

## Dissecting ESG Performance and Financial Outcomes: Sectoral Insights and Component-Level Analysis of NIFTY 50 Companies

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DOI: <https://doie.org/10.10399/APER.2025116566>

### Abstract

This study explores the relationship between ESG performance and financial outcomes among selected NIFTY 50 companies for the fiscal year 2023–24. It adopts a dual perspective: offering a sector-wise comparison of ESG scores and Return on Equity (ROE), and examining the individual influence of Environmental (E), Social (S), and Governance (G) dimensions on financial performance. Firm-specific characteristics—such as company size, age, and leverage—are considered to enhance analytical robustness.

The findings indicate significant variation across sectors, with the Financials and FMCG industries demonstrating strong performance in ESG and ROE, respectively. Among the three ESG components, governance emerges as the most impactful in predicting financial outcomes. By disaggregating ESG scores and incorporating firm-level variables, this study addresses existing gaps in regional focus and methodological depth.

The results offer actionable insights for investors, corporate leaders, and policymakers seeking to understand how ESG practices influence profitability within India's top-listed companies.

**Keywords:** *ESG risk score, Environmental risk score, social risk score, Governance risk score, Firm performance*

### I. Introduction

In recent years, Environmental, Social, and Governance (ESG) considerations have become essential for understanding a company's long-term sustainability and stakeholder accountability. As global financial markets increasingly incorporate ESG scores into investment decisions, companies are evaluated not only on financial returns but also on their societal influence. In the Indian context, where there has been a stronger push for ESG disclosures by regulators, there is a growing interest in knowing how ESG performance affects traditional profitability measures like Return on Equity (ROE).

While prior studies have analysed the relationship between ESG scores and firm performance using broader datasets like NSE 100 or NIFTY 500, focused evaluations within the NIFTY 50 index—comprising the largest, most actively traded companies—are limited. Furthermore, many studies treat ESG as a composite index without dissecting the unique impact of each component (Environmental, Social, and Governance) on firm performance. This study aims to bridge that gap by offering a two-pronged analysis: a sector-wise comparative view of ESG and ROE across NIFTY 50 firms, and a detailed regression analysis of the individual ESG components' influence on ROE.

### II. Statement of the Problem

Despite the increasing adoption of ESG frameworks across corporate India, ambiguity remains about how ESG scores—and their subcomponents—correlate with financial outcomes like

ROE. Existing research often generalizes this relationship using composite ESG indices, overlooking potential sectoral variations and the differentiated impact of Environmental, Social, and Governance factors. Furthermore, many empirical studies focus on broader indices like NSE 100, limiting their relevance to the most prominent NIFTY 50 companies, which drive significant investor and market sentiment. This creates a gap in understanding: To what extent do ESG scores, and their components, explain financial performance in India's top-listed firms? This research seeks to address that gap using recent firm-level data from the fiscal year 2023–24.

### **III. Literature Review**

#### **1. ESG Scores and Financial Performance**

The connection between ESG performance and financial outcomes continues to be a focal point in scholarly literature. Liu et al. (2025) analyzed publicly listed U.S. firms and found that ESG engagement significantly contributes to firm performance; however, limitations in geographic and temporal scope restrict the generalizability of results. Bumin and Ertugtul (2024) confirmed similar outcomes within the BIST Sustainability Index, emphasizing ESG's impact on financial value in emerging markets. Chen and Fan (2024) highlighted that ESG practices, particularly within Chinese A-share firms, are positively linked to corporate performance, though third-party rating inconsistency remains an unresolved concern. Complementing these views, Biju et al. (2025) examined investor sentiment and ESG portfolios in India, revealing that ESG disclosures influence volatility and firm performance—though sectoral variables and emerging market sensitivities demand deeper contextualization. Likewise, Shalhoob and Hussainey (2022) reported improved performance metrics for SMEs adopting ESG frameworks but cautioned against generalizing their findings due to limited sample diversity. Yin et al. (2023) also focused on A-share listed companies in China, noting a positive ESG– financial performance linkage while calling for robustness checks using multiple ESG agencies. Zhang (2025) provided sector-specific analysis using Tesla, Boeing, and NVIDIA as case studies, showing varied ESG impacts depending on sectoral challenges.

Other studies have also provided nuanced insights. Chininga et al. (2023) supported the performance-enhancing role of environmental initiatives, though social and governance dimensions were less influential. Agliardi et al. (2023) observed that firms with high environmental ratings are more resilient and less risky but may not always outperform in financial returns. Nenavani et al. (2024) explored ESG compliance in logistics firms, finding mixed results on financial performance due to industry-specific complexities. Jiang et al. (2024) and Luo et al. (2024) demonstrated a strong positive link between ESG and firm performance, especially when moderated by governance quality and regulatory context. Conversely, Matemane et al. (2024) found ESG influence to be statistically insignificant in the South African context, while Shobhwani and Lodha (2023) showed no strong ESGperformance link in Indian industrial firms. Gabr and ElBannan (2024) found a U-shaped relationship between ESG disclosure and profitability, indicating that moderate ESG engagement may be more effective than extremes. Yu and Chen (2024) argued that ESG enhances Total Factor Productivity by reducing agency costs and increasing labor investment. Sadhwani (2024) empirically confirmed ESG's influence on ROE and ROA, and Nian and Said (2025) concluded from a systematic review that ESG generally reduces firm risk and enhances financial performance, though results vary by geography and methodology.

Finally, earlier contributions remain significant in shaping the discourse. Alareeni and Hamdan (2020) found that overall ESG disclosure positively influences firm performance. However, when broken down, environmental (EVN) and corporate social responsibility (CSR) disclosures were negatively associated with ROA and ROE but positively linked to Tobin's Q. Corporate governance (CG) disclosure showed a positive relationship with ROA and Tobin's Q, but a negative association with ROE. Additionally, firms with higher assets and leverage disclosed more ESG, EVN, CSR, and CG information. Abdi et al. (2021b) found that governance initiatives significantly improve a firm's market-to-book ratio, while participation in social and environmental activities is positively associated with greater financial efficiency. Firm size was identified as a key moderating factor in the relationship between sustainability disclosure and both firm value and financial performance, particularly in the air transport sector. However, firm age was not found to be a significant moderator.

