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Analysis of the Cyclical Behaviour of Lending Banks in the Offshore and Shipping Industries

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NORWEGIAN SCHOOL OF ECONOMICS

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Abstract

Traditional bank lending has always been the major source of capital to shipping and offshore. These industries being some of the most capital intensive, the need for financing is obvious. However, due to their cyclical nature there is greater risk associated with lending to the industries. Bank lending as a form of debt financing has evolved during the last 20 years, and with fluctuating markets the banks applied new strategies to both mitigate risks and align with new regulatory framework.

After the financial crisis, several banks incurred significant losses due to their high exposure to the volatile shipping and offshore industries. As a result, many have downsized their involvement in these sectors, leading to a noticeable contraction in lending. The shipping and offshore sectors have weathered a challenging period, characterized by low freight rates, asset values, and oil price. Lower cash flow and revenues have posed challenges for companies within these sectors, impeding their ability to sustain operations and secure bank financing. Recent upturn in freight rates and oil price might stimulate investments and the launch of promising ventures. The latter raises an important question, have banks altered their lending strategies, or are they continuing to exhibit cyclical lending patterns?

The data used in this thesis is collected from three Nordic banks quarterly reports over the past 20 years. These banks have maintained a substantial presence in the shipping and offshore sectors, particularly in the Nordic region. Their financial backing and commitment have played a pivotal role in strengthening these sectors, thereby contributing to the growth of the region's energy exports and the development of a modern merchant shipping fleet. Our methodology involved a mixed-method approach. A quantitative analysis of the banks' lending portfolios and qualitative interviews with representatives from the banks.

The implications of the findings suggest that banks demonstrate cyclical lending behavior, which is natural when cash flow and contracts are a key consideration for them. Furthermore, our research indicates that banks have reformed their asset evaluation processes and are also placing more emphasis on their relationship with clients. Nevertheless, banks remain receptive to good investment opportunities, which emerge in a booming market.

Keywords – Shipping, Offshore, Bank, Lending, Cyclicity

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1. Introduction

In the evolving global economy, the shipping and offshore industries play essential roles, acting as the vital pillars of international trade and energy production. These industries are two of the most capital-intensive industries in the world and well known for being cyclical (El-Masry, Olugbode og Pointon 2010, Agis, Brandta og Brett 2016). The shipping industry, with over 5000 years history, has been the backbone of the global economy. The industry is prominent for its cyclical nature, which is driven by fluctuations in supply and demand. These cyclical shifts have a significant impact on the industry's profitability and cash flow, thereby influencing lending practices and the associated risk of lending. The offshore industry consists of a range of economic activities that take place in the open ocean. Offshore oil and gas are the most common sector, and it involves the extraction of petroleum and natural gas from reserves beneath the ocean floor. This industry plays a pivotal role in global energy production, accounting for a significant portion of the world's oil and gas output. In this sector, fluctuations in asset pricing, costs and revenue are mainly driven by changes in oil price. High oil prices can yield substantial profits and positive cash flows, while downturns can result in losses and defaults. Both these industries are capital-intensive, requiring substantial initial and ongoing investments in vessels, drilling, and extraction activities. This results in huge markets for both newbuilding and second-hand market (Koskinen og Hilmola 2005). To illustrate the magnitude of this financial commitment, the top 40 shipping banks lends out \$290.12bn to the shipping sector (Petropoulos 2022). For the offshore sector, since 2016, the top 30 leading offshore oil and gas companies have received \$422.82bn in financing from banks (Banking on Climate Chaos 2023).

The loans issued to these industries carries a considerable risk, due to the volatile nature of rates and prices within these sectors. Lending banks must carefully assess and manage risk associated with extending credit. All the factors affecting these industries, adds layers of complexity to the risk evaluation process. Banks must continually adapt their risk assessment models to account for changing dynamics. Because of the capital-intensive nature of these industries, banks often rely on assets, such as ships and rigs, as collateral. The value of these assets can fluctuate significantly with market conditions, making it hard for banks to assess their worth and have an appropriate loan-to-value (LTV) ratio. The cyclical patterns of these industries, lead to periods of boom and bust. Market downturns often results in weakened

rates, cash flow and revenues. Consequently, shipping, and offshore companies may face challenges in repaying their principal debt obligations. Therefore, banks must be prepared to navigate these fluctuations and take actions to protect their interests, such as adjusting interest rates, debt restructuring or reducing exposure.

The thesis aims to answer the following hypothesis and research questions, through the collection and analysis of a large data sample of bank lending to the shipping and offshore sectors. We aim to establish if there exists a relationship between lending practices and business cycles.

Main hypothesis: *Lending banks tend to issue more loans for shipping and offshore during the peak of a business cycle compared to trough/recovery.*

Research question 1: *Is there a difference in lending between a boom and bear market?*

Research question 2: *Why are the banks' lending behaviour cyclical?*

To examine our hypothesis and elaborate on our research questions, we conducted a series of interviews with representatives from various Nordic banks engaged in lending to the shipping and offshore sectors. These interviews give us valuable input and perspective, as they allow us to get insights on lending from the banks point of view; which factors are important for them and reasoning behind their timing. Additionally, we ask for their opinion on our hypothesis, thereby benefiting from their professional and sector-specific knowledge. Our study aims to determine whether lending practices differ across various stages of a business cycle. We use the Welch's t-test to examine potential differences in loan growth between a boom and bear market of the cycle. To further investigate the differences within a cycle, we utilize a Linear Mixed Model, which is believed to effectively illustrate the impact of the independent variables on the dependent variable and how this varies over time.

Our research explains the complex dynamics between business cycles, lending behaviour, and the capital-intensive shipping and offshore industries, providing valuable insights for banks operating in these sectors. By enhancing the understanding of the cyclical nature of these industries and its impact on lending practices, banks can refine their risk assessment models, predict periods of increased risk more accurately, and adapt their lending practices to mitigate potential losses. This can lead to the development of better risk models that consider the

cyclical nature of these industries and its effects on asset values and profitability. While our research is primarily targeted at banks, it holds valuable insights for a diverse range of stakeholders. Companies within shipping and offshore can greatly benefit from this understanding of lending practices across business cycles. This knowledge can help them anticipate changes in capital availability, informing their financial planning, investment decisions, and prepare for negotiations with lenders. By understanding the complex dynamics, banks can both protect their interests in addition to contribute positively to the sustainable growth of vital global industries.

The thesis is organized as follows: In Chapter 2 we present a review of relevant current literature on fluctuations, asset values, capital market lending and risk. In Chapter 3 we describe the methodology and statistical approach. Chapter 4 contains the process of collecting and processing data. The results of our analysis and interviews are presented in Chapter 5 and 6. Chapter 7 discuss our findings in light of theoretical concepts. In Chapter 8, we conclude on our findings.

2. Litterature Review

Chapter 2 reviews relevant literature for both the shipping and offshore sectors. It places particular emphasis on the cyclical nature of these industries, the nuances of bank lending to these sectors, and the potential risks associated with asset valuation from a banking perspective.

Financing within shipping and offshore markets depends largely on bank lending to fund operations and the acquisition of assets, both newbuilds and second-hand (Kavussanos og Visvikis 2016, 73). The industries are well known to be volatile in both their earnings with cyclical trends giving periods of high profit margin while also having downturns with losses. Albertijn, Bessler and Drobertz (2011) studied how the shipping industry financed its operations and the risks connected to cash flows. They identified that the biggest risk for shipping companies was fluctuations in the freight rates, where they presented several methods to mitigate the risk, by either securing cash flow through contracts or derivatives (Albertijn, Bessler og Drobertz 2011). The risk of freight rate fluctuations is essential for the understanding of how banks mitigate their own risk when issuing loans, where they need a certain degree of liquidity as assurance for the repayment of the debt (Kavussanos og Visvikis 2016, 79). Moreover, since many companies in these industries finance asset acquisitions through debt, there are certain conditions and obligations associated with the loan agreements, known as covenants (Gong, Ye og Zeng 2013). These covenants include credit assessments of the borrower, continuously measuring LTV and the ability to pay principals for the borrower (Gong, Ye og Zeng 2013).

Jugović, Komadina, & Perić Hadžić (2015) studied which factors influenced the freight rates in maritime shipping markets. In their research they emphasized the importance of how world economy, trade, average profits, political events and costs, effects the demand side in maritime and other connected sectors, while the supply side is influenced by the world fleet and its productivity, shipbuilding, shipbreaking and freight rates (Jugović, Komadina og Perić Hadžić 2015). Additionally, Dahl et al. (2017) suggests cost overruns in projects financing within the oil and gas sector to be related to pro-cyclical investments. In the article they concluded with the interplay of cost overruns and pro-cyclical investments, with the difference in estimated

and realized costs being the key influencer, for the pro-cyclical investments for offshore and other related sectors.

The loan-to-value (LTV) ratio is used for measuring the loan compared to the asset value, where banks typically have an LTV of 60-80% (Kavussanos og Visvikis 2016, 105). However, Gong, Ye and Zeng (2013) conducted a research survey on financing practices before and after the financial crisis, where the respondents were banks associated with the Hong Kong Shipowners Association. For the survey, three main criteria for bank lending, security, marketing and quality were defined. The results showed that after the financial crisis banks have become more concerned about security and quality, with less emphasis on marketing. They found the LTV ratios to be lower after the financial crisis, due to losses stemming from fluctuations in asset values. Gong, Ye and Zeng (2013) concludes that banks in the survey have a lower risk appetite and have become more stringent on requirements for collateral and guarantees. Furthermore, the valuation of the assets in shipping finance exhibits very high price volatility (Kagkarakis og Tsouknidis 2023). Kagkarakis and Tsouknidis (2023) found that breaches in covenants with fluctuating asset values could force technical defaults of shipping loans, due to asset-backed financing depending largely on asset prices.

Gavalas and Syriopoulos (2015) created a model on credit rating and loan quality for bank shipping finance. Given the increased regulatory changes after the financial crisis of 2008, banks were forced to apply a stricter regulatory framework which should incorporate closely monitoring and accurately assessment of the borrower's credibility and risk profile. The study emphasizes the importance for improved credit rating decisions in bank lending. This can support risk-based loan pricing, efficiency and transparency in loan decisions with an emphasis on bank risk management (Gavalas og Syriopoulos 2015). This is relevant to the industries studied in this thesis, as shipping and offshore industries heavily depend on bank lending to finance capital-intensive projects (Syriopoulos 2010). Moreover, Syriopoulos (2010) addressed the extraordinary super-cycle trends in the freight market causing companies building liquidity reserves pursuing an expansion in their fleet, which disrupted the balance between supply and demand. This fleet extension was predominantly funded by external sources such as bank lending, with companies entering alarming levels of leverage (Syriopoulos 2010).

