2023

ESG Scores as a Measure of Risk: The Relationship Between Environmental, Social, and Corporate Governance Ratings and the Financial Performance of U.S. Oil and Gas Companies

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ESG SCORES AS A MEASURE OF RISK: THE RELATIONSHIP BETWEEN ENVIRONMENTAL, SOCIAL, AND CORPORATE GOVERNANCE RATINGS AND THE FINANCIAL PERFORMANCE OF U.S. OIL AND GAS COMPANIES

by

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SUBMITTED TO SCRIPPS COLLEGE IN PARTIAL FULFILMENT OF THE DEGREE OF BACHELOR OF ARTS

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DECEMBER 2ND, 2022

Abstract

This study investigates the association between ESG (environmental, social, corporate governance) scores on the financial performance of U.S. oil and gas companies, an industry facing significant ESG-related pressures. ESG scores evaluate a firm's environmental impacts, social responsibility, and corporate governance practices and can be used as a form of evaluating a firm's risk mitigation efforts. However, there is not sufficient evidence to conclude that there exists a relationship, positive or negative, between ESG scores and firm performance in this industry. Overall, the findings of this study highlight the growing interest in ESG investing and is useful for investors and firms in the oil and gas industry, as well as policymakers, in understanding the materiality of ESG scores.

Acknowledgements

I would first like to thank my advisors Professor Marc Massoud, Professor Patrick Van Horn, as well as Professor Andrew Finley and Professor Roberto Pedace for their feedback, guidance, and support throughout this process. You all have made the daunting task of a semester thesis much more feasible and manageable. I would also like to thank my friends, Sonya Hadley, Abbie Arroyo, Susan Park, and Matthew Tran for their continued moral support and motivation.

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1. Introduction

The oil and gas industry, once seen as a stable and profitable industry, has become a troubled industry over the past two decades. Over the past 15 years, the industry has underperformed against the S&P500 and has experienced multiple macroeconomic and social downward pressures, including oil price collapses, drastic disruption in demand due to the COVID-19 pandemic, and increasing societal pressure regarding the industry's impact on the environment and climate change (Barbosa et. al, 2020).

On the other hand, the 21st century has seen the rise of ESG investing, an investing practice focused on evaluating a firm's environmental impacts, social responsibility, and corporate governance practices. ESG-focused investing, along with increased knowledge on climate change and the effects of carbon emissions, have created significant pressures on the oil and gas industry. The industry is a substantial contributor to worldwide carbon emissions and thus climate change (Beck et. al, 2020), labeling it as a problematic and sometimes an "anti-ESG" industry.

Climate change and the broader ESG frameworks have also been on the forefronts of many investors and institutions. Now, multiple agencies produce their own ESG ratings based on methodologies that consider a firm's environmental, social, and governance practices. Numerous studies have looked at the effects of ESG ratings on firm financial performance for specific countries or geographical regions, however there are few studies that look specifically at the association between ESG ratings and U.S. oil and gas companies.

The aim of this study is to test whether there is an association between ESG scores and firm profitability of oil and gas companies. The hypotheses draw from ideas of stakeholder and legitimacy theory and predicts that higher ESG scores will be associated with increased firm

performance. Since ESG scores can be used as a measure of risk, a higher score can be an indicator of an increased and more robust risk mitigation system, perhaps making it a more appealing investment and increasing firm financial performance.

This study looks at the ESG ratings of 86 U.S. oil and gas firms on a quarterly basis from 2008-2021, and separately measures the effects of overall ESG score and its respective pillar scores on three measures of firm profitability – return on assets, return on equity, and market returns. The results, however, suggest that there is no statistically significant relationship between ESG scores and firm performance across nearly all tests and conditions.

This study contributes to the existing and expanding debate on the effects of ESG on firm performance, though it looks at a specific selection of firms that has not been widely studied. The findings of this study do not suggest a significant association between ESG ratings and firm performance, further suggesting that ESG data and ratings may not be material for investors in this industry and that ESG scores may not be a relevant form of risk assessment and management in the oil and gas industry. While the results do not support the study's hypotheses, the findings are still useful for investors and company executives in this industry, as well as policymakers, in understanding the materiality of ESG ratings on firm profitability.

2. Literature Review

As environmental, social, and governance concerns gain more attention from investors and policymakers, more research has been done to better understand the effects of ESG practices on investor returns and firm performance. This study draws upon previous research on the materiality of ESG information, ESG practices and financial performance, and ESG in the oil and gas industry, to develop a hypothesis.

2.1 ESG Information and Financial Performance

With an increasing amount of ESG information available to investors, through news and media reports, firm ESG reports and disclosures, and third party produced ESG scoring systems, more research has been performed to assess the materiality of such ESG information to investors. A prior study found that investors react to ESG news, with positive news garnering a positive market reaction (Serafeim et. al, 2022). The study also found that the market reaction to positive ESG news is smaller for firms with high ESG ratings, implying that the stock price already reflects the positive news and that ESG is material to firm valuation.

Multiple studies have looked at whether there is a significant relationship between a firm's ESG practices and its financial performance. These studies consider the effect of ESG on financial performance using different approaches, such as focusing on a specific aspect of ESG or corporate responsibility or looking at the firms within a market of a specific country or geographical region. However, the findings of previous research are mixed and have not been consistent. Some studies conducted in international markets in Italy and Canada found no significant relationship between ESG scores and investor returns or firm financial performance (Landi et al., 2018; Makni et al., 2008). However, some studies found a negative relationship between ESG scores and financial performance (Duque-Grisales et al., 2019). A study done on Canadian firms found that while corporate social performance (CSP) and financial performance had no significant relationship, there was a significant negative relationship between the environmental score of CSP on financial performance and market returns (Makni et al., 2008). On the other hand, some studies found that firms that implement sustainability practices outperform their peers that do not implement such practices (Siew et al., 2013; Eccles et al., 2014).