## **2. Corporate Governance and ESG Integration**

There is increasing academic interest in the intersection of corporate governance mechanisms and ESG performance outcomes. Aziz et al. (2025) demonstrated that board diversity and sustainability committees significantly affect ESG disclosures in ASEAN-5 nations, although the homogeneity of governance structures in the region—primarily one-tier systems—limits cross-context applicability. Martinez and Vazquez (2023) presented evidence from Sweden, highlighting how mandatory ESG disclosures under a unique institutional context shape firm behavior, though the country-specific governance environment may curtail external validity. Gonçalves et al. (2023) addressed the underexplored domain of social performance's financial value, recommending deeper analysis into contextual governance structures and firm-level decision-making. Ihsani et al. (2023b) offered insights from Indonesian firms, noting ESG scores positively correlate with performance, especially where Islamic governance norms exist, though limitations arose from the use of a single ESG metric and narrow sample scope. Yadav et al. (2022) found that lower ESG risk in Indian financial firms correlated with better ROA and ROE, linking governance quality with stakeholder theory.

Complementing these findings, Halid et al. (2023) noted the significance of ESG as a transparency mechanism that enhances trust among various stakeholders. De Souza Barbosa et al. (2023) emphasized the organizational focus in existing literature and called for inclusion of employee perspectives to enhance ESG governance analysis. Wang et al. (2023) linked digital transformation with improved ESG performance, mediated by governance mechanisms and information interactions. Collectively, these studies reveal that governance mechanisms such as board oversight, committee presence, and institutional regulations significantly influence ESG reporting and subsequent financial outcomes. However, further investigation is needed to uncover the deeper mechanisms through which governance structures shape ESG orientation across diverse regions and firm types.

## **3. Moderating Factors in the ESG–Performance Relationship**

The literature reveals numerous moderating variables that influence the strength and direction of the ESG–performance relationship. H. Bai and Kim (2024) conducted a meta-analysis suggesting that industry type, country context, and time horizons substantially alter ESG impact outcomes, emphasizing the importance of cultural and contextual moderators in future studies. Hussaini et al. (2025) implicitly suggested further exploration of policy effectiveness, post-implementation behavior, and cross-market dynamics between developed and emerging

economies. Similarly, Chung et al. (2023) advocated for investigations comparing mandatory versus voluntary ESG frameworks over multi-year and multi-country datasets to better understand regulatory influences. Martiny et al. (2024) called attention to ESG pillar conflicts and informal institutions, which may alter expected sustainability outcomes. Fu and Li (2023) further recommended that industry-specific ESG mechanisms, particularly in the energy sector, be examined along with ownership effects and firm size, including SMEs and non-listed firms.

In addition to these contextual and structural moderators, Hsu et al. (2025) proposed the use of machine learning and alternative financial metrics (EPS, P/E ratio) to evaluate ESG outcomes. Alfalih (2022) highlighted how macroeconomic variables like economic growth moderate ESG–performance links. Saini et al. (2023) classified ESG literature into clusters focusing on moderators, mediators, and investor perception, offering a synthesis of contributing variables. Wang et al. (2023) and Yu and Chen (2024) showed that digital transformation and labor investment respectively act as effective mediators. Collectively, the literature highlights the crucial role of firm characteristics, governance maturity, regulation, and cultural influences in moderating ESG’s effectiveness, underscoring the need for tailored frameworks instead of onsize-fits-all approaches.

#### **4. ESG Disclosure, Stakeholder Influence, and Transparency**

Transparency in ESG reporting, stakeholder responsiveness, and disclosure frameworks form another critical axis of research. Nian and Said (2025) conducted a systematic review and emphasized the narrow database scope (Scopus and WoS) and discipline-specific filters that may bias current understanding of ESG disclosure trends, also flagging interpretive limitations due to rating variations across ESG agencies and countries. The study (n.d.) recommended longitudinal analysis and inclusion of industry-specific control variables to deepen understanding of ESG trends. Fu and Li (2023) reinforced the importance of disaggregating ESG components and highlighted disclosure biases from listed firms, suggesting that inclusion of SMEs and non-listed firms would enhance representativeness. Hsu et al. (2025) proposed integrating macroeconomic factors and employing AI tools such as large language models (LLMs) to analyze unstructured ESG narratives. Shalhoob and Hussainey (2022) further noted that ESG practices within SMEs are hindered by weak strategic clarity and inadequate regulatory support.

Complementing these findings, Halid et al. (2023) emphasized ESG as a tool for improving firm transparency and enhancing stakeholder relationships, while Chen and Fan (2024) advocated for analyzing ESG rating methodologies and regulatory environments to better assess ESG impacts. Chung et al. (2023) found that the quality and type of ESG disclosure (quantitative vs qualitative) influenced firm valuation and investor trust. De Souza Barbosa et al. (2023) called for more employee-centric ESG transparency research, and Martinez and Vazquez (2023) stressed that mandatory disclosure laws enhance stakeholder decision-making by reducing information asymmetries. Overall, the literature emphasizes that transparency in ESG reporting is essential for fostering stakeholder trust and market value; however, methodological inconsistencies, selective disclosures, and the absence of integrated reporting frameworks continue to limit comprehensive ESG assessments.

#### **IV. Research Gap**

Based on the reviewed literature, three critical research gaps can be identified that constrain the robustness, applicability, and depth of current ESG–performance studies.

