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**The effect of ESG performance on cost of capital: a study of the oil
and gas industry in the US**

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ABSTRACT

This paper will study the impact of ESG scores on the cost of equity of companies in the energy sector. More specifically it will study this relationship on companies in the oil and gas industry, as well as other competing energy industries, in the US from 2020 to 2021 and makes use of panel data. The relationship of interest will be studied using a random effects model. The results obtained in this thesis suggest that ESG scores do not have a significant impact on the cost of equity or financial performance, but rather that cost of equity is more strongly related to some of the control variables.

Keywords: ESG, cost of equity, oil and gas industry, energy sector.

JEL codes: G300, Q400

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CHAPTER 1 Introduction

In recent years, studies relating to the topic of environmental, social, and governance (ESG) objectives have become more common, reflecting society's increasing concern regarding this topic (Wang et al., 2023). Even though these measurements are becoming more widespread, especially as a result of pressure from the public and certain performance requirements by governments, a significant number of companies and countries still fail to react and adapt to the ESG standards. This can be a consequence of the concern regarding an unsubstantiated relationship between efforts to improve ESG scores and negative performance on shareholder measures, such as stock price per share (Sheehan et al., 2023). These concerns extend to other measures different from the shareholder returns, such as the company's cost of capital, this being defined as the ratio between interest expense and total interest-bearing debt outstanding.

Previous literature already studied the relationship between ESG measures and the cost of equity and provided empirical results to support their hypotheses (Gonçalves et al., 2022). In their paper, the authors studied publicly listed European companies obtained on the STOXX Euro600 from 2002 to 2018. Publicly listed companies will also be the unit of analysis used in this thesis. The authors found that companies in the upper half of ESG performance enjoy lower capital costs, while firms lagging in the area were penalized and suffered higher costs of equity. Every day it becomes more important for a company to prioritize objectives affecting the ESG score as they have a considerable impact on the firm's reputation. Past literature has found that companies with a better public reputation will on average enjoy a lower cost of equity financing. Alternatively, a negative reputation can lead to higher scrutiny and regulatory intervention and consequently a higher cost of capital (Cao et al., 2014).

The relationship between performance on ESG scores and cost of capital and different measures of financial performance has already been studied using different samples in economically developed countries. For instance, using publicly listed companies in Europe (Gonçalves et al., 2022) or in Australia (Lee et al., 2009) authors found a negative relationship between the aforementioned variables. Nevertheless, these studies reached their conclusions based on a very diversified sample in terms of the industries to which the companies studied belonged. Existing literature provides results indicating that companies in industries subject to systematic social taboos that are more likely to cause social and environmental damage produce better ESG measures than other industries (Garcia et al., 2017). These results suggest that even in these industries it is relevant to investors and shareholders that companies follow responsible practices. Most industries in the energy sector are subject to a negative reputation and are especially vulnerable to this pressure due to the nature of their practices but are, nevertheless, still fundamental to providing energy.

The objective of this paper is to study the impact of ESG scores on the cost of equity of companies in the energy sector. Therefore, this thesis will contribute knowledge regarding the relevance of ESG in a sector that has shown an improvement in ESG measures (Naeem et al., 2022). This thesis will study how ESG score performance affects the cost of equity of companies in the oil and gas industry, as well as the renewable energy sector and the electricity sector, and hopes to provide a more effective approach to studying ESG importance on an almost not studied industry. Past literature has studied the impact of ESG scores on financial performance using a sample of companies in the energy sector from 24 different countries (Yilmaz, 2022). Nevertheless, their study focused on the sector as a whole and provided no knowledge regarding how this relationship behaves within each industry. Therefore, the presence of numerous firms with a larger focus on sustainable energy sources could impact the results of their study. Additionally, concerns regarding cultural differences among the countries and companies in the sample are not addressed by the authors. Nevertheless, the relationship studied is highly relevant as it can provide companies in the industry with an insight into how investment in ESG-related activities can benefit their financial performance.

We will study this topic using a sample of 64 companies based in the US during the years 2020 and 2021. The companies studied belong to the oil and gas industry, as well as electricity producers and companies in the renewable energies sector to provide insight into how ESG performance impacts other sectors competing with the oil and gas industry. The sample used in this thesis will be composed of publicly listed US companies, more specifically those listed in NASDAQ. The financial performance information and ESG statistics necessary for this analysis, collected by Refinitiv Compustat, were obtained from the Eikon database. This sample provides reliable and detailed information. In addition, in a developed economic environment we can rely on certain assumptions to hold. This situation will allow our results to truly reflect the impact of factors external to the company on the cost of capital, such as the stock market, which has been proven to be affected by ESG information disclosure (Huang et al., 2019). To dive into this topic further, we will study the research question: What impact does the ESG score have on a company's cost of equity in the oil and gas industry?

Moreover, the US does not have any regulations or standards of performance regarding ESGs that companies must uphold but companies are encouraged to share this information and, in most cases, make public their ESG scores. As a matter of fact, 19 of the companies in the sample used decided to not make this information public. Nevertheless, past literature has not extensively studied whether ESG reporting has an impact on the public image of the company or its financial performance. The lack of knowledge regarding this topic motivates the following secondary research question that this thesis will study: What impact does ESG measures reporting have on a company's cost of equity in the energy sector?

This thesis delved into the two research questions mentioned in this introduction and obtained the following results. The regression model used in this paper finds that no significant relationship exists in the sample between the variable measuring ESG scores and the firm's financial performance as measured by the cost of equity. Similarly, the selected regression model does not find a significant relationship between the cost of equity and the dummy variable indicating whether firms report ESG performance or not.