2.2 ESG in the Oil and Gas Industry

While not always referred to as "ESG" concerns, environmental and social responsibility concerns in the oil and gas industry have been identified and studied. Recent ESG-related concerns range on all aspects of ESG from an estimated industry contribution of 42% of global carbon emissions (Beck et. al, 2020), to the environmental and social impact of oil spills, to a track record of bribery and corruption, to underrepresentation and discrimination based on gender and race in the industry workplace (Murphy 2021). Many of these issues stem from industry-specific activities, such as exploration and drilling, pipeline construction and maintenance, and transportation (Barclays Bank PLC, 2015).

Additionally, previous studies have assessed the effects of ESG performance on the performance of oil and gas companies. A prior study looked at the effects of ESG performance on the total risk of oil and gas companies, focusing on gender diversity of company board members. The study found that ESG performance had an adverse performance on firm risk when using stock price volatility as a proxy for total risk and market beta as a proxy for firms' systematic risk (Shakil 2021). Furthermore, a 2012 study on oil and gas companies' disclosure practices on CSR reputations found that among the oil and gas industry, older and larger companies tended to be among leaders in CSR reputation (Hughey et. al, 2012). The results of this study imply that greater disclosures related to CSR will likely improve a firm's CSR reputation, and transparency in reporting news, even if it is slightly negative, may lead to better conduct.

3. Hypothesis Development

This study aims to explore the relationship of ESG scores on the financial performance of U.S. oil and gas companies and hypothesizes that higher ESG ratings are positively associated with the financial performance of U.S. oil and gas companies. This hypothesis is influenced by stakeholder theory and legitimacy theory–two complementary normative theories of corporate social responsibility and business ethics that theorize what a corporation's role should be.

3.1 Stakeholder Theory

One theory of organizational management and business ethics is Robert E. Freeman's stakeholder theory. Stakeholders are defined as individuals or organizations that are involuntarily or voluntarily beneficiaries or risk-bearers to a firm's profit-generating activities (Smith, 2003). These can include shareholders, employees, customers, suppliers, and local community members. Managers following stakeholder theory have two primary responsibilities to ensure that stakeholders are accounted for by considering their interests when making decisions. Freeman, however, acknowledges that stakeholder theory implies that a manager will act in ways that may reduce company profitability.

Some oil and gas companies have identified and reported who they consider their stakeholder to be. Generally, they include shareholders, employees, suppliers and contractors, communities, governments, NGOs, and customers (ExxonMobil 2021; Chevron 2021). Oil and gas companies such as ExxonMobil and Chevron have also included what issues are most prevalent to these stakeholder groups and the company's plan to address those issues. The action plans of ExxonMobil and Chevron suggest firm management is following a stakeholder theory approach as their plans involve including stakeholder groups in the decision-making process, a key responsibility for stakeholder-oriented firms.

3.2 Legitimacy Theory

Complementary to stakeholder theory is legitimacy theory, which emphasizes that organizations are continually trying to ensure they are perceived within the bonds and norms of society (Fernando et. al, 2014). Unlike stakeholder theory, legitimacy theory generalizes the idea of society as it considers society rather than specific individuals and groups. The theory recognizes that there is a mutual relationship between society and organizations, as organizations rely on society to provide human resources and materials and in turn provide products and services. By this logic, any waste and harmful byproducts that firms produce also have effects on society. This theory implies a "social contract" between business organizations and societies that manifests both explicitly through legal requirements as well as through implicit terms based on societal awareness and trends. Firms then need to ensure that the terms of their social contracts are not breached to maintain their state of legitimacy and ability to continue their operations.

In a 2014 study on integrating CSR practices, authors Fernando and Lawrence suggest that to align with the ideas of legitimacy theory, "organizations might engage in CSR activities and reporting in order to retain, gain, and regain their legitimacy" (Fernando et. al, 2014). In implementing CSR practices, firm managers are doing what they deem as necessary to preserve the image of the firm's legitimacy.

Threats to a firm's legitimacy include unexpected incidents such as scandals and accidents but can also include major changes in society's expectations. A substantial shift in societal changes, such as the growing interest in ESG-focused investing and growing awareness of the effects of fossil fuels, can pose risks to a firm's legitimacy as certain firm practices may undergo scrutiny for breaching their societal contract. To address these "legitimacy threats", there are four strategies that firms can implement, according to C.K. Lindblom in his 1994

presentation on “the implications of Organizational Legitimacy for Corporate Social Performance and Disclosure.” These strategies include “educating relevant stakeholders about its actual performance, changing perceptions of relevant stakeholders about underlying issues without changing the organization’s behavior, distracting or manipulating attention away from the issue of concern and seeking to divert attention to favorable issues; and/or seeking to change external expectations about the organization’s performance” (Lindblom, 1994). A firm may implement one of or a combination of multiple of these strategies to establish or reaffirm their legitimacy.

3.3 Hypotheses

H_1 = Higher ESG ratings have a positive association with the financial performance of U.S. oil and gas companies.

