

# Sustainability and Resilience in the Indian Stock Market: A Comparative Empirical Evaluation of NIFTY 50 and NIFTY100 ESG Index (2018–2024)

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## **ABSTRACT**

This paper examines whether sustainability-oriented equity investing in India is financially competitive and resilient compared to conventional benchmark investing. The study focuses on two major indices of the National Stock Exchange: the NIFTY 50, representing the broad large-cap market, and the NIFTY100 ESG Index, representing an environmental, social and governance (ESG) screened portfolio. Using monthly data from February 2018 to December 2024, the analysis evaluates return behaviour, volatility and risk-adjusted performance over the full sample and three sub-periods: the pre-COVID phase (2018–2019), the COVID-19 crisis year (2020) and the post-pandemic recovery period (2021–2024). Simple and logarithmic returns are computed from month-end index levels. The study employs descriptive statistics, paired-samples t-tests, variance comparison, Sharpe-style ratios and a CAPM-type regression of ESG returns on NIFTY 50 returns. Over the full period, the NIFTY100 ESG Index exhibits a slightly higher average monthly return (around 1.14%) compared to NIFTY 50 (around 1.05%), with almost identical volatility (about 5% per month). Annualised geometric returns are estimated at approximately 12.78% for the ESG index and 11.66% for NIFTY 50, with similar annual volatility. However, the difference in mean monthly returns is not statistically significant at the conventional 5% level ( $p \approx 0.41$ ). During the COVID shock year, the ESG index records higher average monthly returns (about 2.08% versus 1.66%) and slightly lower volatility than NIFTY 50, with the return difference approaching significance at the 10% level ( $p \approx 0.084$ ). A regression of ESG log returns on NIFTY 50 log returns yields a beta close to one ( $\beta \approx 0.98$ ) and a small, statistically insignificant positive alpha (around 0.10% per month), indicating a high degree of co-movement with the benchmark index and suggesting that ESG screening does not materially alter systematic market exposure. Overall, the results indicate that ESG investing in India does not involve a performance penalty and may offer modest resilience benefits during periods of market stress. The findings also indicate that ESG-related information may not yet be fully incorporated into asset pricing in the Indian equity market. The findings have implications for investors, corporate decision makers and regulators seeking to foster sustainable and robust capital markets.

**Keywords:** ESG, NIFTY 50, NIFTY100 ESG, sustainable finance, resilience, COVID-19, Indian stock market

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## **1. Introduction**

Financial markets across the world are undergoing a structural transition in which sustainability considerations are increasingly integrated into investment decision-making. Environmental risks, social concerns and governance quality are recognised not merely as ethical issues but as determinants of long-term corporate performance and market stability. This has led to the rapid growth of ESG-themed indices, funds and reporting standards.

In India, the sustainable finance landscape has strengthened considerably over the past decade. Regulatory initiatives such as the Business Responsibility and Sustainability Reporting (BRSR) framework, evolving corporate governance norms and the creation of ESG indices by stock exchanges reflect this shift. Among these, the NIFTY100 ESG Index offers a transparent benchmark for investors who wish to align their portfolios with ESG principles while retaining exposure to leading Indian companies.

# Sustainability and Resilience in the Indian Stock Market: A Comparative Empirical Evaluation of NIFTY 50 and NIFTY100 ESG Index (2018–2024)

A key question, however, persists: **does ESG-based investing deliver financial performance comparable to or better than traditional benchmark investing?**

A related issue concerns resilience: **do ESG-screened portfolios behave differently during crisis conditions, such as the COVID-19 pandemic?** These questions are particularly relevant for an emerging economy like India, where capital markets are deepening and sustainability policies are gaining prominence.

Against this backdrop, the present study conducts an empirical comparison between the NIFTY 50 index and the NIFTY100 ESG Index over the period 2018–2024. By analysing full-sample performance and sub-period behaviour before, during and after the COVID-19 shock, the study seeks to assess whether ESG investing in India is financially sustainable and resilient.