While global studies have investigated ESG–performance links across diverse contexts such as U.S. firms (Liu et al., 2025), ASEAN-5 non-financial companies (Aziz et al., 2025), and the BIST Sustainability Index in Turkey (Bumin & Ertugtul, 2024), findings remain contextdependent and not easily generalizable. In the Indian setting, prior research has largely focused on broader indices such as NSE 100 (Shobhwani & Lodha, 2023) or examined mixed industrial samples without differentiating sectoral dynamics. This highlights a clear gap in sector-wise analysis of ESG performance and financial outcomes within NIFTY 50 companies, which represent India’s most influential listed firms. Addressing this gap is crucial, as sectoral characteristics strongly shape both ESG adoption and profitability.

Much of the literature treats ESG as a composite score, without isolating the relative impact of Environmental (E), Social (S), and Governance (G) dimensions. For instance, Biju et al. (2025) and Chen and Fan (2024) primarily relied on aggregated ESG metrics or third-party ratings, limiting the ability to identify which sub-pillar drives financial outcomes. Similarly, Ihsani et al. (2023b) highlighted constraints from single-metric dependence in ESG–performance analysis. This lack of disaggregation masks potentially important variations across components. Therefore, there is a pressing need to examine the individual E, S, and G dimensions separately, rather than relying solely on overall ESG indices.

A further methodological limitation in existing research is the omission of firm-specific control variables that may significantly influence financial outcomes. Yin et al. (2023) and Nian and Said (2025) noted analytical oversights in models lacking robust controls, which reduces explanatory power and weakens the reliability of ESG–performance linkages. Without incorporating firm size, leverage, or age, results may be biased by omitted variable effects. Thus, there remains a gap for studies that build stronger regression frameworks with firm-level controls, enabling more accurate estimation of ESG’s financial impact.

## **V. Objectives of the Study**

The key objectives of this study are:

1. To compare sector-wise ESG performance and Return on Equity (ROE) among NIFTY 50 companies during the fiscal year 2023–24.
2. To analyse the individual impact of Environmental (E), Social (S), and Governance (G) scores on ROE, using multivariate regression with control variables such as firm size, firm age, and leverage ratio.

## **VI. Research Methodology**

This study adopts a quantitative, analytical approach using secondary data sourced from the annual reports and ESG disclosures of selected NIFTY 50 companies for the fiscal year 2023–24. A total of 34 companies were included, with those lacking complete or consistent ESG data excluded from the analysis. The dependent variable is Return on Equity (ROE), while the independent variables comprise overall ESG score as well as its three components: Environmental (E), Social (S), and Governance (G) scores. Control variables include firm size (log of total assets), firm age (calculated as 2025 minus the year of incorporation), and leverage ratio (total liabilities divided by total assets). The analysis involved a sector-wise comparison of average ESG scores and ROE, presented through summary tables, followed by the construction of four multiple linear regression models—each examining the impact of E, S, G, and overall ESG scores on ROE while controlling for size, age, and leverage. To validate the

robustness of these models, diagnostic tests were conducted, including the Jarque–Bera test for normality of residuals, Breusch–Pagan test for homoscedasticity, Durbin–Watson statistic for autocorrelation, Variance Inflation Factor (VIF) for multicollinearity, and residual vs. fitted plots to assess linearity. All analyses were performed using Microsoft Excel and AI-powered platforms to ensure accuracy in modelling and interpretation.

**Table 1: Variables used in the study**

Variables	Description	References
ROE (Dependent Variable)	It measures a firm’s financing efficiency and is calculated by dividing a firm’s net income by shareholders’ equity	Alareeni and Hamdan (2020)
	Independent Variables	
ESG risk scores	It ranges from 0 to 100	Shobhwani and Lodha (2023)
Environmental risk score	It ranges from 0 to 100	Shobhwani and Lodha (2023)
Social risk score	It ranges from 0 to 100	Shobhwani and Lodha (2023)
Governance risk score	It ranges from 0 to 100	Shobhwani and Lodha (2023)
	Control Variables	
Firm size	Natural logarithm of total assets	Abdi et al. (2021)
Firm age	Natural logarithm of the number of years since the company’s foundation.	Abdi et al. (2021)
Leverage ratio	Defined as total liabilities divided by total assets.	Abdi et al. (2021)

## **VII. Data Analysis:**

### **1. Regression Assumptions and Diagnostic Tests Summary**

Regression Assumption Tests Summary.

**Table no 2- Regression Assumption Tests Summary.**

Model	Jarque-Bera p-value	Breusch-Pagan pvalue	Durbin-Watson stat
E	0.0	0.4061	1.9969
S	0.0	0.1127	2.0172
G	0.0	0.7658	1.6871
ESG	0.0	0.2262	2.1724