The remainder of this paper is structured as follows. Chapter 2 reviews the existing literature on the impact of ESG performance on other measures of financial performance, as well as it introduces the most relevant concepts in this paper. Chapter 3 presents and evaluates the dataset studied in this thesis, introduces the variables of interest and control variables used, and provides descriptive statistics for them. Chapter 4 dives into the methodological framework used in the analysis. Moreover, Chapter 5 presents the results obtained from our study and relates these to the hypotheses of this thesis. Chapter 6 concludes the paper, as well as introduces the research implication and limitations of the research.

CHAPTER 2 Theoretical Framework

2.1 Research Areas

ESG is a concept that has developed recently, or at least it has recently become widespread. The goal of ESG scores is to measure the non-financial risks and opportunities inherent to a company's daily activities (Paweł Szałowski, 2022). In other words, it provides a framework that allows stakeholders and other participants in the financial markets to understand how an organization is managing risks and opportunities related to environmental, social, and governance criteria (Corporate Finance Institute, 2023). The results for these multiple measurements make up the final score for the three main pillars of ESG performance, which will be the variables studied in this thesis. These are the Environmental pillar (ENSCORE), the Social pillar (SOSCORE), and the Governance pillar (GCSCORE).

Furthermore, our variable of interest will be the company's cost of equity capital. The cost of equity of a company can be defined as the rate of return that a firm pays out to its equity investors (Corporate Finance Institute, 2023). The cost of equity effectively reflects the ease with which a company can attract new investors and is publicly available for most companies. For these reasons, it was selected as our variable of interest to study financial performance. It is also commonly used to assess the relative attractiveness of different investments, or as a capital budgeting threshold for the required rate of return of a project (Kenton, 2023). In this thesis, the cost of equity of each company will be obtained using the Capital Asset Pricing Model (CAPM). This model takes into consideration variables such as risk or the time value of money in relation to its anticipated return and evaluates the value of an investment. Therefore, the CAPM model follows the formula $C_i = E_0 + \beta_i(E_m - E_0)$. Where C_i represents the cost of equity, E_0 is the risk-free rate of return, E_m is the market rate of return and β_i measures the systematic risk of the company compared to the rest of the market (Ross, 1978).

2.2 Hypothesized Relationships

This thesis hypothesizes that ESG performance will have an impact on a company's cost of equity due to multiple effects studied in past literature. More specifically, it is hypothesized that a negative relationship between ESG measures and cost of equity in the context of publicly listed companies in the oil and gas industry will hold and provide similar results to those obtained by Gonçalves et al., (2022).

***Hypothesis 1:** A company's cost of equity is negatively affected by its ESG score performance.*

In other words, positive performance on ESG scores leads to lower cost of equity and improved financial performance.

Firstly, ESG will positively impact financial performance as a result of lower agency costs due to improved stakeholder engagement and a higher level of transparency, which will lead to reduced informational asymmetry (Cheng et al., 2011). Secondly, a company's focus on ESG performance can result in new opportunities for the firm. Reporting ESG performance helps firms to identify strategic, reputational, operational, and financial risks that could impact their future performance and market value (Kiron et al., 2013). Lastly, firms with above-average sustainability performance tend to disclose more details regarding their sustainability initiatives and activities to signal their long-term commitment to ESG objectives and this way differentiate themselves in the financial market (Borghesi et al., 2014) (Crifo et al., 2015) (Dhaliwal et al., 2010).

This thesis's second hypothesis is also related to the existence of a positive relationship between ESG and financial performance, or more specifically a negative relationship between ESG performance and cost of equity. We hypothesize that companies that do not report their ESG scores perform relatively worse than those that do as they signal to the market that their results are negative, as otherwise these would be publicly shared (Akerlof, 1970). Past literature regarding this effect is limited. Nevertheless, this effect is expected as investors tend to find firms capable of signaling their commitment to ESG objectives to be more attractive investments. As previously mentioned, companies signaling their long-term commitment to ESG objectives will hold a competitive advantage and should enjoy lower cost of equity, as a result of better stakeholder engagement (Cheng et al., 2011) (Dhaliwal et al., 2010). Thus, we arrive at the following hypothesis.

***Hypothesis 2:** The decision of a company to report its ESG scores will have a negative impact on the cost of equity.*

Additionally, high sustainability companies are more likely to be long-term oriented, as well as to exhibit higher disclosure of nonfinancial information (Eccles et al., 2014). These are traits that are also attractive to investors and should lead to lower costs of equity.

2.3 Review of Existing Literature

Profound research has been done in recent years regarding the nature of ESG measures and, more specifically, their impact on the financial performance of companies. The regulations implemented in numerous countries regarding the disclosure of environmental, social, and governance scores have provided researchers with broad samples of detailed and reliable information. This is especially true when studying the aforementioned relationship in the US or developed countries in Europe. For instance, past literature has studied the relationship between firms' ESG performance and the cost of capital of the largest European firms listed on the STOXX Euro 600 between the years 2018 and 2002 (Gonçalves et al., 2022). The authors obtained statistically significant results suggesting that an improvement in the

company's ESG scores resulted in reduced cost of equity capital. Further research has been done in European companies studying the effect of ESG controversies, which accounts for specific events that affect the company's ESG performance negatively, on the cost of equity capital (La Rosa & Bernini, 2022). The results of this study suggest that negative ESG performance increases the cost of equity. Nevertheless, the authors also found that company efforts to improve their environmental performance have a mitigating effect on this relationship. Additionally, this article provides evidence suggesting that the aforementioned relationship is stronger in countries subject to stronger market regulations. This occurs because investors hold higher expectations of the more efficient market's scrutiny role regarding company-related controversy.

