition one regarding the tendency of sticky dividends in LNG and container shipping companies fairs well for LNG companies but less so for container firms, illustrated by a weak slope for lagged dividends. Interestingly, the regression to explain $D_t$ for bulk shipping firms reported a higher slope for lagged dividends than container firms, which argues for stickier dividends in the bulk segment. The prevalence of stickier dividends in bulk firms can be related to agency costs which will be discussed below.

A summary of the findings from the above statistical analysis can be found in Table 13.1 in Appendix A.
9 Discussion of Results

The findings summarized in the below figures are discussed in the following sections. The alignment of the choices between the three segments varies for the different predictions, which argues for different driving forces within each segment. The differing capital structure choices derived from the above findings speak to the importance of distinguishing between segments in shipping when analyzing the industry.

9.1 The Pecking Order Model

![Figure 9.1: Findings from testing propositions related to the pecking order model]

As previously stated, the findings from the statistical analysis support the main prediction of the pecking order model that firms prefer debt financing to equity financing. All three segments supported this feature. The prediction that firms prefer short- to long-term debt due to asymmetric information and issuance costs is not a substantial issue for the firms operating in either of the three segments. Long-term debt absorbs more of the variation in investment than short-term debt. The model’s prediction that dividends are generally sticky but adjusted to account for variations in cash flows and investment opportunities to avoid costly equity issuance is not supported by the regressions to explain share issues and dividends.

According to the pecking order model, the typically longer charter contracts in the LNG and container segments argue for stickier dividends due to better earnings visibility. Despite the characteristic of commonly longer charter contracts, the prevalence of sticky dividends
was not found in container firms. Companies in the LNG segment reported the stickiest dividends, and interestingly, firms operating in the bulk segment had stickier dividends than container firms. That LNG carrier firms reported the stickiest dividends was expected given the segments’ characteristic long time-charter contracts. However, the stickiness, depicted by the slopes of lagged dividends, which aim to capture how dividends change from one year to the next, was surprisingly weak. A reason why sticky dividends exhibited by a reluctance to change dividend amounts, depicted by a high slope for lagged dividends, appear not to be a feature in the container segment might be due to the state of the container market in the sample period. Figure 13.7 and Figure 13.3 show that the container segment has experienced an oversupply of tonnage, causing lower freight rates and likely diminishing returns. The Figures 13.8 and 13.9 show the difficulty container shipping firms have coped with the last decades. Several of the largest companies have reported downbeat earnings for several quarters, and a general downward deterioration of profitability from 2004 to 2016, but especially after the financial crisis in 2008 until the previously mentioned effect of the Covid-19 pandemic shifted the landscape dramatically (Shin et al., 2018). The poor earnings environment has resulted in an increased focus on consolidation and cost-cutting, explaining the lack of sticky dividends in the segment. Container firms have been pricing their services around marginal cost, leaving little to no room for generous dividend distributions to shareholders (Glave et al., 2014). A reason why sticky dividends appear to be a feature among bulk firms, even with their more short-term oriented charter market than the other two segments, can be a consequence of governance problems related to agency theory that investment decisions have been fueled by self-interest rather than the interest of the shareholders. Hence, a predictable dividend policy might reduce the information asymmetry and agency costs that have plagued some companies in the segment (Yeo, 2018).

The quantitative tests found that firms in all three segments prefer debt to equity financing. This feature has been established from previous academic research, namely that the pecking order serves as a sound predictor of financing choices in the shipping industry, where bank loans are typically preferred to other forms of financing, but especially equity (Albertijn et al., 2011) and (Drobetz et al., 2013)

There are several reasons why debt is preferred to equity issuance among shipping firms. First, the industry is highly capital intensive, increasing the difficulty of financing
a project solely with equity. Secondly, the management increases the potential return on equity by increasing leverage; thirdly, debt is recognized as cheaper than equity; finally, the company can lower its weighted average cost of capital (WACC) by maximizing its debt capacity. The relationship between the benefits of debt and the cost of capital is illustrated by Figure 9.2. Increasing amounts of debt lower the overall cost of equity because the lenders require a lower return when lending than when they provide equity. This is because debt holders are paid before equity holders. Hence, debt is deemed less risky than equity from a capital provider’s point of view. An amount of debt maximizes the benefits of a company’s WACC. Shipping firms would like to obtain a leverage level that maximizes the benefits due to the lower cost of capital. A lower cost of capital results in a lower cash break even for the vessels due to the lower financing costs, allowing the firms to compete on the cost of capital. As previously mentioned, a lower cash break even allows a company to charter their vessel out for less while maintaining profitability, resulting in the company with the lowest WACC winning the best charters.

