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DETERMINANTS OF PROFITABILITY: EVIDENCE FROM NORDIC ENERGY COMPANIES

Bachelor's thesis

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I hereby declare that I have compiled the thesis independently
and all works, important standpoints and data by other authors
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has not been previously presented for grading.

The document length is 8185 words from the introduction to the end of the conclusion.

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ABSTRACT

This study focuses on the different determinants of profitability within the Nordic energy industry. This study includes 265 large Nordic energy companies with operating profit over 100 million. The time period of the study is from 2013-2021 and overall 1637 observations were made in the Model 1 and 1668 observations were made in the Model 2. To investigate the determinants of profitability two dependent variables as in return to assets (ROA) and return to equity (ROE) were chosen and five independent variables size, liquidity, growth, capital intensity and debt ratio to investigate te connection with profitability. The results of this study show that in Model 1 debt ratio, liquidity and growth rate has positive impact on profitability and company size and capital intensity has negative impact on profitability. In the Model 2 liquidity and growth rate has positive impact on profitability and company size, capital intensity and debt ratio has negative impact on company profitabilty.

Keywords: Profitability determinants, Nordic, Energy

INTRODUCTION

The energy industry is a critical sector that plays a significant role in the economic development of any country. As concerns about climate change and environmental sustainability continue to mount, the energy industry has undergone significant changes in recent years, with increasing focus on renewable energy sources and sustainable practices. The Nordic region is known for its leadership in green energy, with countries such as Denmark, Finland, Norway, and Sweden pioneering the transition towards a low-carbon economy and the Nordic countries have taken a lead in promoting the use of renewable energy sources, reducing carbon emissions and achieving carbon neutrality by 2050. The energy sector in the Nordic region is characterized by a mix of large, companies and smaller, companies that operate in diverse segments of the value chain. While companies have received considerable attention in the literature, the profitability determinants of Nordic energy companies are less explored.

The profitability of energy companies is a key indicator of their financial performance and is influenced by a range of factors such as company-specific characteristics, industry dynamics, and macroeconomic factors. Understanding the determinants of profitability is crucial for Nordic energy companies, as it can help them identify their strengths and weaknesses, develop effective strategies and make informed investment decisions. Moreover, the findings of this research could be useful for policymakers, investors, and other stakeholders interested in the Nordic energy industry.

Also, in the recent years The COVID-19 pandemic had a significant impact on the energy industry, affecting the demand, supply, and prices of energy products. It was found that COVID-19 also had a significant impact on companies performance (Qadri, et. Al 2023). And currently Europe is experiencing an energy crisis that has been triggered by a combination of factors, including rising energy demand, supply chain disruptions, low renewable energy output, and high natural gas prices. After the Russian invasion to Ukraine the energy prices have risen since Europe was

dependant on the Russian gas supply. Also, the European electricity prices have increased with the reduction of the natural gas supply (Zettelmeyer et. al 2022).

The aim of this thesis is to examine the determinants of profitability for Nordic energy companies for the years 2013-2021. The thesis will focus on companies that operate in different segments of the energy value chain, including renewable energy, oil and gas exploration, and energy trading. We will use financial data from these companies to analyze the effects of various company specific on their profitability. Our analysis will draw on existing literature on the determinants of profitability of companies and will extend the scope of previous research by examining the Nordic energy context.

The research questions that guide this thesis are
1. What are the determinants of profitability for Nordic energy companies?
2. What company specific factors influence the profitability of Nordic energy companies?

This study will focus on the 265 largest companies operating in the nordic energy industry selected by the companies operating revenue and investigates how company specific factors affects the profitability of the companies. The company specific factors selected for this study are: liquidity, size, growth, capital intensity, fixed assets ratio and debt ratio. In this study we will focus on nordic companies and to be more specific to Finland, Sweden, Denmark and Norway. We excluded Iceland from this study since in the Iceland there were lack of companies that would fit the study.

This study will try to investigate and examine the impact of the chosen company-specific variables on profitability in the larger companies operating in the Nordic energy industry. This study chose to only cover company-specific financial measures since it gives good understanding of a companys financial performance and health. While several internal and external factors can be influencing company profitability focusing only on the company-specific it gives us better understanding of the companys strengths and weaknesses and allowing for more meaningful comparisons between different time periods.

In this study we will first examine and review previous studies and discuss about the selected independent variables chosen for this study. Then we will go over the hypothesis and what we excpect the relationship between the independent variables have with profitability. We will also discuss about methodology and data, where we will explain about the methodology and data used

and why it is used in this study and lastly we will go over the models used in this study and discuss about the findings.

Overall, the amount of studies focusing on investigating different determinants of profitability is high. But the significance of this study is that there is a huge lack of studies on the determinants of profitability in the energy industry. The Nordic region has been a subject of many studies but those studies have focused on different industries. Since there is so great lack of previous related studies, it seems important to investigate the determinants of profitability in the Nordic energy industry.

1. LITERATURE REVIEW

1.1. Review of previous literature

1.1.1. Theoretical background

The Nordic energy industry has been characterized by a focus on renewable energy, the development of a united electricity market, and the current challenges posed by the energy crisis. The Nordic countries, which include Denmark, Finland, Iceland, Norway, and Sweden, have been leaders in promoting renewable energy sources and reducing greenhouse gas emissions. According to the Nordic Energy Technology Perspectives 2019 report by the Nordic Council of Ministers, the Nordic countries have made significant progress in increasing the share of renewable energy in their energy mix, for example, Iceland generates almost 100% of its electricity from renewable sources, while Denmark, Norway, and Sweden generate more than 50% of their electricity from renewables.