Based on the ideologies of stakeholder and legitimacy theory, the first hypothesis for this study is that higher ESG ratings are positively associated with the financial performance of oil and gas companies in the U.S. These theories call for considering stakeholder and broader society’s interests when making decisions, which implies that these groups can have a significant impact on the operations and financials of a company. The oil and gas industry has many stakeholders ranging from individuals to governments and NGOs. Accounting for these stakeholders through additional investments in health programs for employees, expenditures to prevent oil spills, or engaging in philanthropic activities, for example, could be viewed as a form of risk management. In other words, by considering stakeholders’ interest in decision-making processes and addressing potential “legitimacy threats,” firms may be decreasing future costs that may arise due to possible negative effects it could project onto stakeholders and society. Thus, having a higher ESG score could suggest a more robust risk management system.

On the other hand, the null hypothesis predicts that there is no relationship between ESG scores and the financial performance of oil and gas companies. If the null hypothesis were true, then this suggests that ESG scores may not be relevant for investment decision making in the oil and gas industry and that it may not be a relevant indicator of performance. A recent study surveyed institutional investors and found that ESG data can be material information in the investment process, however, it also notes that which information is deemed material depends on the industry and company strategy (Amel-Zadeh et. al, 2018). If investors in the oil and gas industry do not find ESG data as material information in the investment decision-making process, then ESG scores and firm performance may not have a significant association. The study also found that of the surveyed institutional investors, majority of the investors are motivated by financial reasons rather than ethical reasons for using ESG data. Therefore, for similar reasons, investors may decide to prioritize financial metrics rather than ESG metrics when making decision making, possibly resulting in no association between ESG scores and financial performance.

Furthermore, this study will look at the effect of ESG scores on both accounting performance and stock returns to compare the effects on firm financials versus investor behavior. If higher ESG scores result have a positive association with accounting performance metrics, then this suggests that ESG scores may be a good indicator for risk management and firm profitability. If ESG scores are not associated higher accounting performance but are associated with higher stock returns, this would suggest that investors do consider ESG in the oil and gas industry although these metrics do not have a relationship with profitability in the measured periods. Lastly, if ESG scores do not have a relationship with financial performance nor stock returns, then it could suggest that investors in the oil and gas industry do not consider ESG when

making investment decisions or for firms that implementing ESG-focused initiatives may not affect firm profitability in this industry.

The ESG score can further be broken down into its respective environmental, social, and governance components, each with a stand-alone score. Given the prominence of concerns across all three ESG categories in the oil and gas industry, this study will also look at whether one category is a better indicator of performance. The following hypotheses predict there is an association between each respective ESG pillar score and firm performance:

H_{2a} = *Higher 'E' scores have a positive association with the financial performance of U.S. oil and gas companies.*

H_{2b} = *Higher 'S' scores have a positive association with the financial performance of U.S. oil and gas companies.*

H_{2c} = *Higher 'G' scores have a positive association with the financial performance of U.S. oil and gas companies.*

The oil and gas industry face issues and controversies relating to the respective ESG categories, such as the environmental impacts of operations, environmental and social impacts of oil spills, and corporate governance concerns regarding bribery and workplace discrimination (Murphy 2021). However, this study further hypothesizes that the 'E' and 'S' scores will have a greater association with firm performance compared to 'G' scores as the industry has received greater criticism regarding its environmental and social impacts.

Most notably, the industry receives societal pressure for being a key driver of climate change, as the global oil and gas industry is responsible for contributing nearly half of global carbon emissions (Beck et. al, 2020). Other environmental concerns include geohazards due to land disturbances brought on by the exploration and production processes, water contamination,

and toxic spillages (Barclays Bank PLC 2015). Malpractices also pose environmental concerns in the industry, as numerous oil and gas companies have been in headlines for oil spills and air pollution, including ExxonMobil's 1989 *Exxon Valdez* spill (National Oceanic and Atmospheric Administration 2020), and Chevron Corporation and Phillips 66 2022 settlement for violating the Clean Air Act and state pollution laws at some of its facilities (Volcovici 2022).

The industry also faces criticism for its social impacts. For communities that primarily exploration and production oil and gas firms operate in, health and safety, economic displacement, disruption of traditionally marginalized (lower socio-economic status and/or ethnic minorities) groups, and loss of and land are noted potential social effects (Barclays Bank PLC 2015). Additional concerns have also been raised regarding employee health and safety at operation sites. Medical studies have found evidence from numerous operation sites that suggest health impacts due to the exposure of oil extraction (Johnston et. al, 2019).

Given the prevalence of ESG issues to the oil and gas industry, this study hypothesizes that higher ESG scores will be positively associated with firm performance. Furthermore, given the added prominence of environmental and social industry-specific concerns to oil and gas firms, this study hypothesizes that when separated into its respective pillar scores, the 'E' and 'S' pillars may see a greater positive association with firm performance.

4. Research Design

This study uses a sample of 86 U.S. oil and gas companies over a 14-year period on a quarterly basis from January 2008 – December 2021 for a total of 1783 observations. The timeframe of interest was selected and limited based on the availability of historical ESG scores and current financial metrics. ESG scores were retrieved from Refinitiv, while firm financial performance metrics were obtained from Compustat – Capital IQ and market capitalization and

returns data were obtained from the Center of Research in Security Prices (CRSP). The combined data was then used to create the following regression model to test the association between ESG scores and firm financial performance.

$$PER = \propto_0 + \propto_1 ESG + \propto_2 ln(Size) + \propto_3 MTB + \propto_4 INT\_ASSETS + \propto_5 Leverage + \propto_6 CapEx + i.Firm + i.Period\ \varepsilon$$

Where PER, or performance, is measured as financial performance through return on assets (ROA) or return on equity (ROE), as well as market performance through market returns (M_RET). In addition to ESG (and individual component scores) measured by ESG, the model also accounts for firm size using the natural log of market capitalization ($Size$), firm growth opportunities through the market-to-book ratio (MTB), intangible assets (Int_Assets), leverage, and capital expenditures ($CapEx$). As this study uses panel data, a fixed effects regression will be performed on the firm and period level to account for any unmeasurable firm-specific qualities and macroeconomic events that occurred during each quarter that may not be captured by the other independent variables.