In addition to risk, collateral and covenants for bank loans, Lee and Pak (2018) did a study on banks providing shipping loans. They found customer relations to be a crucial factor for

obtaining loans during phases of lower freight rates. This is contradictory to conventional belief, where bank loans are asset-backed financing with mortgage contracts (Lee og Pak 2018). Nevertheless, asset valuation and cash flow are still crucial factors, since it provide securities in addition to the relation between bank and borrower (Lee og Pak 2018).

Considering the literature available, Albertijn, Bessler and Drobertz (2011) summarized the risks associated with freight rate fluctuations as mainly based on world trade, supply and demand. This is also supported by by Jugović, Komadina, & Perić Hadžić (2015) study on the cyclicity of the rates. Furthermore, for bank loans the credit assessment, cash flow and asset valuation are critical factors for decision makers at banks (Gong, Ye og Zeng 2013, Kavussanos og Tsouknidis 2016, Kagkarakis og Tsouknidis 2023, Gavalas og Syriopoulos 2015, Syriopoulos 2010). Additionally, Lee and Pak (2018) found that relations have emerged as another key factor for obtaining traditional bank lending in these industries.

By identifying patterns and potential correlations between lending behaviour and business cycles, our study adds further understanding to existing literature and fills gaps specifically about bank lending through cycles. Where we look at lending to cyclical industries, leading to increased understanding on the topic of bank lending and business cycles.

3. Research Methodology

In this methodology chapter, we adopt a mixed-methods approach, incorporating both qualitative and quantitative methods to provide comprehensive insight of the research topic. We conduct key informant interviews with a purposively selected sample to gather detailed information about participants' experiences and perspectives and analyse the data using thematic analysis. Additionally, we use regression analysis to examine the relationships between variables to understand underlying patterns and trends in the data, which will aid in making inferences about the data. This approach of combining qualitative and quantitative methods allows for triangulation and validation of findings, providing a more holistic understanding of the research questions.

3.1 Key Informant Interviews

As Holstein and Gubrium (2001) states it is important to acquire one or more key informants when researching using a mixed method, adding to the confirmability of the research. In addition Marshall (1996) emphasises that key informants should fulfil some of these criteria: knowledgeable, willing to participate, communicative, impartial and a role in the understanding of the subject which gives the researcher deeper insight: “an expert source of information’ who can, ‘as a result of their personal skills, or position within a society, ... provide more information and deeper insight into what is going on around them” (Marshall 1996). Marshall (1996) also states that once the key informant is detected, the researcher should use these five criteria to ensure the productive output of the informant. Furthermore, on the topic of different types of individuals, O’Leary (2021) lists the following types to be considered participants: experts, insiders, highly experienced, a leader, the observant, and those with secondary experience. However, key informants are not generally the main focus of a research project or the primary source of data, but are therefore meant to be one of several sources of data collection used in a mixed-method research, and the method aims to support the findings through confirmation or corrections (Cossham og Johanson 2018, Innes, et al. 2016). The confirmation or corrections given from the key informants enable for a faster data collection where they can either confirm the relevance of the data or correct the filters used (Marshall 1996).

A key informant can be valuable during a study or research on a topic in their field of knowledge. Although there are some limitations, the five criteria, which Marshall (1996) mentions are all essential to whether the information and perspective of the key informants should be credible. The partial bias of key informants should also be considered, as sources of information and data should be unbiased, but that is not always the case. The use of key informants should therefore be limited as they could have strong opinions of their own, affecting the credibility of the research. Another limitation is selecting the right key informants. If they are already known to the researcher, it is easier to determine their expertise on the topic, with some being obvious due to their background and role in the organization (Cossham og Johanson 2018). There can also be ethical dilemmas around what the key informants share, especially related to confidential information and how this information is being used by the researcher. With potential to harm the key informants, clarity about what the information is being used for and how, should be agreed on by both parties before sharing information.

Data from the key informants was collected through semi-structured interviews. This form of interview is not standardized and often starts with a list of themes or key questions (Saunders, Lewis og Thornhill 2019). In our case, we started with three primary topics and posed follow-up questions based on the informants' responses. This approach enabled a fluid dialogue, providing us with the opportunity to dig deeper into the informants' unique insights, experience, and expertise.

3.2 Welch's T-Test

With the purpose of testing differences in lending between a boom and bear stages of the cycle, we based part of our analysis on an independent sample t-test. This facilitated our investigation into whether banks exhibit a tendency to issue more loans during the highs of the cycle as opposed to the lows.

The hypotheses for the test is the following:

H0: There is no significant difference in the issuance of loans for the shipping and offshore industries during boom and bear stages of the cycle.

H1: There is a significant difference in the issuance of loans for the shipping and offshore industries during boom and bear stages of the cycle.

We utilized a Welch's t-test (Welch 1938), which is the most robust independent sample t-test in situations involving unequal sample sizes or variances within the groups (Zimmerman og Zumbo 1993). The test yields the same outcome as the corresponding test assuming equal variance but is more reliable in cases where this assumption is violated (Delacre, Lakens og Leys 2017). To calculate the t-statistic, we found the difference between the means of changes in the loan book for each group. We then divided this difference by the sum of the standard deviations for the respective groups. This allows us to determine the degree to which the means differed from each other.

$$t = \frac{(\bar{x}_1 - \bar{x}_2)}{\sqrt{\frac{S_1^2}{N_1} + \frac{S_2^2}{N_2}}}$$

We conducted the Welch-Satterthwaite equation (Satterthwaite, 1946) to calculate the degrees of freedom for our analysis. This equation is designed to determine the effective degrees of freedom in situations where there is unequal variance between the two groups.

$$df = \frac{(\frac{S_1^2}{N_1} + \frac{S_2^2}{N_2})^2}{\frac{(\frac{S_1^2}{N_1})^2}{N_1 - 1} + \frac{(\frac{S_2^2}{N_2})^2}{N_2 - 1}}$$

Power-law distributions are often featured in entrepreneurial finance, and this pattern may also be present in our data. This can pose a problem for the Welch t-test, as it increases the probability of a type 1 error, meaning rejecting a valid null hypothesis. There are two acceptable solutions to this issue. The first is to log-transform the variables to normalize the data. The second one is to use a nonparametric test, which does not require normally distributed observations. To deal with this, we used the first solution by logging all the observations from the lending data (Wooldridge 2018, 120). We used a Shapiro-Wilk normality test, to check if this assumption is violated or not. If the p-value from the test is less than the significance level of 0.05, we reject the null hypothesis that the sample comes from a normally distributed population.

3.3 Linear Mixed Model

The influence of the shipping and offshore market on banks loan appetite and lending behavior across different time periods, can be obtained by using Linear Mixed Model (LMM). LMM is a parametric linear model incorporating fixed effect and random effects parameters, commonly used in the analysis of clustered data, repeated measurement, and longitudinal studies. LMMs were first introduced by Airy in 1956 as a model with one random factor and no fixed factors (West, Welch og Galecki 2014). Over time, the model has been developed by various statisticians and is now used a lot in medicine, social sciences, biology, and economy.

LMMs separate the known effects into two groups; fixed effects, and random effects. Fixed effects describe the relationship between dependent and independent variables across the entire population. In the analysis, fixed effects typically represent the average response of loans to change in the market conditions, other relevant factors within the population or a unit of analysis. Random effects, describes the clusters or subject in the population. Random effects share many similarities with the residual component in a regular linear model. This is the part which cannot be explained by the independent variable (fixed effect). LMMs help us look deeper into the model's residual, separating variance within and between individuals. Random effects can be divided into between-individual and within-individual effects.

In the analysis, we investigate the impact shipping and offshore cycles have on lending to these sectors, where between-individual effects represent variations in loans across different time periods. Analyzing these effects can provide valuable insight into the factors driving lending to the shipping and offshore market. The LMM is expressed as:

$$y = \beta X + uZ + \epsilon$$

- y is the loan book.
- β and u are estimated coefficients for X and Z .
- X and Z are known design matrices relating to the observations y .
- ϵ is an unknown vector of random errors.

Restricted maximum likelihood (REML) is a form of maximum likelihood estimation. Estimates are not based on all the information on maximum likelihood, but on a transformed

set of the data (Corbeil og Searle 1976). REML was presented as an estimation method for variance components matrices in unbalanced data using an expectation-maximization algorithm (Calvin 1993). In this process, it is important to understand the expectation-maximization algorithm. This algorithm is iterative and computationally demanding, and it operates in two steps. E-step, which creates a function for the expectations of the log-likelihood evaluated using the current estimates for the parameters. M-step computes parameters maximizing the expected log-likelihood found on the E-step (Hinton og Neal 1998).

4. Data Description

The quantitative analysis in this thesis utilizes quarterly financial reports from three Nordic banks spanning from Q1-2004 until Q4-2022. The outstanding loan values for the maritime division for each bank are collected from the banks' interim reports. This data provides quantitative information regarding the progressive banks' loan exposure to the shipping and offshore sector. This exposure is represented in units of millions of USD. Two indices, Clarksons Platou Seafreight Index (ClarkSea) and Clarkson Offshore Index representing shipping and offshore market are collected from Clarksons Shipping Intelligence Network and Offshore Intelligence Network. The Offshore Index is a market indicator covering Rig, OSV and subsea day rates. The index is in points and represents dollars, but the ratio is not 1:1. This index gives an indication of the overall activity, utilization and day rates across the offshore oil and gas market. ClarkSea is a shipping market indicator, tracking average vessel earnings across the major shipping sectors, including tankers, bulkers, containerships, and gas carriers, weighted by the number of ships in each segment (Clarksons Research 2023). The ClarkSea Index is expressed in USD per day and provides information on the performance of the shipping market, this is widely used as a benchmark in the shipping industry. Given the significant scale disparity between the indices, we standardized the Offshore index to align with the same scale as the ClarkSea Index.

All the data from Clarkson is denominated in or calculated on US dollars, while the quarterly reports feature EUR, NOK, and SEK. To address this problem, we collected quarterly exchange rates between EUR and NOK, against USD from Clarkson. For SEK to USD, we gathered monthly historical exchange rates from Investing.com (2023) and transformed it to quarterly numbers. Further data cleaning is conducted to ensure that all Loan Outstanding figures are organized in the same size to ensure accuracy and consistency.

