



(RESEARCH ARTICLE)



## Do ESG scores reflect financial performance? A confidence interval-based analysis of Nifty50 Companies

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### Abstract

This paper examines the association between Environmental, Social, and Governance (ESG) risk scores and accounting-based measures of financial performance—specifically Return on Assets (ROA) and Return on Equity (ROE)—across a selected sample of Indian firms listed in the Nifty50 index. As ESG becomes an integral part of investment screening, understanding its financial implications is vital. Drawing on publicly available ESG risk ratings and financial data, this research applies statistical methods grounded in accounting theory and implements them using Python-based tools such as confidence interval estimation and t-tests. The analysis reveals that firms with higher ESG risk (lower ESG compliance) do not necessarily underperform; in fact, they show slightly higher average profitability. This introduces skepticism about the assumed short-term financial superiority of ESG-aligned companies and suggests a need for deeper accounting-integrated ESG analysis.

**Keywords:** ESG scores; Financial performance; Nifty50 companies; Return on Assets; Return on Equity; Sustainable investing

### 1. Introduction

In recent years, ESG investing has gained unprecedented momentum, transforming from a niche ethical concern into a mainstream investment strategy. Stakeholders—including asset managers, regulators, and consumers—now increasingly evaluate firms not only on financial parameters but also on their environmental stewardship, social responsibility, and governance structure. This paradigm shift has prompted corporations to align their operations with ESG frameworks to attract investment and enhance reputation.

However, despite ESG's rising prominence, its direct linkage to short-term financial performance remains ambiguous. While it is widely hypothesized that ESG compliance leads to superior operational efficiencies, risk mitigation, and stakeholder trust—all of which could translate into better financial performance—evidence remains mixed and often context-specific. Particularly in emerging economies like India, the relationship between ESG scores and traditional financial metrics such as ROA and ROE has not been fully explored in a statistically robust manner.

This study bridges that gap by employing a data-driven, reproducible approach to test whether ESG performance is a meaningful predictor of accounting profitability. The goal is to critically examine the widely held assumption that ESG-compliant firms always perform better financially, by comparing a select group of Nifty50 companies based on their ESG risk classifications.

#### *Research Objectives*

The objectives of this study are as follows:

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- To examine whether ESG risk scores are associated with accounting-based measures of financial performance, specifically Return on Assets and Return on Equity, for a selected sample of firms listed on India's Nifty50 index.
- To compare the profitability of firms across different ESG risk classifications by analyzing differences in ROA and ROE using statistical inference techniques.
- To evaluate the extent to which ESG risk scores reflect short-term financial performance in the context of an emerging market.

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## 2. Literature Review

The relationship between ESG performance and firm profitability has been the subject of extensive academic scrutiny. Friede et al. (2015) conducted a meta-analysis of over 2,000 empirical studies and reported that the vast majority indicate a non-negative or positive correlation between ESG factors and financial outcomes. Similarly, Khan, Serafeim, and Yoon (2016) found that firms performing well on material ESG dimensions consistently outperformed peers in terms of stock returns and accounting profitability.

Conversely, a growing body of work challenges these findings. Revelli and Viviani (2015) observed that while ESG-focused funds may deliver ethical value, their financial performance does not necessarily exceed that of conventional portfolios. Some scholars argue that ESG compliance could even hinder performance in the short term due to increased operational costs, compliance burdens, or misallocation of capital toward non-core initiatives.

Importantly, many existing studies either lack methodological rigor—particularly in the context of statistical validation—or focus exclusively on developed markets. Few incorporate advanced statistical methods like confidence interval analysis and t-tests to evaluate the impact of ESG on accounting-based indicators such as ROA and ROE. This study fills that gap by applying these tools using Python, ensuring transparent, reproducible, and statistically meaningful results.