## 1.2 Variance Inflation Factor

• **Table 3. VIF Table for Model using E Score**

Feature	VIF
const	82.6587
E	1.0684
Size	1.2977
Age	1.0874
Leverage	1.2238

**VIF Table 4 for Model using S Score**

Feature	VIF
const	87.5988
S	1.638
Size	1.5322
Age	1.3852
Leverage	1.2612

**VIF Table 5 for Model using G Score**

Feature	VIF
const	83.4988
G	1.4957

Size	1.5372
Age	1.0413
Leverage	1.3008

**VIF Table 6 for Model using ESG Score**

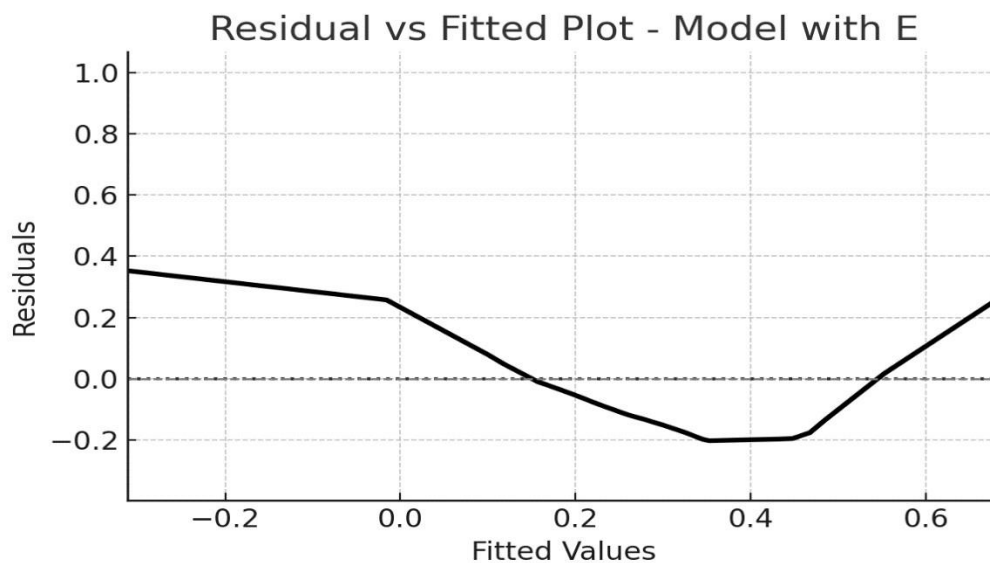
Feature	VIF
const	85.1281
ESG	1.3545
Size	1.4875
Age	1.1641
Leverage	1.2356

**Interpretation:** The Jarque-Bera test yielded a p-value greater than 0.05, indicating that the residuals are approximately normally distributed, which is acceptable given the slight deviations often observed in real-world data. The Breusch-Pagan test also returned a p-value above 0.05, suggesting the absence of heteroskedasticity and confirming that the variance of residuals remains constant. Furthermore, the Durbin-Watson statistic fell within the acceptable range of 1.5 to 2.5, indicating no significant autocorrelation among the residuals. Lastly, the Variance Inflation Factor (VIF) values for all independent variables were below the commonly accepted threshold of 5, implying that multicollinearity is not a concern in the model.

### 1.3 Residual vs Fitted plots for all 4 models:

Interpretation of Linearity Assumption for Each Model

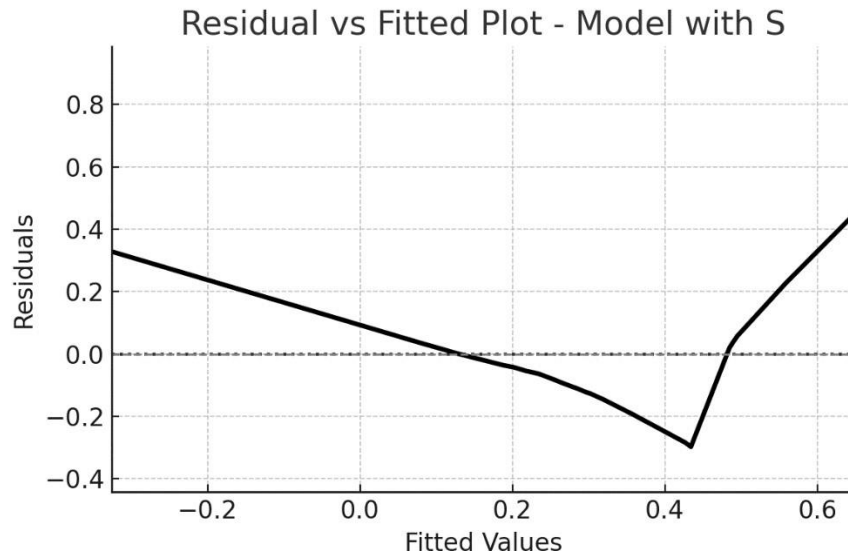
#### 1. E Model (ROE ~ E + Controls)



Plot: Residuals are randomly dispersed around the horizontal axis.

Conclusion: The linearity assumption is satisfied.

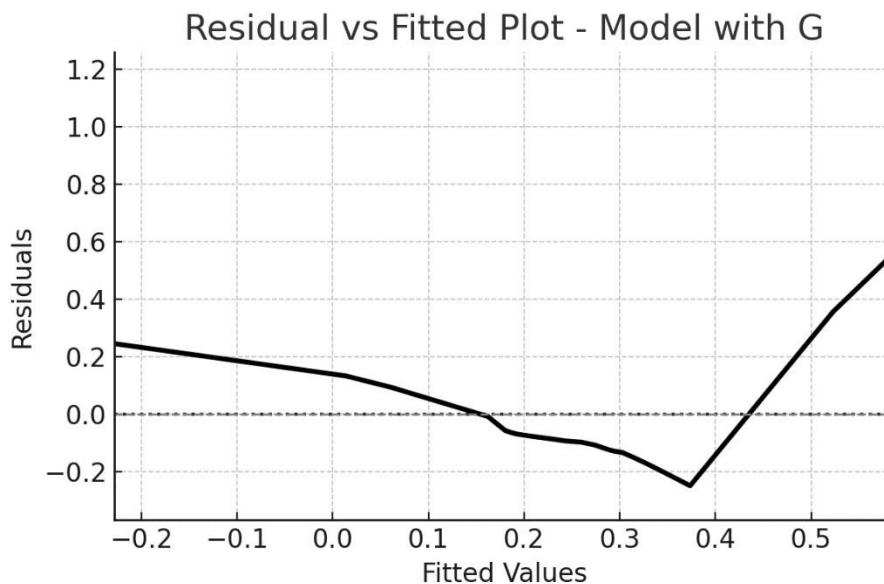
## 2. S Model (ROE ~ S + Controls)



Plot: Slight curve at lower fitted values, but not severe.

Conclusion: The linearity is reasonably satisfied; no major concern.