The objectives of the study are:

1. To compare the average returns, volatility and risk-adjusted performance of NIFTY 50 and NIFTY100 ESG Index over the period February 2018 to December 2024.
2. To examine whether the ESG index displays different behaviour during the COVID-19 crisis year relative to normal and recovery periods.
3. To analyse the relationship between ESG index returns and broad market returns using a CAPM-style regression framework.

The paper contributes to the literature on sustainable finance by providing index-level, India-specific evidence based on real data across a significant and turbulent time frame.

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## 2. Review of Literature

### 2.1 Global Evidence on ESG and Performance

International research on ESG investing offers mixed but generally encouraging findings. Many studies report that ESG portfolios perform on par with or slightly better than conventional portfolios in risk-adjusted terms. Explanations include improved risk management, stronger stakeholder relationships and better governance structures, which may reduce the probability of adverse events and support long-run cash flows.

There is also evidence that ESG-screened portfolios may behave defensively during crises. Several empirical studies covering the Global Financial Crisis and the COVID-19 pandemic suggest that companies with stronger ESG profiles or ESG indices suffered smaller drawdowns or recovered more quickly than their non-ESG counterparts. The proposed mechanism

is that these firms are better prepared for shocks due to robust governance, proactive risk assessment and greater reputational capital.

However, the magnitude and consistency of ESG outperformance vary across markets, time periods and ESG methodologies. Some studies find neutral relationships, and a few identify potential short-term costs when ESG strategies restrict the investible universe.

### 2.2 ESG and Capital Markets in India

The Indian context has drawn increasing interest as regulatory frameworks and disclosure norms evolve. Indian stock exchanges have introduced ESG indices to facilitate sustainable investing. Research focusing on Indian firms and indices indicates that markets generally respond positively to enhanced ESG disclosure and better corporate governance practices. Studies of ESG funds and indices often conclude that these vehicles can compete effectively with non-ESG alternatives, though evidence is still emerging and sometimes limited by data availability.

Despite increasing attention, index-level empirical analysis comparing a major ESG index with a mainstream benchmark across crisis and non-crisis periods remains relatively limited in India. This study seeks to fill that gap by using actual monthly data for NIFTY 50 and NIFTY100 ESG over a seven-year span that includes the COVID-19 disruption.

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## 3. Research Design and Methodology

### 3.1 Data and Sample

The study uses daily closing index values for:

- **NIFTY 50 Index** – representing the broad large-cap Indian equity market.
- **NIFTY100 ESG Index** – representing an ESG-screened portfolio drawn from the NIFTY 100 universe.

Data span from **1 January 2018 to 31 December 2024**. For analytical consistency, the study uses **month-end closing values** to compute monthly returns, starting from February 2018. This yields a total of **83 months** of paired observations for both indices.

Although high-frequency daily and weekly data are available for both indices, the study adopts monthly return intervals for three key reasons. First, monthly aggregation helps mitigate high-frequency volatility clustering and transient market microstructure effects, thereby providing a clearer view of underlying performance trends. Second, ESG-related disclosures are typically incorporated into investor decision-making over medium- to long-term horizons rather than at high-frequency intervals. Third, the use of

## Sustainability and Resilience in the Indian Stock Market:

### A Comparative Empirical Evaluation of NIFTY 50 and NIFTY100 ESG Index (2018–2024)

monthly observations aligns with several prior studies in sustainable finance and allows for meaningful comparison across sub-periods, especially during structurally distinct phases such as the COVID-19 crisis. Therefore, monthly data are considered more appropriate for capturing the strategic impact of ESG investing in the Indian context.

The index data for both NIFTY 50 and NIFTY100 ESG Index were obtained from the official National Stock Exchange of India website. Where necessary, data were cross-verified using financial databases such as Bloomberg and Yahoo Finance to ensure consistency. The indices used in the study are total return indices adjusted for dividends and periodic rebalancing, ensuring that returns reflect both price appreciation and reinvested income.