The companies from the US have also been the subject of study for this relationship in the context of a developed economic environment. Past literature has provided results that prove components of economic sustainability disclosure, as well as ESG dimensions of sustainability performance, affect the cost of equity capital (Ng & Rezaee, 2015). Additionally, in this study, the authors find that their results are strengthened when the company has an above-average ESG performance. To arrive at these conclusions the authors gathered information from 3000 companies between 1990 and 2013. Therefore, we can conclude that previous literature provides considerable evidence supporting the existence of a relationship between ESG score performance and the firm's cost of equity in developed economic environments, more specifically Europe and the US. Nevertheless, the studies do not dive any further into how the industry to which a company belongs would affect this relationship. The authors in the aforementioned papers do not mention how the assumptions of their work could be affected if they were to conduct their study in a different region with different economic conditions.

Studies performed on companies based in South-East Asia have provided results indicating that this relationship also exists in this region (Rizqi Umar, 2022). This study finds ESG performance to be negatively associated with the cost of equity and the relationship to be significant at the 1% level. Nevertheless, the results obtained for companies in this region contrast with those obtained in European samples in the different impact that the governance factor has on the relationship. In the case of European companies, environmental and governance factors are most important while social factors tend to be less significant (Mio et al., 2023). In contrast, South-East Asian companies are not significantly affected by the governance factor (Rizqi Umar, 2022).

Other past papers support the aforementioned results obtained in South-East Asia. Past literature has shown that when studying the same relationship in a sample of Chinese A-share companies between 2010 and 2020, similar results are obtained (Chen et al., 2023). In addition, the authors conducting this study not only found a direct impact of ESG performance on the cost of equity capital, but they also

discovered mediating effects that could indirectly reduce the cost of capital by reducing the market risk and increasing the company's equity diversification.

For most of the aforementioned literature, as well as for this thesis, the company's cost of equity has been selected as the most relevant and accurate measure of the firm's financial performance, as other statistics such as the return on assets or the profit of the company would be significantly affected by the company's cost of equity. Therefore, it is best to study directly the impact of ESG performance on the cost of capital as it is less likely to provide biased results due to the impact of other factors affecting a company's performance (Wang et al., 2023). Extensive literature does exist studying the relationship between ESG score performance and other financial indicators of the company.

For instance, previous literature has examined the relationship between ESG score performance and financial measures as the Return on Assets (RoA) and the Return on Equity (RoE), as well as the firm's value (Alareeni & Hamdan, 2020) (Aydoğmuş et al., 2022). Additionally, previous literature gives reason to believe that these results are consistent independently of the geographical location where the study is performed, as similar results were obtained when using a sample of Asian companies (Melinda & Wardhani, 2020). The results obtained in this literature also show a positive relationship between ESG performance and financial performance. Results not only align with those of the studies that use the cost of equity capital in their analysis but also with the results that are expected from this thesis.

It is therefore safe to say that extensive previous literature on the topic exists and is available and that the relationship holds regardless of the geographical sample used. Nevertheless, most of the past studies never mention the impact that belonging to a specific industry would have in the relationship studied, but rather study a multi-industrial sample or one retrieved from a specific geographical region. This does not mean that literature studying this relationship for a specific industry is non-existent. A study conducted using data from 125 companies from the energy sector from 24 different countries during the period of 2009 to 2019, provides evidence that ESG score performance does have an impact on the cost of debt and cost of equity of the company (Yilmaz, 2022). This paper's sample is mostly made up of companies based in European countries or other developed economies such as Japan or the USA. Even though results show a significant coefficient for the country control variable, the impact or possible bias that this might have on the results is not further addressed in the study.

Another study conducted using a sample of China's listed power generation companies obtained similar results based on the panel regression model (Zhao et al., 2018). Nevertheless, this paper uses return on capital employed (ROCE), rather than the cost of equity or cost of debt, as a measure of corporate financial performance.

Past literature regarding the relationship studied in Hypothesis 2 is very limited. Therefore, the results obtained from this thesis are especially relevant as they will provide evidence either supporting or disregarding the impact of signaling commitment with ESG objectives on financial performance.

CHAPTER 3 Data

3.1 Sample

We collected panel data on 64 US-based companies for the period 2020 to 2021. This period was selected as it provided the most extensive data on ESG performance. Additionally, it allows this thesis to study the most recent information available. As has already been mentioned, the companies studied belong for the most part to the Oil and Gas industry, but companies in the Renewables energies and Electricity sectors have also been included. Ideally, other industries related to the energy sector would have been included in this thesis. Nevertheless, reliable information was only available for the studied industries. The companies included in this analysis have been gathered from three different industries in the energy sector, as they can provide some insight regarding the extent to which our relationship exists in other industries competing in similar markets. All companies in this sample are publicly listed in the NASDAQ during the entire period. Out of the 64 companies in this sample, 19 of them decided to not report their ESG performance during this period. The reasons why these companies decided to not report their ESG information are unknown. This might be due to poor ESG performance or because the company considers it too costly. Companies spend an average of 154,000 dollars annually just on climate scenario analysis and/or disclosure (K Brock et al., 2022). The performance of these 19 companies will be studied to contrast against the performance of the remaining 45 with the objective of testing Hypothesis 2 and concluding whether reporting the ESG scores, regardless of the performance on this aspect, affects the company's cost of equity.

