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Return Efficiency of ESG Themed Equity Indices in India: A Comparative Study with the Nifty 100 Benchmark

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Abstract:

ESG-themed indices serve as benchmarks for evaluating the performance of companies that align with sustainable practices. The growing prominence of environmental, social, and governance (ESG) considerations in investment strategies has raised concerns about the financial competitiveness of ESG indices compared to the conventional benchmarks.

This study provides an empirical assessment of the performance efficiency of ESG-themed indices in India by comparing leading indices, including the Nifty 100 ESG Index and the Nifty 100 Enhanced ESG Index. The Nifty 100 has been used as a conventional benchmark. Daily data for one year were analysed using three established risk-adjusted performance measures, namely Sharpe Ratio, Treynor Ratio, and Jensen's Alpha. To evaluate the return efficiency among select indices, paired sample t-tests were applied.

Findings suggest that ESG indices in India underperformed relative to the Nifty 100 in terms of total risk–return efficiency and excess return generation. Again, in the case of systematic risk, the ESG indices remained comparable with the Nifty 100. In conclusion, ESG indices are nuanced in function and are gaining attention from socially responsible investors tremendously, and, hence, the study contributes to the emerging body of literature on ESG performance in developing markets and offers practical implications for investors, fund managers, and policymakers seeking to align sustainable finance with financial performance objectives.

Keywords: ESG indices, Nifty 100, Sharpe Ratio, Treynor Ratio, Jensen's Alpha, Performance Efficiency, Sustainable Finance.

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Introduction

The rapid growth of sustainable practice, transformed the global investment landscape by embedding environmental, social, and governance (ESG) considerations into financial decision-making. Nowadays, Investors globally are focusing on non-financial parameters and financial parameters alongside. Stock Index, namely the Market Index, is a leading component to reflect the transformation of investment behaviour. This paradigm shift has led to the emergence of ESG-themed indices, which could be defined as benchmarks that reflect the company's performance based on their environmental, social, and governance criteria, along with their traditional financial metrics, and hence evaluate the performance of companies that align with sustainable practices.

Eventually, Indian equity market has witnessed the introduction of dedicated ESG indices by the respective Stock exchanges. Some of the very renowned indices include Nifty 100 ESG Index, Nifty 100 Enhanced ESG Index, Nifty 100 ESG Sector Leaders Index, and S&P BSE 100 ESG Index, which reflect the growing investor demand for socially responsible investment opportunities. As investing in the ESG component is gaining momentum, to balance sustainability with profitability, understanding its performance efficiency becomes crucial for institutional investors, retail participants, and policymakers.

Performance efficiency, on the other hand, refers to the ability of an index to generate optimal returns relative to the level of risk undertaken. There are three well-reputed conventional risk-adjusted return measures, namely the Sharpe Ratio, Treynor Ratio, and Jensen's Alpha, that offer a robust framework to evaluate the return efficiency of indices. Some Existing studies in India and Asia evidenced that ESG indices may outperform conventional indices in the short run (Chelawat & Trivedi, 2015), while others argue that ESG indices perform comparably to or even lag behind traditional benchmarks, especially during volatile periods (Rehman et al., 2016; Jasuja, Prosad, & Nautiyal, 2021; Singh & Maurya, 2021). More recent analyses also indicate that socially responsible indices, including ESG, Shariah, and thematic indices, do not demonstrate significant long-term performance advantages over conventional benchmarks (Jonwall, Gupta, & Pahuja, 2024). Hence, the existing knowledge argues the relevance of performance efficiency and that too in comparison with conventional indices.

The study is an attempt to investigate the return efficiency of ESG-themed equity indices in India in comparison with the Nifty 100 benchmark. Daily data over one year has considered, and standard risk-adjusted performance metrics were applied to assess the said objectives and seeks to contribute to the ongoing debate on whether ESG integration enhances financial performance in emerging markets, intending to provide valuable insights for investors considering ESG-

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focused strategies, as well as for policymakers striving to promote sustainable financial instruments without compromising market competitiveness.