One of the main trends in the Nordic energy sector has been the emergence of renewable energy sources, such as wind, solar, and hydropower. Also the Lisbon Treaty was one of the more important legal basis that introduced the creation of Article 194, that aimed to establish and ensure the functioning of the EU's energy market its recurity of supply, to promote energy efficiency and saving, to develop renewable energy infrastructure and interconnect existing energy networks (Kanellakis et al. 2013). The renewable energy sources have become increasingly competitive in recent years, driven by technological advancements, falling costs, and government incentives. According to the International Energy Agency's Nordic Energy Transitions 2021 report, the cost of solar and wind energy in the Nordic countries has declined significantly over the past decade, making them more competitive with traditional energy sources. The report also notes that the Nordic countries have been leaders in the development of new renewable energy technologies, such as offshore wind and bioenergy.

Another trend in the Nordic energy sector has been the development of a united electricity market. This market, known as the Nord Pool, was established in 1993 and allows for the trading of

electricity between the Nordic countries. According to the Nord Pool website, the market has been successful in promoting competition and price transparency in the electricity market, and has contributed to the integration of renewable energy sources.

However, the Nordic energy industry, like many others, is currently facing an energy crisis. The crisis has been driven by several factors, including rising energy demand, supply chain disruptions, and extreme weather events. According to the European Commission's Energy Crisis in Europe: Questions and Answers report, the crisis has led to increased energy prices and concerns about energy security, highlighting the importance of a resilient and diversified energy system. A study found that there is growing trends of future power prices towards 2050 (Chen et. Al. 2021)

For a long time, the Nordic energy industry has been at the forefront of the transition towards a more sustainable and renewable energy system. The emergence of renewable energy sources, the development of a united electricity market, and the current challenges posed by the energy crisis are the main trends currently in the energy sector in the Nordic countries. These trends highlight the importance of continued investment in renewable energy sources, the development of resilient energy systems, and the need for international cooperation in the energy sector.

The determinants of profitability have been a subject of interest in the financial literature for several decades. Researchers have investigated various company-specific and external factors that influence the financial performance of companies, including profitability. Although in this study we will be only focusing on the company-specific The existing literature has identified several determinants of profitability, including size, leverage, liquidity, industry characteristics, macroeconomic factors, and company-specific factors.

1.1.2. Size

Fareed, Ali, Shahzad, Nazir, and Ullah (2016) examined the determinants of profitability in the power and energy sector. They used panel data analysis techniques to investigate the impact of various firm-specific and industry-specific factors on the profitability of firms. The study covered data of 16 firms from the years 2001 to 2012. In their study they found out that there is positive relationship between company size which was measured by taking the natural logarithm of total assets of the firms and profitability which was measured using the return on assets (ROA) ratio.

The study also found that larger firms in the power and energy sector tend to be more profitable than smaller firms.

Luts, Savolainen, and Collan (2021) aimed to identify the determinants of profitability for renewable energy companies in Germany. The authors analyzed financial data of 783 renewable energy firms for the period of 2010-2018 using longitudinal panel data regression models. The study used the return on assets as the dependent variable and measured the company size as the natural logarithm of total assets. The results of this study indicated that the company size had a positive and significant impacy on profitability. Implying that larger companies operating in the renewable energy sector were more profitable than smaller ones.

Morina, Ergün, and Hysa (2021) investigated the drivers of renewable energy firms' performance. Their study focused on renewable energy companies in the European Union over the period of 2004-2018. The dependent variable in their study was the return on assets (ROA), which measures the profitability of the firms. Company size was measured using the natural logarithm of total assets. The findings showed that company size had a significant positive effect on profitability, indicating that larger firms tend to be more profitable in the renewable energy sector.

Xu, Akhtar, Haris, Muhammad, Abban and Taghizadeh-Hesary (2022) examined the impact of energy crises on firm profitability and productivity in an emerging economy context. The study used a sample of 424 non-financial listed companies in Pakistan over the period 2001-2017. The authors used return on assets (ROA) and return on equity (ROE) as proxies for profitability. In their study the results showed that larger firms were more profitable than smaller firms, which was measured using the natural logarithm of total assets.

1.1.3. Liquidity

Egbunike and Okerekeoti (2018) investigated the relationship between macroeconomic factors, firm characteristics, and financial performance of selected quoted manufacturing firms in Nigeria. The sample size consisted of 21 consumer goods manufacturing companies and the data was obtained for the period of 2011-2017. The study used return on assets (ROA) as a proxy for financial performance and liquidity as one of the firm characteristics. The study used multiple linear regression as a method to examine the relationships between the dependent and independent variables. In the study they found that liquidity had a significant positive relationship on ROA.