Table 1: Descriptive statistics of variables

	Mean	Median	Sd	Min	Max	Nr.obs
Loan Outstanding	32490	31386	11224	11415	50296	75
Loan Outstanding (log % change)	0.48%	-0.08%	5.55%	-10.84%	15.16%	74
ClarkSea Index	19103	14164	10253	7858	44222	75
Offshore Index	21643	22114	6450	10447	33801	75
USD/NOK	7,17	6,67	1,38	5,09	10,03	75
EUR/USD	1.25	1.25	0.12	1.01	1.56	75
USD/SEK	7.87	7.77	1.18	5.99	10.73	75

The dependent variable, Loan Outstanding, represents the banks' loan portfolios for the shipping and offshore industries. This value is a combined by the lending to shipping and offshore, there is no precise information regarding the loan book spilt between the industries. This data includes a quite rough period within the shipping and offshore segments. The period has been influenced by a financial crisis, with volatility in both shipping freight rates and oil price, leading to cycles during the period we analyse. The loan portfolios consist of two components: new loans from financing or refinancing and existing loans. The process of filtering this data required manually downloading all quarterly reports from the last 20 years and collecting their portfolio exposure for each quarter. With this collection method we managed to get approximately 75 reference points from the three banks. The three banks exposure to shipping and offshore activities establish foundations of reference points to increase the validation of our findings.

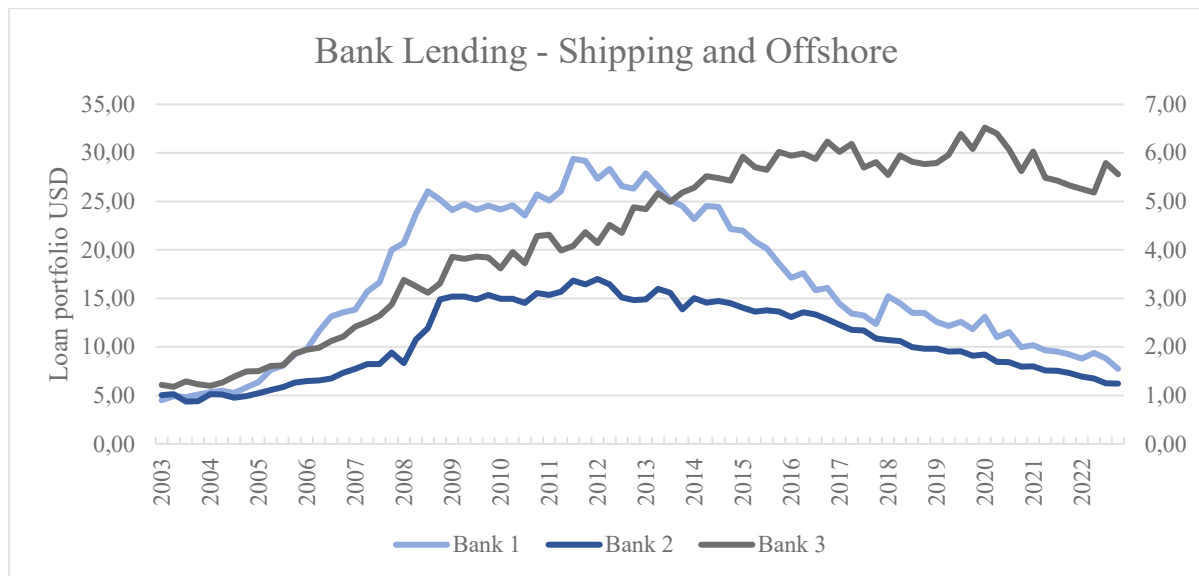


Figure 1: Bank lending from the different commercial banks in billions of USD dollars (Bank 3 displayed on the secondary axis).

To make a dependent variable of the total amount of outstanding loans from the banks, we used quarterly financial reports, which we aggregated for the three banks. For the Welch's t-test, we aim to determine whether there is a difference in lending practices between boom and bear in a cycle. To facilitate this comparison, we transformed the Loan Outstanding data into percentage change between each quarter. This transformation help us detect whether banks have a tendency to issue more loans during boom of a cycle.

Cycles in the shipping market are heavily influenced by the fluctuating supply-demand balance for the transportation services and the subsequent changes in rates, whereas for the offshore market it is driven by changes in the oil price. Different stages of a cycle are characterized by distinct features related to earnings and costs. Trough is defined by sustained low freight rates. Recovery has an increase in freight rates, surpassing operating costs. For Peak, freight rates are high, often 2-3 times the operating costs. The collapse stage is characterized by a sharp decline in freight rates (Stopford 2009).

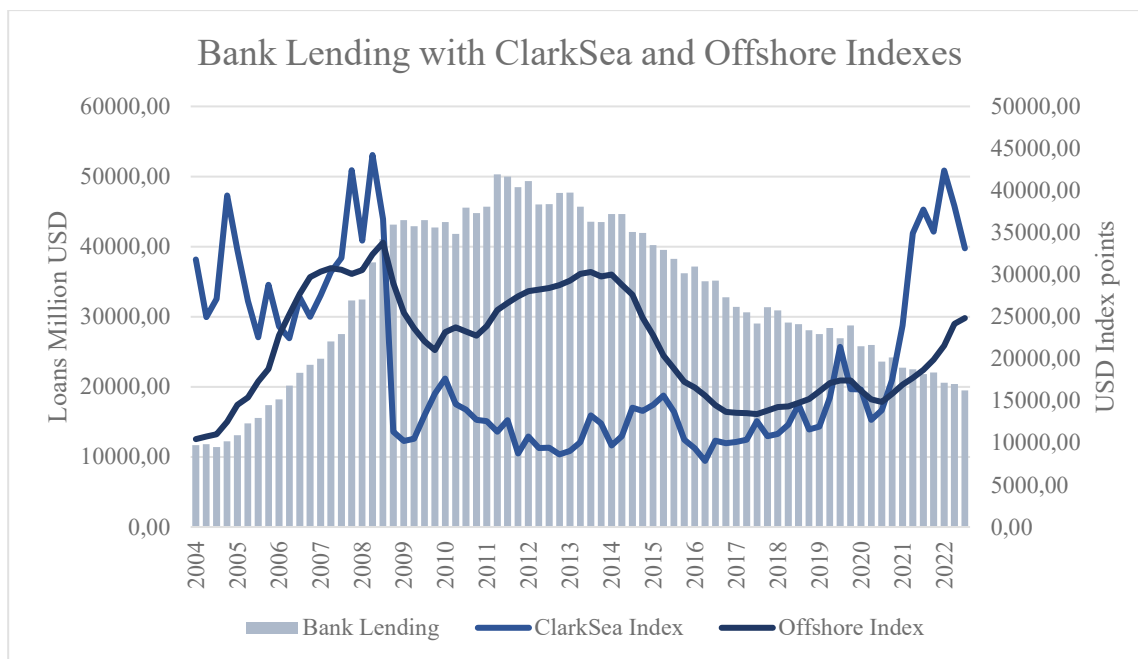


Figure 2: Bank lending with ClarkSea Index and Offshore Index (ClarkSea Index and Offshore Index displayed on the secondary axis).

As seen in the figure above, the cyclical patterns differ across the segments during the defined period. However, by analysing two distinct variables to gauge cyclical fluctuations, we can clearly discern when these cycles transition into different phases of their respective cycles. First period (2004-2008) showcase a high ClarkSea Index and a high Offshore Index, which corresponds with the characteristics of a peak. Second period (2009-2015) represent a collapse/trough stage for shipping, with ClarkSea Index averages at 12,000 USD per day. The offshore sector displays resilience, showing signs of recovery from the crisis and a high Offshore Index. In the third period (2016-2020), both ClarkSea Index and the Offshore Index are low, indicating that these industries are in a trough stage. For the fourth period (2021-2022), the landscape seems to be shifting. Increasing rates and a high ClarkSea Index, signals a recovery or peak phase for shipping. The Offshore Index experience a modest upswing, driven by an increase in the oil price.

In the Welch's t-test, we test the difference in lending between two groups. The groups are determined by the average of the indices, separating the observations into boom and bear groups. The average of the indices is just over two times the low values of these indices, aligning with Stopford's description of the characteristics of a cycle. During the trough stage, day rates are equivalent to operating costs, while in the peak stage, day rates are 2-3 times higher than operating costs (Stopford 2009).

Collecting data through secondary sources has its limitations, particularly in the case of bank's quarterly reports. The inconsistency in the publication of similar quarterly reports over time is a major challenge faced in this process. In addition, banks use different terms to refer to the shipping and offshore service industries, making it difficult to accurately determine the portfolio exposure by industry. The sensitive nature of this information also makes it harder to obtain, further complicating the collection of data. Adding to the validation of the data, the implementation of the Basel Accords, particularly Basel II and III, has increased the reporting standards in the banking sector. The Basel Accords focus on both the capital and liquidity of banks and provide a framework for high-quality reporting, improving the credibility of the data collected (Bank for International Settlements 2018). The reporting standards established by Basel Accords provide a valid framework for data collection and analysis, allowing for a better understanding of the banking sector. The data collected through secondary sources is still valuable in providing a comprehensive understanding of the banking sector and its trends following their loan portfolios.

5. Quantitative Analysis Results

In this chapter we present our main results from the analysis of the relationship between bank lending and cycles within shipping and offshore. We will start by presenting the results from the Welch's t-test and then the linear mixed model.

5.1 Welch's T-Test

The assumption of normality is crucial in a Welch's t-test, and based on the Shapiro-Wilk normality test, we determined that this assumption was violated for our full sample. To rectify this, we log-transformed the percentage change in loans, effectively normalizing the distribution.