#### 3.2 Computation of Returns

Two types of monthly returns are computed:

(i) Simple Monthly Return:  $R_t = (P_t - P_{t-1}) / P_{t-1}$

(ii) Logarithmic Monthly Return:  $r_t = \ln(P_t / P_{t-1})$

Simple returns are used for descriptive statistics and interpretation; log returns are used for annualisation and regression analysis.

#### 3.3 Period Segmentation

To examine behaviour across different market regimes, the sample is divided into three sub-periods:

- **Pre-COVID period:** February 2018 – December 2019
- **COVID crisis period:** January 2020 – December 2020
- **Post-COVID recovery period:** January 2021 – December 2024

This segmentation enables comparison of ESG and benchmark index performance under normal, stressed and recovering conditions.

#### 3.4 Statistical Tools

The following tools are applied:

1. **Descriptive Statistics** – mean, standard deviation, minimum and maximum monthly returns for both indices over the full sample and sub-periods.

2. **Paired-Samples t-Test** – to test whether the difference between the mean monthly returns of the ESG index and NIFTY 50 is statistically significant:

$$H_0: \mu_{ESG} - \mu_{NIFTY} = 0 \quad H_1: \mu_{ESG} - \mu_{NIFTY} \neq 0$$

3. **Variance Comparison** – to compare volatility of ESG and NIFTY 50 returns using the ratio of sample variances.

4. **Sharpe-Type Ratio** – a simple risk-adjusted measure based on monthly returns:

$$Sharpe_i = \frac{R_i - R_f}{\sigma_i}$$

where  $R_f$  is an assumed monthly risk-free rate of 0.5% and  $\sigma_i$  is the standard deviation of simple monthly returns.

5. **CAPM-Style Regression** – to assess the relationship between ESG and NIFTY 50 returns:

$$r_t^{ESG} = \alpha + \beta r_t^{NIFTY} + \varepsilon_t$$

where  $\alpha$  measures average excess performance and  $\beta$  reflects systematic risk relative to the benchmark.

## 4. Empirical Results

### 4.1 Full-Period Performance (February 2018 – December 2024)

Over the entire sample of 83 months:

- **NIFTY 50**
  - Mean simple monthly return:  $\approx 1.05\%$
  - Standard deviation:  $\approx 5.03\%$
  - Minimum monthly return: about  $-23.25\%$
  - Maximum monthly return: about  $+14.68\%$
- **NIFTY100 ESG Index**
  - Mean simple monthly return:  $\approx 1.14\%$
  - Standard deviation:  $\approx 5.05\%$
  - Minimum monthly return: about  $-21.56\%$
  - Maximum monthly return: about  $+15.20\%$

Using log returns, the annualised geometric returns are approximately:

- **NIFTY 50:**  $\sim 11.66\%$  per annum
- **NIFTY100 ESG:**  $\sim 12.78\%$  per annum

Annualised volatility is around **17.86%** for NIFTY 50 and **17.76%** for the ESG index, indicating nearly identical overall risk.

### 4.2 Full-Period Statistical Comparison

A paired-samples t-test comparing monthly returns of the two indices over the entire period yields:

- t-statistic  $\approx 0.83$
- p-value  $\approx 0.41$

Since the p-value is significantly above 0.05, the difference in mean monthly returns between the ESG index and NIFTY 50 is **not statistically significant** at the 5% level. This indicates that, over the full sample, ESG investing delivers performance that is statistically similar to the traditional benchmark.

A comparison of sample variances shows that the ratio of ESG variance to NIFTY 50 variance is close to 1, confirming that the two indices exhibit very similar volatility.

The Sharpe-type measure, using a 0.5% monthly risk-free rate, indicates slightly higher risk-adjusted performance for the ESG index than for NIFTY 50. However, the difference is modest, consistent with the t-test findings.

### 4.3 Sub-Period Behaviour

## Sustainability and Resilience in the Indian Stock Market: A Comparative Empirical Evaluation of NIFTY 50 and NIFTY100 ESG Index (2018–2024)

### 4.3.1 Pre-COVID Period (February 2018 – December 2019)

In the pre-COVID period:

- NIFTY 50 records a mean monthly return of about **0.50%** with volatility of roughly **3.88%**.
- The ESG index records a very similar mean monthly return of around **0.52%** with volatility near **4.00%**.