Samo and Murad (2019) aimed to examine the impact of liquidity and financial leverage on the profitability of textile companies in Pakistan. The study employed secondary data of 40 publicly quoted textile companies during the period of 2006 to 2016. The study used panel data analysis, including pooled regression and fixed effect model to investigate the relationships between the variables. The dependent variable was profitability, measured using Return on Assets (ROA), while liquidity was measured using current ratio (CR) and quick ratio (QR). In this study they found tha liquidity as current ratio had a positive strong relationship between profitability. Additionally the study showed that financial leverage had a negative and significant impact on firm profitability.

Kumar, Srivastava, Tabash and Chawda (2021) investigated the relationship and impact of company-specific factors had on profitability of public private partnerships in India using panel data of 171 unlisted companies from different infrastructure sectors that included power generation, real estate, road and ports. The findings indicated company-specific factors such as liquidity had a significant positive impact on firm profitability.

1.1.4. Growth

Gharaibeh and Bani Khaled (2020) investigated the determinants of profitability for Jordanian services companies. The study used a sample of 46 service companies listed on the Amman Stock Exchange for the period of 2014 to 2018. They applied fixed and random effects models to panel data to investigate the relationship size, tangible assets, growth, business risk, debt to equity ratio and debt to assets ratio had on profitability measured as operating profit, return on assets and return on equity. The growth in this study was calculated by percentage change in total assets. The study found out that growth had positive impact on ROA on fixed and random effects models but negative effect on the pooled model.

Al-Jafari, Khaled and Al Samman (2015) conducted an investigation to determine the factors affecting the profitability in industrial companies listed on Muscat securities market in Oman.. The study used data from 17 companies during the time period of 2006-2013. The study applied multiple linear regression model to find out relationships between dependant variables profit margin and return on assets that were the selected measurement for profitability. The study had six independent variables average tax rate, size, growth, fixed assets ratio, leverage and working capital. The study found out that size, growth, fixed assets ratio and working capital had a

statistically significant positive relationship between profitability but the average tax rate and leverage showed negative relationship between profitability.

Le, Mai and Nguyen (2019) Investigated the profitability determinants of constriction companies in Vietnam for the period of 2008-2015. Their data included 584 observations and used FEM regression model to investigate the relationship with profitability return on assets and return on equity and independent variables debt ratio, size, growth rate, asset utilization performance, age and the proportion of fixed assets in total assets. In their study they found out that company age and debt ratio regatively affect the profitability and growth rate, asset utilization performance have positive impact on profitability.

1.1.5. Capital intensity

Hossain (2020) investigated the determinants of profitability for manufacturing companies listed on the Dhaka Stock Exchange in Bangladesh. The study used panel data regression analysis on a sample of 34 firms over a period of 6 years from 2014 to 2019. The study included several independent variables, including liquidity, leverage, sales growth, management efficiency, capital intensity, firm size, working capital, annual inflation and GDP growth to examine their impact on the dependent variable, profitability. The study two models and two dependent variables return on equity (ROE) and return on assets (ROA).The study conducted a regression analysis and the results showed that liquidity, leverage, managerial efficiency, sales growth and capital intensity has a a statistically significant positive impact on profitability and on the other hand the study indicated that that liquidity and leverage have a statistically significant negative impact on profitability has a significant negative impact on profitability.

Pantea, Gligor and Anis (2013) studied the economic determinants of Romanian firms' financial performance. They conducted a study including 55 Romanian industrial companies and collected data over the time period of 1999-2012. They used panel data analysis and conducted two models random effects model and fixed effects model. As a measurement to represent profitability they used return on assets and return on equity and for independent variables they used firm size, firm growth, capital intensity, human resources and CSR. From the analysis they concluded that positively in the firm performance affected the firm size, capital intensity and its human resources. They found that firm size had the most significant impact on performance.

1.1.6. Debt ratio

Alarussi and Gao (2021) Investigated the determinants of profitability in Chinese listed companies. The study included data from 100 companies during the period of 2017-2019, also they used random selection method in order to achieve credibility and fairness in their study. They cinducted a pooled ordinary least squares regression to analyze the data. For dependent variables they chose return on assets and earnings per share. As for independent variables they chose liquidity, intangible assets, working capital, leverage (as in Debt ratio and leverage ratio), firm size and firm effiency. The results showed tat there was a positive and strong relationship between debt ratio and ROA but not with EPS. The results also showed that the firm size, working capital and intangible assets have positive and significant relationships with profitability with bot ROA and EPS. In addition the findings show negative and strong relationship between liquidity and profitability.

Gharaibeh and Bani Khaled (2020) Investigated the determinants of profitability in Jordanian service companies. In the study they investigated the effect of financial characteristics and capital structure on the profitability within 46 service companies listed on the Amman Stock Exchange over the period 2014-2018. The study used bith fixed and random effects models to panel data. The study included independent variables size, tangible assets, growth, business risk, debt to equity ratio and debt to assets ratio. Profitability was measured by operating profit, return on assets and return on equity. In their study they found that debt to assets ratio has a negative and significant impact on the profitability of service companies in Jordan.

1.2. Hypothesis development

In the field of finance, there are many factors that influence a company's profitability. In this study we use five different company-specific factors as independent variables to investigate the relationship between each independent variable and profitability. The company profitability in this study is measured with both return on assets (ROA) and return on equity (ROE) and with thease measurements two models are conducted in which both of these variables act as a dependent variable in their own model. Return on assets measures the companys profit in relation to its assets. This ratio gives an idea of ho efficiently a company uses its assets to generate profits. Return to equity, on the other hand, measures a companys profits in relation to its equity. This ratio indicates

how much profit a company is generating in relation to the equity invested by its shareholders. Both of these ratios are good metrics for profitability and they help investors and analysts to evaluate a companys financial performance.