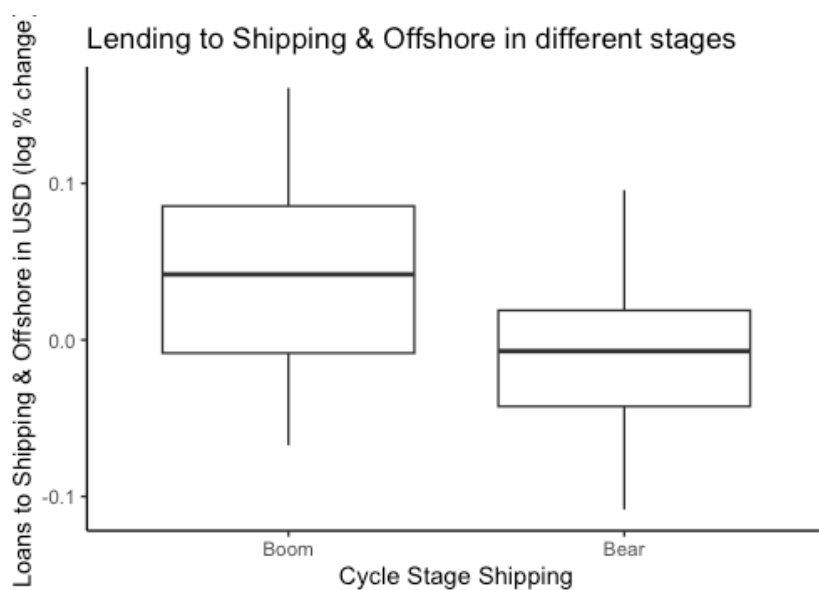


Figure 3: Boxplot of percentage change in loans for boom and bear in the shipping cycle

Table 2: Test 1 difference in mean above and below average ClarkSea Index

	t-stat	df	p-value	diff in mean	95% confidence interval	
Test 1: ClarkSea	3.5951	41.616	0.0009 ***	0.049	0.0215	0.0765
Num. Obs.	74					
Note:			*p<0.05	**p<0.01	***p<0.001	

The test of the logged variables above and below ClarkSea average, showed that the percentage change in loans is statistically higher ($p < 0.01$) when ClarkSea is above 19,071 USD per day than below. There is an average increase of 0.049% in quarter-to-quarter loan growth during the booming period, compared to the bear period. It is important to highlight that the bear period is characterized by a marginal negative growth in loans from quarter to quarter, while the booming period exhibits a positive growth trend.

Test 2 was between percentage change in loans when Offshore Index is higher or lower than average.

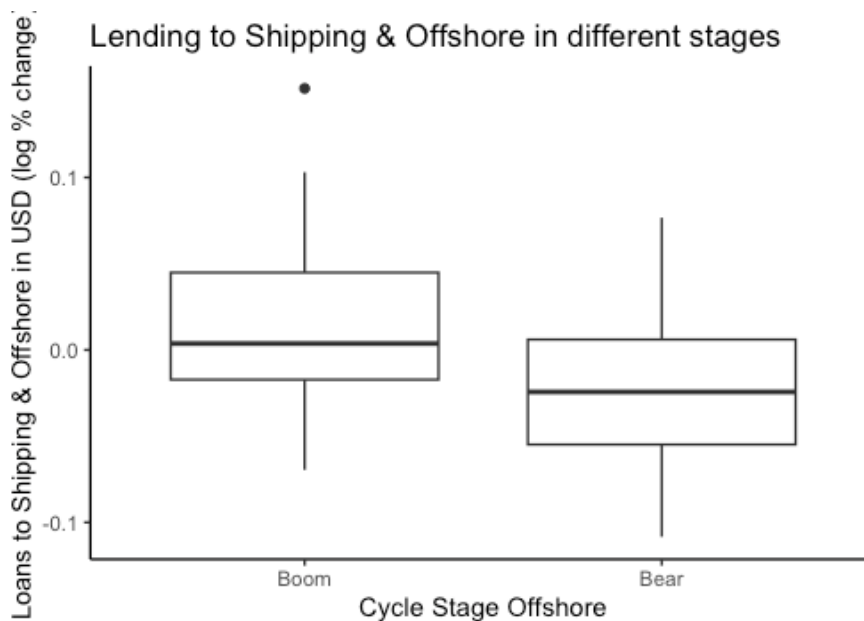


Figure 4: Boxplot of percentage change in loans for boom and bear in the offshore cycle

Table 3: Test 2 difference in mean above and below average Offshore Index

	t-stat	df	p-value	diff in mean	95% confidence interval	
Test 2: Offshore	3.3781	64.917	0.00124 **	0.0394	0.0161	0.0628
Num. Obs.	74					
<i>Note:</i>			*p<0.05	**p<0.01	***p<0.001	

Test 2 showed that the log percentage change in loans is statistically higher when Offshore Index is above 72.78. The observed average difference in loan growth quarter-to-quarter between the two periods is 0.0394%. The boom period is marked by a slight positive loan growth between each quarter, while the bear period displays a negative trend in quarter-to-quarter loan growth.

We conducted a Shapiro-Wilk normality test to check if the dataset is normally distributed, this test performs well with small sample sizes ($n < 50$). These tests support the validity of our Welch's t-test. For test 1, $W = 0.97615$, $p = 0.1453$. For test 2, $W = 0.97492$, $p = 0.1936$. Both tests fail to reject the null hypothesis, which stated that the data is normally distributed. In other words, there is no strong evidence to suggest that 'log_loans_usd' deviates significantly from a normal distribution.

5.2 Linear Mixed Model

The results from the Linear mixed model fit by RMLE are values of the response variable Loans in USD millions to shipping and offshore. The model provides an overview of the effects of the ClarkSea Index and Offshore Index on the total lending across four different time periods, from 2004 until 2023. Both predictors have varying impacts on the total lending in the different time periods. The scaled residuals shows that the majority of the model's predictions are close to the observed data. The median Value is -0.017423, which indicates that the model does not systematically over- or underpredict the response variable.

Table 4: Linear Mixed Model

	Dependent Variable:				
	OLS		Loan Outstanding		Linear Mixed-effects
	(1)	(2)	(3)	(4)	(5)
ClarkSea Index	-0.737*** (0.063)	0.011 (0.094)	0.487*** (0.106)	0.089 (0.093)	0.445*** (0.095)
Offshore Index	1.072*** (0.101)	0.803*** (0.090)	0.769*** (0.074)	0.960*** (0.092)	0.882*** (0.072)
Time Period 2		20,628.220*** (2,095.457)	35,723.570*** (8,853.324)	32,919.050*** (10,198.180)	57,196.030*** (10,557.710)
Time Period 3		14,742.800*** (2,070.131)	41,093.570*** (8,591.117)	34,910.010*** (12,423.340)	38,602.440*** (9,689.608)
Time Period 4		2,313.539 (1,581.520)	27,906.890*** (9,275.142)	33,083.150*** (11,836.520)	42,439.340*** (9,296.439)
ClarkSea Index:factor(Time Period 2)			-0.514* (0.266)		-0.974*** (0.285)
ClarkSea Index:factor(Time Period 3)			-1.466*** (0.229)		-1.471*** (0.231)
ClarkSea Index:factor(Time Period 4)			-0.816*** (0.165)		-0.483*** (0.176)
Offshore Index:factor(Time Period 2)				-0.439** (0.218)	-0.657*** (0.207)
Offshore Index:factor(Time Period 3)				-1.153** (0.546)	0.190 (0.480)
Offshore Index:factor(Time Period 4)				-1.528*** (0.399)	-1.255*** (0.371)
Constant	23,362.170*** (2,483.425)	3,005.098 (3,311.463)	-10,727.560* (6,264.343)	-2,927.189 (6,935.646)	-12,013.390** (5,576.549)
Model	LM	LM(Time Period)	LMM(Clark)	LMM(Offshore)	LMM
Observations	75	75	75	75	75
R2	0.761	0.902			
Adjusted R2	0.755	0.895			
Log Likelihood			-672.993	-681.162	-664.246
Akaike Inf. Crit.			1,367.986	1,384.325	1,365.491
Bayesian Inf. Crit			1,393.478	1,409.817	1,388.936
Residual Std. Error	5,562.116 (df = 72)	3,646.664 (df = 69)			
F Statistic	114.792*** (df = 2; 71)	126.522*** (df = 5; 69)			

Note: The data is sourced from Q2-2004, to Q4-2022. Time period 2/3/4 are categorical. First period is a peak stage for shipping and offshore. Time period 2 is from Q1-2009, to Q4-2015. Trough stage for shipping and recovery for offshore. Time period 3 is from Q1-2016, to Q4-2020. Trough stage for shipping and trough for offshore. Time period 4 is from Q1-2021, to Q4-2022. Peak stage for shipping and recovery for offshore. p < 0.1; **p < 0.05; ***p < 0.01

Table 5 presents the results from the Linear mixed model with stepwise estimations from a simple linear model, with only two predictors ClarkSea Index and Offshore Index. Until a linear mixed-effects model with interaction between the indices and time periods. The result from the OLS is reported in column 1 and 2, and it shows that the relationship between Loan Outstanding and Offshore index is positive, while the ClarkSea Index is negative. The results reported in columns 3 and 4 show that the indices have a varying impact on Loan Outstanding. Both models demonstrate that the average loan book changes with time periods, peaking during the third period. The degree of change in the loan book differs significantly between the two models. In column 3 (Clark), there is a substantial difference across periods, while the model in column 4 (Offshore) shows only slight variations in the loan book across different

periods. This contrast suggests that the impact of the ClarkSea Index on loan values changes more drastically over time compared to the Offshore Index.

When accounting for time periods in column 3, we observe that ClarkSea have a positive relationship with Loan Outstanding, though changes to a negative slope after the initial period. The steepest slope is in the interaction term ClarkSea Index:factor(Time Period 3) (-0.979), due to a low shipping market and reduction in the banks portfolios. In this model, the Offshore index exhibits a positive, statistically significant relationship with Loan Outstanding. When we consider the interaction between the Offshore Index and different time periods (column 4), we find a positive slope during the first (0.960) and second periods (0.960-0.439=0.521). After the crash at the end of period 2, the slope shifts negatively. The steepest decline is noted in the fourth period (-0.568). This trend can be attributed to the three Nordic banks' decision to limit their exposure to this sector in the recent years, primarily as a response to significant losses in 2016. In this column we observe that the ClarkSea Index is positive, but not statically significant.

The main results are reported in column 5. The model shows that the average loan book changes between the different periods. Based on the coefficients for the different time periods, we can indeed observe a trend in loan values. The factor (Time Period 2) suggests a substantial increase in the average loan book in period 2 (57,196) compared to period 1 (-12,013). The coefficients are significantly positive ($p < 0.05$), meaning that the increase in loans is statistically significant and not likely due to chance. This may be the results of optimistic sentiment from the banks after the boom, even though the index collapsed. In period 3, the loan values fall from the level in period 2 (38,602-57,196=-18,593). This is a result of the banks wanting to reduce their exposure to these industries, especially after the offshore crash. For the last period (42,439) we see a small increase in the average loan book compared to period 3. This comes from a more positive trend in the markets and a better market outlook for these years.