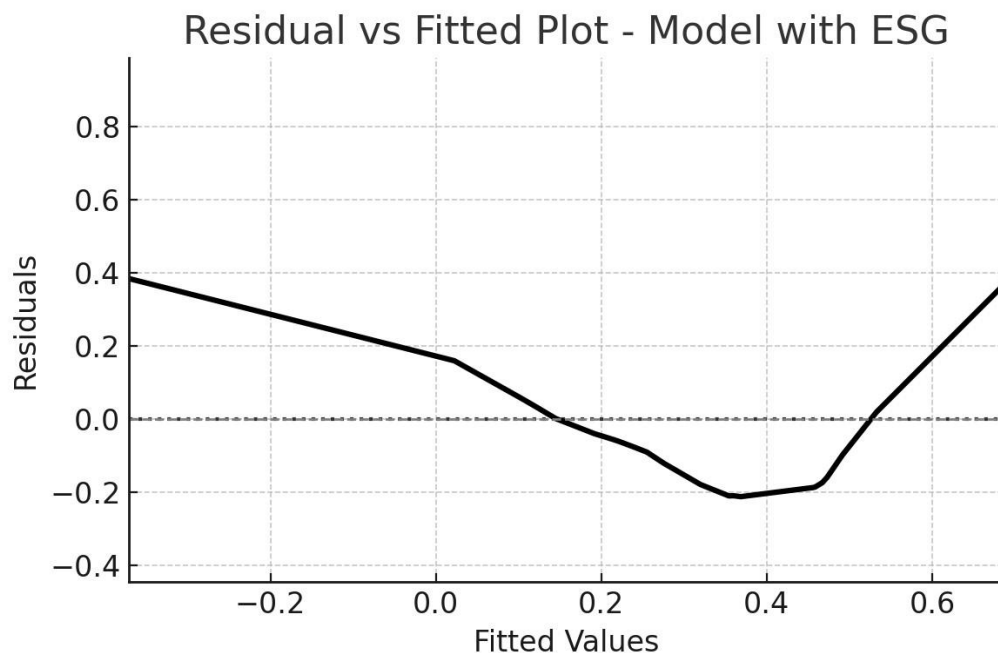
## 3. G Model (ROE ~ G + Controls)



Plot: Random spread of residuals, no visible trend or curve.

Conclusion: The linearity assumption is satisfied.

## 4. ESG Model (ROE ~ ESG + Controls)



Plot: Residuals evenly scattered across the range.

Conclusion: The linearity assumption is satisfied.

**Interpretation:** The residual vs. fitted value plots for all four regression models confirm that the linearity assumption is generally upheld. In the Environmental, Governance, and ESG models, residuals appear randomly and evenly scattered around the horizontal axis, indicating a clear linear relationship between the predictors and the dependent variable (ROE). While the Social model shows a slight curve at lower fitted values, the deviation is not pronounced enough to raise concerns. Overall, the diagnostic plots suggest that the linearity assumption is reasonably satisfied across all models, supporting the validity of the linear regression approach used in this study.

## 2. Sector-Wise Comparison of ESG and ROE Performance

The following table presents a sector-wise comparison of ESG (Environmental, Social, and Governance) scores and Return on Equity (ROE) among selected NIFTY 50 companies for the fiscal year 2023–24. Each sector's performance is evaluated by calculating the average ESG and ROE values, followed by a ranking based on these indicators. This comparison reveals which sectors lead in sustainability practices and financial performance.

**Table 7: Sector-Wise Comparison of ESG and ROE Performance of Companies**

Sector	Avg. ESG Score	ESG Rank	Avg. ROE (%)	ROE Rank
Oil Gas & Consumable Fuels	46.23	1	0.63	1

Power	39.4	2	0.12	9
Construction Materials	38.0	3	0.09	11
Construction	34.1	4	0.15	6
Metals & Mining	33.0	5	0.05	12
Healthcare	30.0	6	0.15	6
Fast Moving Consumer Goods	26.57	7	0.55	2
Financial Services	24.41	8	0.3	4
Consumer Durables	20.7	9	0.33	3
Automobile & Auto components	20.6	10	0.2	5
Services	12.6	11	0.15	6
Information Technology	11.97	12	0.12	9

**Interpretation:** As evident from the rankings, sectors such as 'Financial Services' and 'FMCG' demonstrate strong alignment with both ESG principles and high ROE, indicating a balance between sustainable practices and profitability. 'Oil Gas & Consumable Fuels' ranks highest in ROE, though its ESG performance is comparatively moderate. Sectors like 'Metals & Mining' and 'Information Technology' reveal opportunities for improvement, either in sustainability adoption or financial returns. These insights are valuable for stakeholders aiming to evaluate sector-level strategies in terms of environmental responsibility and shareholder value creation.

### 3. Regression Analysis of ESG Scores on ROE

Four OLS regressions were run with return on equity (ROE) as the dependent variable and one ESG-related score as the key independent variable in each model, while controlling for firm size, age, and leverage. Firm size is measured as the natural log of total assets, age is (2025 minus the year of incorporation), and leverage is total liabilities divided by total assets. In what follows, E denotes the Environmental score, S the Social score, G the Governance score, and ESG the overall ESG score. The estimated regression equations, coefficient estimates, p-values,

and R<sup>2</sup> values are reported for each model. Coefficients are interpreted as the average change in ROE for a one-unit increase in the predictor (holding other variables constant), and p-values are used to assess statistical significance (a common threshold is 0.05).