The first independent variable is the company size. In this paper we use the natural logarithm of sales of the companies to measure its size. Size is a crucial firm characteristic that has a significant impact on profitability. The relationship between size and profitability has been extensively researched and widely documented in academic literature in studies it is concluded that size enhances the financial performance of energy firms (Fareed et al. 2017). Several studies have shown that larger firms tend to be more profitable than smaller firms, for example in a study by Gaio and Henriques (2018) they found out that larger companies on average are more profitable than small and medium sized.. This can be attributed to several factors such as economies of scale, increased bargaining power, and improved access to resources and capital. Also its been found that firm size can be one of the strongest determinants of profitability in the power and enegy sector (Fareed et al. 2016). Based on these statements we can draw conclusion that the size is important factor affecting profitability. Therefore following hypothesis can be drawn.

Hypothesis 1 (H1): There is a positive relationship between company size and company profitability.

Liquidity and profitability are two critical aspects of financial management that companies need to consider in their operations. Liquidity refers to a company's ability to convert its assets into cash quickly, while profitability refers to the company's ability to generate income in excess of its expenses. In this study liquidity is measured as current ratio of the companies. Previously, the results in the terms of liquidity and profitability have shoved that liquidity has a negative and strong relationship (Alarussi et al. 2021). But there has also been studies that show that liquidity has a positive and significant effect on ROA (Egbunike et al. 2018). We can see that there is a trade-off between liquidity and profitability. To increase profitability, companies may invest in long-term projects or engage in activities that tie up their cash flow, such as purchasing new equipment or expanding their operations. While this can lead to increased profitability, it can also lead to reduced liquidity, as the company's cash is tied up in these investments.

Hypothesis 2 (H2): There is a negative relationship between liquidity and company profitability.

The third independent variable is growth. In this study it is measured by the growth percentage companys total assets. In some cases, growth can lead to higher profitability as it increases revenue and market share, leading to economies of scale and scope. On the other hand, growth can also lead to lower profitability if the cost of growth outweighs the benefits. For instance, if a company invests heavily in expanding its business without generating sufficient revenue, it may experience lower profitability. In previous studies growth in sales and assets have been associated with positive effect on profitability (Luts et al. 2021).

Hypothesis 3 (H3): There is a positive relationship between growth and company profitability.

The fourth independet variable is capital intensity. It is measured by dividing total assets byt sales revenue. Capital intensity refers to the amount of capital required to generate revenue or produce goods and services. It is a measure of how much capital a company needs to invest in order to generate a certain level of output or revenue. Capital-intensive businesses often have high profit margins because they are able to leverage their large investments in fixed assets to generate significant revenue. However, the high costs associated with these investments can also increase a company's debt burden, which in turn can impact profitability by increasing interest expenses and reducing cash flow. Studies has shown that capital intensity has a statistically significant positive impact on profitability (Hossain 2020). In general, the relationship between capital intensity and profitability depends on a number of factors, including the industry in which the company operates, the efficiency with which it uses its capital, and the competitive landscape. Companies that are able to effectively manage their capital investments and generate high levels of revenue from their fixed assets are typically more profitable than those that are not.

Hypothesis 4 (H4): There is a positive relationship between capital intensity and company profitability.

The fifth independent variable in this study is debt ratio. In this study debt ratio is calculated by dividing the total liabilities with total assets. Debt ratio refers to the proportion of a company's total assets that are financed by debt, either in the form of loans or bonds. Debt can be an important source of financing for companies, but excessive debt can also be detrimental to a company's financial health. The level of debt a company carries can have a significant impact on its profitability. In some studies debt ratio was significant but it was negative for small and medium sized companies and positive for large firms (Luts et al. 2021). This can be since a moderate level

of debt can be beneficial for a company, as it can provide a tax shield and increase the return on equity for shareholders. Additionally, if a company uses debt to finance productive investments that generate a return greater than the cost of the debt, it can lead to an increase in profitability. Debt financing can be a double-edged sword, which can improve the companys return rate but also greatly increase the companys risk (Zhang et al. 2020). And thus author believes that this will effect companies profitability negatively hence the hypothesis.

Hypothesis 5 (H5): There is a negative relationship between debt ratio and company profitability.

In conclusion, this paper has provided an overview of the selected variables that impact company profitability, including ROE, ROA, size, liquidity, growth, capital intensity, and debt ratio. Based on existing literature, we have proposed hypotheses to test the relationships between these variables and company profitability. Further research is needed to confirm these hypotheses and to identify other factors that may impact company profitability.

2. METHODOLOGY AND DATA

2.1. Data and descriptive statistics

The present study investigates the determinants of profitability for Nordic energy companies using regression analysis. To achieve this objective, a cross-sectional dataset of financial information from Nordic energy companies has been collected from Orbis Europe. The dataset includes information on both the dependent variable (profitability) and a range of independent variables (company-specific and external factors) that are expected to influence profitability.