The relationship between size and leverage is somewhat ambiguous in the pecking order and trade-off models. Firm size implies lower information asymmetry between the managers and the capital markets, i.e., a large firm should obtain cheaper equity than a smaller firm due to less severe signaling effects when issuing equity. The trade-off model predicts an inverse relationship between size and bankruptcy costs, where a more prominent firm imposes a lower probability of default, i.e., a correlation between firm size and leverage (Drobetz et al., 2013). The proposition was derived from the data gathered from the interviews and the previous predictions of the two models that in shipping, larger firms will have better access
to financing throughout the cycle. Interestingly, a positive relationship between firm size and long-term debt issuance only held for LNG shipping companies, where only a weak negative relationship was found for bulk firms and a somewhat stronger negative relationship for container shipping firms. Even though the results were not conclusive, the findings differ from previous academic research on the relationship between size and leverage (Rajan and Zingales, 2016); (Frank and Goyal, 2009) but a similar inconsistent relationship was found in the (Drobetz et al., 2013)’s paper on capital structure in globally listed shipping companies. The slopes only report, on average, 1.34 standard errors from zero. Nevertheless, the findings are fascinating.

The above shows that the pecking order model fairs well when predicting the financing choices of the three segments, where debt is favored over equity issuance. Moreover, long-term debt absorbs more variation than short-term debt in the regressions to explain the short-term versus long-term debt financing of new investments. The quantitative tests show that the bulk industry has a more significant propensity for financing investments using the short-term than firms operating in the LNG and container segments. This is another interesting finding, but firms operating in the three segments favor long-term to short-term debt financing. A reason why bulk firms appear to be more inclined to use short-term debt than firms in the other two segments can be that the representatives of the bulk shipping all represent established companies with a good track record and well-known owners. A feature that might enable them to obtain financing at better terms than smaller companies, which might need to draw on equity financing or more risky short-term debt. The bulk industry comprises many smaller companies, which can be why short-term debt financing might be more prevalent in this segment due to smaller firms often exhibiting higher costs of equity and long-term debt due to the increased risk of default. Moreover, (Titman and Wessels, 1988) found that smaller firms tend to utilize more short-term debt as opposed to long-term due to the increased costs of obtaining long-term debt and equity relative to larger companies. Their findings are supported by the slopes for $MCT$ for LNG and bulk companies in Table 14.5, depicting a negative relation between firm size and long-term debt. A second reason for the prevalence of short-term debt usage is the previously mentioned spot-market-oriented strategies bulk firms operate. Recall from the section introducing the shipping industry that under voyage charters, or spot contracts, the tonnage supplier, i.e., the vessel’s owner, incurs operating expenses such as bunker costs. Prepaid bunker costs
9.2 The Trade-off Model

The findings relevant to the trade-off model imply that companies have a target mixture of short- and long-term debt and that firms in the bulk and LNG segment tend to revert to a target leverage ratio at a relatively high speed, illustrated by the high slopes. The findings of the high speed of adjustments differ from previous research, see (Fama and French, 2002) and (Fama and French, 2012) (2011), whose research found slow target leverage reversion causing the relevancy of this prediction to be questioned.

The desire and importance to remain flexible to take advantage of profitable opportunities when they arise was the basis of this proposition. The proposition appears to be a sound hypothesis based on the interviews and the cyclicality of the shipping industry mentioned several times. However, whether companies adjust their leverage ratio to where they are in the cycle was difficult to test in practice due to the lack of data. The proxy for an optimal leverage ratio relies on the assumption that the optimal leverage ratio relates to where the industry is in a cycle. This optimal leverage ratio is reflected as the average leverage ratio of the companies operating the respective segments.

The quantitative tests did not establish a conclusive reversion among companies in all three segments to an optimal leverage ratio. Only container shipping firms reported a reversion to a target leverage ratio, whereas bulk and LNG firms reported the opposite relationship but
without statistical significance. Hence, it cannot be concluded with statistical certainty that bulk or LNG shipping firms do not follow an optimal leverage ratio or actively manage their leverage to where they are in the cycle. However, the information gathered from the market participants appears to support a desire to do so. The weak support of active adjustments of companies’ leverage ratio to a target is aligned with previous research, stating that a leverage ratio reversion is a second-order priority among managers (Graham and Harvey, 2001)(Graham and Harvey, 2004)(Fama and French, 2012)(Deangelo and Roll, 2011).

There are typically two factors that influence the rate of adjustment to the target. The consequence of the deviation is one factor where the costs increase with the decrease in financial flexibility, which might hinder the firm from chasing certain opportunities. This argument is supported by (Alexandridis et al., 2020) ’s findings that shipping firms tend to follow a target capital structure but with deviations and that acquisition activity decreases with abnormal leverage. The consequences of deviating from targets should be more severe for highly levered companies whose costs of financial distress increase dramatically and consequently their ability to do business as they see fit.