3.2 Variables of Interest

Identifying and examining the main variables of interest is fundamental to comprehending the research question proposed in this thesis. The following segment aims to introduce and explore the main variables of interest regarding a company's cost of equity and ESG performance. Through a meticulous examination of these variables, we will dive into their significance, and potential effects, ultimately contributing to a more comprehensive understanding of the relationship under scrutiny.

Cost of Equity (CoEq): As previously mentioned, in this thesis we use the cost of equity as the measure of a company's financial performance. The data for this variable was obtained from the AlphaSpread (2023) database. In this thesis, we will study a sample for this variable of $N=64$ for $t=2$. Other measures used in previous literature have been considered to represent financial performance, such as the company's return on asset investment (ROAi) (Alareeni & Hamdan, 2020), the company's share price or return on capital employed (ROCE) (Zhao et al., 2018). Nevertheless, the impact on these measurements occurs as a result of the change in the cost of equity. Cost of equity offers the most accurate results as ESG performance impacts financial performance through the image that shareholders have of the company.

Environmental, Social, and Governance Combined Score (TRESGCS): This variable is the final ESG score of a company. It is composed of the results of the variables measuring performance on the three pillars (Environmental pillar, Social pillar, and Governance pillar), as well as the ESG controversies score (TRESGCCS). All the aforementioned will be included in the regression to determine the extent to which each aspect affects the dependent variable. TRESGCS is positively related to the three individual measures for each pillar while being negatively related to the controversies score. Data is available for this variable for only 45 of the companies in our sample. Information regarding this variable was obtained from the Eikon Refinitiv Database, which is the source where data on all control variables was also obtained.

Environmental Pillar Score (ENSCORE): The environmental pillar is the first of three pillars that, combined with the ESG controversies score, make up the ESG Combined Score. These three pillars are included as control variables to study whether any specific pillar impacts the cost of equity with a higher coefficient than the rest. Including these variables is relevant to the study as it would be logical to expect a higher coefficient in the environmental pillar given the nature of the industries studied (The Corporate Governance Institute, 2023). The Environmental Pillar Score attempts to measure the extent to which a company is managing its environmental impact well and how prepared they are to face challenges related to climate change. It includes measures such as carbon emissions, waste disposal, or resource depletion. It is important to clarify that for all ESG control variables we have 45 observations across two years.

Governance Pillar Score (CGSCORE): This score refers to the performance of the company regarding the governance pillar. This pillar is associated with how the company is managed and everything concerning its relationship with its shareholders (The Corporate Governance Institute, 2023). This pillar rates measures such as the firm's executive compensation, board elections, or shareholders' rights.

Social Pillar Score (SOSCORE): The third pillar of ESG is the social pillar. As the name suggests, it concerns all subjects related to the social tasks that the firm performs and how it impacts communities and individuals either locally or worldwide.

3.3 Control Variables

This paper segment aims to introduce and discuss multiple control variables that have been identified through economic theory as significant contributors to the variables of interest. Through a comprehensive exploration of these control variables, we will gain a better understanding of their individual effects and their collective influence on the phenomenon under investigation.

Total Debt as a percentage of Common Equity (debtperequity): Previous literature studying the impact of multiple variables on the cost of equity of a company assumed a constant debt-to-equity ratio (Brigham & Gordon, 1968). Nevertheless, there is no reason to believe that such an assumption would hold in the sample studied in this thesis. Total debt as a percentage of common equity is included as a control variable as equity financing can impact a firm's cost of equity. For instance, additional equity financing can lead to an increased number of outstanding shares, which may result in a diluted value of the stock for existing customers and lead to a stock selloff (Drury, 2021).

Dividends per share (DPS): This thesis includes dividends per share as a control as it is a variable that impacts directly a firm's cost of equity. As previously mentioned in this thesis we obtained the cost of equity of each company through the CAPM model, but an alternative model to calculate this is the dividend capitalization model, which needs the company's dividend per share to arrive at a result. This is relevant as it exemplifies the impact of this control on the studied variable.

Industry Dummies (ind_n): As mentioned earlier in the Sample section, this thesis studies data from companies in three different fields. This variable will be included to study the extent to which ESG scores impact the cost of equity in each of the different industries. To be more specific, this will be three different dummy variables. Dummy ind_0 will take value 1 for those companies belonging to the Oil & Gas industry and 0 otherwise. Dummy ind_1 will do the same thing for the Renewable Energies sector and dummy ind_2 will indicate which firms belong to the Electricity industry.

ESG_Dummy: This control variable takes value 1 if the company reports its ESG performance and value 0 if the company does not. It is included in the analysis to study Hypothesis 2 of this thesis. As previously mentioned, 45 firms reported their ESG scores during the studied period while 19 decided not to.

The variables introduced above are part of the final regression model used in this thesis, which will be explained in Chapter 4 of this paper. Nevertheless, other additional control variables were considered. These variables were not included as too many variables can be problematic when studying a small sample. Furthermore, Chapter 4 will explain in detail the model selection method. Below we will introduce the aforementioned additional control variables.

Price (P): This variable represents the company's market share price, which is an ideal control for phenomena that impacts the cost of equity heavily. Firstly, the market share price can provide a clear image of the market perception of a company's prospects, as well as its current financial performance. The aforementioned can impact a company's cost of equity as they heavily influence how attractive the company is to an outside investor.