We also investigated interaction effects between the ClarkSea Index and time periods, as well as between Offshore index and time periods. The results indicated that the relationship between the indices and Loan Outstanding significantly differed across time periods, as proven by the statistically significant interaction terms ($p < 0.01$). In the initial period (peak), before the financial crisis, there was a positive correlation of 0.44 between Loan Outstanding and the rising ClarkSea Index. Post-crisis in the second period (collapse/trough), the interaction effects

reversed, turning negative ($0.445-0.974 = -0.529$). The slope between Loan Outstanding and ClarkSea Index have changed direction, because of the dramatic decline in index, while Loan Outstanding remained high due to the duration of tenors. In the third period (trough), the negative (-1) interaction effects continued as banks endeavored to mitigate their exposure to these industries, while the ClarkSea Index exhibited a low and stable trend. In the fourth period (recovery/peak), the slope flattens out ($0.445-0.483=-0.038$). The ClarkSea Index is rising, and the banks seems satisfied with the size of their portfolio. All of these coefficients are statically significant ($p<0.05$) and have an impact on Loan Outstanding.

The Offshore Index exhibited a positive relationship with Loan Outstanding in the first period (Peak). The correlation between The Offshore Index and Loan Outstanding is 0.882, The Offshore Index was rising alongside with the increase in the loan portfolios. In the second period (recovery), the slope between offshore and Loan Outstanding levels out ($0.882-0.657=0.225$). The Offshore market first went down after the crisis, but then recovered due to rise in the oil price. The banks had not yet begun to reduce their portfolio because they maintained an optimistic outlook towards the shipping and offshore industry, hence a positive slope. In the third period (collapse/trough), the slope between offshore and Loan outstanding was steep positive ($0.882+0.190=1.072$), reduction in the bank's portfolio and a decline in the index, resulted in strong and positive correlation. However, this interaction was not statically significant. In the last period (recovery), the slope between the Offshore Index and Loan Outstanding have changed direction and this relationship is now negative ($0.882-1.255=-0.373$). This result indicates that the banks continued to minimize their exposure to the offshore sector after the crash in 2016, while the Index experienced an upturn in this period.

The correlation matrix of fixed effects reveals some associations between the predictor variables and their interactions with the time periods. Conversely, the correlations are between weak to moderate, indicating that multicollinearity is not a significant concern in this model.

6. Qualitative Interviews with Key Informants

In order to gain a comprehensive understanding and strengthen the expected findings of the factors that influence bank behaviour in this sector, a qualitative research approach was carried out in addition to the quantitative method. The research involved key informant interviews with representatives from three banks. Through these interviews, we gathered insights from the bank's perspective on cyclicity and dynamics, and which criteria they prioritize in their decision-making models. Findings from the interviews provide a more nuanced and in-depth exploration of the complex factors that influence bank behaviour within these industries.

Table 5: Interviews, date, duration, form and interviewee position

Interview date	Duration	Form	Key informant position
23.01.2023	30 min	Digital/Microsoft Teams	Head of Department
22.02.2023	30 min	Physical	Assistant Bank Manager
27.02.2023	30 min	Digital/Microsoft Teams	Client Manager
20.03.2023	30 min	Digital/Microsoft Teams	Client Associate

Four interviews were conducted with employees from the Nordic banks. The interviews were mainly digital, with one exception only, as their shipping and offshore departments are not located in Bergen. The interviewees are referred to as key informants, each having varying backgrounds from banking, shipping and offshore sectors. The interviews followed a semi-structured approach, where a set of topics were discussed in order to gather information related to the thesis research questions. The main questions were:

- 1) When reviewing loan applications for both existing and new clients, which factors are important for your bank when lending to shipping and offshore?
- 2) Given your banks portfolio towards shipping and offshore, can you comment on lending to cyclical industries?
- 3) For the last topic, we discussed if banks lend more in a booming market compared to a recession.

We estimated approximately 10 minutes for each topic, we discussed around these topics with follow-up questions to enable the key informants to elaborate on the topics. Semi-structured interviews provide an opportunity for the interviewer to encourage a discussion around a certain topic. This can offer more information as the structure leaves room for the interviewee to showcase their experience and knowledge, while staying on the path of the interview topics.

6.1 Topic 1: Bank Lending Criteria for Shipping and Offshore industries

Topic 1 explores how banks assess loan applications from both existing and new applicants. The goal was to understand how the banks consider different factors and how they interplay in lending decisions. Insights on how banks reflect around their decision making, allows for further insight to whether cyclical effects can be described as the key element for changes in lending portfolios. From the interviews, it became apparent which key factors are important when determining the suitability of clients for bank lending. Credit analysis, cash flow, ESG, macroeconomics and KYC requirements were mentioned as factors, with different emphasis from each bank. The banks may prioritize these factors slightly differently, however, they shared a similar response to what their key focus was. Quoting the Assistant Bank Manager:

“The number one priority is the ability to pay, whether it’s through contracts which gives reasonable secure cash flow for the contract period... while the second most important priority is equity and collateral with a realistic asset valuation for a set time period for estimating the assets value.” – Assistant Bank Manager

The credit analysis of a project has minimum requirements that must be met for loan eligibility. The banks were quite similar in their response, with all stating the importance of contracts and cash flow, to serve as fundamental prerequisites for loan approval. In addition, the valuation of the assets were critical when reviewing applicants. When the cycle is at a peak with high asset values it is important to carefully measure the LTV for each loan, which is used to mitigate risks of overvaluation due to cyclical tendencies of asset value (Kavussanos og Visvikis 2016, 65). This type of asset-based lending is a common practice in which the profitability of the asset itself is the primary determinant of lending eligibility. The credit analysis therefore heavily relies on the loan applicant’s ability to pay liabilities through operation, segment and type of asset.

“...there can be a lot of risk by purely depending on asset-based lending, therefore we’ve began to weigh the importance of management and relations, which has proved to be a factor of success...” – Client Manager

Hence there has been a gradual shift away from solely focusing on financial risk and profitability in recent years. Historically, financial factors had a significant impact on a company's likelihood of receiving a loan. During the financial crisis, banks endured heavy losses due to defaults on principals and declining asset values. This led banks to incorporating a greater focus on relations and history, when reviewing loan applicants. Additionally, in 2015-2017, offshore companies experienced difficulties, resulting in banks reducing their exposure towards the industry.

Management and relations were crucial in periods of lower cash flows, as in these periods banks rely on the owners of the companies to meet their debt obligations. When the banks state they are more than ever looking at management, relations, and ownership they emphasize the importance of owners and management being able to steer the company through different cycles and not breaching covenants. Relations with companies has become more common as it enables for further understanding from both the banking side and company. On the other hand, banks are not actively seeking new clients, because they have incorporated a stricter KYC protocol. However, if the project looks financially stable and they’re impression of the company meets KYC requirements, the deal can be done, with favourable terms for the bank.

“...we’ve become increasingly attentive about ESG due to the stranded asset risk, with a big focus on the environmental part of ESG...” – Client manager

Environmental, social, and governance (ESG), and ethical considerations, have become increasingly relevant to banks when considering lending eligibility. Even though the shipping and offshore industries are not known to be the most eco-friendly, there is new technology that can work as a positive contribution for the loan applicant. The risk of a stranded asset has become more apparent as changes in technological, environmental or regulatory policies advance.

As the banking industry and the role of the banks continues to evolve, it is likely that the criteria for lending eligibility will adapt to reflect changing social and economic priorities. The banks have different approaches to determining loan suitability, with each bank following

different strategies when weighting criteria for loan applicants. These criteria are how they measure ESG, management and relations, in addition to the traditional asset-based approach.

Topic one elaborates on which elements are important when banks decide on the loan eligibility of clients. This part of the interviews can thus be used to reflect on how the cyclicity of the industries play a role in portfolio changes for the banks. For the asset-based part of the answers, including credit analysis, asset valuation and cash flows, the difference between banks is small. While some banks place more emphasis on financial factors than others, these factors fundamentally underpin every loan decision. A key finding within this topic is that new elements appear with the emphasis on ESG, management and relations.

6.2 Topic 2: Cyclicity in the Banks Portfolio

The goal of the second topic was to establish a connection between how the banks change their portfolio in accordance with the cycles. Two of the banks in our sample have quite similar lending patterns, while the third has had a rising trend. Therefore, it supports the thesis on further understanding the lending patterns and their connection to the cycles within these industries. The topic explores the banks different lending patterns, emergence of new financing alternatives and different segments within the portfolios.

As shown in chapter 4, two of the banks have similar lending patterns. These banks increased their portfolio from 2004 till 2011, until they reached a peak in their lending portfolios. The key informants describe this as a result of a high orderbook from 2008-2011, where the world orderbook as a percent of the world fleet reached a peak of 55.09% in 2008 within shipping (Clarksons Research 2023). With a demand driven bank lending, banks found little reason to reject promising projects, consequently leading to a substantial exposure to these industries. Syndication of loans also plays a role for the similarity of patterns with these banks as they often join in syndicates to reduce their own risk. Additionally, the syndication of bank lending increases the amount of capital towards the industries, with banks wanting to capitalize on the momentum. The third bank had a different pattern, with an increasing trend in their loan portfolio they took market shares as a relatively small player in addition to joining syndicated loans.

"... it is hard not to be cyclical, when the shipyards and owners of the assets want to refinance when the market is booming..." – Client Manager

Hence the banks portfolios in comparison to cycles, will be pro-cyclical when the markets are booming. In this period, there will be an increase in demand for assets, as well as the need for financing. Another factor that may contribute to spikes in the lending portfolios, is the correlation between higher freight and asset prices.

"...as the tenors of the loans are typically five years, the mortgagor will likely want to refinance the loan at the peak as this grant better terms ... in addition as the loans approach maturity it is accounted as current debt, which could have an impact on investor relations and could also be a reason for refinancing." – Client Manager

With better refinancing terms, owners want to renegotiate loan conditions during periods of higher market activity. Hence the banks try to operate counter-cyclically and do not consider cycle when evaluating loan applications for the shipping and offshore industries. The rationale behind this approach is that the typical loan duration of 5-7 years is likely to include multiple phases of a business cycle.

"...with good future outlooks and a high demand for capital, it does not mean that our willingness to take risk increases, but with the right opportunities the loan appetite increases." – Assistant Bank Manager

While two of the banks have reduced their overall exposure towards the industries, it is not mainly because they are seeking to reduce their risk. The emergence of new financing alternatives has been prominent in the period 2004-2023, with Asian asset-based leasing alternatives offering a very competitive rate. The Nordic banks have been unable to compete with those rates, and therefore lost market shares. However, the banks states they find themselves in a fine balance where they achieve a good return on the capital. In addition, the lending towards the industries can be competitive when the outlook is good, where more financing alternatives emerge.