The paired-samples t-test for this sub-period indicates no meaningful difference in average returns, suggesting that the ESG index tracked the broad market closely under normal conditions.

### 4.3.2 COVID Crisis Year (January 2020 – December 2020)

The COVID period shows more distinct behaviour:

- NIFTY 50 exhibits a mean monthly return of about **1.66%** and volatility close to **10.00%**.
- The ESG index shows a mean monthly return of around **2.08%** and volatility of about **9.53%**.

The ESG index thus displays **higher average returns with slightly lower volatility** during the crisis year. A t-test for this period yields a p-value of approximately **0.084**, indicating that the difference in returns is not significant at 5% but may be considered weakly significant at the 10% level. This suggests that ESG-based investing might have offered some resilience during the extreme uncertainty of 2020.

### 4.3.3 Post-COVID Recovery Period (January 2021 – December 2024)

In the recovery phase:

- NIFTY 50 shows an average monthly return of about **1.17%** with volatility of around **3.68%**.
- The ESG index displays a mean monthly return of approximately **1.19%** and volatility near **3.91%**.

Differences in this period are minor, and statistical testing again indicates no significant divergence, implying similar performance as markets stabilised and resumed growth.

## 4.4 Comparative Performance Summary

Table 1: Comparative Return, Risk and Significance Measures Across Periods

Period	Index	Mean Return (%)	Std. Dev (%)	Sharpe Ratio	p-value
Full Sample	NIFTY 50	1.05	5.03	0.11	
	ESG	1.14	5.05	0.13	0.41

	Index				
Pre-COVID	NIFTY 50	0.50	3.88	0.00	
	ESG Index	0.52	4.00	0.01	>0.50
COVID	NIFTY 50	1.66	10.00	0.12	
	ESG Index	2.08	9.53	0.17	0.084
Post-COVID	NIFTY 50	1.17	3.68	0.18	
	ESG Index	1.19	3.91	0.18	>0.50

The comparative summary presented in Table 1 provides a consolidated view of return, risk, and statistical significance across different market phases. Over the full sample period, the ESG index exhibits marginally higher average returns and slightly better risk-adjusted performance compared to the NIFTY 50, although the difference is not statistically significant ( $p \approx 0.41$ ). This reinforces that ESG investing in India does not entail a performance disadvantage.

During the pre-COVID period, both indices display nearly identical performance, indicating that ESG screening does not materially alter portfolio behaviour under stable market conditions.

The most notable divergence is observed during the COVID-19 crisis year, where the ESG index demonstrates higher mean returns and lower volatility compared to the benchmark. The Sharpe ratio is also higher for the ESG index, suggesting superior risk-adjusted performance. Although the p-value ( $\approx 0.084$ ) indicates only marginal statistical significance, the economic significance supports the argument that ESG-oriented portfolios may offer resilience during periods of heightened uncertainty.

In the post-COVID recovery phase, the performance of both indices converges again, indicating that ESG advantages are more pronounced during crisis periods rather than in normal market environments.

## 4.5 Regression Analysis

A CAPM-style regression using log returns over the full sample provides the following estimates:

## Sustainability and Resilience in the Indian Stock Market:

### A Comparative Empirical Evaluation of NIFTY 50 and NIFTY100 ESG Index (2018–2024)

- Intercept ( $\alpha$ ): approximately **0.10%** per month
- Slope ( $\beta$ ): approximately **0.98**
- Coefficient of determination ( $R^2$ ): around **0.97**

The beta close to one indicates that the ESG index moves almost one-for-one with the NIFTY 50, confirming its close alignment with overall market movements. The alpha is small and statistically insignificant, indicating that the ESG index does not generate strong systematic excess returns beyond what its exposure to the broad market would predict. However, the positive sign is in line with the marginal outperformance seen in descriptive statistics.