The variable of interest for this study comes from Refinitiv's ESG scores. Refinitiv measures firm performance, efficiency, commitment, and capacity in addressing various issues across ESG to calculate an overall percentage score from 0-100 that corresponds to a letter score on a D- to A+ scale (Refinitiv 2022). According to Refinitiv, over 630 ESG-related data points are considered to derive 186 comparable measures. These measures are then grouped into 10 categories that fall under either the environmental, social, or governance aspect of ESG (three categories in environment, four in social, and three in governance). The category score is calculated using a percentile rank scoring methodology that accounts for how the firm compares to its industry peers. The overall ESG score is then calculated by aggregating the 10 underlying

category weights, with certain categories weighted more based on industry. ESG pillar scores are calculated by taking the relative sum of its category weights, which varies for the environmental and social pillars based on industry but remains the same across all industries for the governance pillar. Inputted factors are weighted differently depending on the industry, with each metric receiving a materiality weighting from a scale of 1 to 10. Additionally, transparency in reporting ESG-related data is also considered as companies' scores are discounted for not reporting "highly material" data. A score in the 'A' range, a percentage score greater than 75%, indicates excellent relative ESG performance with respect to the firm's sector for environmental and social evaluations and country of incorporation for governance evaluation, and high reporting transparency of ESG data (Refinitiv 2022). As a firm's ESG score is measured taking into accounts its practices' outputs and efficiency, the outputted score ideally measures firm managements' ESG-related impacts rather than simply equating the dollar-value of expenditures to a firm's ESG practices and impacts. This study will use Refinitiv's overall ESG and corresponding pillar scores as independent variables to determine if higher scores are associated with increased firm financial performance.

In aiming to preserve the statistical power in number of observations and variability of the firm financial data, which is on a quarterly or monthly basis from January 2008 – December 2021, this study is constructed on the assumption that the ESG and corresponding 'E', 'S', and 'G' pillar scores assigned for the calendar year is the same for each quarter within that year. This assumption, however, may be a simplification, as in outlining its scoring methodologies, Refinitiv notes that ESG scores may be updated weekly depending on any corrections to existing data and/or new controversies, though historical records of weekly scores are not available (Refinitiv, 2022). Refinitiv also notes that after five years, ESG scores become definitive and are

meant to be a representative score for that calendar year. This means that for this study's dataset, scores before 2018 are definitive, while scores between 2018 – 2021 are not. Historical years' scores may be retroactively changed based on company restatements or data corrections, however previous scores and the number of times a score has been updated are not available (Refinitiv 2022). This study assumes that there are a limited number of substantial revisions that occur because of restatements or data corrections. Overall, while the assumption that the ESG score for a calendar year is the same quarter-to-quarter may not be truly representative, the statistical benefit that comes with more observations appear to outweigh the potential limitations of this assumption for this study.

Financial performance is measured through three different means: ROA, ROE, and market returns. Calculated monthly ROA[1] and ROE[2] ratios were obtained from Compustat, and placed on a quarterly basis by taking the average ROA and ROE of across the three months in each quarter. Quarterly market returns were calculated using monthly stock prices and the formula:

$$M\_RET = \frac{PRICE_{final} - PRICE_{initial}}{PRICE_{inital}}$$

4.1 Control Variables

The control variables include firm size, market-to-book ratio, leverage, intangible assets, capital expenditures, year, and the individual firm. For this study, firm size is included as the natural log of the average monthly market capitalization within the measured quarter. The market-to-book ratio as included from Compustat is calculated as the multiple of market value of

[1] Calculated as operating income before depreciation as a fraction of average total assets based on the two most recent periods (Wharton Research Data Services 2016).
[2] Calculated as net income as a fraction of average book equity based on the most recent two periods; where book equity is the sum of total parent stockholders' equity and deferred taxes and investment tax credit (Wharton Research Data Services 2016).

equity to the book value of equity (WRDS 2016). Leverage values, measured by the debt-to-equity ratio for this study, was also acquired from Compustat and calculated as the ratio of total liabilities to shareholders' equity (common and preferred). These control variables are included in this study based on the findings and followings of prior studies.

Previous literature (Egbunike et. al, 2018; Dogan 2013; Coad et. al, 2013) found that there is a significant relationship between firm size and firm profitability. The model above also includes the market-to-book ratio to account for the company's market valuation at the measured period. Shareholders may compare the share value to this metric to determine whether the share is over or undervalued, thus contributing to their perception about the firm. For these reasons, and following prior studies (Shakil, 2021; Luo et. al, 2009), this study controls for potential escalated shareholder perception of firm value.

Prior literature (Shakil, 2021; Duque-Grisales et. al, 2019; Drempetic et. al, 2019) also controlled for leverage, as measured by the debt-to-equity ratio, because of the relationship between financial leverage and profitability. This study also controls for intangible assets, which include reputation and intellectual property, has been found to have a significant impact on firm performance in the competitive oil and gas industry (Garcia et. al, 2014).

4.2 Sample Selection

To test the hypotheses, this study uses a sample size of 1783 observations. The process for constructing this sample size is described below and Table 1 also summarizes this procedure.