Literature Review

Chelawat & Trivedi (2015) explored the capability of ESG investment to generate returns in India. The Capital Assets Pricing Model has been used to evaluate data collected from BSE and NSC websites. The findings advocated that, in the short run, the ESG Index outperforms the conventional index and hence, ESG investing enhances investment returns, without any significant difference in risk.

Rehman et al. (2016) evaluated the risk and return characteristics of stock indices of companies from eight Asian countries that practice environmental, social, and governance (ESG) with the conventional composite indices. The results indicate that there are no significant differences in the returns or risk-adjusted returns between the ESG indices and the composite indices within countries. Further concealed that the market volatility of the ESG indices is higher than that of the conventional indices. The overall results indicate that the performance of ESG equity indices of many Asian countries is similar to the performance of conventional indices, suggesting that investors can pursue socially responsible investing objectives without a material difference in portfolio performance from conventional investing.

Tripathi & Bhandari (2016) examine the performance of socially responsible portfolios across different sectors and indices in India. To measure performance, different traditional risk-return measures have been used. The overall findings of the study suggest no empirical evidence on the performance evaluation of socially responsible portfolios across different sectors.

Jasuja et al. (2021) reported the overall financial performance of socially responsible indices of the National Stock Exchange using traditional risk-adjusted return measures and volatility through the T-GARCH model and concluded that no significant difference exists between the return performance of sustainability indices and the market benchmark index. Furthermore, suggested that socially responsible investments in India are providing reasonable returns to investors, and hence corporates should focus on ESG parameters to attract capital from investors and deliver better corporate financial performance and thereby increasing the potential of growth of socially responsible investing in India.

Singh & Maurya (2021) examined the historical growth perspective of the ESG index and suggest that the return performance of the ESG index and the market index are highly positively correlated in the long run, and the return performance of the ESG index is highly volatile during

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the period of high market volatility. Overall, the research concludes that in the long run, ESG parameters add value to shareholders' wealth

Jonwall, Gupta, & Pahuja (2024) evaluate the performance of different socially responsible indices, including Shariah, ESG, and thematic indices, at a single place, for both the pre- and post-COVID periods, and report that no significant difference exists between socially responsible indices and the conventional index in terms of return, as measured by the CAPM model.

Research Gap

The growing interest in sustainable finance and the integration of environmental, social, and governance (ESG) factors in investment decision-making have led to the expansion of ESG indices worldwide, including in emerging markets such as India. With time, the literature on the performance of these indices also gains importance worldwide. After an extensive review, it has been observed that there exists a multidimensional approach in the existing literature, which offers mixed findings, often shaped by methodological differences, time horizons, and the emphasis on risk versus return. Moreover, the empirical evidence revealed by existing literature regarding the comparative return performance of ESG indices against conventional market benchmarks remains inconclusive. This has created a significant research gap in understanding the return efficiency of ESG indices in the Indian context, particularly assessed using robust performance metrics such as the Sharpe Ratio, Treynor Ratio, and Jensen's Alpha on the basis of daily trends.

Research Question

The research attempts to address the following questions;

- Do Indian ESG-themed equity indices outperform the Nifty 100 benchmark in terms of return efficiency?
- Do ESG-themed equity indices in India generate significantly different return efficiency compared to the conventional Nifty 100 index?
- Which ESG-themed equity index demonstrates the highest return efficiency?

Research Objective

1. To evaluate whether Indian ESG-themed equity indices outperform the Nifty 100 benchmark in terms of return efficiency.
2. To examine whether ESG-themed equity indices in India generate significantly different return efficiency compared to the conventional Nifty 100 index.

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3. To identify the ESG-themed equity index with the highest return efficiency.

Research Hypotheses

H_{01}: There is no significant difference in the Sharpe Ratio between ESG indices and the benchmark index, namely the Nifty 100.

