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ENVIRONMENTAL, SOCIAL, AND GOVERNANCE (ESG) METRICS AND FINANCIAL RETURNS IN INDIAN ENERGY-INTENSIVE INDUSTRIES: AN EMPIRICAL STUDY

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Abstract

This investigation examined the connection between "Environmental, Social, and Governance (ESG) disclosure" and the financial outcomes of Indian businesses that are operating in the energy-intensive industry. The study has adopted "correlation and regression" techniques to investigate the relationship between "ESG scores and financial metrics such as Return on Assets (ROA), Return on Equity (ROE), and Tobin's Q". The study outlined that ESG scores have a negative impact on ROA and ROE. This may be because it takes time for ESG investments to yield results. The study also found that the ESG scores of an organisation are affected by the size of the organisation. The study also indicated through "panel data regression that Tobin's Q" have a negative relationship with ESG outcomes in the context energy-intensive companies.

KEYWORDS: *Environmental, Social, Governance (ESG) Metrics, Financial Returns, Energy-Intensive Industries*

1 INTRODUCTION

Research Background and Problem Statement

For the global economy and society to expand sustainably, the "environmental, social, and governance (ESG)" paradigm must be used. Following its introduction in 2004, the ESG concept has been established over subsequent years. Countries worldwide continue to promote the ESG principle for the integrated growth of government, society, and the environment (Li et al., 2021). The efficiency of businesses in terms of economic and ESG matters to investors, managers, and other stakeholders. "Economic, environmental, social, and corporate governance performance" are all integrated into a company's performance. Around the world, investors belonging to different categories look for appealing financial outcomes along with beneficial impact on the ecology and communities (Ahmad et al., 2021).

Corporate objectives are gradually shifting from immediate profit to more long-term value creation due to ethical concerns and the worldwide push towards sustainability. The studies that focus on ESG as a metric for environmental outcomes suggest that businesses that are more environmentally friendly do better in the context of environmental and social factors and generate shareholder value in the long term, so there is no need to choose between "short-term returns and long-term value" (Zumente and Bistrova, 2021). Firm performance and overall ESG risk are negatively correlated. Interestingly, mismanaged ESG risks are the main cause of this detrimental effect, with management gaps having an impact that is around 800% more than that of unmanaged risks. Poorly managed ESG risks have a greater impact in the first year and less in the years to come (Nguyen et al., 2025).

It is understandable why companies are expected to support ESG objectives given their power and capabilities. Corporate operations are the root cause of numerous environmental and social issues. More significantly, businesses are in the greatest position to address a large number of the growing ESG needs. Our expectations of firms in relation to ESG and their capacity to meet these expectations are significantly at odds. The disparity results from the fact that none of the current corporate actors have the necessary drive and expertise to successfully advance ESG objectives (Hannes et al., 2023). The discussion of sustainability, profitability, and environmental harm brought about by power and energy companies has come under scrutiny recently. It is now crucial for businesses, particularly those in the energy-intensive sector, to exercise caution when it comes to their ESG policies because major investors from all over the world are shifting their mindset away from merely increasing profits to a more sustainable and environmentally friendly approach. They run the risk of losing significant investors if they don't devise plans to include ESG into their corporate practices, jeopardising the survival and expansion of these businesses (Dhar, 2023).

Over the past ten years, corporate ESG practices have attracted a lot of scholarly attention. Most of this research focuses on developed nations, even if a sizable portion of the ESG literature examines the connection with "corporate financial performance (CFP)". The data regarding ESG and CFP in developing nations is still lacking, irrespective of the fact that the majority of research conducted in industrialised nations shows a favourable correlation. Therefore, additional study is required in developing nations that are moving in more convergent paths (Janah and Sassi, 2021). Considering this gap, the present study aims to investigate how ESG affect financial performance (FP) in the context of energy-intensive companies in India.

Aims and Objectives

The study primarily examines the relationship between ESG metrics and financial returns in Indian energy-intensive industries.