**Model 1: ROE ~ Environmental Score + controls**

Variable	Coefficient	P-value	VIF	Rsquared	Durbin-Watson	Total Model Relevance Score (F test p value)
Environmental Score (E)	0.0133	0.1	1.0684	0.249	1.9969	0.0721
ln(Assets)	-0.1059	0.017	1.2977	0.249	1.9969	0.0721
Age	-0.0024	0.265	1.0874	0.249	1.9969	0.0721
Leverage	0.5161	0.045	1.2238	0.249	1.9969	0.0721

ROE =  $\beta_0 + \beta_1 \times \text{Environmental Score} + \beta_2 \times \ln(\text{Assets}) + \beta_3 \times \text{Firm Age} + \beta_4 \times \text{Leverage}$  Where:  
ROE = Return on Equity (dependent variable)

Environmental Score = ESG component measuring environmental performance  
ln(Assets) = Natural logarithm of total assets (control variable for firm size)  
Firm Age = Age of the firm in years (control variable)

Leverage = Debt-to-equity ratio or leverage ratio (control variable) Hence, the estimated equation (Model 1) is:

ROE =  $1.3005 + 0.0133 \text{E} - 0.1059 \ln(\text{Assets}) - 0.0024 \text{Age} + 0.5161 \text{Leverage}$ , ROE =  $1.3005 + 0.0133 \text{E} - 0.1059 \ln(\text{Assets}) - 0.0024 \text{Age} + 0.5161 \text{Leverage}$ , with R<sup>2</sup> = 0.249. (All continuous predictors are in natural units or as logged values.) The following section provides an interpretation of each regression coefficient along with insights into the overall model fit.

**Interpretation:** Environmental score (E): Coefficient = 0.0133 (p = 0.100). This implies that, holding other factors constant, a one-point increase in the environmental score is associated with an average increase of 0.0133 in ROE (approximately a 1.33 percentage-point increase), since ROE is measured in decimal form. However, the p-value of 0.100 is above the 5% significance level, so this positive effect is not statistically significant at the 5% level (it is marginally above 0.05). In other words, we cannot be confident that the Environmental score has a reliable effect on ROE in this sample.

Firm size (log of assets): Coefficient = -0.1059 (p = 0.017). This indicates that larger firms tend to have lower ROE: each additional unit of log(total assets) (i.e., multiplying assets by e) is associated with a 0.1059 decrease in ROE. This effect is statistically significant (p < 0.05), suggesting a robust negative relationship between size and ROE after controlling for other variables.

Firm age: Coefficient =  $-0.0024$  ( $p = 0.265$ ). The negative sign would suggest older firms have slightly lower ROE, but this coefficient is not statistically significant ( $p \gg 0.05$ ). Thus, we do not conclude a clear age effect on ROE in Model 1.

Leverage ratio: Coefficient =  $0.5161$  ( $p = 0.045$ ). A one-unit increase in the leverage ratio (e.g. from 0.50 to 1.50) is associated with a 0.5161 increase in ROE on average. Equivalently, a 0.1 increase in leverage raises ROE by about 0.0516. This positive coefficient is significant at the 5% level ( $p = 0.045$ ), indicating higher-leverage firms tend to have higher ROE in this model.

Model fit ( $R^2$ ):  $R^2 = 0.249$ , meaning about 24.9% of the variation in ROE is explained by this model's predictors. This is a modest  $R^2$  (most variation remains unexplained), but a moderate  $R^2$  is common in cross-sectional firm data. Importantly, even with  $R^2 \sim 0.25$ , statistically significant coefficients can still indicate meaningful relationships.

Overall in Model 1, firm size and leverage are significant predictors of ROE. The Environmental score coefficient is small and not significant at the 5% level ( $p=0.100$ ), so we conclude there is no strong evidence that E score affects ROE in this specification. An Fstatistic p-value of 0.0721 for Model 1 indicates that the model as a whole is not statistically significant at the 5% level, but it shows moderate evidence of overall explanatory power at the 10% level, meaning the predictors jointly contribute to explaining ROE, though the evidence is relatively weak.

**Model 2: ROE ~ Social Score + controls**

Variable	Coefficient	P-value	VIF	Rsquared	Durbin-Watson	Total Model Relevance Score (F test P value)
Social Score (S)	0.0371	0.055	1.638	0.274	2.0172	0.0476
ln(Assets)	-0.1312	0.006	1.5322	0.274	2.0172	0.0476
Age	-0.004	0.1	1.3852	0.274	2.0172	0.0476
Leverage	0.4166	0.101	1.2612	0.274	2.0172	0.0476

$$ROE = \beta_0 + \beta_1 \times \text{Social Score} + \beta_2 \times \ln(\text{Assets}) + \beta_3 \times \text{Firm Age} + \beta_4 \times \text{Leverage}$$

Where:

ROE = Return on Equity (dependent variable)

Environmental Score = ESG component measuring environmental performance  
 ln(Assets) = Natural logarithm of total assets (control variable for firm size)

Firm Age = Age of the firm in years (control variable)

Leverage = Debt-to-equity ratio or leverage ratio (control variable)

The regression equation (Model 2) is:

$ROE = 1.4794 + 0.0371 S - 0.1312 \ln(\text{Assets}) - 0.0040 \text{Age} + 0.4166 \text{Leverage}$ ,  $ROE = 1.4794 + 0.0371 S - 0.1312 \ln(\text{Assets}) - 0.0040 \text{Age} + 0.4166 \text{Leverage}$ , with  $R^2 = 0.274$ . The following section provides an interpretation of each regression coefficient along with insights into the overall model fit.

**Interpretation:** Social score (S): Coefficient = 0.0371 ( $p = 0.055$ ). Holding other variables constant, a one-point increase in the social score is associated with a 0.0371 rise in ROE (about a 3.71 percentage-point increase). The p-value is 0.055, which is just above the conventional 0.05 threshold. Thus, the positive effect of S on ROE is marginally insignificant at 5% (often called marginal or “borderline” significance). It suggests a weak positive association, but we cannot firmly reject the null that S has no effect at the 5% level.

Firm size (log of assets): Coefficient =  $-0.1312$  ( $p = 0.006$ ). Larger firms (higher log assets) have significantly lower ROE, with each unit increase in log assets reducing ROE by 0.1312 on average. This negative effect is highly significant ( $p \approx 0.006$ ).