H_{11}: There is a significant difference in the Sharpe Ratio between ESG indices and the benchmark index, namely the Nifty 100.

H_02: There is no significant difference in the Treynor Ratio between ESG indices and the benchmark index, namely the Nifty 100.

H_12: There is a significant difference in the Treynor Ratio between ESG indices and the benchmark index, namely the Nifty 100.

H_03: There is no significant difference in Jensen's Alpha between ESG indices and the Nifty 100 benchmark.

H_13: There is a significant difference in Jensen's Alpha between ESG indices and the Nifty 100 benchmark.

Research Methodology

This study adopts an empirical and quantitative research design to examine the return efficiency of ESG-themed equity indices in India in comparison with the conventional Nifty 100 benchmark. The analysis is conducted using secondary data obtained from the official websites of the National Stock Exchange (NSE).

Data and Sample: The study uses daily closing price data for the period of one year, from 1st January 2024 to 31st December 2024, representing approximately 249 trading days. The indices selected are:

- Nifty 100 ESG Index
- Nifty 100 Enhanced ESG Index
- Nifty 100 Index (as the conventional benchmark)

The 91-day Treasury bill yield is used as the risk-free rate, converted into a daily rate for comparability.

Variables and Measures: Return efficiency is evaluated using three established performance measures, including Sharpe Ratio, Treynor Ratio, and Jensen's Alpha.

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Statistical Tools and Techniques:

- **Paired sample t-tests** are employed to examine whether the differences in return efficiency metrics between ESG indices and the Nifty 100 benchmark are statistically significant.

Calculations of daily returns and ratio measures are performed in Microsoft Excel, while inferential statistical analyses are conducted using IBM SPSS.

Data Analysis and Discussion

Analysis - 1: Risk-Adjusted Performance in terms of the Sharpe Ratio of Indian ESG Equity indices compared to Traditional Indices (Nifty 100);

The study aims to evaluate whether ESG indices in India demonstrate significantly different risk-adjusted returns compared to the traditional market benchmark using the Sharpe Ratio as a performance measure. Sharpe Ratio is a widely accepted risk-adjusted performance metric, defined as the excess return a portfolio secures over the risk-free rate of return per unit of total risk. A higher Sharpe ratio reflects better performance. The ratio can be calculated as,

$$\textbf{Sharpe Ratio} = \textbf{Rp} - \textbf{Rf} \,/\, \sigma p.$$

The corresponding hypotheses are as follows,

H_{01}: There is no significant difference in the Sharpe Ratio between ESG indices and the benchmark index, namely the Nifty 100.

H_{11}: There is a significant difference in the Sharpe Ratio between ESG indices and the benchmark index, namely the Nifty 100.

Table 1: Paired Samples Test among the Sharpe Ratios of Nifty 100 ESG, the Sharpe Ratios of Nifty Enhanced ESG, and the Sharpe Ratios of Nifty 100:

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Sharpe Ratio of Nifty 100 ESG - Sharpe Ratio of Nifty 100	-4.357	7.398	.469	-5.282	-3.432	-9.275	247	.000
Pair 2	Sharpe Ratio of Nifty Enhanced ESG - Sharpe Ratio of Nifty100	-6.312	4.856	.308	-6.920	-5.705	-20.471	247	.000

Source: Author Creation using SPSS.

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To test for significant differences in the performance between indices, a **paired samples t-test** has been employed. The results reflect the mean difference between Nifty 100 ESG and Nifty 100 benchmark is **−4.357 (**SD = 7.40), and, for the Nifty 100 ESG Enhanced, the mean difference is **−6.31** (SD = 4.86); these negative values indicate that the Sharpe ratios of EGS indices are statistically lower than that of Nifty 100. Again, the **t-value of pair 1 is −9.275,** and for pair 2 is **−20.47,** suggesting values that are far beyond the critical t-value (±1.96 for 95% confidence), meaning the differences are strongly significant.