2 LITERATURE REVIEW

ESG disclosure and practices in Energy-Intensive Industry

Lukács et al. (2025) evaluated 60 company sustainability statements from the Central and Eastern European automotive, energy, and construction industries using "automated text-mining tools" to evaluate ESG disclosure procedures. The results show significant differences in the emphasis of qualitative disclosures across sectors, especially with regard to biodiversity and climate change. Even while the total number of ESG disclosures seems to be the same across industries, there may still be variation because of other factors (such as the disclosures' specificity or quality). Strategic disclosures, including "risk management, goal-setting, and stakeholder impact assessment", are still less often disclosed, despite the fact that ESG subjects like workforce and climate change attract widespread attention.

Yucel and Yucel (2024) offered insightful information about the intricate relationships between the governance (G), social (S), and environmental (E) scores in different energy

industry subsectors. The results demonstrated how social and environmental outcomes had a significant reciprocal impact on all subsectors, including "oil and gas exploration and production and uranium". As stressed by the systems thinking approach, the connection showed feedback loops, whereby changes in one ESG aspect led to alterations in the other two. Thus, in accordance with the "creating shared value (CSV) strategy", energy corporations must implement integrated sustainability plans that simultaneously "address environmental and social issues".

Karlapudi and Reddy (2022) examined the degree to which Indian power sector businesses have incorporated ESG practices and contrasted public and private sector reporting practices. The findings of the Independent Sample and One Sample t-tests demonstrate that the ESG reporting procedures of the "Public and Private Sector Power Companies" differ significantly from one another. The study found that both public and private sector organisations provide more information about the "social and governance components than the environment component". This discrepancy results from the corporations' desire to raise their total disclosure score in order to satisfy stakeholders.

Baratta et al. (2023) showed how improvements in "environmental and governance, along with new social sustainability" laws, might have a major positive impact on industry's carbon emissions. The new innovation idea landscape is rapidly adopting the ESG paradigm. For fighting the negative outcomes of the process of industrialisation, researchers are emphasising the need of green innovation and ethical corporate practices. The research under review represents a remarkable effort to understand a paradigm that promotes "sustainable and inclusive social and environmental development".

ESG Scores and Financial Performance Indicators

Candio (2024a) investigated the potential influence of ESG score on "market-based and accounting-based" financial outcomes metrics. With small positive benefits estimated in the majority of cases, the analytical results indicated that there is a considerable variety of impact across the various ESG scores and metrics of financial success. Amongst the group of listed European firms, the governance score was the one that consistently predicted better financial success out of the three pillars. While the social aspect did not show to have any predictive function for "accounting-based indicators", the environmental component of the score only had an inconsistent impact on these measures.

Candio (2024b) investigates whether CSR mindset moderates the connection between "ESG and financial results". Overall, disparate patterns of impact are found among FP metrics and ESG predictors. The influence of the ESG score on ROA alone was found to be negatively moderated by the presence of a CSR committee, while the equity price was found to be negatively moderated by an outside auditor's review of the CSR report. Sandberg et al. (2023) examined the connection between ESG ratings and the financial results of businesses "operating in the European food sector from 2017 to 2020". The findings point to a moderate but substantial positive relationship between "ESG ratings and financial performance, particularly profitability as determined by ROA and ROE". Domanović (2022) examined the possibility of a relationship between public sector FP metrics and ESG performance indicators. The findings indicate that traditional financial indicators are the primary focus of the Republic of Serbia's public energy sector companies' annual financial statements. While the others only use some ESG indicators, one uses all of them. Nevertheless, there was no discernible positive or direct connection between financial outcome indicators and ESG indices. On the contrary, it is possible that there is no connection between ESG indicators and financial success metrics.