Furthermore, the cyclicality in different segments, such as container vs. tankers, varies as one segment can experience high freight rates, while the rest of the industry have lower rates. This can lead the banks to increase their portfolio towards the one segment that performs well. The

underlying reasons are driven by supply and demand for goods transported, where an increase in oil production would drive the demand for tankers.

The main takeaway from this topic is that the banks experiences difficulties with not being cyclical. When the industries experience a good period, the credit analysis and cash flow outlooks are justified with contracts, higher asset values and a strong demand financing. During a booming market the banks clients often want to refinance their existing debt. In addition, with the emergence of new financing alternatives the banks strategies have incorporated other sources of financing, such as bond issuance to increase their own competitiveness in the markets. However, the banks states they find themselves in a sweet spot at the moment in regards to their exposure to the shipping and offshore industries.

6.3 Topic 3: Do Banks Lend More in a Booming Market Compared to a Recession?

For topic 3 we asked the banks their opinion on our main hypothesis: Lending banks tend to issue more loans for shipping and offshore during the peak of a business cycle compared to trough/recovery. With this topic we aimed to connect the dots from our quantitative analysis of the hypothesis with complementary information directly from the bank's own assessment.

"...we try to distance us from the where we find ourselves in the cycle, but in booming periods, when the LTV is low, good contracts/cash flow and favourable market conditions, could potentially lead to more lending ... by carefully estimating asset values it is possible to mitigate risks considering a fall in the markets." – Client Associate

As previously established, cash flow, contracts and asset values are the dominant factors in determining loan eligibility. In a booming market, the factors are usually favourable for the shipping and offshore companies. This again increases the amount of clients seeking financing. Additionally, the banks' credit analysis models estimating less risk compared to a similar case in a recession. Historically, the banks used market values to assess assets which caused LTV to be artificially low. When markets decline, asset prices tend to fall drastically, resulting in significant losses by using the market value of the assets. This experience has led

to the adoption of more prudent valuation methods as averaging the assets value over time, to mitigate such risks.

“...with some difficulties in the offshore sector in 2016, we developed a new approach to reduce our exposure towards the industry and terminate relations to non-performing clients...” – Client Manager

From the crash in the offshore industry in 2016, the banks stated that they had to reduce their exposure towards the industry, after they took some heavy losses. This included extensive work on managing clients, which had issues with cash flow and their operations were almost non-existing. A drop in oil price resulted in insolvency with a lot of the banks clients, thus the banks started to filter out existing clients and restructuring their portfolio, with only the “good” batch of clients and eliminating the “bad”. As mentioned, this resulted in heavy losses for the banks and reduction of exposure towards the industry. This finding is quite significant as we can see from figure 2 in chapter 4, that the total portfolio of the Nordic banks has decreased with a steady downward trend during the past decade. Especially a larger reduction in 2015-2017, where the offshore crash caused a headache for the banks exposed to the industry. However, after the elimination of “bad” clients, banks started focusing on management and the owners behind the companies, as well as their ability to withstand rough times. In addition, the focus on ESG emerged, and for clients to become attractive they need to incorporate ESG in their business plan. This might be harder for offshore companies compared to shipping, but nonetheless it has also become an important factor for the banks to consider.

As seen from the analysis (Section 5.2), we examined the relationship between the banks’ loan book and the ClarkSea index, as well as the Offshore index during various time periods. We found that before the financial crisis there was a positive relationship between the indices and loans. Following the crisis, the situation became more complex. This period proved challenging for the shipping industry, with low freight rates and numerous of bankruptcies. Consequently, banks experienced significant losses, primarily due to overestimating the value of assets and validity of shipping contracts. The model confirms that the banks was afraid of issuing more loans in this period, showing that it was a strong negative relationship between loans and the indices. In the third period the key informants confirm they wanted to reduce the banks exposures to these industries (double the slope from -0,53 to -1 for ClarkSea index). Especially, after the crash in the offshore industry. In the fourth period, the findings were quite intriguing. While there was still a negative correlation between loans and the indices, it was

evident that the negative effect from the offshore sector was more pronounced. Although the ClarkSea index and loans maintained a negative relationship, we observed that the correlation has shifted from strongly negative to much less negative. This change could potentially indicate the beginning of a positive relationship between loans and the ClarkSea index in the coming period. The key informants confirms that they currently find themselves in a “sweet spot”, but they are open to extending more loans to the shipping industry, provided the right conditions are met.

As stated previously the model which the banks use as a decision-making tool could potentially be biased when market outlooks are positive. It may overestimate the amount of loans that banks can disburse under favourable market conditions, as the companies checks off many criteria during highs of the cycle. Some informants mentioned that they had realized that the model didn't take into consideration the current position in the cycle, which could affect its accuracy in loan disbursement. Consequently, banks might issue more loans during the peak of the cycle as opposed to the troughs, without being fully aware of it.

7. Discussions

In this chapter a discussion of the results is provided to answer our main hypothesis through the research questions presented in the methodology chapter. The discussion focuses on reviewing the key findings from our analysis with the following hypothesis:

Banks tend to issue more loans for shipping and offshore during the peaks of cycles compared to trough/recovery.

The research questions posed in this thesis are:

1. *Is there a difference in lending between a boom and bear market?*
2. *Why are the banks' lending behaviour cyclical?*

7.1 RQ 1: Is there a Difference in Lending Between a boom and bear market?

The first research question was to find whether there is a difference between lending in boom and bear of the cycles. Our findings show that the banks do tend to issue more loans during the boom of the cycles, shown in the results from the t-test. This relationship between business cyclicity and bank lending is a significant finding, due to the implication of a coming collapse which can result in insolvency. Factors such as low freight rates, low oil price and falling asset prices are the main reasons for defaults on principal payments. Therefore, the banks are often holding back on issuing loans during bear markets. The Welch's t-tests showed that there is a significant difference between lending in a boom versus a bear market in the shipping and offshore industries. The test results suggest that, on average, there is a 4-5 basis point higher loan growth quarter-on-quarter for the booming period than for the bear period.

There can be several reasons for the banks to issue more loans during a booming market. First and foremost, a crucial factor for the bank is a positive cash flow. During boom of cycles shipping and offshore companies have a good cash flow and have the ability to repay the loans. This makes it easier for the banks to issue more loans, since there seems to be low risk of default (Kavussanos og Tsuoknidis 2016). One can imply that there would be less risks associated with lending in the beginning of an upward trend, rather than the peak, due to the

increasing profit margins and asset valuation (Albertijn, Bessler og Drobertz 2011). Additionally, from the interviews we found that borrowers want to obtain financing when market outlook is generally good. With low LTV and profitable ventures, ship and rig owners are in favourable position to renegotiate their loan terms. The banks also mentioned increased activity and optimism during the peaks of the cycle, as the industries want to capitalize on the trend with the acquisition of new assets. In addition, even though the banks experience increased activity they still want to remain risk averse, through evaluating risk, pricing, and due diligence in project proposals.

In times of economic downturns, banks often place significant emphasis on their established relationship and history with their clients (Lee og Pak 2018). This observation aligns with findings from the interviews, where banks expressed a preference for lending to clients with whom they have established solid relationships. This is seen as a safer path when navigating periods of reduced cash flow. Under such circumstances, the banks may rely on the owners' ability to pay their liabilities to prevent losses.

Syndicated lending can enable banks more control over the risks associated with the lent-out capital. In addition, this can also cause more banks wanting to join the syndicate as some of the banks can be seen as a sign of quality. Furthermore, the combination of banks in syndicates can lead to more capital aggregated towards these industries causing a domino effect, which can be an underlying cause to why bank lending increases during the peaks.

As stated, the results show that banks do in fact increase their loan portfolios towards the industries in a booming freight market. This finding highlights the need for risk management during these peaks, as the activity increases and the higher default risk in the event of a market downturn. This provides valuable insight into the relationship between cyclicity and bank lending to these industries.

7.2 RQ 2: Why are the Banks' Lending Behaviours Cyclical?

Data collection from the Nordic banks show a cyclical trend of the banks' portfolios, and in the second research question we sought to understand the reasons why the banks are cyclical. Findings from the interviews shows the banks are very aware of the cycles, and the effects of

strong shipping and offshore markets with the cycles turning at some point. Jugović, Komadina, & Perić Hadžić (2015) addressed the underlying factors for fluctuations in the freight rates, where the global trade was ultimately driven by supply and demand. The cyclical nature of the banks' can be assumed to be no different, where the need for financing for shipping and offshore companies changes during the cycles.

The interviews revealed that the banks' credit assessments for different projects improves, with better inputs such as contracts, stable cash flow and higher asset valuations. However, it does not imply that their level of risk increases, but rather that the lending appetite could increase. An upturn in market activity increases demand for financing, this aligns with Syriopoulos (2010) findings in his article about the capital markets within the shipping sector.

Newcomers and smaller banks may strategically choose to act counter-cyclical to gain market shares. As cycles fluctuate, smaller banks identify growth opportunities during downturns where larger, more established banks often face difficulties in a bear market. This is illustrated in figure 1, where Bank 3 demonstrates a rising trend in lending, while Bank 1 and 2 reduced their lending portfolios in line with the cyclical downturn. Moreover, Bank 3 has gained market shares through this counter-cyclical strategy, achieving a loan portfolio size comparable to that of the two other banks. This demonstrates the potential effectiveness of a counter-cyclical strategy for smaller or newer banks.

Based on our observations from the Linear Mixed Model analysis and the interviews, we found that during booming market conditions, such as those before the financial crisis, it was relatively easy for shipping and offshore companies to obtain loans. The lending was demand driven. Consequently, banks had no valid reason to limit investments for promising projects.

After the financial crisis, our model revealed a negative relationship between the indices and Loan Outstanding. As banks began to experience losses on these loans, they became stricter in their lending practices and started reducing their exposure to these industries. This trend persisted as long as freight rates, cash flow and revenues remained low. Especially after the offshore crash in 2016, which prompted banks to further reduce their offshore exposure. The model shows that the relationship between Offshore Index and Loan outstanding was strongly negative after 2016. This finding was corroborated by the banks in the interviews, who confirmed that they were no longer interested in lending to the offshore industry.