Further, for both cases, the p-value, **p = 0.000 (<0.05, < 0.01),** indicates that for both 5% and 1% levels of significance, the outcomes are highly statistically significant. These results lead to the rejection of the null hypothesis (H_{01}) that there is no significant difference in Sharpe Ratios between ESG indices and the benchmark index, and on a similar note, suggesting that ESG indices underperformed the Nifty 100 in terms of risk-adjusted returns in the short run.

Analysis- 2: Risk-Adjusted Performance in terms of the Treynor Ratio of Indian ESG Equity indices compared to Traditional Indices (Nifty 100);

Though the Sharpe Ratio is a well-accepted risk-adjusted performance measure but it considers the total risk involving both the systematic and unsystematic risk under study. However, unsystematic risk is minimized to a large extent in well-diversified portfolios, such as market indices and ESG indices. In such a scenario, using the Treynor Ratio, another well-known risk-adjusted performance metric, which evaluates performance relative to systematic risk, could shed light on the performance efficiency more appropriately for diversified investors. A higher Treynor ratio reveals better risk-adjusted performance relative to the market. The ratio can be calculated as

$$\textbf{Treynor Ratio} = Rp - Rf / \beta p.$$

The corresponding hypotheses are as follows,

$H_0$2: There is no significant difference in the Treynor Ratio between ESG indices and the benchmark index, namely the Nifty 100.

$H_1$2: There is a significant difference in the Treynor Ratio between ESG indices and the benchmark index, namely the Nifty 100.

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Table 2: Paired Samples Test among the Treynor Ratios of Nifty 100 ESG, the Treynor Ratios of Nifty Enhanced ESG, and the Treynor Ratios of Nifty 100:

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Treynor Ratio of Nifty 100 ESG - Treynor Ratio of Nifty 100	-2253.622	9223.372	2473.714	-7125.886	2618.641	-.911	247	.363
Pair 2	Treynor Ratio of Nifty Enhanced ESG - Treynor Ratio of Nifty100	8.898	321.529	20.417	-31.315	49.112	.436	247	.663

Source: Author Creation using SPSS.

The paired sample t-test of Treynor ratio for the Nifty ESG vs. Nifty 100, a mean difference of −2253.622 (SD = 9223.372, SE = 2473.714), with a t-statistic of −0.911 and an associated p-value of 0.363. Again, for the Nifty 100 Enhanced ESG vs. Nifty 100, the mean difference was 8.898 (SD = 321.529, SE = 20.417), with a t-statistic of 0.436 and a p-value of 0.663.

For both pairs, the p-value is more than 0.05 (p = 0.363, 0.663> 0.05), indicating statistical insignificance. This lack of statistical significance implies that the variations in mean Treynor ratios across the indices are not robust enough to reject the null hypothesis of no difference in risk-adjusted performance. Therefore, there is insufficient evidence to conclude that ESG indices differ in their risk-adjusted performance in terms of systematic risk from the conventional benchmark within the study period.

Analysis- 3: Risk-Adjusted Performance in terms of the Jensen Alpha Ratio of Indian ESG Equity indices compared to Traditional Indices (Nifty 100);

Jensen Alpha, another established risk-adjusted performance measure, indicates the performance of an investment manager or fund manager in terms of return, after adjusting for market risk. In other words, Jensen Alpha can be defined as a performance metric that measures the excess return of a portfolio or index over the expected return predicted by the Capital Asset Pricing Model (CAPM), given its level of systematic risk (beta). The Ratio can be calculated as,

$$\textbf{Jensen Alpha Ratio} = R_p - [R_f + \beta_p (R_m - R_f)]$$

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The corresponding hypotheses are as follows,

$H_0$3: There is no significant difference in Jensen's Alpha between ESG indices and the Nifty 100 benchmark.

$H_1$3: There is a significant difference in Jensen's Alpha between ESG indices and the Nifty 100 benchmark.