A second factor is transaction costs that might hinder firms from actively managing their leverage ratio to the extent predicted by the theory. The occurrence of significant transaction costs was highlighted by one of the interviewed market participants, and the effects of said costs are commonly highlighted as one of the main reasons for firms deviating from an optimal leverage ratio (Leary and Roberts, 2005) (M and Rangan, 2006) (Allen et al., 2019). (Faulkender et al., 2012) found that overleveraged firms tend to gravitate or adjust more rapidly to a target leverage ratio than underleveraged firms, supporting the argument that costs of deviation for highly levered firms exceed those of less levered companies. Remembering that shipping firms are substantially more levered than average firms, as pointed out in Section 6.2, one would expect a high speed of adjustments for shipping firms. The economic magnitude of the slopes for $LS_{t-1}$ shown in Table argue for substantial equity and debt issuance as a response to deviations from a target ratio. However, the slopes have bad signs for bulk and LNG firms, suggesting that these firms’ reversions to target are not a feature.
The rate of adjustments is also dependent on the business cycle, where an expansion often leads to more rapid adjustments than in market downturns. This can be explained by the capital markets and capital providers’ increased willingness to provide capital in good times, reducing the costs of adjustment (Drobetz et al., 2013) (Halling et al., 2016) (Hackbarth et al., 2006) (Cook and Tang, 2010). Hence, there is no optimal leverage ratio among shipping firms, or an optimal leverage ratio for a segment does not exist. The presence of a firm-specific leverage ratio might be more rational and likely, given the differing exposure firms have to operational risk exhibited by their chosen chartering strategy. Differing target leverage ratios can be explained by varying access to debt and capital markets. The geographical origins and ties for different companies might cause such variations, where companies with ties to countries known for their willingness to fund shipping operations, such as Norway, might experience better access to capital than companies with ties to other countries (Norevik and Gulbrandsen, 2020). Nevertheless, a mean-reverting leverage ratio might be detected in the long run, as proposed by (Chen, 2007) and (Lemmon and Zender, 2008), but by remembering that a typical shipping cycle on average lasts approximately seven years. Considering that the quantitative tests are done based on a sample period of 20 years, it seems unlikely that a sample with a longer duration would yield different results.

Perhaps the most exciting finding is that the companies within each segment have an optimal mixture of short-term and long-term debt, which they tend to revert to actively. A reason for the findings of the apparent propensity of firms in the three segments’ rapid adjustment towards a target mixture of short- and long-term debt can be that it is the current portion of the long-term debt that is the driving force. The current portion of long-term debt in the case of shipping companies is mainly comprised of the down payments to be paid within one year. Hence, by attempting to answer this feature by applying data from the interviewees, a company’s current liabilities of publicly listed shipping firms will likely be smaller in relation to total debt and see a lower percentage change fluctuation from year to year than the company’s non-current liabilities. Hence, the rapid reversion can be explained by increases and decreases in the current portion of long-term debt, which comprises current liabilities. This finding contradicts previous research on capital structure choices, which states that target leverage ratios and reversion to a target ratio are not highly prioritized, see (Graham and Harvey, 2001) ’s survey of chief financial officers of publicly listed companies and (Graham and Harvey, 2004). This paper
finds evidence that supports a quick reversion to a target short-term to long-term debt mixture, depicted by the steep slopes for $STS_{t-1}$ in Table 14.5. Whether a reversion to a target mixture of short- and long-term debt is an active measure taken by managers in the shipping industry or simply a feature that happens organically. However, based on the data from the interviews and previous research on the industry, it seems unlikely that a dynamic adjustment of said target is essential consideration managers make. Furthermore, the application of short-term debt is more prevalent among services and consumer companies with more significant fluctuations in working capital than in the shipping industry, further supporting the prediction of a reversion being a random occurrence (Pleasko, 2000).

9.3 Market Conditions Models

![Diagram](image)