ESG and Its Impact on Financial Returns:

ESG considerations are essential for mitigating climate change. Even though ESG has a direct impact on CFP, energy firms still need to include it in their business planning. The outcome of the study suggested that the ESG performance of energy businesses has a small and adverse influence on their bottom line. On the contrary, an independent assessment of the ESG pillars revealed that "environmental responsibility" had a substantial detrimental impact. On the other hand, the businesses CFP has a positive but not statistically significant relationship with its "corporate social and governance" responsibilities (Makridou et al., 2024).

Meylani and Sari (2024) examine the moderating role of green innovation on the link between ESG practices and financial success in the Indonesian energy industry. The study revealed that although ESG policies by themselves have little influence on FP, green innovation can greatly mitigate negative effects. This implies that, via cost reductions, increased productivity, and enhanced market positioning, green innovation may amplify the

benefits of ESG policies on CFP. The study's findings highlight the necessity of combining green innovation with ESG policies to achieve sustainable financial development, which has significant ramifications for business managers and legislators.

Zhang (2025) investigates the connection between financial outcome and business ESG performance. The findings reveal that financial success is much improved by corporate ESG performance. After taking robustness and endogeneity tests into consideration, this finding remains valid. Subsequent investigation shows that business innovation emphasis has a negative moderating influence on the "link between ESG and financial performance", whereas finance restrictions have a positive moderating effect. According to heterogeneity research, businesses in state-owned companies, high-pollution industries, and eastern areas see a greater positive impact from ESG performance. In addition to creating favourable incentive systems, like tax breaks and government subsidies, to recognise businesses with exceptional ESG performance, regulatory agencies should continue refining ESG evaluation methods to guarantee their scientific rigour, comprehensiveness, and openness.

Iazzolino et al. (2023) examine the potential effects of ESG elements on the FP of a sample of companies from various European industries. The results of the study demonstrated that various industries are affected by ESG variables in different ways, with some being more susceptible to them than others. It is evident that while the "Technology and Consumer sectors have lower ESG risk", the Energy and Materials sectors have higher efficiency values that correlate to higher risk. Since member firms in the energy sector are subject to intensive "social and environmental scrutiny" because of the nature of their operations, it is reasonable to assume that the industry has high levels of ESG risk.

ESG components and financial Outcomes

Li et al. (2024) examine how the FP of businesses in these environmentally intense industries is affected by the installation of ESG systems. The investigation shows that businesses in sectors with major environmental implications see a considerable improvement in their FP when ESG systems are implemented. In particular, "social responsibility programs" increase staff efficiency and the loyalty of customers, investments in environmental protection result in more efficient use of resources, and sound "corporate governance enhances management structures and decision-making procedures". These findings are supported by the case study of Hunan Valin Steel Co., Ltd., which shows that a thorough ESG framework not only assists these businesses in achieving their ecological and community responsibility goals but also significantly enhances their FP.

Al Amosh et al. (2023) examined whether the FP of firms is impacted by their disclosure of ESG characteristics. The outcome shows that the FP metrics are positively impacted by the "environmental and social performance disclosure" as well as the overall ESG disclosure. On the contrary, only the ROA indicators are positively impacted by governance efficiency. This demonstrates how the larger stakeholder groups can put pressure on the business to disclose environmental and social data outside the purview of governance in order to achieve sustainability in a coordinated way. All aspects of sustainability reporting work together to lessen information asymmetry, boost stakeholder confidence, and raise a company's worth.

Assael et al. (2023) examine whether the portion of price returns that cannot be explained by traditional equity factors—particularly the market one—can be explained by ESG scores. The results show that there exists a correlation between price return and disputes. The market capitalisation of a firm has a considerable impact on the average effect of all other ESG scores. Surprisingly, the majority of statistically significant influential ESG scores have a negative impact on the price returns of "small and mid-sized businesses". The ESG score of large-capitalisation enterprises, however, is substantially more favourable.

