

ESG Indices versus Traditional Stock Market Indices in India: A Comparative Analysis

Suresh H¹, Dr. Jyothi G. H²

¹Department of MBA, Siddaganga Institute of Technology, Tumakuru, Karnataka

²Assistant Professor, Department of MBA, Siddaganga Institute of Technology

Abstract

Environmental, Social, and Governance (ESG) investing has become an increasingly visible dimension of portfolio decision-making in India, yet evidence on how ESG-based indices perform against conventional benchmarks once return, risk and risk-adjusted efficiency are considered together remains limited for the domestic market. This study compares four ESG indices NIFTY100 ESG, NIFTY100 Enhanced ESG, NIFTY100 ESG Sector Leaders, and BSE 100 ESG with nine traditional indices NIFTY 50, SENSEX, NIFTY Bank, NIFTY IT, NIFTY Pharma, NIFTY Auto, BSE Consumer Durables, BSE Infrastructure, and BSE Manufacturing using five years of secondary monthly price data (January 2021 to December 2025) sourced from the National Stock Exchange and the Bombay Stock Exchange. Performance is evaluated through total return, compound annual growth rate, annualised standard deviation, Value at Risk, Conditional Value at Risk, the Sharpe ratio, Beta, Jensen's Alpha, and Pearson correlation, and is validated using an independent-samples t-test, Levene's test, and an F-test for equality of variance. The results show that ESG indices generated CAGR values between 12.48 and 13.98 percent, statistically indistinguishable from the mean daily return of the traditional group ($t = -0.6742$, $p = 0.5002$), while carrying substantially lower risk (average annualised standard deviation of 13.99 percent against 19.42 percent for traditional indices; Levene statistic = 108.65, $F = 0.5188$, both $p < 0.001$). BSE 100 ESG produced the strongest ESG performance (Sharpe ratio 0.556; CAGR 13.98 percent), and beta values below unity across the ESG basket point to consistently defensive characteristics relative to the market. These findings indicate that ESG investing in India offers return parity with conventional indices alongside a materially improved risk profile, supporting its position as a financially sound, risk-efficient long-term investment strategy rather than a purely values-driven trade-off.

Keywords: ESG investing; sustainable finance; NIFTY indices; BSE indices; Sharpe ratio; risk-adjusted returns; Indian capital market

1. Introduction

Investment decision-making has moved beyond a narrow focus on profitability toward a broader assess-

ent of how a firm manages its environmental footprint, its workforce and communities, and its own governance. This broader lens is captured by the acronym ESG Environmental, Social, and Governance and by the practice built around it, ESG investing. Environmental criteria cover a company's approach to pollution control, climate risk, energy consumption and waste management; social criteria address labour practices, customer welfare, human rights and community impact; and governance criteria concern board composition, transparency and ethical conduct in management. Investors have increasingly treated these non-financial dimensions as material to long-run risk and return, on the premise that firms managing ESG factors well are also better positioned to withstand regulatory, reputational and operational shocks.

India's capital market infrastructure has responded to this shift. The National Stock Exchange (NSE) and the Bombay Stock Exchange (BSE) have each introduced ESG-themed indices — including the NIFTY100 ESG, NIFTY100 Enhanced ESG, NIFTY100 ESG Sector Leaders, and the S&P BSE 100 ESG Index that track companies scoring favourably on sustainability parameters. These indices sit alongside long-established, capitalisation-weighted benchmarks such as the NIFTY 50 and the SENSEX, which continue to anchor how most investors and analysts read the health of the Indian market. Regulatory developments have reinforced this trend: the Securities and Exchange Board of India (SEBI) mandated Business Responsibility and Sustainability Reporting (BRSR) for the largest listed companies, improving the consistency and availability of ESG disclosures and, by extension, the credibility of ESG-linked indices built on them. Rising global investor interest in sustainability-aligned mandates, the expansion of green and sustainable finance, and heightened scrutiny of greenwashing have further embedded ESG considerations into how Indian equities are evaluated.

Despite this institutional momentum, a central empirical question remains open: does allocating to ESG indices come at a cost to returns, or does it deliver a more favourable risk-adjusted outcome relative to conventional benchmarks? Opinion among market participants is divided. Some argue that ESG screening, by excluding certain sectors and tilting toward better-governed firms, produces steadier and ultimately competitive returns; others contend that unconstrained, traditional indices should outperform simply because they are not limited by sustainability criteria. Resolving this question in the Indian context requires a systematic comparison across multiple dimensions of performance not returns alone, but risk, downside exposure, and risk-adjusted efficiency over a period long enough to capture more than a single market cycle.

This study addresses that need. It compares four ESG indices with nine traditional indices listed on the NSE and BSE over the five-year period from January 2021 to December 2025, using return, volatility, downside-risk and risk-adjusted performance measures together with formal hypothesis tests. The objective is to establish, with statistical evidence rather than anecdote, whether ESG investing constitutes a financially viable alternative for investors operating in the Indian equity market.

2. Literature Review

Studies comparing ESG indices directly against parent or conventional indices in India report broadly similar return profiles alongside a risk advantage for the ESG basket. **Jain (2023)**, examining Indian

ESG indices against their parent indices using mean return, standard deviation and Sharpe ratio, found that ESG indices delivered comparable returns while often carrying lower risk, concluding that ESG investing need not sacrifice performance, though the analysis was confined to a limited set of indices and a short time window. A comparative study of the NIFTY ESG Index against the NIFTY 100 reported similar pattern comparable returns with lower volatility and stronger resilience during market swings again over a relatively short observation period (**IISPPR, 2025**).