#### 4.6 Diagnostic Tests for Regression Model

To validate the reliability and robustness of the estimated CAPM regression model, diagnostic tests were conducted to examine potential violations of classical linear regression assumptions, particularly heteroscedasticity and autocorrelation in the residuals.

##### 4.6.1 Test for Heteroscedasticity: Breusch–Pagan Test

Heteroscedasticity refers to the presence of non-constant variance in the regression residuals, which can lead to inefficient estimates and biased standard errors, thereby affecting hypothesis testing.

The Breusch–Pagan (BP) test was employed to detect heteroscedasticity in the regression residuals. The null hypothesis ( $H_0$ ) assumes that the variance of the residuals is constant (homoscedastic), while the alternative hypothesis ( $H_1$ ) suggests the presence of heteroscedasticity.

Test Results:

Breusch–Pagan  $\chi^2$  statistic = 1.87

Degrees of freedom = 1

p-value = 0.171

##### Interpretation:

Since the p-value (0.171) is greater than the conventional significance level of 0.05, the null hypothesis of homoscedasticity cannot be rejected. This indicates that the residuals do not exhibit statistically significant heteroscedasticity.

Therefore, the assumption of constant variance of errors is satisfied, and the estimated standard errors of the regression coefficients can be considered reliable.

##### 4.6.2 Test for Autocorrelation: Durbin–Watson Statistic

Autocorrelation in residuals, particularly in time series data, can lead to biased estimates of standard errors and may invalidate statistical inference. As the analysis is based on monthly time-series data, testing for serial correlation is essential.

The Durbin–Watson (DW) statistic was computed to detect first-order autocorrelation in the regression residuals.

Test Results:

Durbin–Watson statistic ( $d$ ) = 1.95

##### Interpretation:

The DW statistic ranges between 0 and 4, where:

A value close to 2 indicates no autocorrelation

Values below 2 indicate positive autocorrelation

Values above 2 indicate negative autocorrelation

The obtained value of 1.95 is very close to 2, indicating the absence of significant first-order autocorrelation in the residuals.

Thus, the residuals can be considered independently distributed over time, satisfying a key assumption of the regression model.

##### 4.6.3 Implications for Model Validity

The results of both diagnostic tests confirm that:

The regression model does not suffer from heteroscedasticity

There is no evidence of autocorrelation in residuals

The estimated coefficients ( $\alpha \approx 0.10\%$  and  $\beta \approx 0.98$ ) are statistically reliable and unbiased

The high explanatory power of the model ( $R^2 \approx 0.97$ ) is not driven by spurious relationships

These findings strengthen the validity of the CAPM-based regression results and support the conclusion that the NIFTY100 ESG Index exhibits strong comovement with the benchmark index, indicating that ESG screening does not materially alter systematic market exposure with stable statistical properties.

## 5. Discussion

The empirical results suggest several important conclusions regarding the sustainability and resilience of ESG-based investing in the Indian equity market.

The empirical findings indicate that ESG-oriented investment strategies in India produce returns that are broadly comparable to those of conventional benchmark indices. While the ESG index exhibits slightly higher average returns, the difference is not statistically significant, suggesting that sustainability considerations can be integrated into portfolio construction without adversely affecting financial outcomes.

A key empirical finding of this study is the absence of a statistically significant difference in average monthly returns between the ESG index and the conventional benchmark over the full sample period ( $p \approx 0.41$ ). Rather than being a limitation, this result contributes meaningfully to the ongoing debate on the existence of an “ESG premium.”

## Sustainability and Resilience in the Indian Stock Market: A Comparative Empirical Evaluation of NIFTY 50 and NIFTY100 ESG Index (2018–2024)

In the Indian context, the finding suggests that ESG investing does not generate systematic excess returns in normal market conditions, but importantly, it also does not impose a performance penalty. This aligns with the “no trade-off” hypothesis, which posits that sustainability considerations can be incorporated into investment strategies without sacrificing financial performance. For an emerging market like India, where ESG adoption is still evolving, the absence of a strong premium may reflect transitional dynamics—such as heterogeneous disclosure practices, varying investor awareness, and gradual regulatory strengthening.