Research Gap

The ESG investigation progressively revealed a more intricate aspect. Its content is on internal governance and the interplay between many aspects. Still, there is potential for more development (Li et al., 2021). Clarifying the connection between CFP and ESG is essential before talking about how to choose and balance ESG and standard revenue development programs. Yet, the connection between ESG and CFP has received little attention (Zhou et al., 2023). This relationship has yielded mixed findings; some studies have found positive effects, while others have found negative ones, and some have found no meaningful relationship at all. These results emphasise the need for more study into the complex relationship between "governance, social, and environmental" issues and financial success (Salem et al., 2024). Considering this gap, the present

research examines the relationship between ESG metrics and financial returns in Indian energy-intensive industries.

Hypothesis Test

"Hypothesis 1 (H1). There is a significant relationship between ESG score and financial performance".

3 DATA AND METHODOLOGY

Research Design

This study adopted a quantitative research method along with an explanatory research design. According to George and Merkus (2021) explanatory study is a method used to look into why something occurs when there isn't much information accessible. Giannopoulos et al. (2022) conducted a similar study to examine a Norwegian Listed Firms for their ESG disclosure and their impact on financial performance. The regression anyalysis showed mixed results. The analysis was conducted using panel data regression analysis and two proxies for the dependent variable (financial performance)". A similar design has been used for this study.

Sample Size and Period and inclusion of the companies

In the context of this study, the focus has been on energy-intensive sector companies like oil & gas exploration, production, transportation, power generation and transmission, Iron and Steel, Cement, Chemicals and Petrochemicals, Non-Ferrous Metals, Fertilizers, Pulp and Paper, Textiles Companies with min 5 years of ESG records have been included, which are 26 in number. The financial data set is studied over a period of 5 years (2019-2023).

Research Variables

A variable is important when creating quantitative research initiatives. In any investigation, a variable generates more excitement than a constant. Anything that is changeable and/or has several values is called a variable. The variables must be quantified in order to perform an analysis; this entails measuring, providing values, and using a scale (Kaur, 2013). In the context of this study, the following variables are used.

Giannopoulos et al. (2022) indicate that investing in ESG efforts has a major impact on the company's financial success. The increasing investment in ESG activities has a negative impact on ROA, while on Tobin's Q, the influence was positive. Additionally, Tobin's Q may be viewed as a stand-in for growth and long-term success, and ROA as a gauge of financial performance in the short run. Koundouri et al. (2022) demonstrated that businesses with high ESG performance typically had lower beta coefficients, a commonly used indicator of shareholders' risk. This suggests a relatively reduced equity risk, with the exception of the automobile industry. The analysis found that it does not appear to be directly impacted by ESG performance, with the exception of media companies whose ESG leaders have a comparatively better debt-to-equity ratio. Domanović (2022) demonstrates that there is no direct and positive relationship between the use of ESG indicators and financial success in public corporations that report on them in full or in part. Naeem et al. (2022) show that the overall ESG performance of environmentally conscious companies has a positive impact on ROE and Tobin's Q.

Dependent Variables

The variable that is influenced by the independent variable is known as the dependent variable (Kaur, 2013). In the context of this study, dependent variables are

- Return on Assets (ROA%): Calculated as the company's net income divided by average assets.
- Return on Equity (ROE): The Company's net income divided by shareholders' equity.
- Tobin's Q: Company's market value divided by total assets.

Independent Variable

The independent variable is the cause. Its value is unaffected by the other research factors. The dependent variable is the consequence, while the independent variable is the antecedent (Kaur, 2013). In the context of this study, the independent variable is:

- Refinitiv Score (ESG Score): Taken from Refinitiv Repository.

Control Variables

Anything that is restricted or kept constant throughout a research project is called a control variable. Although it is not relevant to the goals of the study, this variable is controlled since it may affect the results (Bhandari, 2021). In the context of this study, the control variables are:

- Leverage: Debt-to-equity ratio.
- Size: Calculated as the natural log of total assets".