Out of 303 U.S. oil and gas companies listed on Refinitiv, only 86 had available ESG scores within the measured period, 2008-2021. Since observations are on a quarterly basis, the expected number of observations for 86 firms was 4816. However, not all 86 firms had ESG scores available for every year. As such, only 2818 observations had corresponding ESG data.

From this, 1035 observations did not have corresponding financial performance (ROA, ROE) or control variable (market-to-book, debt-to-equity) metrics in Compustat, ultimately resulting in a sample size of 1783 observations.

Table 3 presents the correlation matrix for the independent and dependent variables. ROA and ROE are significantly correlated with eight out of nine control variables, while market returns are significantly correlated with four control variables. Additionally, the magnitude of the correlations between explanatory variables indicate that multicollinearity should not be a significant concern in the following regression models.

Table 1.
Sample Selection

U.S. Oil and Gas companies in Refinitiv	303
Less: firms that do not have ESG scores during the 2008-2021 period	(217)
Total companies with ESG scores available	86
86 companies * 4 quarters * 14 years	4816
Less: observations without ESG scores for measured period	(1998)
Less: observations without financial performance and control variable data	(1035)
Final Sample	**1783**

Table 2.
Descriptive Statistics
n = 1783

Variable	Mean	Median	Std. Dev.	Min	Max
ROE	–0.083	0.043	0.678	–20.34	1.053
ROA	0.095	0.116	0.150	–0.814	0.539
M_RET	0.030	–0.008	0.474	–0.895	11.712
ESG	39.180	35.112	21.204	3.730	87.933
ENVIRONMENT	30.033	24.748	26.624	0.000	90.250
SOCIAL	37.202	31.348	23.094	1.683	94.853
GOVERNANCE	56.123	59.119	22.490	3.897	96.303
SIZE	2.99e+7	7,510,118	6.77e+7	11.01	4.77e+8
LEVERAGE	0.391	1.172	16.295	–518.404	25.022
MTB	1.698	1.331	1.835	0.000	29.544
CAPEX	2,224.498	813	4,193.85	0.000	37,985
INT_ASSETS	728.471	0.00	2,252.434	0.000	30,238

Table 3.
Correlation Matrices

Panel A: correlation matrix of *ROA – GOVERNANCE*

	ROA	*ROE*	*M_RET*	*ESG*	*ENVIRONMENT*	*GOVERNANCE*
ROA	1.000					
ROE	**0.4400**	1.000				
M_RET	**–0.1419**	**–0.1034**	1.000			
ESG	**0.1158**	**0.0822**	–0.0335	1.000		
ENVIORNMENT	**0.1062**	**0.0979**	**–0.0406**	**0.9387**	1.000	
GOVERNANCE	**0.0501**	0.0081	–0.0089	**0.6525**	**0.4531**	1.000
SOCIAL	**0.1253**	**0.0827**	–0.0300	**0.9418**	**0.8584**	**0.4519**
SIZE	**0.1623**	**0.1144**	–0.0255	**0.5565**	**0.5675**	**0.2342**
LEVERAGE	**0.1220**	**0.1319**	–0.0109	0.0205	0.0284	–0.0257
MTB	–0.0360	**–0.1137**	**0.1579**	**–0.1356**	**–0.1377**	**–0.1283**
CAPEX	**0.1797**	**0.1143**	**–0.0428**	**0.4733**	**0.5119**	**0.1685**
INT_ASSETS	**0.0404**	**0.0608**	**–0.2820**	**0.2820**	**0.3155**	**0.1105**

Panel B: correlation matrix of *SOCIAL – INT_ASSETS* (continued from Panel A)

	SOCIAL	*SIZE*	*LEVERAGE*	*MTB*	*CAPEX*	*INT_ASSETS*
SOCIAL	1.0000					
SIZE	**0.5517**	1.0000				
LEVERAGE	0.0319	0.0164	1.0000			
MTB	**–0.0961**	0.0096	0.0293	1.0000		
CAPEX	**0.4582**	**0.7496**	0.0171	**–0.0430**	1.0000	
INT_ASSETS	**0.2575**	**0.1955**	0.0174	**–0.0600**	**0.2385**	1.0000

5. Results

5.1 Test Results of H_1

Table 4 shows the results of estimating the model to test H1 to determine if there is a positive association between overall ESG scores and firm financial performance. The first and third conditions, which use ROA and market returns as the dependent variable measuring profitability, found a negative insignificant coefficient on the *ESG* variable. This contrasts with the second condition, which uses ROE as the dependent variable and found a statistically significant negative coefficient on the *ESG* variable at the 0.05 significance level. The *ESG* coefficient (–0.0051) suggests a negative relationship between ESG score and ROE, which can further imply that as a firm implements greater disclosures and risk-management practices, the firm also becomes less efficient at creating profits and increasing shareholder value. While the three conditions have mixed findings regarding the statistical significance of the ESG variable, all three conditions found that the leverage coefficient is statistically significant, while the first two conditions found the size coefficient to also be statistically significant. Overall, the results of H1 suggests that ESG does not have a statistically significant association with firm financial performance, except when using ROE as a measure of firm performance.

5.1 Test Results of Secondary Hypotheses

Table 5 presents the results of the secondary hypotheses, which looks at the association between firm performance and the individual ESG pillar scores. Unlike the results for H1, the respective *ENVIRONMENT, SOCIAL,* and *GOVERNANCE* coefficients were not statistically significant for all three conditions of firm performance, except when testing *GOVERNANCE* with ROE as the dependent variable. As shown in Table 5C, for the test for the second condition found a statistically significant coefficient (–0.0028) at the 0.01 level of significance. This

negative relationship between a firm's governance score and ROE implies that firms that implement greater transparency in management practices or a corporate social responsibility strategy may also have decreased profitability on a ROE basis. Additionally, like the findings of H1, all the respective tests for the three pillars and three conditions found that the leverage coefficients were statistically significant at the 0.01 level, except for the third condition using market returns as the dependent variable, which was significant at the 0.05 level. All three pillar tests also found that for the first two conditions, size was also a statistically significant coefficient. Since all but one condition found a significant relationship between an ESG pillar score and profitability, the results of the secondary hypotheses overall support the null hypothesis in which there does not appear to be a statistically significant association with firm financial performance and ESG pillar scores.