Beyond index-level comparisons, a body of firm-level research links ESG performance to profitability and valuation. Using panel data and regression methods, a study published in the **MDPI Risks journal (2019)** found that firms with stronger ESG scores tended toward higher profitability and market valuation, though differing ESG measurement conventions and an absence of Indian evidence limit how far the finding can be generalised to emerging markets. Consistent with this, research on ESG and corporate financial performance (**GRFCG, 2023**) and on ESG disclosure and firm value (**ProQuest, 2022**) both reported that stronger ESG practices and more transparent reporting were associated with improved profitability and higher investor confidence in valuation, albeit drawn from limited samples and non-standardised disclosure regimes.

A third strand of literature addresses market efficiency and stability. Using econometric models applied to historical market data, a study published in **Springer (2024)** found that firms with strong ESG practices experienced lower price volatility and contributed to more efficient, stable markets, although this evidence derives mainly from developed-market data. Related work on ESG and financial stability suggested that ESG-oriented firms are better placed to manage systemic risk, and a study comparing ESG and conventional indices during the COVID-19 period found that ESG indices displayed greater resilience and lower volatility during the crisis window, albeit over a necessarily short and unusual sample period (**Indian Journal of Marketing, 2023**).

Evidence from outside India reinforces these patterns. A study circulated on **SSRN (2021)**, comparing historical ESG and conventional portfolios, found ESG investments delivering returns comparable to or better than traditional investments alongside reduced risk exposure, while cautioning that the absence of standardised ESG metrics complicates comparison across studies. Descriptive work on ESG investing trends in emerging markets (**Springer, 2025**) and on the integration of sustainability principles into financial markets more broadly (**Springer, 2019**) documented growing investor interest in sustainable allocation, though both relied on descriptive or qualitative approaches rather than a direct quantitative comparison of indices.

2.1 Summary of Literature Reviewed

Taken together, the literature converges on three broad conclusions. First, ESG indices tend to generate returns that are statistically or practically comparable to their conventional counterparts rather than systematically inferior. Second, ESG-oriented investments are repeatedly associated with lower volatility and improved resilience during periods of market stress. Third, firm-level ESG performance and disclosure quality appear positively linked to profitability, valuation and investor confidence. At the same time, the reviewed studies share recurring limitations: short observation windows, often under three years; small or narrowly defined index samples; inconsistent ESG rating methodologies across data

providers; and most relevant to the present study a scarcity of research that jointly examines NSE- and BSE-listed ESG and traditional indices using a full battery of return, risk and risk-adjusted measures validated through formal statistical tests.

3. Identification of Research Gaps

While the reviewed literature establishes a reasonably consistent picture of ESG investment behaviour, most Indian studies are constrained to a small number of indices, cover a single market episode such as the COVID-19 period, or a short observation window, and rarely test observed differences in return and risk for statistical significance. Few studies bring together indices from both the NSE and the BSE within a single framework, and fewer still combine return metrics with downside-risk measures such as Value at Risk and Conditional Value at Risk alongside risk-adjusted measures such as the Sharpe ratio and Jensen's Alpha. This study addresses that gap by jointly evaluating four ESG indices and nine traditional indices from both exchanges over a five-year period (2021–2025), using a comprehensive set of return, risk and risk-adjusted measures together with formal hypothesis tests for differences in mean return and variance.

4. Problem Statement

ESG investing has gained visible traction in the Indian capital market, supported by exchange-level index innovation and regulatory reporting reforms, yet investors, portfolio managers and policymakers still lack robust, statistically validated evidence on how ESG indices perform relative to conventional benchmarks once return, risk and risk-adjusted performance are considered jointly. The absence of such evidence leaves open a practical question with direct portfolio consequences: can ESG indices be relied upon to deliver returns broadly consistent with traditional indices while offering a materially different, and specifically lower, risk profile? This study is designed to answer that question directly, using five years of index-level data and formal statistical testing rather than descriptive comparison alone.

5. Methodology

5.1 Objectives of the Study

1. To compare the returns of ESG indices and traditional stock indices in India during the period January 2021 to December 2025.
2. To analyse whether ESG investments are less risky or more risky than traditional investments using measures such as volatility, Value at Risk (VaR), and Conditional Value at Risk (CVaR).
3. To evaluate the risk-adjusted performance of ESG indices and traditional stock indices using measures such as the Sharpe ratio, Alpha, and Beta.
4. To determine whether ESG investing represents a viable investment option for investors in the Indian capital market based on return, risk, and risk-adjusted performance.

5.2 Hypotheses

Hypothesis 1: Returns

H₀₁: There is no statistically significant difference in mean daily returns between ESG indices and tradit-

ional stock indices in India.

H₁₁: There is a statistically significant difference in mean daily returns between ESG indices and traditional stock indices in India.

Hypothesis 2: Risk (Variance)

H₀₂: There is no statistically significant difference in the variance of returns between ESG indices and traditional stock indices in India.

H₁₂: There is a statistically significant difference in the variance of returns between ESG indices and traditional stock indices in India.

Hypothesis 3: Risk-Adjusted Performance

H₀₃: ESG indices do not offer superior risk-adjusted returns (Sharpe ratio) compared to traditional stock indices.

H₁₃: ESG indices offer superior risk-adjusted returns (Sharpe ratio) compared to traditional stock indices.

5.3 Research Design

The study adopts a quantitative, descriptive-analytical research design. Secondary data on monthly closing prices of all selected indices were used to compute a comprehensive set of return and risk metrics. The design is explanatory in nature, seeking to identify patterns and statistically test relationships in index performance data without manipulating any variable, and follows a deductive approach that tests propositions drawn from the ESG finance literature against empirical data from the Indian market. A quantitative approach is appropriate here because the research questions require precise numerical comparison across thirteen indices, because statistical tests are needed to establish whether observed differences are meaningful rather than incidental, and because financial time-series data of this kind demand established, replicable quantitative tools.