Dividend Yield (DY): Dividend Yield has been included as a control variable as it holds a relationship with the company’s cost of equity, ceteris paribus. When the dividend yield decreases, it indicates that the return from dividends is relatively lower compared to the stock price. In such cases, investors may demand a higher return, thus increasing the cost of equity.

Market Value (MV): As mentioned in the theoretical framework section of this thesis, we expect a relationship between ESG performance and cost of equity to exist as a result of the impact that ESG has on the opinion of investors and shareholders. Market value is a reliable indicator of the size of the company and consequently of the attention it receives, not necessarily from the public, but from participants in the financial market.

3.4 Descriptive Statistics

After testing the assumptions used in this regression, we can proceed to describe the results obtained for the variables in the study. As it has been previously mentioned, outliers were removed from the sample. To be more specific, 4 companies were removed from the study, meaning that this is now composed of 60 firms and a total of 120 observations. A table summarizing the mean and standard deviation, as well as the maximum and minimum values observed, has been included below.

TABLE A1: Summary statistics for control variables and variables of interest.

	Mean	Std. Dev	min	max
F_CoE	6.17	0.85	4	8
TOTAL DEBT % COMMON EQUITY	239.63	2211.64	-2659	23862
DPS	0.41	0.76	0	4
MV	3772.75	7902.45	0	44168
TRESCGS	30.81	25.53	0	89
ESG_Dummy	0.72	0.45	0	1
ind_0	0.48	0.50	0	1
ind_1	0.27	0.44	0	1
ind_2	0.25	0.43	0	1
Observations	120			

Note: This table reports the summary statistics of all variables in the regression model, including the mean, the standard deviation, and the minimum and maximum values. Total Debt as a Percentage of Common Equity is measured as a percentage. Variables “ESG_Dummy”, “ind_0”, “ind_1”, and “ind_2” are binary variables indicating whether the company reports ESG scores and the industry the company belongs to, respectively.

It is worth highlighting the summary statistics for two specific variables. Firstly, the variable of interest Cost of Equity, given that it is the focus of this thesis. This variable can take values ranging from 0 to

100, nevertheless, the cost of equity for the firms in this sample ranged between 4.00 and 8. He et al. (2013) found the average cost of equity, for a sample of firms from numerous industries, to be 8.93. Compared to their results, we find that the cost of equity of our sample is relatively low. Therefore, companies in the energy sector in the US are less equity financed on average than those in He`s et al. (2013) study. We can easily appreciate in the table that this variable has relatively low standard errors. Secondly, the control variable measuring Total Debt as a percentage of Common Equity is mentioned as a result of the considerably large standard deviation and the large difference between the minimum and maximum values. While the mean of the sample for this specific variable is 239.63 the standard deviation stands at 2211.64. This is due to the fact that some companies are more inclined to enter large levels of debt while keeping low levels of common equity, and vice versa. This leads to a large difference between the minimum value (-2659) and the maximum (23862) and thus a relatively large standard deviation from the mean.

CHAPTER 4 Method

This section introduces the econometric model that will be used to tackle the research question and test its economic and econometric validity and relevance.

4.1 Model Selection Method

The model selection method employed in this thesis was the following. Firstly, a regression model with all of the variables mentioned in segments 3.2 and 3.3. We used this regression model to decide whether a Random Effects or a Fixed Effects model would be more appropriate. The regression model including all variables follows the formula $CoEq = \beta_{0i,t} + \beta_{1i,t}TRESGCS + \beta_{2i,t}debtperquity + \beta_{3i,t}DPS + \beta_{4i,t}P + \beta_{5i,t}DY + \beta_{6i,t}MV + \beta_{7i,t}ind_0 + \beta_{8i,t}ind_1 + \beta_{9i,t}ind_2 + \beta_{10i,t}ESG_{dummy} + \beta_{11i,t}ENSCORE + \beta_{12i,t}CGSCORE + \beta_{13i,t}SOSCORE + \beta_{14i,t}TRESGCCS$.

A Random Effects model was deemed appropriate after running the regression expressed above using a Fixed Effects model and a Random Effects model and performing a Hausman Test to decide which model is most adequate (Princeton University, 2023). There was not enough evidence to reject the null hypothesis, which states that the individual effects are strictly uncorrelated with the regressors, and therefore it was determined that the Random Effects model is the most effective and reliable model to study the relationship between the cost of equity and ESG performance. In the Random Effects model, individual-specific effects are uncorrelated with the explanatory variables (Wooldridge, 2010).

Once the Random Effect model had been decided upon, the general-to-specific approach was used to determine the final regression. The model $CoEq = \beta_{0i,t} + \beta_{1i,t}TRESGCS + \beta_{2i,t}debtperquity + \beta_{3i,t}DPS + \beta_{4i,t}ind_0 + \beta_{5i,t}ind_1 + \beta_{6i,t}ind_2 + \beta_{7i,t}ESG_{dummy} + \beta_{8i,t}TRESGCCS$ was selected as it only includes variables that are essential to answer the research questions or those providing significant results.

The selected model allows us to maximize the within-the-model R-squared while minimizing the number of variables in the regression. As mentioned in segment 3.3 of this paper, a large number of variables can be problematic when working with a small sample. The final model used in this thesis does not include the variables measuring the score of the companies in each of the ESG pillars (ENSCORE, CGSCORE, and SOSCORE), or the Controversies Score (TRESGCCS) either. Therefore, the effect of these variables will not be observable in this paper. Despite the fact that studying these variables could provide interesting insight regarding the impact of each pillar on the cost of equity, this is not the focus of this thesis.