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## 3. Research Methodology

### 3.1. Sample and Data Sources

This research draws on a sample of 20 prominent companies from India's Nifty50 index, selected to ensure sectoral diversity and data completeness. The companies studied are:

- Infosys Ltd.
- Hindustan Unilever Ltd.
- Tata Steel Ltd.
- State Bank of India
- ICICI Bank Ltd.
- ITC Ltd.
- Wipro Ltd.
- Tata Consultancy Services (TCS)
- Bajaj Finance Ltd.
- Axis Bank Ltd.
- NTPC Ltd.
- Larsen & Toubro Ltd. (L&T)
- HCL Technologies Ltd.
- Tech Mahindra Ltd.
- Nestlé India Ltd.
- UltraTech Cement Ltd.
- Sun Pharmaceutical Industries Ltd.
- Coal India Ltd.
- Power Grid Corporation of India Ltd.
- Mahindra & Mahindra Ltd.

Publicly available ESG risk scores for 2024 were used to classify the firms, while financial data (ROA and ROE) was sourced from Yahoo Finance and Moneycontrol.

### 3.2. ESG Group Classification

Firms were grouped into two categories based on their ESG risk scores:

- **High ESG Group:** Firms with ESG risk scores below the median (i.e., lower risk).
- **Low ESG Group:** Firms with ESG risk scores equal to or above the median (i.e., higher risk).

### 3.3. Statistical Tools

All computations were performed using Python:

- **Pandas** for data handling,
- **NumPy** for numerical operations,
- **SciPy** for statistical tests, and
- **Matplotlib** for visualizations.

Statistical techniques applied:

- **Confidence intervals (95%)** to measure precision around the group means
- **Independent-sample t-tests** to test for significance between group means

This ensures methodological transparency and reproducibility of results.

## 4. Results

**Table 1** Group-Wise Confidence Intervals and T-Tests

Metric	ESG Group	Mean (%)	95% Confidence Interval	p-value
ROA	High ESG	11.62	[4.65, 18.59]	0.701
ROA	Low ESG	13.16	[7.57, 18.75]	
ROE	High ESG	22.25	[15.20, 29.30]	0.351
ROE	Low ESG	31.43	[11.29, 51.57]	

Although Low ESG firms show marginally higher average ROA and ROE, the p-values indicate no statistically significant difference between the two groups.

## 5. Discussion

The findings raise important questions about the perceived financial benefits of ESG compliance. While firms with lower ESG performance were expected to underperform, the opposite trend—though statistically insignificant—was observed. This warrants deeper analysis and may point to three key explanations:

- **Delayed Realization of ESG Benefits:** ESG investments may not yield immediate financial returns. The benefits, such as improved risk management or long-term brand equity, may manifest only over extended periods. In short-term financial metrics like ROA and ROE, these effects remain latent.
- **Greenwashing and Symbolic Compliance:** Some firms may engage in greenwashing—making ESG claims without substantive implementation. These companies might appear ESG-compliant without incurring associated operational costs, thus preserving financial performance while improving their public image.
- **Market Inefficiencies in ESG Pricing:** Particularly in emerging markets, ESG factors may not yet be fully integrated into investor valuation models. As a result, firms with poor ESG performance might still receive strong investor support based on traditional metrics, masking potential ESG-related risks.

Collectively, these factors suggest a need to reevaluate how ESG risk is interpreted in relation to accounting performance and encourage a more nuanced view that accounts for temporal, sectoral, and regional differences.

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## 6. Conclusion

This study tested the assumption that strong ESG performance correlates with superior financial outcomes using a data-driven comparison of 20 firms from India's Nifty50 index. Contrary to expectations, firms with higher ESG risk showed slightly better short-term accounting performance (ROA and ROE), though not to a statistically significant degree. These findings challenge the blanket assumption that ESG excellence ensures immediate financial outperformance.

The results underscore the importance of context, time horizon, and implementation depth in evaluating ESG effectiveness. More comprehensive longitudinal studies are needed to determine whether these trends persist over time and whether ESG investments indeed pay off in the long term. Meanwhile, the potential for greenwashing and investor mispricing remains a critical area for future research.

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## Compliance with ethical standards

### *Disclosure of conflict of interest*

The authors declare that there is no conflict of interest regarding the publication of this research.

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