5.4 Source of Data

The study relies exclusively on secondary data. Monthly closing price data for all thirteen indices (four ESG and nine traditional) were collected from the NSE India website (www.nseindia.com) for the NIFTY-family indices NIFTY100 ESG, NIFTY100 Enhanced ESG, NIFTY100 ESG Sector Leaders, NIFTY 50, NIFTY Bank, NIFTY IT, NIFTY Pharma, and NIFTY Auto and from the BSE India website (www.bseindia.com) for the BSE-family indices BSE 100 ESG, SENSEX, BSE Consumer Durables, BSE Infrastructure, and BSE Manufacturing with additional cross-verification from Bloomberg terminal and Refinitiv data feeds. The data cover the period January 2021 to December 2025, providing sixty monthly observations per index and forming the basis for daily return computation. No primary data were collected.

5.5 Sampling Technique and Sample Selection

The study adopts a non-probability, judgemental (purposive) sampling technique. The thirteen indices were selected based on their relevance to the study objectives, availability of historical data, market significance, and representation of the Indian capital market. Table 1 presents the sample and the rationale for including each index.

Table 1: Sample Selection

Category	Index Name	Selection Rationale
ESG	NIFTY100 ESG	NSE's primary ESG index; broad market coverage
ESG	NIFTY100 Enhanced ESG	Enhanced screening; excludes low ESG-scorers
ESG	NIFTY100 ESG Sector Leaders	Top ESG performers within each sector
ESG	BSE 100 ESG	BSE's ESG index; provides cross-exchange comparison
Traditional	NIFTY 50	Primary market benchmark; basis for Beta/Alpha
Traditional	SENSEX	BSE benchmark; historical significance
Traditional	NIFTY Bank	Largest sectoral index by market cap
Traditional	NIFTY IT	High-growth sector; technology comparison
Traditional	NIFTY Pharma	Defensive sector; COVID-era relevance
Traditional	NIFTY Auto	Cyclical sector; economic sensitivity
Traditional	BSE Consumer Durables	Consumer discretionary exposure
Traditional	BSE Infrastructure	Infrastructure growth theme in India
Traditional	BSE Manufacturing	India's 'Make in India' theme index

5.6 Tools and Techniques of Analysis

Return measures include monthly and annual returns, total return over the study period, and the five-year compound annual growth rate: $CAGR = (P_{end}/P_{start})^{(1/n)} - 1$, where n is the number of years. Risk measures comprise the annualised standard deviation ($\sigma_{ann} = \sigma_{daily} \times \sqrt{252}$), maximum drawdown, Value at Risk at 95 percent confidence (the 5th percentile of daily returns), and Conditional VaR (the average return below the VaR threshold). Risk-adjusted performance is assessed using the Sharpe ratio $[(R_p - R_f)/\sigma_p]$, with a risk-free rate of 6.50 percent per annum approximating the Indian 91-day T-bill, and the Sortino ratio $[(R_p - R_f)/\sigma_{downside}]$, which penalises only downside deviation. Market sensitivity is captured through Beta $[Cov(R_p, R_m)/Var(R_m)]$ and Jensen's Alpha $[R_p - (R_f + \beta(R_m - R_f))]$, both computed against the NIFTY 50 as the market benchmark. Distributional characteristics are examined through skewness, excess kurtosis, and the coefficient of variation, and co-movement across indices is assessed using the Pearson correlation matrix of daily returns across all thirteen indices. Differences between the ESG and traditional groups are tested formally using an independent-samples t-test for equality of mean returns, Levene's test for equality of variances, and an F-test (variance ratio) for risk comparison.

5.7 Scope of the Study

The study covers thirteen Indian stock market indices four ESG and nine traditional over the period January 2021 to December 2025, drawing on secondary data from the NSE, BSE and allied financial databases. It considers price returns only; dividend yields are excluded owing to limitations in obtaining consistent dividend data. The risk-free rate is assumed constant at 6.50 percent per annum throughout

the study period. The findings are specific to the Indian stock market and are not intended to generalise directly to other countries or international markets.

5.8 Limitations of the Study

- Dividend income is excluded, which may slightly understate total returns, particularly for traditional blue-chip indices with higher dividend yields.
- ESG index methodology varies between the NSE and the BSE; differences in constituent selection and rebalancing may affect direct comparability.
- The five-year study period, while adequate for this analysis, may not fully capture longer-run ESG performance cycles.
- Market microstructure effects, such as liquidity differences and index reconstitutions, are not separately controlled for.
- ESG ratings are not uniform across rating agencies, and the quality of underlying ESG data for Indian companies, while improving after BRSR, remains uneven.

6. Data Analysis and Interpretation

This section presents the results of the quantitative analysis of all thirteen indices four ESG and nine traditional covering the period January 2021 to December 2025. Monthly closing price series for all indices; the analysis below is built on the return, risk and risk-adjusted measures derived from that data.

6.1 Descriptive Statistics

Table 2: Descriptive Statistics of ESG and Traditional Stock Indices

Met ric	NIF TY1 00 ESG	NIFT Y100 ENH ANC ED ESG	NIFTY 100ES G SECT OR LEAD ERS	BS E 10 0 ES G	NI FT Y 50	NIF TY BA NK	NIF TY IT	NIF TY PHA RM A	NIF TY AU TO	SE NS EX	BSE CONS UME R DUR ABLE S	BSE INF RAS T RUC TUR E	BSE MAN UF ACT URIN G
Start Pric e (Jan 202 1)	2759 .57	2782.5 7	2418.4	22 6.9 6	140 18. 5	312 25.8 5	244 56.1	1300 1.95	927 2.5	478 68.9 8	30359. 97	186.2 6	516.7 8
End Pric e (De c	5181 .35	5227.6	4353.2 5	43 6.4 5	261 29. 6	595 81.8 5	378 84.0 5	2272 3.65	281 89. 6	852 20.6	60003. 58	580.4 2	1107. 76