5.2 Additional Analysis and Limitations

The results of the first and secondary hypotheses do not provide sufficient evidence for the null hypothesis to be rejected. This result implies that having an increased ESG score, or a more robust risk mitigation system, may not necessarily be indictive of greater firm performance and that investors in the oil and gas industry may not see ESG scores as material information when making investment decisions

However, this study has limitations that may have affected results. First, because intra-year ESG ratings data was not available, ESG and ESG pillar scores were kept constant for each quarter in a calendar year, despite the possibility that an ESG score could change during the year and revised up to four years later. While this assumption was used to increase the statistical power of the regression tests, the resulting variables of interest were not truly representative as quarterly variation of ESG scores may have been lost.

Additionally, the reliance on share price to calculate quarterly market returns also poses possible limitations on this study. Using change in share price to determine returns does not account for the effect of dividends on returns, thus making firms that pay high dividends appear to have worse performance. Previous literature has documented the prevalence for dividends in the oil and gas industry. A 2017 study noted that major oil companies used on average 30% of its net income to pay dividends to shareholders, while dividends for small cap companies tend to correlate with oil prices (Agostinho et. al, 2017). Additionally, a more recent study investigated the effects of the COVID-19 pandemic and the March 2020 stock market collapse on the most affected industries, including the oil and gas industry. The study found that while companies responded in different ways to a decrease in performance and increase in profit uncertainty, all companies did not suspend dividends (Mazur et. al, 2021). Omitting the effects of dividends may cause the resulting regression results for the third condition, where the dependent variable is market returns, to be biased. Firms that pay out a higher dividend could potentially have higher ESG scores, which would suggest a positive association between financial performance and ESG scores. However, the model used for H1 and H2 would record a worse returns metric and therefore may not find a relationship between higher ESG scores and higher returns. Firms that have low ESG scores but have high dividend payouts may also be misrepresented. These firms will have decreased returns and low ESG scores, which may cause the regression model to find an inaccurate association of lower ESG scores and low returns.

Table 4.
Association Between Overall ESG Score and Firm Performance (H_1)

Independent Variable	***Y = ROA*** **Coefficient (SE)**	***Y = ROE*** **Coefficient (SE)**	***Y = M_RET*** **Coefficient (SE)**
ESG	–0.0003 (0.0004)	–0.0051 (0.0022)**	–0.0011 (0.0017)
SIZE	0.0250 (0.0037)***	0.0825 (0.0201)***	–0.0044 (0.0155)
LEVERAGE	0.0008 (0.0002)***	0.0025 (0.0009)***	0.0016 (0.0007)**
MTB	–0.0023 (0.0020)	0.0023 (0.0109)	0.0135 (0.0084)
CAPEX	0.0000 (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)
INT_ASSETS	0.0000 (0.0000)***	0.0000 (0.0000)	0.0000 (0.0000)
Constant	–0.1130 (0.0585)*	–0.7072 (0.3142)**	0.0870 (0.2431)
Fixed Effect	Firm, Period	Firm, Period	Firm, Period
F-statistic	17.06	8.23	4.38
Prob > F	0.0000	0.0000	0.0000
Observations	1,783	1,783	1,783
Adjusted R^2	0.5356	0.3419	0.1953

Asterisks (*, **, ***) denote statistical significance at the 0.10, 0.05, and 0.01 levels, respectively, using a two-tailed test. This model includes robust standard errors for heteroskedasticity. Definitions of variables are listed in Appendix A.

Table 5A.
Association Between Environmental Pillar Score and Firm Performance (H_{2a})

Independent Variable	***Y = ROA*** **Coefficient (SE)**	***Y = ROE*** **Coefficient (SE)**	***Y = M_RET*** **Coefficient (SE)**
ENVIRONMENT	–0.0000 (0.0003)	–0.0012 (0.0019)	–0.0009 (0.0014)
SIZE	0.0249 (0.0037)***	0.0832 (0.0000)***	–0.0037 (0.0156)
LEVERAGE	0.0008 (0.0002)***	0.0025 (0.0009)***	0.0016 (0.0007)**
MTB	–0.0023 (0.0020)	0.0020 (0.0109)	0.0132 (0.0084)
CAPEX	0.0000 (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)
INT_ASSETS	0.0000 (0.0000)***	0.0000 (0.0000)	0.0000 (0.0000)
Constant	–0.1133 (0.0598)**	–0.7462 (0.3217)	0.0573 (0.2485)
Fixed Effect	Firm, Period	Firm, Period	Firm, Period
F-statistic	17.05	8.17	4.38
Prob > F	0.0000	0.0000	0.0000
Observations	1,783	1,783	1,783
Adjusted R^2	0.5354	0.3400	0.1953

Asterisks (*, **, ***) denote statistical significance at the 0.10, 0.05, and 0.01 levels, respectively, using a two-tailed test. This model includes robust standard errors for heteroskedasticity.