**Figure 9.4:** Findings from testing propositions related to the market conditions models

The results derived from the regressions that explain the split in outside financing between debt financing and equity issuance provided mixed results concerning the prediction of the Market conditions models that firms with higher $P/B$ ratios tend to allocate more equity issues in new investments than firms with lower $P/B$ ratios. The results exhibited a weak economic and statistical relationship between the $P/B_{t-1}$ and $dS_t$ for bulk and LNG firms and an inverse relationship for container firms. These findings point to a weak link between shipping companies’ valuation and equity issuance viewed in isolation. Hence, the market conditions models’ prediction of a positive relationship between company valuation and financing choices serves as a weak indicator for the choices made in these three shipping segments. (Fama and French, 2012) found reliable traits for the same regressions in their research covering micro, small, medium, and large corporations, but also they found the relationship to be economically weak. An explanation for why the relationship between
$P/B$ and equity issuance is weak and mixed can be because of frequently mentioned but important characteristics of the cyclicality of the shipping industry and the correlation between asset values, freight rates, and firm value. The previously emphasized importance of counter-cyclical behavior when investing in shipping an argument was also highlighted by the market participants. When firm values are high, measured using the proxy for $P/NAV$, $P/B$, the stock price is "communicating" that the firm should do an equity issue due to the company's relative valuation. However, due to the correlation between asset values, freight rates, and firm value, the timing of investment opportunities and company valuation tend not to coincide. Hence, performing equity issuance when market values are high and letting proceeds remain on the balance sheet for a longer period without employing the capital is not necessarily a sound decision from an opportunity cost of capital point of view. Even though the academic theory argues for an equity issue, firms could issue equity when firm value is high relative to book value and use the proceeds to reduce the leverage ratio. However, according to the market participants, this is also a rarity. Firms tend to raise new debt in these situations rather than equity. When the freight market is thriving, the players in the capital markets tend to eagerly provide capital at a low cost, incentivizing firms to re-finance at lower rates while still maintaining the leverage, providing them with good opportunities for high ROI. A second reason for the apparent disconnect between company valuation and equity issues can be explained by the findings of Alti and Sulaeman (2012). They found that a positive relationship between the two factors is evident in situations with substantial interest from institutional investors. Hence, the lack of positive evidence for this relationship can be due to measuring error because the regression does not take this into account.

Proposition 7 gained weak support from the regressions to explain $dSTD_t$ and $dLTD_t$ in Table 14.6 and Table 14.5. Again, the bulk and LNG firms are more inclined to issue long-term debt when their $P/B$ is high, whereas, for container firms, the opposite relationship appears to be true. Hence, similarly to the findings of Baker and Wurgler (2002), it appears that there is indifference regarding the choice of financing and market valuation. Baker and Wurgler found that the choice of financing is more dependent on the availability of capital, i.e., which financing instrument is easiest and cheapest to obtain Baker and Wurgler (2002). This notion is also supported by the findings regarding proposition 7, finding only a weak link between valuation and equity issuance.
10 Conclusion

This paper analyzes the capital structure choices of firms operating in bulk, LNG, and container shipping segments from 2000 to 2021. The sample period has covered at least one shipping market cycle for each segment to better understand the firms’ financing behavior during times of immense financial and operational pressure caused by the volatility that characterizes the shipping industry. The capital structure choices have been analyzed using three regressions pairs that test different pecking order predictions, trade-off, and market conditions models.

10.1 Pecking Order Model

The findings of this paper support the pecking order model’s prediction that firms prefer debt to equity when financing investments. This prediction holds for firms in all three segments. The second prediction of the split between short-term and long-term debt explained by the second pair of regressions provides results that firms operating in all three segments favor long-term debt to short-term debt when financing new investments, contradicting the pecking-order model’s prediction. Firms adjust their dividends to investment opportunities and avoid costly equity issuance, which fairs well for all three segments. The low slopes for $D_{t-1}$ indicate that dividend amounts do not remain unchanged from year to year. However, the results also support that firms in the three segments do not vary dividends significantly to fluctuations in earnings or investment opportunities, arguing for somewhat sticky dividends.

10.2 Trade-off model

The regressions that split short-term and long-term debt provide mixed evidence that firms in the three segments revert their leverage ratio towards an optimal target ratio. Both bulk and LNG firms tend to issue more long-term debt when their leverage ratio exceeds the industries’ target ratio, contradicting the prediction of the trade-off model. At the same time, container firms tend to issue more equity, in line with the model’s prediction.
Hence, it cannot be concluded that there is an optimal leverage ratio in the bulk or LNG segment. Interestingly, the regressions to explain the split between short- and long-term debt implies an optimal mixture of short- and long-term debt, exhibited by statistically and economically significance and rapid adjustment to target. This finding supports the prediction of the trade-off model and has not previously been highlighted by scientific research.

10.3 Market Conditions Models

The mixed evidence of the market conditions models’ prediction of the relation between \( P/B_{t-1} \) and equity issues and long-term debt paints a good picture of the models’ inability to predict capital structure choices in the three segments. First, \( P/B_{t-1} \) and equity issues positively relate to bulk and LNG firms, but the opposite relationship is apparent for container firms. The second prediction that high \( P/B_{t-1} \) favors long-term to short-term debt provides mixed results.

Based on the information above, the pecking-order model serves as a superior predictor of the capital structure choices in the three shipping segments, followed by the trade-off model. The market conditions models serve as a poor predictor of the capital structure choices, yielding mixed and inconclusive results. The firms operating in the three shipping segments tend to be aligned in their choices of financing instruments and also in support of the main predictions of the pecking order and trade-off models, but with deviations regarding reversion to an optimal leverage ratio. Hence, the findings suggest that there is not one single theory that can successfully explain the firms’ financing behavior comprising the three segments. Rather, it appears that the application of several theories in combination can better explain and predict the companies’ choices.