Method of Analysis (Empirical Model)

An empirical model is a mathematical representation that is not generated from theory but instead through observations or experiments. It is only valid within the range of operating conditions examined and is usually fitted to data using regression techniques. Empirical models work best

in some situations and are not appropriate for universal applications (Wilson et al., 2018).

"Three variables are chosen to secure accuracy in the hypothesis test – ROA, ROE and Tobin's Q

Empirical Framework:

$$\mathbf{ROA_{it} = b_0 + b_1ESG_{it} + b_2SIZE_{it} + b_3LEV_{it} + \varepsilon}$$

$$\mathbf{ROE_{it} = b_0 + b_1ESG_{it} + b_2SIZE_{it} + b_3LEV_{it} + \varepsilon}$$

$$\mathbf{Tq_{it} = b_0 + b_1ESG_{it} + b_2SIZE_{it} + b_3LEV_{it} + \varepsilon}$$

Here, ROE_{it} ROA_{it} and Tq_{it} are the dependent variables for firm I in period t, and ESG_{it} is the independent variable "ESG score" for firm i in period t. Furthermore, the control variables size and leverage are $SIZE_{it}$ and LEV_{it} for firm i in period t, and ε is the error term". The software that has been used for this analysis is StataNow 18 BE

4 RESULTS AND DISCUSSIONS

Descriptive Statistics

Table 1: Descriptive Statistics

"Variable	Observation	Mean	Std. Dev.	Min	Max
ROA	130	7.82	10.06	-5.95	63.17
ROE	130	15.47	17.43	-32.38	100.67
Tobin's Q	130	3.41	9.96	0	91.70
ESG Rating	130	49.63	13.88	0	80.41
Size	130	11.42	1.61	0	12.98
Leverage	130	0.77	1.29	0	11.37"

From the above table, we can observe that the mean ROE is higher compared to the mean ROA. Tobin's Q, in theory, has an equilibrium around a value of 1. <1: Undervalued and >1: Overvalued. Mean Tobin's Q in the context of companies under investigation is 3.41; hence, they can be considered as overvalued. The mean leverage ratio of 0.773 can be considered good for industry standards.

Hausman Test

To decide whether to use a fixed effect or random effect model for the regression, the Hausman test is employed. The random effects model should be used, according to the null hypothesis. The outcomes are as follows:

Table 2: Hausman Test

"Dependent Variable	Test Summary	Chi-Square	Statistics p-Value
ROA	Random Effect Test	5.25	0.15
ROE	Random Effect Test	5.07	0.17
Tobin's Q	Random Effect Test	1.95	0.58"

Consider p-value is significant at a 5%, the null hypothesis was accepted.

Correlation Analysis

We have conducted a "bivariate correlation analysis presented by the Pearson correlation matrix (PCM) for all the variables in the table below":

Table 3: Correlation Analysis

	"ROA	ROE	Tobin's Q	ESG Rating	Size	Leverage
ROA	1.00					
ROE	0.80	1.00				
Tobin's Q	0.15	0.11	1.00			
ESG Rating	-0.14	-0.08	-0.09	1.00		
Size	0.16	0.09	-0.11	0.25	1.00	
Leverage	-0.25	0.06	0.02	0.06	0.13	1.00''

The above table indicates that ESG ratings are negatively (weakly) correlated with ROE, ROA, and Tobin's Q. Because of their strong correlation, ROE, ROA, and Tobin's Q may exhibit an upward trend in response to an increase in another parameter. Size and ESR rating have a positive correlation, meaning that the larger the company, the better the ESG rating.