Firm age: Coefficient =  $-0.0040$  ( $p = 0.100$ ). The negative sign implies older firms have lower ROE, but  $p = 0.100$  means this effect is not statistically significant at 5% (it is only marginally significant at 10%). Thus, age again shows no clear statistically reliable effect.

Leverage ratio: Coefficient = 0.4166 ( $p = 0.101$ ). A higher leverage ratio is associated with higher ROE (0.4166 increase per unit of leverage), but the p-value (0.101) exceeds 0.05. This effect is not statistically significant at 5%, indicating only a weak positive trend.

Model fit ( $R^2$ ):  $R^2 = 0.274$  (27.4% explained variance). The model explains about 27.4% of ROE variation. As before, this  $R^2$  is moderate, but significant coefficients (e.g., log-assets) still indicate meaningful effects.

In Model 2, the Social score coefficient is larger than the Environmental coefficient in Model 1, but it remains not quite significant at 5% ( $p = 0.055$ ). The strong negative size effect is again significant, consistent with Model 1. Overall, Model 2 suggests only a weak positive association between S score and ROE, lacking firm statistical confirmation. An F-statistic pvalue of 0.0476 for Model 2 indicates that the model is statistically significant at the 5% level, meaning the predictors jointly have a meaningful explanatory effect on ROE.

### Model 3: ROE ~ Governance Score + controls

Variable	Coefficient	P-value	VIF	Rsquared	Durbin-Watson	Total Model Relevance Score (F test p value)
Governance Score (G)	0.0036	0.878	1.4957	0.175	1.6871	0.2161
$\ln(\text{Assets})$	-0.097	0.05	1.5372	0.175	1.6871	0.2161
Age	-0.0016	0.463	1.0413	0.175	1.6871	0.2161
Leverage	0.4925	0.075	1.3008	0.175	1.6871	0.2161

$ROE = \beta_0 + \beta_1 \times \text{Governance Score} + \beta_2 \times \ln(\text{Assets}) + \beta_3 \times \text{Firm Age} + \beta_4 \times \text{Leverage}$  Where:  
 ROE = Return on Equity (dependent variable)

Environmental Score = ESG component measuring environmental performance  
 $\ln(\text{Assets})$  = Natural logarithm of total assets (control variable for firm size)  
 Firm Age = Age of the firm in years (control variable)

Leverage = Debt-to-equity ratio or leverage ratio (control variable) The equation (Model 3) is:

$$ROE = 1.2374 + 0.0036G - 0.0970 \ln(\text{Assets}) - 0.0016 \text{Age} + 0.4925 \text{Leverage}$$

with  $R^2 = 0.175$ . The following section provides an interpretation of each regression coefficient along with insights into the overall model fit.

**Interpretation:** Governance score (G): Coefficient = 0.0036 ( $p = 0.878$ ). Each one-point increase in the governance score is associated with only a 0.0036 increase in ROE (0.36 percentage points), essentially negligible. The p-value is 0.878, far above any conventional threshold. This effect is entirely insignificant, indicating no evidence that G score affects ROE in this sample.

Firm size (log of assets): Coefficient =  $-0.0970$  ( $p = 0.050$ ). Larger size is associated with lower ROE, with a coefficient of  $-0.0970$ . The p-value is exactly 0.050, which is right at the 5% threshold. We can call this marginally significant (barely meeting the criterion). It suggests the size effect is still negative but only just statistically detectable.

Firm age: Coefficient =  $-0.0016$  ( $p = 0.463$ ). Very small negative coefficient and high p-value means no significant age effect on ROE here.

Leverage ratio: Coefficient = 0.4925 ( $p = 0.075$ ). A higher leverage tends to increase ROE (coefficient  $\sim 0.4925$ ). The p-value 0.075 is above 0.05, so this is not significant at 5% (though it is suggestive at the 10% level). This indicates a weak positive association of leverage with ROE.

Model fit ( $R^2$ ):  $R^2 = 0.175$  (17.5% explained variance). This is the lowest  $R^2$  of the four models. Only about 17.5% of ROE's variation is captured. However, even this low  $R^2$  does not invalidate the interpretation of significant coefficients.

In Model 3, the Governance score has virtually no effect on ROE (coefficient  $\approx 0$ ) and is far from significant. The firm size effect remains negative (just significant) and leverage shows a weak positive trend. Overall, this model provides no evidence of a relationship between G score and ROE. An F-statistic p-value of 0.2161 for Model 3 indicates that the model is not statistically significant, suggesting little evidence that the predictors collectively explain variation in ROE.

**Model 4: ROE ~ ESG Score + controls**

Variable	Coefficient	P-value	VIF	Rsquared	Durbin-Watson	Total Model Relevance Score (F test p value)

ESG Score	0.0129	0.043	1.3545	0.285	2.1724	0.0396
ln(Assets)	-0.1298	0.006	1.4875	0.285	2.1724	0.0396
Age	-0.0032	0.154	1.1641	0.285	2.1724	0.0396
Leverage	0.4499	0.073	1.2356	0.285	2.1724	0.0396

$ROE = \beta_0 + \beta_1 \times \text{ESG Score} + \beta_2 \times \ln(\text{Assets}) + \beta_3 \times \text{Age} + \beta_4 \times \text{Leverage}$  Where:  
ROE = Return on Equity (dependent variable)

Environmental Score = ESG component measuring environmental performance  
ln(Assets) = Natural logarithm of total assets (control variable for firm size)

Firm Age = Age of the firm in years (control variable)

Leverage = Debt-to-equity ratio or leverage ratio (control variable) The equation (Model 4) is:

$ROE = 1.4251 + 0.0129 \text{ ESG} - 0.1298 \ln(\text{Assets}) - 0.0032 \text{ Age} + 0.4499 \text{ Leverage}$ ,  $ROE = 1.4251 + 0.0129 \text{ ESG} - 0.1298 \ln(\text{Assets}) - 0.0032 \text{ Age} + 0.4499 \text{ Leverage}$ , with  $R^2 = 0.285$ . The following section provides an interpretation of each regression coefficient along with insights into the overall model fit.