The findings of this thesis contribute to the body of knowledge on the topic of capital structure in the shipping industry, the ability of capital structure theories to predict capital structure choices in the three segments, and the differences between the segments. Where previous research has focused on determinants for capital structure in the shipping industry, companies operating in specific countries, and specific segments, this paper focused on
the capital structure choices in three specific segments. The paper provides results that emphasize the importance of distinguishing between different segments in the industry due to the many unique characteristics which define them.

11 Implications

The thesis’ findings give rise to further research in many different areas. The finding that shipping companies actively manage short- to long-term debt ratios is a topic not previously researched. The finding differs from previous academic research. Hence, it could be interesting to look into the applicability of short-term debt in the shipping industry, especially in bulk shipping firms. Moreover, the transformation of the LNG shipping segment from fixtures exclusively being project-linked to becoming more commoditized in recent years can be an interesting research topic. Future research can examine whether the change in fixture duration has affected capital structure determinants and choices. A third exciting topic could be to look into how a company strategy affects the leverage ratio of companies, focusing on whether the company’s strategy is reflected in the capital structure or if leverage ratios tend to remain somewhat fixed within each segment.

Furthermore, the findings obtained in this thesis can inform practitioners such as finance professionals within shipping companies and banking professionals. The findings suggest that bulk and LNG shipping firms do not revert to a target leverage structure. Companies could evaluate whether reversion to a target structure and more active management of the company’s capital structure might prove beneficial. Lenders could use the findings of sticky dividends depicted by the minimal impact variations on earnings and investment outlays had on dividend policy in the three segments. The information could be used to improve the covenants on loan term sheets to reduce the risks of insolvency for their borrowers, resulting in loan losses or loan write-downs. Moreover, several of the market participants communicated a rather distinct distaste towards the banks’ reluctance to behave counter-cyclical. This feature can impair the inclination shipping companies have to finance investments using bank debt the feature, especially when coupled with the lower obtainable LTV compared to that of leasing agreements.
12 Limitations

There are caveats in all research papers, and this paper is no exception. When deciding on a methodology and requirements for sample data, some unfortunate consequences arise, which might have impaired the paper’s findings. For simplicity purposes, data was gathered from Compustat and CRSP, databases widely used in academics, but in the case of listed shipping firms, there were some shortcomings regarding the number of firms available through the database. Only firms that reported balance sheet and income state figures in US Dollars were included in the sample to ensure comparison and calculations on a like-for-like basis. This cutoff reduced the sample size, which can be a problem because the statistical analysis findings may not be applicable for an entire segment when describing the capital structure choices and behavior.

The paper applied proxies on target ratios for total debt, short-term to long-term debt, and company valuation relative to the net-asset-values of firms’ assets. The application of proxies can impair the applicability of the paper’s findings. For example, the assumption that a target or optimum leverage ratio for firms operating in the different segments is reflected in the average leverage ratio for each segment for each year does not necessarily reflect an optimal leverage ratio as explained by the trade-off model. Furthermore, $P/B_{t-1}$ is a simplified version of the valuation metric $P/NAV$, commonly utilized when valuing shipping companies. $P/NAV$ is a substantially more volatile metric than $P/B_{t-1}$ because it incorporates market values rather than book values.

Please refer to Section 7.4 for the implications surrounding the data gathered from the conducted interviews.
References


M. Z. Frank and V. K. Goyal. Capital structure decisions which factors are reliably important. 2009.


I. Oplatka. Eleven pitfalls in qualitative research: Some perils every emerging scholar and doctoral student should be aware of! *The Qualitative Report, 26(6), 1881-1890*, 2021.


# Appendix A

## Table 13.1: Bank Lending (2007-2020)

<table>
<thead>
<tr>
<th>Year</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>$352.30</td>
</tr>
<tr>
<td>2008</td>
<td>$407.40</td>
</tr>
<tr>
<td>2009</td>
<td>$436.18</td>
</tr>
<tr>
<td>2010</td>
<td>$449.76</td>
</tr>
<tr>
<td>2011</td>
<td>$454.89</td>
</tr>
<tr>
<td>2012</td>
<td>$422.14</td>
</tr>
<tr>
<td>2013</td>
<td>$401.00</td>
</tr>
<tr>
<td>2014</td>
<td>$391.45</td>
</tr>
<tr>
<td>2015</td>
<td>$397.54</td>
</tr>
<tr>
<td>2016</td>
<td>$355.14</td>
</tr>
<tr>
<td>2017</td>
<td>$445.00</td>
</tr>
<tr>
<td>2018</td>
<td>$503.70</td>
</tr>
<tr>
<td>2019</td>
<td>$294.40</td>
</tr>
<tr>
<td>2020</td>
<td>$286.90</td>
</tr>
</tbody>
</table>