For the data the aurhor wanted to use large companies since larger companies tend to have more stable financial performance compared to smaller companies, which can make it easier to identify the different variables of profitability. Overall there was data found in Orbis Europe for the years 2013-2021 for 3146 companies operating in the Nordic energy industry. For the samlpe the author chose to study companies with the operating revene over 100 million since operating revenue is a key financial metric that reflects the performance of a company's core business operations. After this there were 265 companies left that were chosen for the sample size.

The data was in addition cleaned by using winsorizing tool in Stata, that changes the value of each outlier to that of the nearest inlier (Gigliotti, 2021). This thesis used the winsorizing to each of the dependent and independent variables in order to fight with the outliers. In efforts to get the most reliable data For example the ROE was winsorized from cuts 5% to 95%, meaning that the extreme values below 5% and above 95% will be replaced by the values at the 5% and 95%. This technique was used similary to all variables with different percentiles to maximize the amount of data in the dataset with the least amount of outliers.

The dataset will be analyzed using fixed-effects regression analysis using the stata software, which allows for the simultaneous analysis of the impact of multiple variables on profitability. The data will be cleaned by removing possible outliers from the variables to make sure that the analysis is as accurate as possible. The regression analysis will help identify the key drivers of financial

performance for Nordic energy companies and provide insights into the relative importance of different factors.

The table 1 represents the descriptive statistics of the data used in this study and in the regression models. The descriptive statistics table we can observe the summary of the main characteristics of the dataset used in this study. The main charasteristics include the number of observations, mean, standard deviation, minimum value and maximum value.

Table 1. Descriptive statistics table

	ROA	ROE	Size	Liquidity	Growth	Capital intensity	Debt ratio
Observations	1978	1947	1993	1982	1721	1939	1992
Mean	8.011	25.189	13.03	1.587	10.112	2.846	0.629
Standard deviation	13.654	35.931	1.845	1.449	29.724	2.309	0.21
Minimum	-30.89	-22.88	0.971	0.119	-45.152	0.004	0.00004
Maximum	64.507	129.611	19.88	10.767	102.493	8.936	1

Source: Authors calculations

From the table 1 it can be found that the average return on assets (ROA) for the Nordic energy companies is 8.011 % and the average return on equity (ROE) was 25.289 %. Studied observations for each variables varied from lowest which was growth that had 1721 observations to highest 1993 which was the size.

The table 2 represents the correlation matrix between each independent variable. From which we can study if there is any possible multicollinearity between independent variables. Multicollinearity is also known as a problem when the variables used either as dependent or independent variables are very highly correlated with each other (Brooks, 2019)

Table 2. Correlation matrix

	Size	Liquidity	Growth	Capital intensity	Debt ratio
Size	1				
Liquidity	-0.0936	1			
Growth	-0.082	-0.0117	1		
Capital intensity	0.4963	0.0081	-0.0753	1	
Debt ratio	-0.0199	-0.2125	0.1657	-0.0168	1

Source: Author's calculations

From the table 2 we can see that there does not appear any strong multicollinearity between the independent variables. Multicollinearity can lead to biases or unstable estimates of the regression coefficients thus making it difficult to interpret the relationship between the independent aviables and the dependent variable. And since there is no strong evidence of multicollinearity the results of the regression analysis are more reliable and easier to interpret. However its good to note that there can be detected relatively high correlation between size and capital intensity.

2.1. Methodology

Regression analysis is a statistical tool that is commonly used to study the relationship between different variables, called regression function, between one variable y, called the dependent variable in this study return on assets and return on equity, and several others x, called the independent variables which are in this study: size, liquidity, growth, capital intensity and debt ratio (Orlov 1996). In the context of this thesis, multiple linear regression models will be used to investigate the determinants of profitability for Nordic energy companies. The objective is to identify the factors that influence the profitability of these companiess and quantify their impact.

In this study the multiple regression analysis will use a cross-sectional pooled panel dataset that includes financial information on a sample of Nordic energy companies from the years 2013-2021. The data set will include information on the profitability of the companies, as well as a range of

company-specific to influence profitability. The data set will be analyzed using multiple regression analysis, which allows for the simultaneous analysis of the impact of multiple variables on profitability. For the study regression analysis is conducted to examine and explain the chosen variables. In the study author tought it was important to add multiple determinants of profitability as dependent variables as in return on assets (ROA) and return on equity (ROE). For the independent variables whose relationship with the profitability is investigated. The five independent variables include: size, liquidity, growth, capital intensity and debt ratio.

In conclusion, in this study the general ordinary least squares regression model with panel data and fixed effects while allowing robust standard errors is used to help understanding the determinants of company profitability. Fixed effects are most commonly used model for panel data that employs dummies to account for variables that affect the dependent variabley cross-sectionally but do not vary over time (Brooks, 2019). Panel data analysis is a popular technique used in social sciences and economics to analyze data over time. It involves the collection of data over a period of time on a cross-section of individuals, companies, or countries. The formula for general ordinary least squares with panel data and fixed effects while allowing robust standard errors that was used for this study goes as follows:

Model 1:

$$ROA_{it} = \beta_0 + \beta_1 Size_{it} + \beta_2 Liquidity_{it} + \beta_3 Growth_{it} + \beta_4 CapitalInt_{it} + \beta_5 DebtRatio_{it} + \alpha_i + \varepsilon_{it}$$