Furthermore, the evidence of marginally better performance during the COVID-19 period indicates that ESG advantages may be state-dependent, emerging more clearly during periods of heightened uncertainty rather than in stable market environments. Thus, the study supports the view that ESG investing in India may function more as a risk management and resilience-enhancing strategy than as a consistent source of abnormal returns.

Second, the analysis of the COVID crisis year reveals that ESG-based investments may offer some degree of downside protection or faster recovery during extreme events. In 2020, the ESG index exhibits higher mean returns and lower volatility than the benchmark, with the difference in performance approaching significance at the 10% level. This pattern is consistent with the view that firms selected into ESG indices may possess stronger risk management practices, better stakeholder relationships and higher governance quality, which can help mitigate the impact of economic shocks.

Third, the similarity in post-COVID performance between the two indices suggests that, in normal to moderately volatile conditions, ESG and non-ESG portfolios may behave very similarly at the index level. This is also reflected in the regression results, where the ESG index shows a beta close to one with respect to NIFTY 50.

These findings contribute to the growing body of evidence on sustainable finance in emerging markets by demonstrating that financial performance and responsible investment practices can coexist without conflict. Overall, the findings indicate that ESG investing in India appears financially sustainable and potentially more resilient in extreme stress periods, without substantially altering risk exposure relative to the main market index. Taken together, these findings reinforce the evolving role of ESG integration as a strategic, rather than purely ethical, component of portfolio construction in emerging markets.

### 6. Conclusion and Implications

This study set out to examine whether sustainable, ESG-oriented investing in India can deliver financial performance and resilience comparable to traditional benchmark investing. Using real monthly data for NIFTY 50 and NIFTY100 ESG from February 2018 to December 2024, the analysis compared returns, volatility and risk-adjusted performance across normal, crisis and recovery periods.

The results demonstrate that ESG-based investing does not cause a performance drag; instead, the NIFTY100 ESG Index delivers slightly higher average returns with similar volatility compared to NIFTY 50. During the COVID-19 crisis year, the ESG index appears to have weathered the shock better, with higher mean returns and marginally lower risk. While statistical significance at conventional levels is limited, the direction and robustness of the findings support the notion of resilience. Importantly, the results suggest that ESG integration does not distort market efficiency but rather complements traditional investment frameworks.

#### Implications for investors:

Investors who wish to incorporate sustainability considerations into their portfolios can do so without compromising financial returns, at least at the index level. ESG index funds or exchange-traded funds tracking the NIFTY100 ESG Index may serve as viable core holdings for long-term investors.

#### Implications for corporates:

The comparable or slightly better performance of ESG indices suggests that markets do not penalise firms for adopting sustainability practices and improving ESG disclosure. On the contrary, stronger ESG profiles may help build investor confidence and support valuations, especially during uncertain times.

#### Implications for regulators and exchanges:

The evidence supports ongoing efforts by regulators and exchanges to promote ESG reporting, transparency and index innovation. Policies that encourage meaningful ESG integration and reliable disclosure can contribute to more stable and resilient capital markets.

### 7. Limitations and Scope for Future Research

This study has some limitations that should be acknowledged:

1. The analysis is conducted at the **index level** and does not examine firm-level ESG scores or sectoral dynamics.
2. Only one ESG index (NIFTY100 ESG) is considered; other ESG or thematic indices may exhibit different behaviours.

## Sustainability and Resilience in the Indian Stock Market: A Comparative Empirical Evaluation of NIFTY 50 and NIFTY100 ESG Index (2018–2024)

3. The study uses a relatively simple risk-free rate assumption and a single-factor regression model. More complex multi-factor asset pricing models and downside risk measures could be explored in future research.

Future work may extend the analysis by using firm-level ESG ratings, distinguishing between environmental, social and governance dimensions, or focusing on specific high-impact sectors such as energy, finance or consumer goods. Additionally, behavioural aspects such as investor flows into ESG funds and their impact on price formation in the Indian market present a rich area for further study.

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