Source: Marine Money
<table>
<thead>
<tr>
<th>Predictions</th>
<th>Pecking Order</th>
<th>Tradeoff</th>
<th>Market Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Share issues versus long-term debt</td>
<td>Debt is preferred to equity issues, short-term debt is preferred to long-term debt, and retained earnings are preferred to equity issue.</td>
<td>Firms operate with target leverage ratios and target mixtures of short- and long-term debt. Firms tend to adjust their leverage ratios to the target ratio.</td>
<td>High $P/B_{t-1}$ firms tend to prefer equity issues to debt financing, long-term debt over short-term debt, and issue more equity than low $P/B_{t-1}$ firms.</td>
</tr>
<tr>
<td>Short-term versus long-term debt</td>
<td>Debt financing is preferred to equity issuance for all segments.</td>
<td>Only Container firms revert leverage back to target. The reversion is economically weak statistically strong.</td>
<td>$P/B_{t-1}$ is positively related to equity issue for LNG and Bulk firms, but negative for container shipping firms.</td>
</tr>
<tr>
<td>Share issues versus retained earnings</td>
<td>Long-term debt is favored over short-term debt for firms in all three segments.</td>
<td>A higher short-term debt surplus pushes firms to apply more long-term debt. This applies for firms in all three segments.</td>
<td>$P/B_{t-1}$ relates positively to long-term debt for LNG shipping firms. Negative relation for bulk and container firms.</td>
</tr>
<tr>
<td></td>
<td>Nearly all variation in investments, total debt, and earnings are absorbed by equity. This is true for firms in all three segments.</td>
<td></td>
<td>Only bulk firms with high $P/B_{t-1}$ tend to issue equity to distribute more dividends. The opposite relationship is apparent for LNG firms, but the evidence is economically weak for LNG firms, and statistically weak for bulk and container firms.</td>
</tr>
</tbody>
</table>

**Figure 13.1:** Summary Empirical Findings
Figure 13.2: Dry Bulk World Fleet
Source: Clarksons.net data
file:///Users/Brage/Downloads/GreekShippingEarningsandInvestmentExpenditure.pdf

Figure 13.3: Container Supply and Demand (2007-2021)
Source: UNCTAD secretariat calculations. Demand is based on data from chapter 1 – figure 1.5, and supply is based on data from Clarksons Research, Container Intelligence Monthly, various issues.
Figure 13.4: Container Shipping - Developments in Supply (1990-2011)

Figure 13.5: LNG Spot Charter Rates - 138-155k cbm Modern Vessels (2005-2021)
Source: Author’s illustration based on data from Fearnley LNG and Poten Partners
Figure 13.6: Baltic Dry Shipping Index
Source: Author’s illustration based on data from Bloomberg Intelligence

Figure 13.7: Container freight index measured in freight rate per thousand dollar
Source: Author’s illustration based on data from Bloomberg Intelligence
Figure 13.8: The 14 Largest Container Firms’ Earnings Before Interest Expenses (percent) Per Quarter (2002-2013)

Figure 13.9: Q1 EBIT Earnings per TEU for Container Firms (2010-2021)
### Variable Definitions

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>$dA_t$</td>
<td>Investment: Change in total assets during fiscal year $t$</td>
</tr>
<tr>
<td>$Y_t$</td>
<td>Earnings: Income before extraordinary items</td>
</tr>
<tr>
<td>$PosY_t$</td>
<td>Positive earnings: Earnings if $Y_t &gt; 0$, 0 if $Y_t &lt; 0$</td>
</tr>
<tr>
<td>$NegY_t$</td>
<td>Negative earnings: Earnings if $Y_t &lt; 0$, 0 if $Y_t &gt; 0$</td>
</tr>
<tr>
<td>$MC_t$</td>
<td>Market cap: The natural log of the share price multiplied by number of shares outstanding</td>
</tr>
<tr>
<td>$D_t$</td>
<td>Dividends: Dividends (cash flow item) at the end of fiscal year $t$</td>
</tr>
<tr>
<td>$NoD_t$</td>
<td>No dividends: A dummy variable = 1 if a firm does not pay dividend during fiscal year $t$, and 0 if not.</td>
</tr>
<tr>
<td>$D_{t-1}$</td>
<td>Lagged dividends: Dividends paid at the end of fiscal year $t-1$.</td>
</tr>
<tr>
<td>$P/B_{t-1}$</td>
<td>Lagged price-to-book ratio: Market capitalization (CRSP price multiplied by shares outstanding) at the end of the fiscal year in $t-1$ divided by book equity at the end of fiscal year $t-1$. Book equity equals stockholders equity plus balance sheet deferred taxes and investment tax credit.</td>
</tr>
<tr>
<td>$NegB_{t-1}$</td>
<td>Negative book equity: A dummy variable equals 1 if the firm’s book equity &lt; 0 at the end of fiscal year $t-1$ and 0 if not.</td>
</tr>
<tr>
<td>$LS_{t-1}$</td>
<td>Lagged leverage surplus: Calculated as the difference between the firm’s actual leverage ratio and the target ratio of the segment the firm operates in. The target ratio is calculated as the average leverage ratio for the segment for each year, where every firms ratio is weighted against its total assets. The leverage ratio is defined as assets less common equity at the end of fiscal year $t-1$ divided by assets at the end of fiscal year $t-1$.</td>
</tr>
<tr>
<td>$dS_t$</td>
<td>Book value of shares issued: Change in common equity plus dividends, $D_t$, less earnings, $Y_t$, during fiscal year $t$.</td>
</tr>
</tbody>
</table>