Regression Analysis

Table 4: Regression Analysis for ROA

"ROA	Coefficient	Robust Std. Err.	Z	P>lZl	[95% Conf. Interval	
ESG Rating	-0.009	0.059	-0.16	0.87	-0.13	0.11
Size	0.55	0.26	2.03	0.04	0.18	1.1
Leverage	-0.14	0.38	-0.37	0.70	-0.88	0.60
_cons	2.04	4.61	0.44	0.66	-6..99	11.08"

The table concludes that the ROA is significant at 5% based on the p-value, "indicating that the null hypothesis is rejected". The ESG rating coefficient suggests that ROA is weakly and negatively impacted by the ESG rating. On the contrary, Aydoğmuş et al. (2022) discovered that ROA and "ESG scores are positively and significantly correlated". Leverage is negative, but the size shows a favourable relationship with ROA.

Table 5: Regression Analysis for ROE

"ROE	Coefficient	Robust Std. Err.	Z	P>lZl	[95% Conf. Interval	
ESG Rating	-0.052	0.14	-0.36	0.72	-0.34	0.23
Size	1.01	0.86	1.18	0.24	-0.66	2.69
Leverage	2.70	1.13	2.28	0.02	-0.47	4.93
_cons	4.43	11.82	0.37	0.71	-18.75	27.61"

The table concludes that the ROE is significant at 5% based on the p-value, indicating that the "null hypothesis is rejected". Nonetheless, the ESG rating coefficient is negative, suggesting that ROE has been negatively affected by the ESG rating. On similar lines, Buallay (2019) imply that the FP is adversely impacted by corporate governance disclosure. On the contrary, Sandberg (2022) indicates a modest but significant positive relationship between FP, specifically profitability as determined by "ROA and ROE, and ESG ratings". Size and leverage are both positive, suggesting that they have a favourable influence on ROE.

Table 6: Regression Analysis for Tobin's Q

"Tobin's Q	Coefficient	Robust Std. Err.	Z	P>lZl	[95% Conf. Interval	
ESG Rating	-0.040	0.08	-0.48	0.63	-0.21	0.12
Size	-0.03	0.47	-0.07	0.94	-0.96	0.89
Leverage	-0.05	0.64	-0.09	0.93	-1.30	1.19
_cons	5.87	6.70	0.87	0.38	-7.3	19.00"

From the above table, we may infer from the p-value that the null hypothesis is rejected since "the Tobin's Q is significant at 5%". The negative ESG rating coefficient suggests that "Tobin's Q is negatively impacted by the ESG rating". On contrary, Barbieri and Pellegrini (2022) demonstrated that "Tobin's Q is positively impacted by the governance score, while ROA is negatively impacted. Size and leverage are both negative, suggesting that they have a negative impact on Tobin's Q.

5 CONCLUSION

This research investigates the "relationship between ESG metrics and financial returns in the Indian energy-intensive sector". The findings of this research indicate that ESG activities have a negative impact on ROA and ROE. Only after a certain amount of investments and accomplishments does ESG start to pay off. Additionally, ROE and ROA may be understood as the variables that capture the short-term impact, Giannopoulos et al. (2022). The size of the organisation is the most important factor in evaluating and explaining the features of ESG performance. A positive correlation between ROA and ROE demonstrates that a company's ESG performance improves with its size. Additionally, separate panel regression using the oil and gas industry (oil & gas exploration, production, transportation, power generation and transmission) reveals "a positive relationship between ESG rating and Tobin's Q"; however, when energy-intensive organisations are included, the Tobin's Q turns negative.

According to these findings, businesses should deliberately incorporate ESG rather than depending just on it to enhance financial outcomes. ESG disclosure frameworks should be improved by regulators to increase comparability and relevance so that investors may make more educated, fact-based decisions. Future studies might include cross-sectoral and longitudinal analyses, alternative performance indicators, or examine the effects of different ESG components independently. Moderating factors like company size, industry dynamics, or regional legislation may help explain the observed inconsistencies in findings and offer deeper insights into the link between ESG and performance.

It should be noted that availability of ESG scores for the samples over larger time is a limitation in this study. Also, the study may be affected by omitted variables as mentioned by Giannopoulos et al. (2022), since there might be various other financial factors that affect the dependent variables than those used for this study.

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