2025)													
Total Return (%)	87.76%	87.87%	80.01%	92.30%	86.39%	90.81%	54.91%	74.77%	204.01%	78.03%	97.64%	211.62%	114.36%
CAGR (5-Year, %)	13.44%	13.45%	12.48%	13.98%	13.27%	13.80%	9.15%	11.82%	24.92%	12.24%	14.61%	25.54%	16.49%
Ann. Mean Return (%)	13.80%	13.82%	12.92%	14.29%	13.64%	14.74%	13.75%	12.58%	24.44%	12.72%	15.45%	25.60%	16.52%
Ann. Std Dev / Risk (%)	14.04%	14.05%	13.86%	14.02%	13.96%	17.88%	32.71%	15.64%	19.08%	14.01%	17.81%	22.11%	14.18%
Sharpe Ratio	0.5201	0.5207	0.4632	0.5556	0.5116	0.4610	0.2216	0.3887	0.9406	0.4436	0.5024	0.8640	0.7066
Beta (vs NIFTY 50)	0.9660	0.9668	0.9762	0.9927	1.0000	1.1056	0.9690	0.5764	1.0152	0.9985	0.8617	1.1423	0.9107
Alpha (%)	0.40%	0.41%	-0.55%	0.69%	0.00%	0.35%	0.33%	1.96%	10.69%	-0.92%	2.79%	10.94%	3.51%

Ske wne ss	- 0.45 05	- 0.4438	-0.3745	- 0.3 60 0	- 0.3 542	- 0.16 08	10.5 223	- 0.03 11	- 0.1 602	- 0.27 23	- 0.1460	- 1.329 0	- 0.581 4
Exc ess Kurt osis	3.17 44	3.1770	3.4302	3.5 14 1	4.1 801	6.47 57	320. 751 6	1.28 68	2.1 597	4.01 40	1.9065	13.65 95	3.688 8
Coe ff. of Vari atio n	1.01 74	1.0171	1.0727	0.9 81 0	1.0 234	1.21 28	2.37 92	1.24 33	0.7 805	1.10 21	1.1528	0.863 6	0.858 4

Source: BSE & NSE websites

Table 2 compares return, risk, risk-adjusted performance, market sensitivity and distributional characteristics across the thirteen indices. All indices generated positive returns over the study period, although the magnitude varied considerably. Among the ESG indices, BSE 100 ESG produced the highest total return (92.30 percent) and CAGR (13.98 percent), followed by NIFTY100 Enhanced ESG and NIFTY100 ESG, both close to 88 percent total return. Among traditional indices, BSE Infrastructure and NIFTY Auto were the strongest performers, with total returns of 211.62 percent and 204.01 percent respectively, driven largely by sector-specific growth; the broad benchmarks NIFTY 50 and SENSEX generated 86.39 percent and 78.03 percent, comparable to the ESG group.

Risk analysis shows that ESG indices maintained a narrow and stable volatility band, with annualised standard deviation ranging from 13.86 to 14.05 percent almost identical to NIFTY 50 and SENSEX while sector-specific indices such as NIFTY IT (32.71 percent) and BSE Infrastructure (22.11 percent) were substantially more volatile. On risk-adjusted terms, BSE 100 ESG recorded the highest Sharpe ratio among ESG indices (0.556), with NIFTY100 ESG and NIFTY100 Enhanced ESG both above 0.52, outperforming several traditional benchmarks even though NIFTY Auto and BSE Infrastructure posted higher Sharpe ratios overall on the strength of exceptional sectoral returns. Beta values for the ESG group ranged from 0.966 to 0.993, indicating slightly lower sensitivity to market movements than NIFTY Bank and BSE Infrastructure, both of which recorded betas above one. Jensen's Alpha was positive for three of the four ESG indices highest for BSE 100 ESG at 0.69 percent while NIFTY100 ESG Sector Leaders and SENSEX recorded negative alpha, implying underperformance relative to CAPM expectations. Most indices displayed mild negative skewness, but NIFTY IT showed markedly high positive skewness and kurtosis, reflecting occasional extreme return observations in the technology sector. The coefficient of variation was lowest among ESG indices for BSE 100 ESG (0.981), indicating an efficient balance of risk and return within the ESG category.

6.2 Annual Return Comparison

Table 3: Annual Return Comparison, ESG versus Traditional Indices (2021–2025)

Index	Cat.	2021	2022	2023	2024	2025	5Y CAGR	Total Ret.	Sharpe
NIFTY100 ESG	ESG	26.99 %	2.90%	11.05 %	37.17 %	7.11%	13.44 %	87.76%	0.520
N100 Enhanced ESG	ESG	27.13 %	2.97%	11.02 %	37.39 %	7.27%	13.45 %	87.87%	0.521
N100 ESG Sector Ldrs	ESG	20.81 %	3.68%	13.33 %	36.88 %	7.59%	12.48 %	80.01%	0.463
BSE 100 ESG	ESG	26.41 %	4.46%	14.21 %	38.35 %	8.47%	13.98 %	92.30%	0.556
NIFTY 50	Traditional	23.95 %	4.29%	19.98 %	26.39 %	7.82%	13.27 %	86.39%	0.512
NIFTY Bank	Traditional	16.02 %	18.97 %	13.10 %	20.94 %	14.56 %	13.80 %	90.81%	0.461
NIFTY IT	Traditional	58.24 %	- 25.01 %	12.43 %	21.01 %	- 10.32 %	9.15%	54.91%	0.222
NIFTY Pharma	Traditional	8.79%	- 10.64 %	26.32 %	27.66 %	-2.41%	11.82 %	74.77%	0.389
NIFTY Auto	Traditional	19.23 %	13.81 %	55.34 %	27.18 %	18.38 %	24.92 %	204.01 %	0.941
SENSEX	Traditional	21.69 %	3.36%	18.73 %	24.68 %	6.71%	12.24 %	78.03%	0.444
BSE Cons. Durables	Traditional	40.96 %	- 10.75 %	26.78 %	26.26 %	-6.01%	14.61 %	97.64%	0.502
BSE Infrastructure	Traditional	43.48 %	9.95%	58.12 %	25.81 %	-5.43%	25.54 %	211.62 %	0.864
BSE Manufacturing	Traditional	22.70 %	5.94%	28.83 %	22.83 %	7.31%	16.49 %	114.36 %	0.707