Model 2:

$$ROE_{it} = \beta_0 + \beta_1 Size_{it} + \beta_2 Liquidity_{it} + \beta_3 Growth_{it} + \beta_4 CapitalInt_{it} + \beta_5 DebtRatio_{it} + \alpha_i + \varepsilon_{it}$$

where:

ROA_{it} - The dependent variable, which is the return on assets for firm i in year t

ROE_{it} - The dependent variable, which is the return on assets for firm i in year t

β_0 – The intercept

β_x – The coefficient for each independent variable

$Size_{it}$ - the size of firm i in year t

$Liquidity_{it}$ - the liquidity of firm i in year t

$Growth_{it}$ - the growth rate of firm i in year t

$CapitalInt_{it}$ - the capital intensity of firm i in year t

$DebtRatio_{it}$ - the debt ratio of firm i in year t

α_i - the firm-specific fixed effect, which captures the unobserved heterogeneity across firms that are time-invariant

ε_{it}- the error term, which captures the idiosyncratic variation in ROA or ROE that is not explained by the independent variables and the fixed effects.

To analyze the impact of independent variables on the dependent variable, several statistical measures in the regression summary output are examined. The significance F value indicates whether the regression model is significant or not. The significance level used in this study is typically 95%, which means that a significance F value below 0.05 is considered statistically significant. If the significance F value is below the specified level, the null hypothesis can be rejected, indicating that the independent variables have a significant impact on the dependent variable. The regression F-statistic tests the null hypothesis that all of the regression slope parameters are simultaneously zero (Brooks, 2019)

The coefficient values of the independent variables show the strength and direction of the relationship with the dependent variable. In multiple regression, each coefficient is now known as a partial regression coefficient, interpreted as representing the partial effect of the given explanatory variable on the explained variable, after holding constant, or eliminating the effect of, all other explanatory variables (Brooks, 2019). A positive coefficient value indicates a positive relationship, whereas a negative coefficient value indicates a negative relationship. A change in the value of an independent variable with a positive coefficient in one direction results in a change

in the value of the dependent variable in the same direction. Conversely, a negative coefficient value suggests that a change in the value of an independent variable in one direction results in a change in the value of the dependent variable in the opposite direction.

P-values are another important measure in regression analysis. The p-value is also often referred to as the probability of being wrong when the null hypothesis is rejected (Brooks, 2019). They indicate the statistical significance of the relationship between the independent variables and the dependent variable. If the p-value of 0.05 or less leads to the rejection of the null, this is equivalent to saying that, if the probability of incorrectly rejecting the null is more than 5% (Brooks, 2019). Conversely, if the P-value is greater than the significance level, the relationship is considered statistically insignificant, indicating that the independent variable has no impact on the dependent variables (Fernando, 2023).

Finally, the R squared value is used to determine how much variation in the dependent variable can be explained by the independent variables (Fernando, 2023). A high R squared value indicates that the independent variables explain a significant proportion of the variation in the dependent variable. In contrast, a low R squared value suggests that the independent variables have limited explanatory power.

These four measures are crucial for determining the relationship between the independent variables and the dependent variable in regression analysis, as they help examine and identify the significance, direction, and strength of the relationships in each of the models.

3.REGRESSION ANALYSIS AND RESULTS

3.1. ROE as dependent variable

The first model (Model 1) of our regression analysis examined the relationship between ROE (Return on Equity) and five independent variables. The overall regression model was found to be

statistically significant, meaning that it provided a good fit to the data and could explain a significant portion of the variation in the dependent variable (ROE).

Table 3. ROE regression summary

Variables	Coefficient	p-value
(Intercept)	108.5	0.001
Size	-5.609	0.022
Liquidity	0.437	0.202
Growth	0.041	0.715
Capital Intensity	-8.24	0
Debt ratio	19.411	0.053
Observations	1637	
R-squared	0.2217	

Source. Authors calculations

We found that company size had a negative and statistically significant relationship with profitability, contrary to our hypothesis (H1) which expected a positive relationship. This indicates that larger companies may not necessarily be more profitable.

The second independent variable, company liquidity, was found to have a positive relationship with profitability, but this relationship was not statistically significant, contradicting our hypothesis (H2) that expected a negative relationship.

Our third independent variable, company growth, was found to have a positive relationship with profitability, in line with our hypothesis (H3). However, the results were not statistically significant at conventional levels, suggesting that there may be other factors influencing the relationship between growth and profitability.

The fourth independent variable, capital intensity, was found to have a negative relationship with profitability, which was not in line with our hypothesis (H4) that expected a positive relationship. This result was statistically significant, indicating that companies that require a higher amount of capital investment may not necessarily be more profitable.

Lastly, we found that debt ratio had a positive and statistically significant relationship with profitability, contrary to our hypothesis (H5) that expected a negative relationship. This suggests that a higher amount of debt may not necessarily lead to lower profitability.

Overall, the model explained 22.17% of the variation in ROE, meaning that the independent variables included in the model could only moderately explain the variation in profitability after controlling for individual specific, time-invariant factory. These findings have important implications for businesses and investors who are looking to maximize their profitability and make informed decisions regarding their financial strategies.