4.2 Testing Assumptions

The next step in this analysis was to run a Variance Inflation Factor (VIF) test to determine whether multicollinearity exists in the model. This test is of relevance to this study as, even though the existence of multicollinearity would not affect heavily the outcome of the regression (Potters, 2023), it is important to our conclusions which variables are truly having an impact on financial performance. The results of the VIF suggest that multicollinearity will not be an issue for our study, as the VIF test coefficient for all variables studied is below $VIF=10$. Nevertheless, the test does show a high level of multicollinearity for the ESG-related variables relative to all other controls. This could be explained by the fact that the ESG-related variables tend to hold a correlation between them, as companies tend to perform well or badly on all three.

After completing the test for multicollinearity this thesis continued to study whether the sample's data is normally distributed or not. This will be assessed through the Shapiro-Wilk Test. The results of this test are of great importance to the conclusions and limitations of this thesis, given that the sample used contains a lower number of companies and years than most studies. After cleaning the sample from outliers, the Shapiro-Wilk test results suggest that the variable of interest (Cost of Equity) is normally distributed for the sample studied. The results of this test are shown in Graph B1 in Appendix B of this paper.

The last test our data will be subject to is the White test. This test is performed in order to determine whether the sample's standard errors are homoscedastic or not. The test showed that we can reject the null hypothesis, meaning that our study suffers from heteroskedasticity. To correct this bias, we included heteroskedasticity robust standard errors in the regression (Schmidheiny et al., 2011).

CHAPTER 5 Results

5.1 Regression Results

After testing our assumptions and readying our data the regression was performed successfully. The results obtained in this thesis suggest that a company's cost of equity is not significantly affected by the ESG score variable (TRESGCS). This can be appreciated in Table A2, as the variable TRESGCS does not provide significant results. Additionally, the variable has a negative coefficient close to zero, implying that even if a significant relationship was found it would show a very small impact on the cost of equity. These results suggest that ESG scores do not have an impact on a company's cost of equity whatsoever. This thesis mentions in Section 2.2 multiple reasons why a significant relationship of negative coefficient was expected. These reasons are related to improved stakeholder engagement and a higher level of transparency leading to reduced informational asymmetry (Cheng et al., 2011), as well as to positive ESG performance helping companies to differentiate themselves in the market (Borghesi et al., 2014) (Crifo et al., 2015) (Dhaliwal et al., 2010). Nevertheless, the results obtained in this thesis suggest that these phenomena are either non-existent or insignificant in the US energy sector.

Results also indicate that the cost of Equity is not affected significantly by the ESG reporting dummy variable (ESG_Dummy), suggesting that ESG reporting does not have an impact on a company's cost of equity. These results indicate that reporting ESG performance is not an effective way of differentiating the company in the market, as it suggests that investors do not require a lower rate of return for companies reporting ESG scores. While the results are insignificant, we see that the coefficient for the ESG reporting dummy variable is 0.08. Therefore, if this variable had provided a significant coefficient, it would suggest that reporting ESG scores leads to an increase in the cost of equity of 8%, thus negatively impacting the financial performance of the company. This effect could be explained by the costs involved in ESG reporting, as they may outweigh the benefits it provides the firm with (K Brock et al., 2022).

Regarding the control variables, we obtain significant results at the 5% significance level for a company's Total Debt as a percentage of Common Equity, Dividends per Share, and Market Value. All the mentioned variables have negative coefficients, meaning that an increase in any of them will lead to a lower cost of equity, *ceteris paribus*. It is worth mentioning that the coefficients for Market Value and for the Total Debt as a percentage of Common Equity levels are close to zero, while Dividend per Share has a much higher coefficient of -0.54 and thus, a higher impact on the cost of equity. A larger coefficient was expected for Dividend per Share compared to the other control variables, as economic theory related to the dividend capitalization model clearly states that a relationship between a firm's dividend per share and its cost of equity exists (Foerster et al., 2005). The results close to zero for Total Debt as a percentage

of Common Equity and for Market Value indicate that the level of equity financing and the size of a company, respectively, have a small but significant negative impact on its cost of equity. While statistically significant, the close to zero results may not be economically significant, as the impact on the dependent variable is relatively small.

Lastly, the dummy variables included to control whether the company belongs to the Oil and Gas industry, the Renewable Energy industry, or the Electricity industry did not provide significant results either. This suggests that the industry of the company does not have an impact on the cost of equity. This result was expected to be significantly positive for the Oil and Gas industry, as it is a company subject to social taboos and pressure by investors to engage in sustainable projects. Nevertheless, the results obtained from this sample do not provide evidence to support that this is the case.

The regression model used has an R-squared of 0.33, meaning that the model explains 33% of the variance of the dependent variable, the cost of equity. This model explains a relatively low percentage of the variance in the variable, which is not unexpected as the main variable of interest is insignificant. Table A2 included below summarizes the results discussed above.

TABLE A2: Regression results

	F_CoE
TOTAL DEBT % COMMON EQUITY	-0.00*** (0.00)
DPS	-0.54*** (0.10)
MV	-0.00*** (0.00)
TRESGCS	-0.00 (0.01)
ESG_Dummy	0.08 (0.35)
ind_0	-0.01 (0.19)
ind_1	0.22 (0.23)
ind_2	0.00 (.)
Constant	6.37*** (0.19)
Observations	120
R ² -Within	0.15
Overall R ²	0.33

Note: This table displays the regression analysis of ESG score (TRESGCS) and all control variables on Cost of Equity (F_CoE). Column 1 displays the variables names, while Column 2 shows the results of the random effects

model. Binary variable “ind_2” was omitted to avoid collinearity with the other industry controls. Heteroskedasticity robust standard errors are given in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5.2 Hypotheses Results

Given the results obtained, we can draw conclusions regarding the hypotheses that were put forward in this thesis.