When market conditions improved and rates, cash flow and revenues increased, the relationship between ClarkSea Index and Loan Outstanding, became less negative. According to our interviews, banks have stopped reducing their exposure to the shipping industry, as they currently find themselves in a “sweet spot”. The banks also indicated that they were consistently open to considering good investment opportunities, which often arise during favourable market conditions (Gavalas og Syriopoulos 2015).

This phenomenon, characterized by favourable market outlooks and investments opportunities, leads banks to increase their lending. While market downturns makes it harder to acquire loans and results in banks reducing their exposure to these industries, which contributes to the cyclical behaviour of the banks.

7.3 Limitations

Research on cyclical behaviour of lending banks in the offshore and shipping industries is limited. This limitation makes it difficult to compare our findings to similar literature, where we need to extract several studies on different parts of our hypothesis to validate the results. With an approach of a mixed method with both a quantitative and qualitative part, we aimed to increase the validity and reliability with further insight both from a quantitative perspective as well as a qualitative. By comparing our findings on the relationship of bank lending and cyclicity to several relevant literature sources, we can draw similarities and concluding remarks of our results.

Monthly data on lending is not possible to extract since this information is considered confidential and therefore difficult to obtain, thus we have based our analysis on quarterly data. With more accurate data on the different segments within the industries, one could expand the thesis to look at segment specific trends. With this information we could have been able to separate the different asset types and alternatively seen a different pattern for each segment within the industries. Reporting standards have improved after Basel I, II and III, resulting in more precise and detailed financial reports. This differs from reports before the crisis, which typically contained a singular, undifferentiated loan figure for both the offshore and shipping sector.

Furthermore, there are some limitations to our method of key informant interviews. The interviewee can be biased towards what their individual thoughts and opinions on the subject. However, due to the number of respondents with similar answers it increases the credibility of their opinions and thoughts.

Some data points required conversion to USD, thus potential complexities related to inflation and currency exchange rates. While we've used historical exchange rates to enhance accuracy, it is important to remember that these conversions introduce a degree of estimations. Therefore, readers should consider this when interpreting the findings of this thesis.

Despite having conducted interviews with three Nordic banks, it is important to remember that these banks represent a small portion of the global bank lending within the shipping and offshore industries. Consequently, we should be careful when generalizing these conclusions to a global context without further research.

7.4 Suggestion for Future Research

This study has explored lending practices in the shipping and offshore industries, examining how they evolve throughout the different stages of a cycle. Since this thesis has looked at the past 20 years and analysed how cycles affect bank lending, it would be quite interesting to see how banks act in the future. This is mainly due to the banks themselves stating that they are in a "sweet spot" for these industries and might not want to change their position too much. It would also be interesting to look further back in time, to see if the activity in these markets correlates more with loans before the financial crisis than after.

There is also potential to add-on the results of this thesis through further research. In this study, we focused on Nordic offshore and shipping banks. It would be interesting to gather information from banks worldwide and compare the result to those presented here, as this could provide a more comprehensive understanding of banks' lending practices in the shipping and offshore sector. We have also observed that Asian banks have increased their loan portfolio, while many others have reduced theirs. Investigating the reasons behind this difference and assessing whether it's more profitable to capture market shares during the troughs of the cycle could offer valuable insights.

From our research, we observed a difference between banks that had substantial exposure during the financial crisis and those that were less exposed. The difference could potentially be explained by a heightened degree of risk aversion among the banks that took significant losses. It would be intriguing to examine whether banks with low exposure during the financial crisis take on more risk, compared to those with high exposure during the crisis.

There is considerable scope for research on this topic, with numerous gaps that could be filled. A complicated factor is that much of the relevant information is confidential, making it difficult to find reliable and accurate public data. While Basel I, II and III regulations have facilitated reporting of loans and exposure to different industries, a substantial amount of valuable data remains concealed and inaccessible. Using alternative methods, utilizing additional data, or adopting a different approach, could potentially lead to new and intriguing findings in this area.

8. Conclusion

The objective of this study was to address the hypothesis about Nordic lending banks present in the shipping and offshore industries, and how they change their portfolio in response to the current stage of the cycle. Through a mixed-method approach, we analysed the relationship between cyclicity within the banks' aggregated lending portfolio. Through a Welch's t-test we confirmed our hypothesis to be true. Additional analysis conducted with a Linear Mixed Model, supported our findings. To expand further knowledge on the behaviour of the banks, we conducted several semi-structured interviews with key informants to elaborate on the behaviour from the banks' perspective.

The results show a significant difference in lending between a boom and bear market. The application of Welch's t-test confirms a statistically significant difference in growth in the banks' lending portfolio to shipping and offshore during the boom of a cycle. Additionally, this finding was confirmed in the dialogues with the key informants stating that market activity increases due to higher freight rates, asset valuations and optimistic outlook for future earnings. This results in new investments or refinancing of other liabilities with better terms.

Furthermore, the linear mixed model indicates that the relationship between loan and indices varies across different time periods, suggesting that the banks change their lending behaviour in different stages of the cycle. In the dataset period, banks have reduced their exposure to these industries when market factors are low. In the recent years when the markets experienced an upturn, banks have stabilized their portfolios and say that they are open for good investments opportunities. This behaviour supports the hypothesis that banks are cyclical in their lending practices.

The lending practice have changed over the years, losses has made the banks reconsider lending practices to incorporate a stricter policy while reviewing applicants, calculating asset values and assessing contract values. They now place a greater emphasis on building and maintaining relationships and the historical track record with their customers, as they consider this a safer path during the trough stage of a cycle. Based on the interviews, banks claim to strive for countercyclical actions. However, as long as contracts and cash flow remain the most crucial factors in their decision-making process, it is natural that more attractive investment opportunities will present themselves during peak of a cycle. This highlights the inherent

challenge for banks in maintaining countercyclical behaviour while still relying on indicators that are cyclical.

As the thesis has focused on the past 20 years, which includes a particularly bad run for shipping in general, as well as difficulties within the offshore industry, it will be interesting to see if our hypothesis remains true in the future. In addition, whether the banks manage to change their cyclical behaviour towards a counter-cyclical approach. The answers to these questions carry considerable implications for industry stakeholders and future economic stability, providing that the financial dance between banks and these volatile industries is far from its final number.

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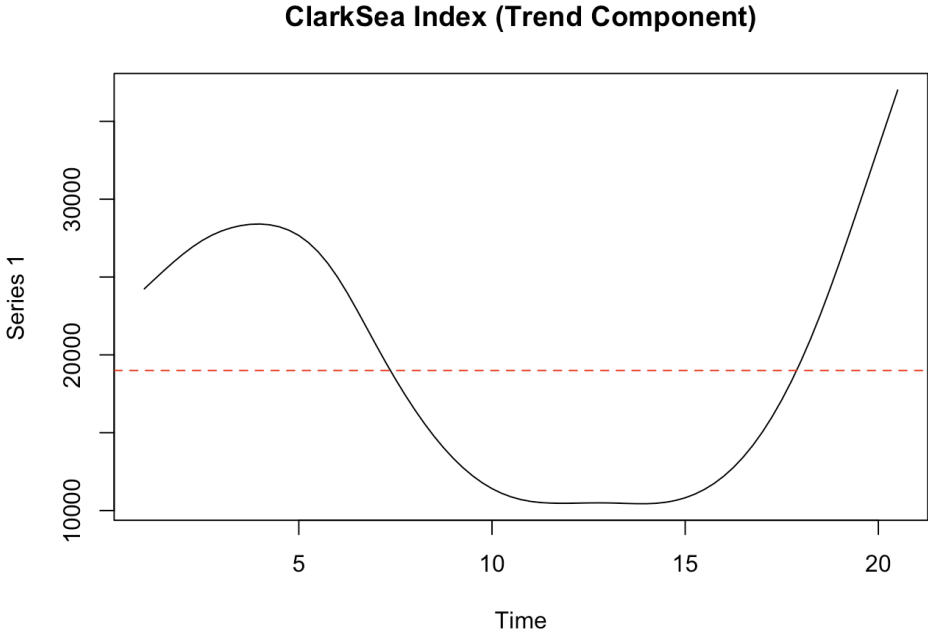
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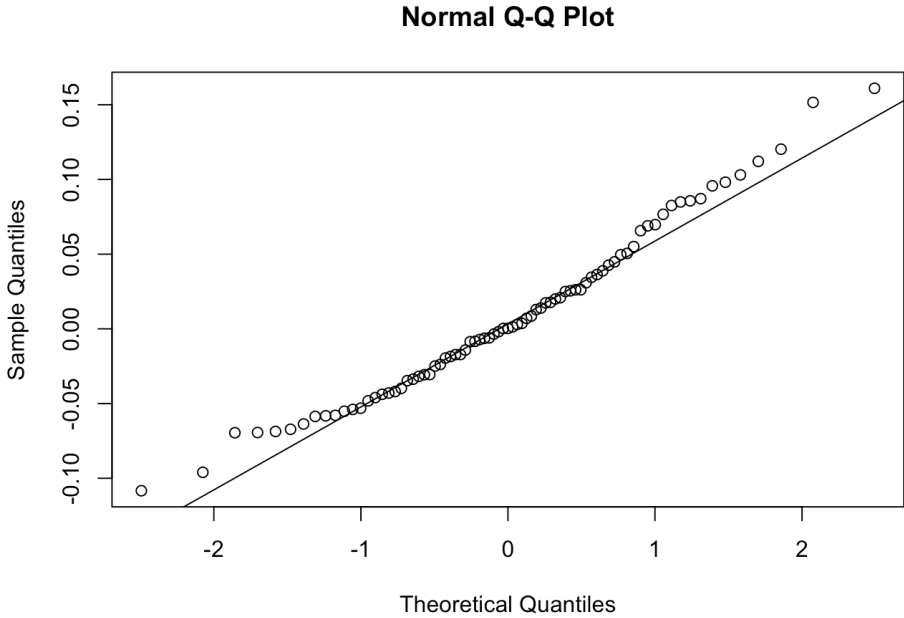
Appendix