3.2. ROA as dependent variable

In Model 2, which is a fixed-effects regression model with the dependent variable ROA, the statistical software Stata was used to analyze the data. A total of 1668 observations were included in the analysis, and the Significance F value was 12.44 with a probability > F of 0, indicating that the model 2 was statistically significant.

Table 4. Regression summary ROA

Variables	Coefficient	p-value
(Intercept)	44.53	0
Size	-1.364	0.064
Liquidity	0.595	0.181
Growth	0.04	0.009
Capital intensity	-3.75	0
Debt ratio	-15.144	0
Observations	1668	
R-squared	0.2525	

Source. Authors calculations

The findings revealed that the first independent variable, company size, had a negative relationship with profitability. However, this result was not statistically significant, and thus the first hypothesis (H1) was rejected.

The second independent variable, company liquidity, was found to have a positive relationship with profitability, which is consistent with the findings from Model 1. However, this result was not statistically significant with a p-value of 0.181. Thus, the hypothesis (H2) suggesting that liquidity has a negative relationship with profitability was rejected.

The third independent variable, company growth, was found to have a positive relationship with profitability, which is in line with hypothesis (H3), and this finding was statistically significant.

The fourth independent variable, capital intensity, was found to have a negative relationship with profitability, which is similar to the finding in Model 1. This result was statistically significant, and it did not support hypothesis (H4).

Finally, the fifth independent variable, debt ratio, was found to have a negative relationship with profitability, which is different from the result in Model 1 where it had a positive relationship with profitability. However, this finding is consistent with the study conducted by Omar et al. (2020). The hypothesis (H5) stating that there is a negative relationship between profitability and debt ratio was accepted, and this finding was statistically significant with a p-value < 0.05.

In summary, Model 2 explains 25.25% of the variation in the dependent variable ROA after controlling for individual-specific fixed effects. A higher fixed effects within R-squared value suggests that the individual-specific fixed effects have a greater impact on the dependent variable than the independent variables included in the model.

3.3 Discussion

In this section I will discuss the findings from the Model 1 and Model 2 that were statistically significant. Indicating that the relationship between the independent and dependent variable is strong and that the relationship is not likely to have occurred by chance. And in this chapter I will only discuss about the similarities between the studies that are relatively the closest to the subject of this study.

The findings regarding the company size and return on equity (ROE) from the Model 1 are similar with the findings from the study Luts et al. (2021), where it was found that company size has

negative relationship with ROE, indicating that companies are generating as much profit per euro of shareholders' equity as it should. This can be explained by the fact that we investigated large companies and large companies tend to have more overhead costs, also large companies have more competition, making it harder for them to maintaing profit margins.

The capital intensity was also found to have negative and statistically significant relationship with profitability (ROE). This indicates that the companies need more investments to generate revenue. In larger companien higher levels of investments can lead to higher costs and expenses, that can reduce the net income available to share holders.

The debt ratio was found to have positive and statistically significant relationship in the Model 1. Indicating that the higher amounts of debt financing used by the companies in this study results in greater returns for its shareholders. These finding are similar once again with the results from a similar study from Luts et al. (2021). The positive relationship between a company's debt ratio and ROE can also be a sing of effective financial management.

The findings from Model 2 where return on assets was the dependent variable indicated statistically significant relationship with four of the independent variables: size, growth, capital intensity and debt ratio.

The size had negative and significant relationship with return on assets (ROA) similar with the results from the Model 1 with return on equity as dependent variable. Once again the findings are in line with the results from the study by Luts et al. (2021), but this time also study from Xu et al. (2022) found similar results. Different result were found by Morina et al. (2021) and Fareed et al. (2016).

In this model growth was found to have significant and positive relationship with ROA. Indicating that the more companies grew the higher profits they were abel to generate. This finding was in line with the study by Fareed et al. (2016).

Capital intensity, similary to the Model 1 was found to have statistically significant and negative relationship with profitability. The results of this study are similar to Morina et al. (2021), who found there to be negative and statistically significant relationship with profitability and capital intensity.

Debt ratio, differently from Model 1 was found to have sstatistically significant and negative relationship with profitability ROA. This result indicates that as the level of debt increases, the profitability of the company decreses. There can be several reasons for this, but one reason could be that the company uses earnings to pay of debt instead of investing into profitable projects. The finding was in line with findings from Luts et al. (2021).

Conclusions

The main reason of deciding to study this topic was the interesting times within the energy industry globally and in the Nordic countries. The determinants of profitability is highly strudied topic within other industries, but there is a lack of studies focusing on the energy industry. The concentration in the energy industry and moreover to the Nordic energy industry should give the readers more idea on how the energy industry and its porfitability works. In this study we focused on the certain company-specific factors. And with the chosen independent factors the author tried to explain how the factors affected and explained the company profitability within the studied Nordic energy companies. The studied companies included 265 largest companies from Denmark, Finland, Norway and Sweden operating in the energy industry.

The research problem in this study was to determinate what are the determinants of profitability and what company-specific factors drives the profitability in the Nordic energy companies. The lack of studies on energy companies was also huge motivation for the study, although it made the study also a little bit harder since there were not enough similar studies conducted on the energy industry. The two research question formulated for this study were "What are the determinants of profitability for Nordic energy companies?" and "What company specific factors influence the profitability of Nordic energy companies?". The research aim was simply to examine the and investigate the determinants of profitability for Nordic energy companies for the years 2013-2021.