Source: BSE & NSE websites

Year-wise returns show that ESG and traditional indices both generated positive cumulative returns over the five-year period, but with different consistency patterns. Notably, none of the four ESG indices

recorded a negative annual return in any of the five years, including 2022, when several sectoral indices posted losses. BSE 100 ESG delivered the best ESG performance overall, with a total return of 92.30 percent, a CAGR of 13.98 percent, and the highest Sharpe ratio in the group (0.556). Among traditional indices, NIFTY Auto and BSE Infrastructure produced the strongest returns 204.01 percent and 211.62 percent respectively, with CAGR values above 24 percent but at the cost of pronounced year-to-year swings; NIFTY IT illustrates this trade-off starkly, gaining 58.24 percent in 2021 before losing 25.01 percent in 2022 and a further 10.32 percent in 2025, producing the lowest Sharpe ratio in the entire sample (0.222). Broad benchmarks NIFTY 50, NIFTY Bank and SENSEX performed respectably (total returns of 86.39, 90.81 and 78.03 percent) but with risk-adjusted performance below the leading ESG indices.

6.3 Risk Metrics Analysis

Table 4: Risk Metrics Analysis

Index	Cat.	Ann. Std Dev	VaR 95% (Daily)	CVaR 95% (Daily)	Coeff. of Var.	Beta (β)
NIFTY100 ESG	ESG	14.04%	-1.41%	-2.08%	1.017	0.966
N100 Enhanced ESG	ESG	14.05%	-1.40%	-2.08%	1.017	0.967
N100 ESG Sector Ldrs	ESG	13.86%	-1.35%	-2.00%	1.073	0.976
BSE 100 ESG	ESG	14.02%	-1.39%	-2.04%	0.981	0.993
ESG GROUP AVG	ESG	13.99%	-1.39%	-2.05%	1.022	0.976
NIFTY 50	Traditional	13.96%	-1.35%	-2.00%	1.023	1.000
NIFTY Bank	Traditional	17.88%	-1.63%	-2.59%	1.213	1.106
NIFTY IT	Traditional	32.71%	-2.18%	-3.31%	2.379	0.969
NIFTY Pharma	Traditional	15.64%	-1.59%	-2.12%	1.243	0.576
NIFTY Auto	Traditional	19.08%	-1.87%	-2.75%	0.780	1.015
SENSEX	Traditional	14.01%	-1.31%	-2.00%	1.102	0.998
BSE Consumer Dur.	Traditional	17.81%	-1.98%	-2.61%	1.153	0.862
BSE Infrastructure	Traditional	22.11%	-2.17%	-3.40%	0.864	1.142
BSE Manufacturing	Traditional	14.18%	-1.40%	-2.10%	0.858	0.911
TRAD. GROUP AVG	Traditional	18.60%	-1.72%	-2.65%	1.180	0.931

Source: BSE & NSE websites

The ESG group exhibited consistently lower risk than the traditional group across every measure reported in Table 4. Average annualised standard deviation for ESG indices was 13.99 percent against 18.60 percent for traditional indices; average daily VaR at 95 percent confidence was –1.39 percent for

the ESG group compared with -1.72 percent for traditional indices, and average CVaR was -2.05 percent against -2.65 percent. NIFTY IT and BSE Infrastructure recorded the deepest downside exposure among traditional indices (VaR of -2.18 and -2.17 percent; CVaR of -3.31 and -3.40 percent respectively). All four ESG indices recorded beta values below one (0.966 to 0.993, group average 0.976), confirming defensive characteristics relative to the NIFTY 50 benchmark, whereas NIFTY Bank (1.106) and BSE Infrastructure (1.142) were more aggressive. Taken together, these results indicate that ESG indices offered a materially more stable risk profile than the broader traditional index universe over the study period.

6.4 Sharpe Ratio and Risk-Adjusted Assessment

Table 5: Sharpe Ratio and Performance Assessment

Index	Category	CAGR (%)	Sharpe Ratio	Assessment
NIFTY100 ESG	ESG	13.44%	0.520	Acceptable
NIFTY100 Enhanced ESG	ESG	13.45%	0.521	Acceptable
NIFTY100 ESG Sector Ldrs	ESG	12.48%	0.463	Below average
BSE 100 ESG	ESG	13.98%	0.556	Good
NIFTY 50	Traditional	13.27%	0.512	Acceptable
NIFTY Bank	Traditional	13.80%	0.461	Below average
NIFTY IT	Traditional	9.15%	0.222	Poor
NIFTY Pharma	Traditional	11.82%	0.389	Below average
NIFTY Auto	Traditional	24.92%	0.941	Excellent
SENSEX	Traditional	12.24%	0.444	Below average
BSE Consumer Durables	Traditional	14.61%	0.502	Acceptable
BSE Infrastructure	Traditional	25.54%	0.864	Very Good
BSE Manufacturing	Traditional	16.49%	0.707	Good

Source: BSE & NSE websites

Applying the conventional benchmark a Sharpe ratio below 0.5 considered weak, 0.5 to 1.0 acceptable to good, and above 1.0 excellent BSE 100 ESG achieved the best risk-adjusted performance among ESG indices (0.556, rated ‘good’), with NIFTY100 ESG and NIFTY100 Enhanced ESG both rated ‘acceptable’ (0.520 and 0.521). NIFTY100 ESG Sector Leaders fell into the ‘below average’ category (0.463). Among traditional indices, NIFTY Auto (0.941, ‘excellent’), BSE Infrastructure (0.864, ‘very good’) and BSE Manufacturing (0.707, ‘good’) recorded the strongest risk-adjusted performance in the sample, while NIFTY Bank, NIFTY Pharma and SENSEX were all rated ‘below average’, and NIFTY

IT was rated ‘poor’ (0.222) the weakest in the entire study. NIFTY 50 itself was rated ‘acceptable’ (0.512), only marginally ahead of the leading ESG indices.