***Hypothesis 1:** A company’s cost of equity is negatively affected by its ESG score performance. In other words, positive performance on ESG scores leads to lower cost of equity and improved financial performance.*

The results obtained in this thesis provide no evidence that supports Hypothesis 1 as it has found that the impact of ESG scores and all related variables is insignificant. Additionally, the coefficients of these variables do not suggest a strong relationship between them and the cost of equity either. Past literature has found the hypothesized relationship to exist and to provide significant results (Lee et al., 2009) (Yilmaz, 2022), but the findings obtained from this regression do not provide supporting evidence for the used sample.

***Hypothesis 2:** The decision of a company to report its ESG scores will have a negative impact on the cost of equity.*

The results provided by the regressions in this thesis provide no supporting evidence for hypothesis 2 either. Hypothesis 2 focused on the impact that a dummy variable, which takes value 1 for those companies voluntarily reporting their ESG scores and 0 for those doing otherwise, on the main variable of interest of this thesis, the cost of equity. Nevertheless, not only did the results turn out to be insignificant on any level, but the coefficient of the dummy variable suggests a positive relationship between both variables. It is hard to explain this coefficient, given that previous literature has only found a positive relationship between ESG reporting and financial performance variables (Almeyda & Darmansya, 2019), as well as the fact that this coefficient is very close to zero and insignificant.

CHAPTER 6 Conclusion & Discussion

6.1 Conclusion

This thesis introduced the research question: What impact does the ESG score have on a company's cost of equity in the oil and gas industry? This study concludes that the existing evidence does not support the existence of a significant relationship between a company's Environmental, Social, and Governance (ESG) scores and its cost of equity. ESG scores did not have a significant impact on the cost of equity. These results suggest that investors' assessments of a company's ESG performance may not be directly influencing the required return on equity for shareholders. Therefore, this thesis cannot conclude that during the time period studied a negative relationship exists between the variables of interest in the energy sector in the USA, nor within any of the specific industries studied.

Additionally, this paper pondered the secondary research question: What impact does ESG measure reporting have on a company's cost of equity in the energy sector? The dummy variable used to study the impact of ESG reporting on a company's cost of equity did not provide significant results. This evidence suggests that a company engaging in ESG reporting does not significantly influence the same firm's cost of equity. Thus, this thesis cannot conclude that, during the time period studied, ESG reporting holds any relationship with the cost of equity of companies in the energy sector in the USA.

6.2 Research Implications

The topic explored in this thesis can be of relevance to policymakers, as well as the directives of companies in the sector. From the perspective of policymakers, results indicating that ESG scores do not significantly impact financial performance suggest that companies might not be concerned with their ESG performance as it will not impact their profitability. This implies that for policymakers to guarantee that ESG objectives are of concern to companies, more restrictive and authoritative measures regulating performance in this area might be necessary. From the perspective of the firms in the studied industries, this information can be useful when taking profit-maximizing decisions.

6.3 Limitations and Suggestions for Future Research

This study provides valuable insights into the impact of ESG on financial performance in the energy sector, an industry that has struggled in the past to compromise with ESG objectives. Nevertheless, several limitations should be acknowledged and accounted for when drawing conclusions from the results of this study. This section outlines these limitations and provides suggestions for future research.

The most relevant limitation of this study is the low number of observations that have been used. After cleaning the data and removing outliers this thesis only includes a total of 60 companies over the span of two years, leading to a total of 120 observations. Therefore, it is difficult to generalize the results obtained from our sample to a large population, like it would be all companies in this sector. Additionally, the short period studied also makes this thesis sensitive to biases caused by specific events suffered during this time period. Although efforts were made to ensure representative sampling, the generalizability of the findings in this thesis may be limited. While there is no reason to believe that either the companies or the time period studied are subject to any bias, a larger number of observations would significantly increase the validity of our findings and probably lead to different or more significant results. Future research could overcome these limitations by investigating a broader database of the industry. Researchers could even focus on an international sample, rather than a local one, to obtain more reliable and generalizable results regarding the oil and gas industry and the energy sector.

The generalizability of our results may also be affected by the contextual factors of this study. This thesis focuses on a very specific context, that is the Oil & Gas industry and other energy producers in the US, which may limit the extent to which our results apply to other industries or populations. Future research could study the influence of these contextual factors such as cultural differences or economic environment on the variables of interest. Lastly, this study focused on a specific aspect of a broader research topic. Several related research questions warrant further investigation. Future studies could explore additional variables, consider alternative conceptual frameworks, or investigate different outcome measures to advance our understanding of the phenomenon under examination.