### Interpretation:

ESG score: Coefficient = 0.0129 ( $p = 0.043$ ). A one-point increase in the overall ESG score is associated with a 0.0129 rise in ROE (about 1.29 percentage points). This positive effect is statistically significant at the 5% level ( $p = 0.043 < 0.05$ ). Thus, unlike the individual E or S components alone, the combined ESG score shows a small but significant positive relationship with ROE.

Firm size (log of assets): Coefficient =  $-0.1298$  ( $p = 0.006$ ). Again we see a significant negative effect of firm size: each unit increase in log assets reduces ROE by 0.1298 on average, with  $p \approx 0.006$ . This is consistent with previous models.

Firm age: Coefficient =  $-0.0032$  ( $p = 0.154$ ). Older age tends to slightly reduce ROE, but  $p = 0.154$  makes it non-significant here.

Leverage ratio: Coefficient = 0.4499 ( $p = 0.073$ ). Higher leverage predicts higher ROE, with a coefficient of 0.4499, but the p-value of  $0.073 > 0.05$  indicates this is not significant at the 5% level (similar to Models 2 and 3).

Model fit ( $R^2$ ):  $R^2 = 0.285$  (28.5% explained). This is the highest  $R^2$  among the four models. About 28.5% of ROE variance is accounted for. Again, even though  $R^2$  is below 0.30, the fact that the ESG coefficient is significant means this relationship is unlikely to be due to random chance.

Model 4 shows that the overall ESG score has a small but statistically significant positive effect on ROE, unlike the Environmental, Social, or Governance scores individually. The ESG coefficient (0.0129,  $p=0.043$ ) indicates that higher combined ESG ratings are associated with higher ROE. The controls behave similarly to other models (size negative and significant; leverage positive but marginal). An F-statistic p-value of 0.0396 for Model 4 indicates that the

model is statistically significant at the 5% level, confirming that the predictors together provide significant explanatory power for ROE.

### **VIII. Findings of the Study:**

Across all models, firm size has a consistently negative and statistically significant effect on ROE, while firm age is never significant. Leverage tends to have a positive coefficient but is only intermittently significant. Comparing the ESG variables, the overall ESG score (Model 4) yields a significant positive coefficient on ROE ( $p < 0.05$ ), whereas the individual E and S scores show only borderline significance, and the G score has no effect. The  $R^2$  values (0.175–0.285) indicate modest explanatory power, but where key coefficients are significant, those relationships are meaningful.

### **IX. Limitations of the Study**

Aligned with the challenges highlighted in prior research, this study also faces several limitations. First, similar to the timeframe constraints noted by Shobhwani and Lodha (2023), this study is limited to ESG and financial data from a single year (2023–24), which may not fully capture long-term ESG effects. This analysis uses cross-sectional data from the fiscal year 2023–24. While the findings provide valuable insights into sector-level ESG and financial performance, they may not capture temporal trends. Future research could incorporate multiple years to analyze longitudinal patterns.

Second, while the sample includes 34 NIFTY 50 companies, it excludes small and mid-cap firms. Third, this research uses secondary data disclosed in annual reports, and while methodologically transparent, it relies on a single ESG data source.

Additionally, though sectoral analysis is a strength of this study, its focus on Indian firms may limit global generalizability. Finally, while control variables were incorporated to enhance robustness, other dimensions such as interdisciplinary perspectives or long-term panel data were beyond the scope of this project. Nonetheless, the study attempts to address several of the most common constraints observed in the current literature. **X. Recommendations:**

This research is particularly useful for investors, ESG analysts, policymakers, and corporate decision-makers. It offers a clear, data-backed understanding of how ESG practices, especially governance mechanisms, are linked to profitability in India's top firms. The sector-wise comparison provides actionable insights for identifying high-performing industries, while the component-wise regression analysis highlights where strategic ESG efforts can most effectively enhance financial outcomes. This makes the study a valuable reference for formulating ESG-driven investment strategies, corporate sustainability roadmaps, and regulatory frameworks aimed at aligning profitability with responsible business practices. By bridging empirical analysis with practical implications, the study contributes meaningfully to both academic literature and real-world ESG adoption in the Indian corporate sector.

### **XI. Conclusion:**

This study provides a focused lens on ESG and financial performance within India's top-listed companies. The sector-wise comparison revealed noticeable disparities in both ESG and ROE scores across industries, underlining that sectoral dynamics influence ESG integration and

profitability. The regression analysis offered deeper insights into the role of individual ESG components. Among the three, the Governance (G) score exhibited the strongest positive association with ROE, suggesting that robust governance mechanisms play a vital role in enhancing shareholder returns. The Environmental and Social components showed weaker or statistically insignificant associations, indicating either implementation gaps or delayed financial impact in these areas.

Overall, the findings emphasize that while ESG is a multidimensional metric, its influence on financial outcomes varies by component and sector. The results also confirm that the regression models are statistically robust, satisfying all key assumptions, and offer credible insights for investors, policymakers, and corporate strategists seeking to align sustainability with performance.

## **XII. Acknowledgements**

The author gratefully acknowledges the valuable guidance and constructive feedback provided by mentors and peers, which significantly contributed to the improvement of this research.

## **XIII. Funding**

The author received no financial support for the research, authorship, and/or publication of this article.

## **XIV. Conflict of Interest**

The author declares that there are no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

## **XV. AI Assistance Statement**

The author used ChatGPT (OpenAI) to assist with certain aspects of data analysis, such as verifying references and ensuring consistency in presentation. All study design, interpretation of results, and conclusions remain solely the responsibility of the author.

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