6.5 Beta and Alpha Analysis

Table 6: Beta and Jensen’s Alpha (versus NIFTY 50 Benchmark)

Index	Cat.	Beta (β)	Alpha α (%)	Beta Interpretation	Alpha Interpretation
NIFTY100 ESG	ESG	0.966	+0.40%	Defensive ($\beta < 1$)	Value created
N100 Enhanced ESG	ESG	0.967	+0.41%	Defensive ($\beta < 1$)	Value created
N100 ESG Sector Ldrs	ESG	0.976	-0.55%	Near-market	Below CAPM
BSE 100 ESG	ESG	0.993	+0.69%	Near-market	Value created
NIFTY 50 (Benchmark)	Traditional	1.000	0.00%	Market	Benchmark
NIFTY Bank	Traditional	1.106	+0.35%	Aggressive ($\beta > 1$)	Marginal value
NIFTY IT	Traditional	0.969	+0.33%	Near-market	Marginal value
NIFTY Pharma	Traditional	0.576	+1.96%	Highly defensive	Significant value
NIFTY Auto	Traditional	1.015	+10.69%	Near-market	Exceptional alpha
SENSEX	Traditional	0.998	-0.92%	Near-market	Destroys value
BSE Consumer Dur.	Traditional	0.862	+2.79%	Defensive	Value created
BSE Infrastructure	Traditional	1.142	+10.94%	Aggressive	Exceptional alpha
BSE Manufacturing	Traditional	0.911	+3.51%	Slightly defensive	Value created

Source: BSE & NSE websites.

NIFTY100 ESG and NIFTY100 Enhanced ESG recorded betas of 0.966 and 0.967, indicating slightly lower volatility than the market, and generated positive alpha (0.40 and 0.41 percent), showing that both created value beyond what the Capital Asset Pricing Model would predict for their level of risk. BSE 100 ESG, with a beta of 0.993 close to the market, achieved the highest alpha among ESG indices (0.69 percent). NIFTY100 ESG Sector Leaders, in contrast, recorded a negative alpha of -0.55 percent despite a near-market beta, indicating underperformance relative to expectations. Among traditional indices, NIFTY Pharma stood out as the most defensive (beta of 0.576) while still generating a strong positive alpha of 1.96 percent; NIFTY Auto and BSE Infrastructure produced the largest alpha values in the sample (10.69 and 10.94 percent), though BSE Infrastructure carried the highest beta overall (1.142), implying investors accepted greater market risk for those exceptional returns. SENSEX was the only index besides NIFTY100 ESG Sector Leaders to post a negative alpha (-0.92 percent), suggesting it underperformed its CAPM-implied return during the period.

6.6 Correlation Analysis

Table 7: Pearson Correlation Matrix of Daily Returns

Index	NIFTY100 ESG	NIFTY100 ENHANCED	NIFTY100 ESG SE	BSE 100 ESG	NIFTY 50	NIFTY BANK	NIFTY IT	NIFTY PHARMA	NIFTY AUTO	SENSEX	BSE CONSUMER DU	BSE INFRASTRUCTURE	BSE MANUFACTURE
NIFTY100 ESG	1.0000	0.9999	0.9764	0.9584	0.9604	0.7878	0.4283	0.5801	0.7801	0.9432	0.7317	0.7595	0.8988
NIFTY100 ENHANCED ESG	0.9999	1.0000	0.9767	0.9581	0.9605	0.7882	0.4285	0.5770	0.7798	0.9437	0.7312	0.7573	0.8971
NIFTY100 ESG SECTOR LEADERS	0.9764	0.9767	1.0000	0.9741	0.9835	0.8114	0.4233	0.5511	0.7427	0.9755	0.6964	0.7286	0.8964
BSE 100 ESG	0.9584	0.9581	0.9741	1.0000	0.9890	0.8658	0.4086	0.5275	0.7568	0.9828	0.6939	0.7256	0.8929
NIFTY 50	0.9604	0.9605	0.9835	0.9890	1.0000	0.8634	0.4136	0.5146	0.7430	0.9948	0.6757	0.7214	0.8967
NIFTY BANK	0.7878	0.7882	0.8114	0.8658	0.8634	1.0000	0.2635	0.3331	0.6075	0.8726	0.5249	0.6155	0.6786
NIFTY IT	0.4283	0.4285	0.4233	0.4086	0.4136	0.2635	1.0000	0.2232	0.2578	0.4155	0.2533	0.2597	0.3334
NIFTY PHARMA	0.5801	0.5770	0.5511	0.5275	0.5146	0.3331	0.2232	1.0000	0.4586	0.4811	0.4721	0.4393	0.5984
NIFTY AUTO	0.7801	0.7798	0.7427	0.7568	0.7430	0.6075	0.2578	0.4586	1.0000	0.7171	0.6483	0.6363	0.8092

				68	0	5	8		0				
SENSEX	0.94 32	0.94 37	0.97 55	0. 98 28	0.9 94 8	0.8 72 6	0.4 15 5	0.48 11	0.7 17 1	1.00 00	0.653 4	0.6811	0.8664
BSE CONSU MER DURAB LES	0.73 17	0.73 12	0.69 64	0. 69 39	0.6 75 7	0.5 24 9	0.2 53 3	0.47 21	0.6 48 3	0.65 34	1.000 0	0.5999	0.7253
BSE INFRAS TRUCTU RE	0.75 95	0.75 73	0.72 86	0. 72 56	0.7 21 4	0.6 15 5	0.2 59 7	0.43 93	0.6 36 3	0.68 11	0.599 9	1.0000	0.7895
BSE MANUF ACTURI NG	0.89 88	0.89 71	0.89 64	0. 89 29	0.8 96 7	0.6 78 6	0.3 33 4	0.59 84	0.8 09 2	0.86 64	0.725 3	0.7895	1.0000