**Table 14.1:** Variable Definitions  
Source: Fama and French (2012)
<table>
<thead>
<tr>
<th></th>
<th>Firms</th>
<th>dS&lt;sub&gt;t&lt;/sub&gt;</th>
<th>dL&lt;sub&gt;t&lt;/sub&gt;</th>
<th>dSTD&lt;sub&gt;t&lt;/sub&gt;</th>
<th>dLTD&lt;sub&gt;t&lt;/sub&gt;</th>
<th>dA&lt;sub&gt;t&lt;/sub&gt;</th>
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<th>NoD&lt;sub&gt;t&lt;/sub&gt;</th>
<th>D&lt;sub&gt;t&lt;/sub&gt;</th>
<th>MC&lt;sub&gt;t&lt;/sub&gt;</th>
<th>NegB&lt;sub&gt;t-1&lt;/sub&gt;</th>
<th>P/B&lt;sub&gt;t-1&lt;/sub&gt;</th>
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<th>STS&lt;sub&gt;t-1&lt;/sub&gt;</th>
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</thead>
<tbody>
<tr>
<td>Bulk</td>
<td>Avg</td>
<td>43</td>
<td>7.64</td>
<td>-16.21</td>
<td>-13.67</td>
<td>-2.54</td>
<td>-11.44</td>
<td>-9.54</td>
<td>9.44</td>
<td>0.60</td>
<td>2.76</td>
<td>5.52</td>
<td>0.02</td>
<td>-11.44</td>
<td>0.51</td>
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<td></td>
<td>Std.  dev</td>
<td>48.28</td>
<td>243.26</td>
<td>233.17</td>
<td>64.00</td>
<td>146.70</td>
<td>47.39</td>
<td>116.81</td>
<td>0.50</td>
<td>6.48</td>
<td>1.67</td>
<td>0.12</td>
<td>2.17</td>
<td>-0.06</td>
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<td>LNG</td>
<td>Avg</td>
<td>10</td>
<td>2.79</td>
<td>5.54</td>
<td>-0.23</td>
<td>5.78</td>
<td>8.25</td>
<td>1.50</td>
<td>4.71</td>
<td>0.68</td>
<td>2.32</td>
<td>6.59</td>
<td>0.00</td>
<td>-11.44</td>
<td>3.27</td>
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<tr>
<td></td>
<td>Std.  dev</td>
<td>9.97</td>
<td>15.93</td>
<td>5.37</td>
<td>15.27</td>
<td>20.63</td>
<td>14.30</td>
<td>0.47</td>
<td>2.42</td>
<td>1.17</td>
<td>0.00</td>
<td>11.54</td>
<td>0.22</td>
<td>0.00</td>
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<tr>
<td>Container</td>
<td>Avg</td>
<td>11</td>
<td>2.11</td>
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<td>Std.  dev</td>
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<td>2.52</td>
<td>0.00</td>
<td>0.00</td>
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**Table 14.2: Summary Statistics**

Means (Ave) and standard deviations (Std Dev) of the regressions variables. Data was derived from Compustat and CRSP’s databases, containing a total of 64 publicly listed shipping companies over a period of 21 years. A description of the variables used can be found in Table 14.1.
<table>
<thead>
<tr>
<th></th>
<th>$a_t$</th>
<th>$dA_t$</th>
<th>$NegY_t$</th>
<th>$PosY_t$</th>
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<th>$MC_t$</th>
<th>$NegB_{t-1}$</th>
<th>$P/B_{t-1}$</th>
<th>$LSt-1$</th>
<th>$R^2$</th>
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<td>Bulk</td>
<td>2000-2021</td>
<td>Coef</td>
<td>-7.61</td>
<td>0.28</td>
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<td>8.57</td>
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<td>-0.00</td>
<td>48.17</td>
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<td></td>
<td></td>
<td>t-stat</td>
<td>-2.02</td>
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<td>0.44</td>
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<td>LNG</td>
<td>Coef</td>
<td>-13.67</td>
<td>0.18</td>
<td>-0.19</td>
<td>-0.75</td>
<td>-4.70</td>
<td>2.14</td>
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<td>0.00</td>
<td>0.52</td>
<td>-3.55</td>
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<tr>
<td></td>
<td>t-stat</td>
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<td>-4.58</td>
<td>-3.31</td>
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**Table 14.3:** Regressions to Explain $dS_t$