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APPENDIX A Descriptive Statistics & Regression Results

TABLE A1: Summary statistics for control variables and variables of interest.

	mean	sd	min	max
F_CoE	6.17	0.85	4	8
TOTAL DEBT % COMMON EQUITY	239.63	2211.64	-2659	23862
DPS	0.41	0.76	0	4
P	25.40	35.11	0	247
MV	3772.75	7902.45	0	44168
DY	2.03	4.71	0	42
ENSCORE	27.49	28.68	0	92
CGSCORE	38.96	30.79	0	97
SOSCORE	33.21	28.83	0	92
TRESGCCS	61.76	46.19	0	100
ESG_Dummy	0.72	0.45	0	1
ind_0	0.48	0.50	0	1
ind_1	0.27	0.44	0	1
ind_2	0.25	0.43	0	1
Observations	120			

Note: This table reports the summary statistics of all variables in the regression model, including the mean, the standard deviation, and the minimum and maximum values. Total Debt as a Percentage of Common Equity is measured as a percentage. Variables “ESG_Dummy”, “ind_0”, “ind_1”, and “ind_2” are binary variables indicating whether the company reports ESG scores and the industry the company belongs to, respectively.

TABLE A2: Regression results

	F_CoE
TOTAL DEBT % COMMON EQUITY	-0.00***
	(0.00)
DPS	-0.54***
	(0.10)
MV	-0.00***
	(0.00)
TRESGCS	-0.00
	(0.01)
ESG_Dummy	0.08
	(0.35)
ind_0	-0.01
	(0.19)
ind_1	0.22
	(0.23)
ind_2	0.00
	(.)
Constant	6.37***
	(0.19)

Observations	120
R^2	
Adjusted R^2	

Note: This table displays the regression analysis of ESG score (TRESGCS) and all control variables on Cost of Equity (F_CoE). Column 1 displays the variables names, while Column 2 shows the results of the random effects model. Binary variable “ind_2” was omitted to avoid collinearity with the other industry controls. Heteroskedasticity robust standard errors are given in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

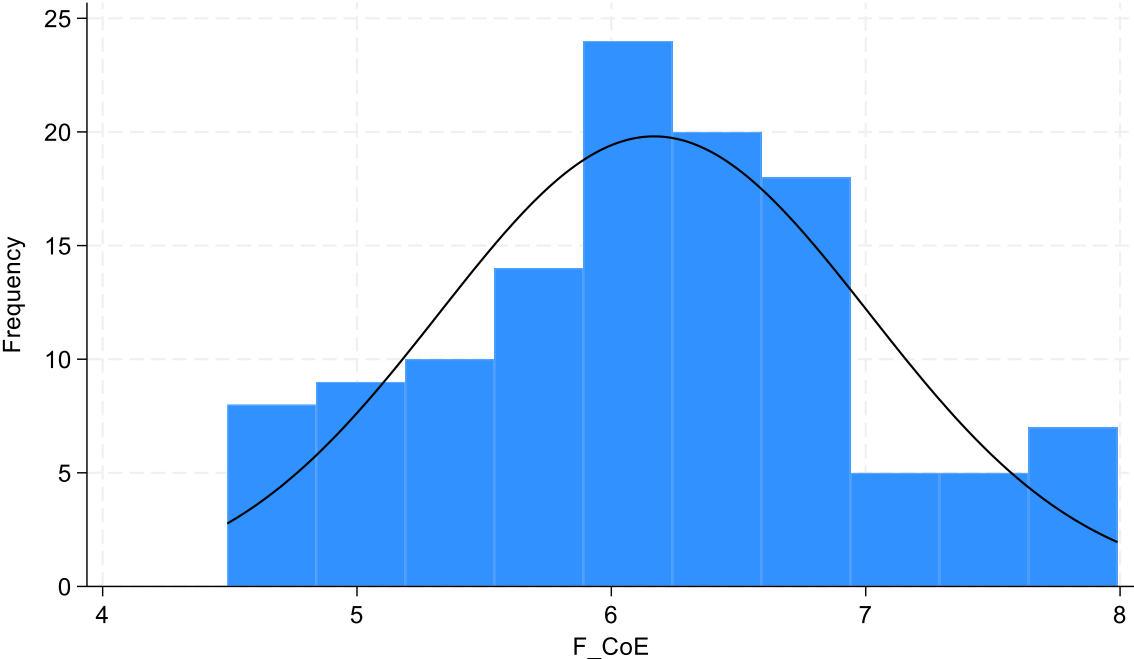
TABLE A3: Correlation results for control variables and variables of interest

	F_CoE	TOTAL DEBT %	DPS	MV	TRESGCS	ESG_D	ind_0	ind_1
		...						
TOTAL DEBT %	-0.08	1.00						
COMMON EQUITY								
DPS	-0.49	-0.02	1.00					
MV	-0.32	-0.03	0.36	1.00				
TRESGCS	-0.10	-0.09	0.29	0.49	1.00			
ESG_Dummy	-0.10	-0.12	0.18	0.29	0.76	1.00		
ind_0	-0.14	-0.07	0.05	-0.00	0.04	0.09	1.00	
ind_1	0.23	-0.03	-0.12	-0.13	-0.11	-0.04	-0.58	1.00
ind_2	-0.07	-0.05	0.06	0.13	0.07	-0.06	-0.56	-0.35

Note: This table shows the correlations between all the variables studied. As we can see in the first column, all variables show a negative correlation with the dependent variable, except for “ind_1”. “ind_1” is a binary variable that takes value 1 when a company belongs to the Renewable Energy industry and 0 otherwise.

APPENDIX B Hausman Test & Shapiro-Wilk Test

GRAPH B1: Shapiro-Wilk Test Results



Note: The graph above shows the results for the Shapiro-Wilk Test performed on the sample. The Shapiro-Wilk Test checks whether the data is normally distributed. The vertical axis shows the frequency, which represents the number of companies that obtained a specific cost of equity level. The horizontal axis represents the cost of equity.