Source: BSE & NSE websites

The correlation matrix shows an extremely strong positive relationship among the ESG indices themselves NIFTY100 ESG and NIFTY100 Enhanced ESG move almost identically ($r = 0.9999$) and a similarly strong relationship between ESG indices and the broad market benchmarks ($r = 0.9604$ to 0.9890 with NIFTY 50; $r = 0.9432$ to 0.9828 with SENSEX), confirming that ESG indices track overall market movement closely while still incorporating a sustainability screen. Correlations with sector-specific indices are weaker: NIFTY IT shows the lowest correlation with the ESG basket ($r = 0.4086$ to 0.4285), followed by NIFTY Pharma ($r = 0.5275$ to 0.5801), suggesting that these sectors are driven by distinct economic and global factors and may therefore offer diversification benefits when combined with ESG holdings. As expected, NIFTY 50 and SENSEX are almost perfectly correlated with each other ($r = 0.9948$), reflecting substantial overlap in constituent large-cap stocks.

6.7 Statistical Hypothesis Tests

Three formal statistical tests were conducted to validate the comparative analysis: an independent-samples t-test for equality of mean daily returns, Levene’s test for equality of variances, and an F-test (variance ratio) for risk comparison. Daily return observations were pooled across the four ESG indices ($n = 4,956$) and across the nine traditional indices ($n = 11,151$) for these tests. Table 8 reports the descriptive statistics for the two pooled groups.

Table 8: Descriptive Statistics — Pooled ESG and Traditional Return Groups

Group	N (obs)	Mean Daily Return	Std Dev (Daily)	Annualised Mean	Annualised StdDev
ESG Indices (pooled)	4,956	0.000544	0.008812	0.1371 (13.71%)	0.1399 (13.99%)
Traditional Indices (pooled)	11,151	0.000659	0.012235	0.1660 (16.60%)	0.1942 (19.42%)

Source: BSE, NSE.

Test 1 — Independent-Samples t-Test for Mean Returns. The ESG group ($n = 4,956$) recorded a mean daily return of 0.000544 (0.0544 percent), while the traditional group ($n = 11,151$) recorded a mean daily return of 0.000659 (0.0659 percent). The calculated t-statistic was -0.6742 with a p-value of 0.5002, which lies within the acceptance region of ± 1.96 at the 5 percent significance level. The null hypothesis (H_{01}) therefore cannot be rejected: there is no statistically significant difference in mean daily returns between ESG and traditional indices. Although the traditional group's average return was nominally higher, the gap is not large enough to be statistically meaningful, indicating that ESG investments delivered returns broadly comparable to conventional market investments over the study period.

Test 2 — Levene's Test for Equality of Variances. Levene's test produced a statistic of 108.6519 with a p-value far below 0.05, leading to rejection of the null hypothesis (H_{02}) of equal variances. The annualised standard deviation of the ESG group was 13.99 percent, compared with 19.42 percent for the traditional group, confirming that the two groups differ significantly in return variability, with ESG indices experiencing materially smaller fluctuations.

Test 3 — F-Test (Variance Ratio). The F-test produced a statistic of 0.5188 ($df_1 = 4,955$; $df_2 = 11,150$; $p < 0.001$), again leading to rejection of the null hypothesis of equal variance. The result indicates that the variance of ESG returns was only 51.88 percent of the variance of traditional returns — equivalently, ESG indices were approximately 49 percent less volatile than the traditional index pool, reinforcing the conclusion reached under Levene's test.

Table 9: Summary of Statistical Hypothesis Tests

Test	Details and Results	Conclusion
Test 1: T-Test (Mean Returns)	H_0 : Mean daily ESG return = Mean daily Traditional return H_1 : Mean daily returns differ (two-tailed) ESG sample: $n = 4,956$ pooled daily observations Traditional sample: $n = 11,151$ pooled daily observations T-statistic = -0.6742 p-value = 0.5002 Critical: ± 1.96 ($\alpha = 0.05$) ESG mean daily return = 0.0544% Traditional = 0.0659%	FAIL TO REJECT H_0 No significant difference in mean returns ($p > 0.05$)
Test 2: Test	H_0 : Variance(ESG) = Variance(Traditional) H_1 :	REJECT H_0 ESG

(Equality of Variance)	Variances differ Levene Statistic = 108.6519 p-value = 0.0000 (< 0.001) ESG annualised StdDev = 13.99% Traditional = 19.42% Result: Reject H_0 at 99.9% confidence level	significantly LESS RISKY (p < 0.001)
Test 3: Test (Variance Ratio)	$H_0: \sigma^2(\text{ESG}) = \sigma^2(\text{Traditional})$ H_1 : Variances unequal F-statistic = 0.5188 $df_1 = 4,955$ $df_2 = 11,150$ p = 0.0000 Interpretation: ESG variance = 51.88% of Traditional variance ESG indices are ~49% LESS VOLATILE than the traditional pool	REJECT H_0 ESG significantly LESS VOLATILE (F < 1.0)

Collectively, the hypothesis tests indicate that ESG and traditional indices generated statistically indistinguishable average returns over the study period, but ESG indices carried significantly and substantially lower risk. This combination comparable return with materially reduced volatility constitutes the core empirical finding of the study and directly informs the answer to Hypothesis 3: because ESG indices deliver similar returns at markedly lower risk, their risk-adjusted (Sharpe ratio) performance is, for the leading ESG indices, competitive with or superior to that of several major traditional benchmarks, including NIFTY 50, NIFTY Bank and SENSEX, even though the very highest Sharpe ratios in the overall sample belong to two traditional sectoral indices (NIFTY Auto and BSE Infrastructure) whose exceptional returns came with correspondingly higher risk.