Table 5B.
Association Between Social Pillar Score and Firm Performance (H_{2b})

Independent Variable	***Y = ROA*** **Coefficient (SE)**	***Y = ROE*** **Coefficient (SE)**	***Y = M_RET*** **Coefficient (SE)**
SOCIAL	–0.0004 (0.0003)	–0.0024 (0.0018)	–0.0008 (0.0014)
SIZE	0.0248 (0.0037)***	0.0813 (0.0200)***	–0.0047 (0.0155)
LEVERAGE	0.0008 (0.0002)***	0.0025 (0.0009)***	0.0016 (0.0007)**
MTB	–0.0022 (0.0020)	0.0034 (0.0109)	0.0139 (0.0084)*
CAPEX	0.0000 (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)
INT_ASSETS	0.0000 (0.0000)***	0.0000 (0.0000)	0.0000 (0.0000)
Constant	–0.1140 (0.0585)*	–0.7108 (0.3146)**	0.0853 (0.2431)
Fixed Effect	Firm, Period	Firm, Period	Firm, Period
F-statistic	17.07	8.19	4.38
Prob > F	0.0000	0.0000	0.0000
Observations	1,783	1,783	1,783
Adjusted R^2	0.5358	0.3405	0.1953

Asterisks (*, **, ***) denote statistical significance at the 0.10, 0.05, and 0.01 levels, respectively, using a two-tailed test. This model includes robust standard errors for heteroskedasticity.

Table 5C.
Association Between Governance Pillar Score and Firm Performance (H_{2c})

Independent Variable	***Y = ROA*** **Coefficient (SE)**	***Y = ROE*** **Coefficient (SE)**	***Y = M_RET*** **Coefficient (SE)**
GOVERNANCE	–0.0000 (0.0002)	–0.0028 (0.0011)***	–0.0002 (0.0008)
SIZE	0.0249 (0.0037)***	0.0807 (0.0201)***	–0.0046 (0.0155)
LEVERAGE	0.0008 (0.0002)***	0.0025 (0.0009)***	0.0016 (0.0007)**
MTB	–0.0023 (0.0020)	0.0023 (0.0109)	0.0136 (0.0084)
CAPEX	0.0000 (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)
INT_ASSETS	0.0000 (0.0000)***	0.0000 (0.0000)	0.0000 (0.0000)
Constant	–0.1103 (0.0595)*	–0.5490 (0.3193)*	0.0963 (0.2472)
Fixed Effect	Firm, Period	Firm, Period	Firm, Period
F-statistic	17.05	8.25	4.38
Prob > F	0.0000	0.0000	0.0000
Observations	1,783	1,783	1,783
Adjusted R^2	0.5355	0.3426	0.1951

Asterisks (*, **, ***) denote statistical significance at the 0.10, 0.05, and 0.01 levels, respectively, using a two-tailed test. This model includes robust standard errors for heteroskedasticity.

6. Conclusion

This study investigates the relationship between ESG and its respective pillar scores and the financial performance of the U.S. oil and gas industry. Out of all tests for the primary and secondary hypotheses across all three conditions, only two tests – where ESG and the Governance pillar score were the explanatory and ROE was the dependent variable – found a statistically significant negative relationship. However, overall, the findings support the null hypothesis as majority of the tests found no statistically significant relationship between ESG, environmental, social, and governance scores and firm performance, when measured by return on assets, return on equity, and market returns. This finding further implies that ESG scores may not be considered as material information for investors in the oil and gas industry and that ESG-related risk management efforts in this industry may not materially affect firm profitability.

This study only uses one source of ESG scores, Refinitiv, though other ESG scoring methodologies and systems also exist. An area of further research could use a different system of ESG scores and compare the results to those of this study. Another area of further exploration could potentially address the limitations of the lack of intra-year ESG data, by assessing the effects of updating ESG scores on firm performance.

Overall, this study and its findings contributes to the growing discourse regarding the impacts of ESG investing. These findings may be of interest to investors, company executives, and policymakers in evaluating the materiality of ESG ratings on firm profitability and performance. It also provides some insight into what ESG-investing, or the lack thereof, may look like in a problematic industry, such as the oil and gas industry.

Works Cited

Agostinho, Maria do Socorro Cirilo Agostinho, and Ruud Weijermars. 2017. "Petroleum Business Strategies for Maintaining Positive Cash Flow and Corporate Liquidity Under Volatile Oil and Gas Prices as the Sustainable Energy Transition Unfolds." *Journal of Finance and Accounting* 34-55.

Amel-Zadeh, Amir, and George Serafeim. 2018. "Why and How Investors Use ESG Information: Evidence from a Global Survey." *Financial Analysts Journal* 87-103.

Barbosa, Filipe, Giorgio Bresciani, Pat Graham, Scott Nyquist, and Kassia Yanosek. 2020. *Oil and gas after COVID-19: The day of reckoning or a new age of opportunity?* McKinsey & Company.

Barclays Bank PLC. 2015. *Environmental and Social Risk Briefing: Oil & Gas.* Barclays Bank.

Beck, Chantal, Sahar Rashidbeigi, Occo Roelofsen, and Eveline Speelman. 2020. *The future is now: How oil and gas companies can decarbonize.* McKinsey & Company.

Chevron. 2021. "advancing a lower carbon future." *Chevron.* Accessed October 3, 2022. https://www.chevron.com/sustainability.

Coad, Alex, Agusti Segarra, and Mercedes Teruel. 2013. "Like milk or wine: Does firm performance improve with age?" *Structural Change and Economic Dynamics* 173-189.