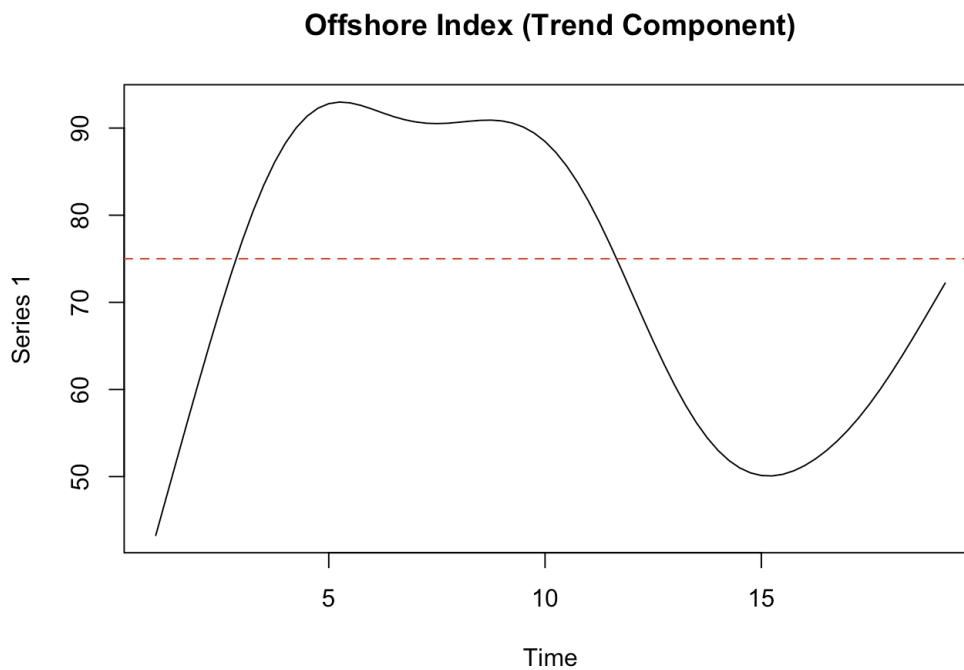
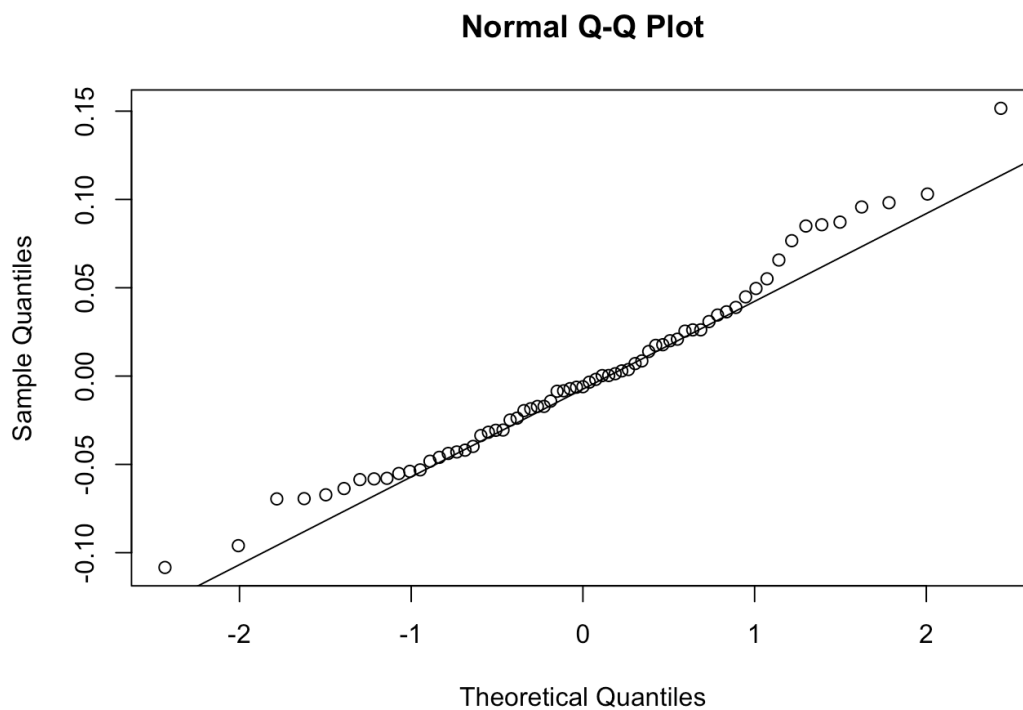
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Appendix A: ClarkSea Index (Trend)

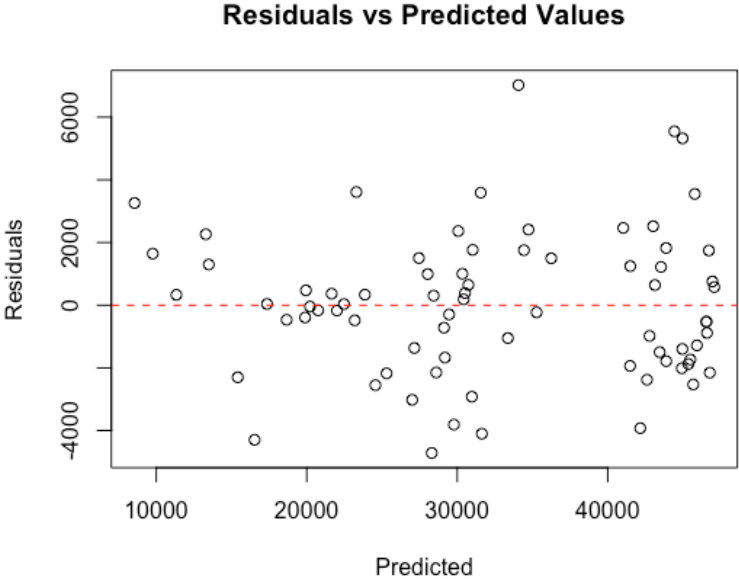


Appendix B: Q-Q Plot Welch's t-test ClarkSea

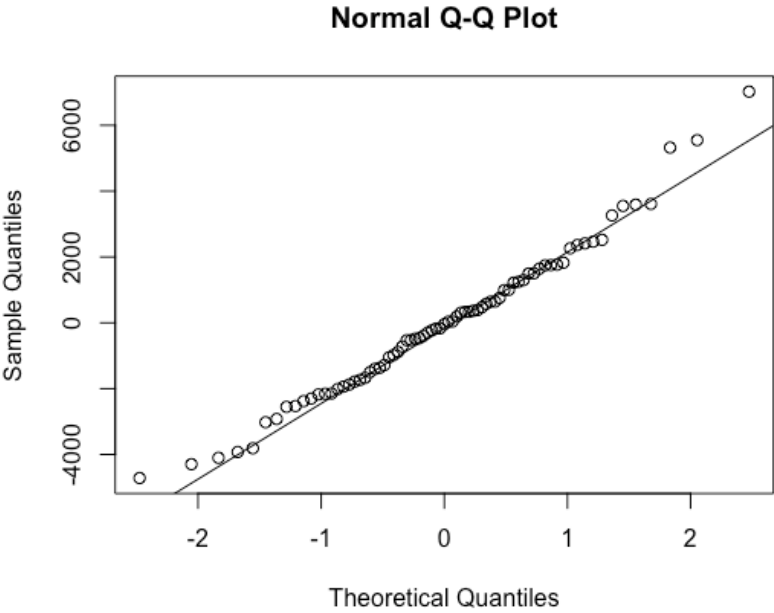


Appendix C: Offshore Index (Trend)*Appendix D: Q-Q Plot Welch's t-test Offshore*

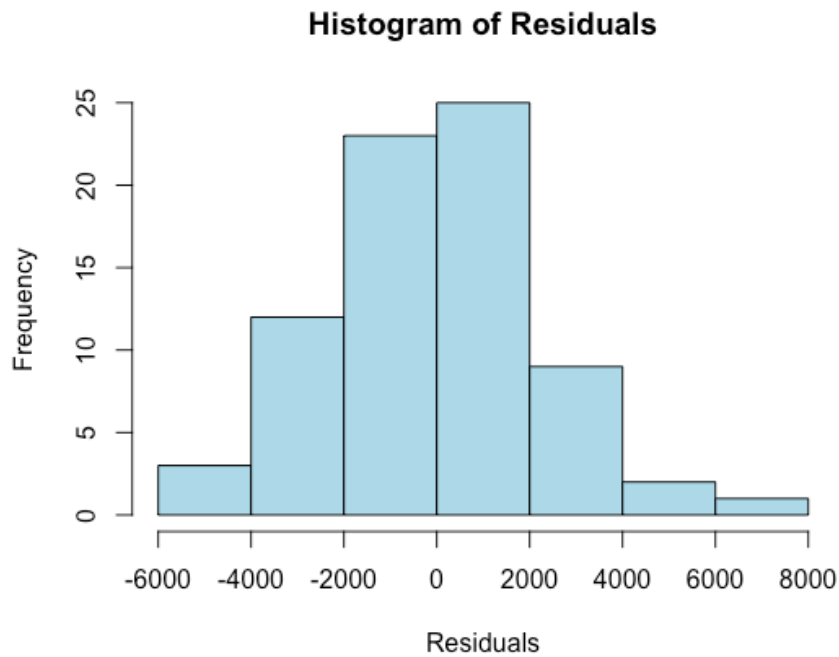
Appendix E: Residuals vs Predicted Values Linear Mixed Model



Appendix F: Normal Q-Q Plot Linear Mixed Model



Appendix G: Histogram of Residuals Linear Mixed Model



Appendix H: Correlation of Fixed Effects

Correlation of Fixed Effects:

	(Intr)	clrks_	offsh_	fc(_)	fc(_)	fc(_)	c_:(_)	c_:(_)	c_:(_)	o_:(_)	o_:(_)
				2	3	4	2	3	4	2	3
clarksea_sd	-0.435										
offshor_ndx	-0.147	-0.287									
fctr(tm_p)2	-0.528	0.230	0.078								
fctr(tm_p)3	-0.576	0.250	0.085	0.304							
fctr(tm_p)4	-0.600	0.261	0.088	0.317	0.345						
clrks_:(_)	0.145	-0.333	0.096	-0.667	-0.083	-0.087					
clrks_:(_)	0.179	-0.411	0.118	-0.094	-0.007	-0.107	0.137				
clrks_:(_)	0.235	-0.541	0.156	-0.124	-0.135	-0.169	0.180	0.222			
offsh_:(_)	0.051	0.100	-0.349	-0.666	-0.029	-0.031	0.555	-0.041	-0.054		
offsh_:(_)	0.022	0.043	-0.150	-0.012	-0.616	-0.013	-0.014	-0.472	-0.023	0.052	
offsh_:(_)	0.029	0.056	-0.195	-0.015	-0.016	-0.463	-0.019	-0.023	-0.546	0.068	0.029

Appendix I: Scatterplot Shipping and ClarkSea