Table 3: Paired Samples Test among the Jensen Alpha of Nifty 100 ESG, the Jensen Alpha of Nifty Enhanced ESG, and the Jensen Alpha of Nifty 100:

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Jensen Alpha of Nifty 100 ESG –Jensen Alpha of Nifty ESG.	-318.517	1174.391	74.573	-465.399	-171.635	-4.271	247	.000
Pair 2	Jensen Alpha of Nifty Enhanced ESG-Jensen Alpha of Nifty ESG.	-288.678	1007.212	63.958	-414.651	-162.705	-4.514	247	.000

Source: Author Creation using SPSS

The paired samples t-test for Jensen's Alpha between the Nifty 100 ESG and Nifty ESG showed a mean difference of −318.517 (SD = 1174.391, SE = 74.573), with a t-statistic of −4.271 and a p-value of 0.000. Similarly, for the Nifty Enhanced ESG vs. Nifty ESG, the mean difference was −288.678 (SD = 1007.212, SE = 63.958), with a t-statistic of −4.514 and a p-value of 0.000. In both cases, the p-values are less than 0.05, indicating statistical significance. This suggests that the differences in Jensen's Alpha between the pairs of indices are strong enough to reject the null hypothesis of no difference. Therefore, there is sufficient evidence to conclude that ESG indices differ significantly in their risk-adjusted performance (alpha generation) compared to one another within the study period.

Research findings and Conclusion

Performance efficiency, a well-used concept in the financial market, reflects the capacity of a stock, fund, or investment to generate return relative to the risk undertaken. The approach is not simply limited to producing high returns but about producing optimal returns per unit of risk,

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thereby ensuring that resources (capital, time, risk exposure) are utilized efficiently. A comparison with a benchmark could justify the aptitude of an index, stock, or fund to secure an optimal return. ESG indices are very new in function and are gaining attention from socially responsible investors tremendously. Considering its relevance among the investors, this study attempted to evaluate the return prosperity of ESG indices compared to conventional indices in India. The present study covers a single year of daily data. To measure the performance, traditional tools, including Sharpe Ratio, Treynor Ratio, and Jensen's Alpha, were applied to the daily performance of selected indices. Paired sample t-tests among performance measures were conducted to determine the significant statistical differences between ESG indices and the benchmark.

The results of the Sharpe Ratios demonstrated that both the Nifty 100 ESG and the Nifty 100 Enhanced ESG indices exhibited notably lower Sharpe Ratios compared to the benchmark Nifty 100. The mean differences were statistically significant at the 5% level, indicating that ESG indices provided inferior risk-adjusted performance relative to the total risk undertaken, thereby implying that investors in ESG portfolios were not sufficiently compensated for volatility over the short term.

Conversely, the Treynor Ratio showed no statistically significant differences between ESG indices and the Nifty 100, at 5% level of significance, suggesting that when systematic risk is considered, ESG indices generally perform in line with the benchmark. Hence, we conclude

that ESG indices are equally efficient as the benchmark when only systematic risk or beta is considered.

Furthermore, Jensen's Alpha values for both ESG indices were significantly negative in comparison to the Nifty 100, with highly significant p-values. This indicates that ESG indices failed to generate abnormal returns beyond those expected under the CAPM framework, thereby reinforcing the earlier observation of underperformance relative to the benchmark.

Consequently, it can be concluded that ESG indices in India did not outperform the Nifty 100 in terms of return efficiency during the study period. Lower Sharpe and negative Jensen's Alpha values suggest that ESG indices were less efficient than the Nifty 100 in converting risk into returns. On the other side, the Treynor ratio, efficiency was statistically not different from the Nifty 100, so they were equally efficient as the benchmark when only systematic risk or beta is considered.

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Limitation and Future Scope of Study

The current study has been conducted based only on a single year of daily data, and provides a short-term perspective on return efficiency, hence, a long-term trend can be analyzed in the future. Again, this research captures the on traditional risk-adjusted performance measures, advanced econometric models could be employed to shed more light on it. Moreover, this study considered the indices listed on NSE, and further indices or cross-border analysis can also be assigned to the same.

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