Regression analusis was conducted using Stata in order to examine the relationship between the chosen dependent variables return on assets and return to equity and independent variables size, liquidity, growth, capital intensity and debt ratio. Then two regression models were constructed, one with ROA as dependent variable and other with ROE as dependent variable. The regression

models used the data from the 265 Nordic companies from the time period from 2013-2021. Before the regression, all extreme values were removed from the sample data by removing the outliers from the data using the winzorising method that replaced the outliers from pre set cut limitations with numbers that were within the cut lines set for the variables. Also before the regression analysis the collinearity between the variables were tested in the correlation matrix, from which was found relatively high correlation between size and capital intensity.

The findings show that in model 1 indicates that company size has a negative and statistically significant relationship with ROE, which goes against the author's hypothesis (H1). Company liquidity has a positive relationship with ROE, but it is not statistically significant, which is contrary to the author's hypothesis (H2). Company growth has a positive relationship with ROE, which supports the author's hypothesis (H3), but the result is not statistically significant at the conventional level. Capital intensity has a negative relationship with ROE, which contradicts the author's hypothesis (H4), and the result is statistically significant. Debt ratio has a positive relationship with ROE, which goes against the author's hypothesis (H5), and the result is statistically significant. And in the model 2 shows that company size has a negative relationship with ROA, but it is not statistically significant, which is different from the finding in Model 1. Company liquidity has a positive relationship with ROA, but it is not statistically significant, which goes against the author's hypothesis (H2). Company growth has a positive and statistically significant relationship with ROA, which supports the author's hypothesis (H3). Capital intensity has a negative relationship with ROA, which goes against the author's hypothesis (H4), and the result is statistically significant. Debt ratio has a negative relationship with ROA, which supports the author's hypothesis (H5), and the result is statistically significant, which is different from the finding in Model 1.

The findings from theses models show that company size and capital intensity have negative and statistically significant relationship between profitability in both of the models. Also debt ratio is found to have negative and statistically significant relationship with profitability in the Model 2 with dependent variable being return on assets (ROA). Positive and statistically significant relationships are found in growth in the Model 2 and with debt ratio in the Model 1. In both models liquidity was found to have statistically insignificant and positive relationship with profitability and in the Model 1 growth was found to have statistically insignificant but positive relationship with profitability.

The reason to study the determinants of profitability in Nordic energy companies was to gain insights into the factors that contribute to the financial success or failure of these companies. By understanding these determinants, policymakers, investors, and industry players can make more informed decisions related to investment, management, and regulation of the energy sector. The study could also provide insights into the current state of the Nordic energy market and identify potential areas for improvement or growth. Furthermore, such research could contribute to the broader literature on corporate finance and could provide insights that may be useful for other industries and regions. Also the current world situation with the energy crisis, COVID-19 pandemic, and the ongoing war in Russia may have had a significant impact on the profitability of Nordic energy companies. The energy crisis has resulted in an increase in energy prices, which may positively impact the profitability of energy companies. However, the COVID-19 pandemic has led to a decrease in energy demand, which may have a negative impact on the profitability of these companies. Additionally, the ongoing war in Russia is affecting the energy market, particularly the supply of natural gas to Europe, which may have further implications on the profitability of Nordic energy companies. Therefore, it is important to continue studying the determinants of profitability in Nordic energy companies to better understand how these factors may affect their financial performance and make informed business decisions.

The limitations of this study were connected to the reasons why this study was important. The lack of similar studies on the energy sector limited the opportunities to investigate and focus more on specific company-specific factors that could have been more connected with the profitability within the industry. The most similar studies were from Fareed et al. (2016), which focused on determinants of profitability in the power and energy sector in Pakistan, Luts et al. (2021), this study focused on the profitability determinants of renewable energy companies in Germany, Morina et al. (2021) this study focused on uderstanding the drivers of renewable energy firms performance, Qadri et al. (2023), in this study they investigated how COVID-19 affected the financial performance of South Asian organizations., and lastly Xu et al. (2022), which investigated energy crisis, firm profitability and productivity in Pakistan. Hopefully this study shows some guidance to further studies focusing on the energy industry even if in this study we focused only on the large companies it could still give quidance to other similar studies conducted on small or medium sized companies.

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APPENDICES

Appendix 1. Regression Model 1 ROE summary

Regression summary			
R-squared			
Within	=	0.2217	
Between	=	0.0346	
Overall	=	0.0527	
Observations	=	1637	
ROE	Coefficient	Standard error	P>t
Size	-5.609	2.426	0.022
Liquidity	0.437	1.198	0.715
Growth	0.041	0.032	0.202
Capital intensity	-8.244	1.259	0
Debt ratio	19.411	9.991	0.053
Intercept	108.505	30.891	0.001

Appendix 2. Regression Model 2 ROA summary

Regression summary			
R-squared			
Within	=	0.2525	
Between	=	0.0465	
Overall	=	0.0551	
Observations	=	1668	
ROE	Coefficient	Standard error	P>t
Size	-1.364	0.733	0.064
Liquidity	0.595	0.444	0.181
Growth	0.039	0.015	0.009
Capital intensity	-3.75	0.439	0
Debt ratio	-15.144	3.626	0
Intercept	44.538	9.329	0

Appendix 3. Non-exclusive licence

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