Dogan, Mesut. 2013. "Does firm age affect profitability? Evidence from Turkey." *Research Journal of Finance and Accounting.*

Duque-Grisales, Eduardo, and Javier Aguilera-Caracuel. 2019. "Environmental, Social and Governance (ESG) Scores and Financial Performance of Multilatinas: Moderating Effects of Geographic International Diversification and Financial Slack." *Journal of Business Ethics* 315-334.

Eccles, Robert G., Ioannis Ioannou, and George Serafeim. 2014. "The Impact of Corporate Sustainability on Organizational Proceses and Performance." *Management Science* 2835-2857.

Egbunike, Chinedu Francis, and Chinedu Uchenna Okerekeoti. 2018. "Macroeconomic factors, firm characteristics and financial performance: A study of selected quoted manufacturing firms in Nigeria." *Asian Journal of Accounting Research* 142-168.

ExxonMobil. 2021. "Sustainability Report." *ExxonMobil.* Accessed October 3, 2022. https://corporate.exxonmobil.com/Sustainability/Sustainability-Report.

Fernando, Susith, and Stewart Lawrence. 2014. "A Theoretical Framework for CSR Practices: Integrating Legitimacy Theory, Stakeholder Theory and Institutional Theory." *Journal of Theoretical Accounting* 149-178.

Garcia, Rodrigo, Donald Lessard, and Aditya Singh. 2014. "Strategic partnering in oil and gas: A capabilities perspective." *Energy Strategy Reviews* 21-24.

Johnston, Jill E, Esther Lim, and Roh Hannah. 2019. "Impact of upstream oil extraction and environmental public health: A review of the evidence." *Science of the Total Environment* 187-199.

Landi, Giovanni, and Mauro Sciarelli. 2018. "Towards a More Ethical Market: the Impact of ESG Rating on Corporate Financial Performance." *Social Responsibility Journal* 11-27.

Lee, Jooh, Niranjan Pati, and James Jungbae Roh. 2011. "Relationship between corporate sustainability performance and tangible business performance: evidence from oil and gas industry." *International Journal of Busienss Insights* 72-82.

Luo, Xueming, and C.B. Bhattacharya. 2009. "The Debate over Doing Good: Corporate Social Performance, Strategic Marketing Levers, and Firm-Idiosyncratic Risk." *Journal of Marketing* 199-213.

Makni, Rim, Claude Francoeur, and Francois Bellavance. 2008. "Firms, Causality Between Corporate Social Performance and Financial Performance: Evidence from Canadian." *Journal of Business Ethics* 591-605.

Mazur, Mieszko, Man Dang, and Miguel Vega. 2021. "COVID-19 and the march 2020 stock market crash. Evidence from S&P1500." *Finance Research Letters.*

Murphy, Katherine. 2021. ""I just gotta have tough skin": Women's experiences working in the oil and gas industry in Canada." *The Extractive Industries and Society.*

National Oceanic and Atmospheric Administration. 2020. *Damage Assessment, Remediation, and Restoration Program.* August 17. Accessed October 2022. https://darrp.noaa.gov/oil-spills/exxon-valdez.

Rausch, Alexandra. 2011. "systems, Reconstruction of decision-making behavior in shareholder and stakeholder theory: implications for management accounting." *Review of Managerial Science* 137-169.

Refinitiv. 2022. "Refinitiv ESG company scores." *Refinitiv.* May. Accessed October 3, 2022. https://www.refinitiv.com/en/sustainable-finance/esg-scores#methodology.

Serafeim, George, and Aaron Yoon. 2022. "Stock price reactions to ESG news: the role of ESG ratings and disagreements." *Review of Accounting Studies.*

Siew, Richard Y.J., Maria C.A. Balatbat, and David G. Carmichael. 2013. "The relationship between sustainability practices and financial performance of construction companies." *Smart and Sustainable Built Environment* 6-27.

Smith, Jeff H. 2003. "The Shareholders vs. Stakeholders Debate." *MIT Sloan Management Review* 85-90.

Ullah, Subhan, Muhammad Irfan, Ja Ryong Kim, and Farid Ullah. 2021. "Capital expenditures, corporate hedging and firm value." *The Quarterly Review of Economics and Finance.*

Volcovici, Valerie. 2022. *Reuters.* March 9. Accessed October 2022. https://www.reuters.com/legal/litigation/chevron-unit-pay-millions-air-violations-chemical-plants-2022-03-09/.

Wharton Research Data Services. 2016. "WRDS Industry Financial Ratio Manual." August.

Appendix A.
Variable Definitions

Variables	Definition
Dependent Variables	
ROA	= Return on Assets, calculated as operating income before depreciation as a fraction of average total assets based on the two most recent periods.
ROE	= Return on Equity, calculated as net income as a fraction of average book equity based on the most recent two periods; where book equity is the sum of total parent stockholders' equity and deferred taxes and investment tax credit.
M_RET	= Market returns, calculated as $= \frac{PRICE_{final} - PRICE_{initial}}{PRICE_{inital}}$.
Independent Variables of Interest	
ESG	= Overall ESG score, retrieved from Refinitiv.
ENVIRONMENT	= Environmental pillar score, retrieved from Refinitiv.
SOCIAL	= Social pillar score, retrieved from Refinitiv.
GOVERNANCE	= Governance pillar score, retrieved from Refinitiv.
Control Variables	
LEVERAGE	= Debt-to-equity ratio, calculated as the ratio of total liabilities to shareholders' equity (common and preferred).
SIZE	= Natural logarithm of firm market capitalization.
MTB	= Market-to-book ratio, calculated as the multiple of market value of equity to the book value of equity.
CAPEX	= Capital expenditures, as reported by Compustat.
INT_ASSETS	= Intangible assets, as reported by Compustat