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**Table 14.4:** Regressions to Explain $dL_t$

The regressions are estimated yearly for the period 2000-2021. Data has been derived from CRSP and Compustat using the SIC 4412. Only firms with the majority of its revenue stemming from the respective shipping segments are included in the data sample.
The regressions are estimated yearly for the period 2000-2021. Data has been derived from CRSP and Compustat using the SIC 4412. Only firms with the majority of its revenue stemming from the respective shipping segments are included in the data sample.

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Table 14.5: Regressions to Explain $dLT D_t$
## Table 14.6: Regressions to Explain $dSTD_t$

The regressions are estimated yearly for the period 2000-2021. Data has been derived from CRSP and Compustat using the SIC 4412. Only firms with the majority of its revenue stemming from the respective shipping segments are included in the data sample.

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### Table 14.7: Regressions to Explain $D_t$

The regressions are estimated yearly for the period 2000-2021. Data has been derived from CRSP and Compustat using the SIC 4412. Only firms with the majority of its revenue stemming from the respective shipping segments are included in the data sample.

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Data has been derived from CRSP and Compustat using the SIC 4412. Only firms with the majority of its revenue stemming from the respective shipping segments are included in the data sample.
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**Table 14.8:** Regressions to Explain $dS_t$

The regressions are estimated yearly for the period 2000-2021. Data has been derived from CRSP and Compustat using the SIC 4412. Only firms with the majority of its revenue stemming from the respective shipping segments are included in the data sample.
Introduction

1) I would like to thank you for taking time out of your busy schedule and allowing me to interview you for my master’s thesis.

2) Presentation of me

3) Presentation of the scope and purpose of the project.

I am researching the capital structure determinants in the three main shipping segments, hereunder bulk shipping, container shipping, and LNG shipping. I want to research whether the capital structure choices of shipping companies are aligned with corporate finance theories on capital structure, and also whether there are any differences between the shipping segments in terms of determinants and preferences of financing.

The focus of the interview will be to understand the decision process of shipping companies when deciding on investments and financing.

4) Recording

To maximize the output of this interesting talk, the interview will be recorded and later transcribed. The transcripts will under no circumstance be shared with others or uploaded.

5) Quotes

In cases where specific parts or content of the interview are deemed especially interesting or relevant, the interviewees will be asked for permission to be quoted. In that event, the interviewee will receive the quote per email to ensure that the interviewee's statement has been interpreted correctly.

6) Anonymity

The interviewee has of course the option to remain anonymous.
Interview guide for interviews with shipping company CFOs

1) Can you please start by telling me about your company, which segment do you operate in?

2) Investment decisions and strategy
   - How do you view timing and how do you decide on when to invest in new vessels?
   - How does your capital structure reflect your strategy?

3) Questions on capital structure
   - How do you and the firm look at capital structure? Do you view it as a means to end, or do you actively manage your leverage to optimize financial performance?
   - Why do you think that the companies in the shipping industry are characterized by the reliance on debt financing when the industry is exposed to so much risk and volatility?

4) Questions on financing decisions
   - What are the most important factors when deciding on which source of financing you choose?
   - Do you expect that there will be a change in sources of financing in the future, where traditional financing sources such as banks become less reliable?

Questions to Pecking order theory

   - Can you provide me with your preferred sources of financing, from most preferred to least?
   - What are the reasons for the order of preferences?
   - Are there times where you choose to issue equity instead of using internal funds, bank loans, and issue debt?
   - Do you consider asymmetric information and the signaling effect when deciding on the type of financing?
Questions related to the Trade-off theory

- Are costs of financial distress something that you actively focus on, if yes, how do you measure it?
- How do costs of financial distress, financial flexibility, and tax benefits influence the choice of capital structure financing?
- Does your company have a target or an optimal capital structure? What are the reasons for this? (if yes: is the choice of funding decided to move back to a target debt ratio?)
- How do you view the relationship between short- and long-term debt?
- Do you take the amount of short- and long-term debt relative to total debt into consideration when deciding on financing, i.e. does the company operate with a target mix of short- and long-term debt?

Questions related to market-timing theory

- If your company issues equity, what is the reason?
- Do you consider the company’s current share price and its development before deciding to issue equity? If yes, are you more inclined to issue debt when your share price has previously declined, than if it was up?
- How do you decide on a dividend policy? Do you consider the possibility to provide shareholders with a somewhat fixed dividend amount frequently?