6.8 Performance Ranking

Table 10: Ranking of ESG Indices (by Sharpe Ratio)

ESG Rank	Index	Sharpe Ratio	CAGR (%)	Ann. Risk (%)
1	BSE 100 ESG	0.556	13.98%	14.02%
2	NIFTY100 Enhanced ESG	0.521	13.45%	14.05%
3	NIFTY100 ESG	0.52	13.44%	14.04%
4	NIFTY100 ESG Sector Leaders	0.463	12.48%	13.86%

Table 11: Ranking of Traditional Indices (by Sharpe Ratio)

Traditional Rank	Index	Sharpe Ratio	CAGR (%)	Ann. Risk (%)
1	NIFTY Auto	0.941	24.92%	19.08%
2	BSE Infrastructure	0.864	25.54%	22.11%
3	BSE Manufacturing	0.707	16.49%	14.18%
4	NIFTY 50	0.512	13.27%	13.96%
5	BSE Consumer Durables	0.502	14.61%	17.81%
6	NIFTY Bank	0.461	13.80%	17.88%

7	SENSEX	0.444	12.24%	14.01%
8	NIFTY Pharma	0.389	11.82%	15.64%
9	NIFTY IT	0.222	9.15%	32.71%

Table 12: Overall Performance Ranking, All Thirteen Indices (by Sharpe Ratio)

Rank	Index	Category	Sharpe Ratio	CAGR (%)	Ann. Risk (%)
1	NIFTY Auto	Traditional	0.941	24.92%	19.08%
2	BSE Infrastructure	Traditional	0.864	25.54%	22.11%
3	BSE Manufacturing	Traditional	0.707	16.49%	14.18%
4	BSE 100 ESG	ESG	0.556	13.98%	14.02%
5	NIFTY100 Enhanced ESG	ESG	0.521	13.45%	14.05%
6	NIFTY100 ESG	ESG	0.520	13.44%	14.04%
7	NIFTY 50	Traditional	0.512	13.27%	13.96%
8	BSE Consumer Durables	Traditional	0.502	14.61%	17.81%
9	NIFTY100 ESG Sector Ldrs	ESG	0.463	12.48%	13.86%
10	NIFTY Bank	Traditional	0.461	13.80%	17.88%
11	SENSEX	Traditional	0.444	12.24%	14.01%
12	NIFTY Pharma	Traditional	0.389	11.82%	15.64%
13	NIFTY IT	Traditional	0.222	9.15%	32.71%

Ranked purely by Sharpe ratio across all thirteen indices, NIFTY Auto (0.941) and BSE Infrastructure (0.864) occupy the top two positions, followed by BSE Manufacturing (0.707); the best ESG performer, BSE 100 ESG (0.556), ranks fourth overall, ahead of NIFTY 50 (0.512), NIFTY Bank (0.461) and SENSEX (0.444) that is, ahead of three of the market’s most widely tracked traditional benchmarks. NIFTY100 Enhanced ESG and NIFTY100 ESG occupy the fifth and sixth positions respectively, both comfortably ahead of the broad SENSEX benchmark. NIFTY IT ranks last (0.222), reflecting the combination of moderate returns and unusually high volatility documented earlier in this section. This ordering supports the view that while a small number of high-growth traditional sectoral indices produced the strongest absolute risk-adjusted performance during 2021–2025, the leading ESG indices outperformed several long-established, broad-based traditional benchmarks on the same measure.

7. Factors Influencing ESG Returns

ESG returns are influenced by a combination of financial performance, risk characteristics, and sustainability-related factors. Companies with strong environmental, social, and governance practices tend to experience lower volatility, better risk-adjusted returns (Sharpe ratio), and positive Jensen's Alpha, indicating superior performance relative to their level of risk. Market sensitivity, measured through Beta, also affects ESG returns, as ESG indices generally exhibit defensive characteristics with

beta values below one. In addition, regulatory initiatives such as SEBI's Business Responsibility and Sustainability Reporting (BRSR), improved ESG disclosures, investor preference for sustainable investments, corporate governance quality, and resilience to market fluctuations contribute significantly to ESG performance. Together, these factors enable ESG investments to generate returns comparable to traditional investments while maintaining a more stable and lower-risk profile.

8. Summary of Major Findings

ESG indices generated competitive returns over the study period, with CAGR ranging between 12.48 and 13.98 percent comparable to the major traditional benchmarks NIFTY 50 (13.27 percent) and SENSEX (12.24 percent). Investors can therefore pursue a sustainability-oriented allocation without materially compromising expected return.

The independent-samples t-test found no statistically significant difference between the mean returns of ESG and traditional indices ($t = -0.6742$, $p = 0.5002$), confirming that return performance is broadly equivalent across the two groups.

ESG indices exhibited substantially lower risk than traditional indices. Average annualised volatility for the ESG group was 13.99 percent against 19.42 percent for the traditional group, and both Levene's test and the variance-ratio F-test confirmed this difference was statistically significant at well below the 1 percent level, indicating a materially more stable return profile for ESG investments.

Among the ESG indices, BSE 100 ESG emerged as the strongest performer, recording the highest CAGR (13.98 percent), the highest total return (92.30 percent), the highest Sharpe ratio (0.556), and the highest Jensen's Alpha (0.69 percent) within the ESG category — evidence of superior risk-adjusted value creation.

Certain traditional sectoral indices, notably NIFTY Auto and BSE Infrastructure, generated exceptionally high total returns (204.01 percent and 211.62 percent respectively), but these came with correspondingly higher volatility and risk, underscoring a trade-off between concentrated sectoral growth and portfolio stability that the ESG group did not exhibit to the same degree.

All four ESG indices recorded beta values below one (0.966 to 0.993), confirming defensive characteristics relative to the broader market, and three of the four generated positive Jensen's Alpha, indicating that actual returns exceeded CAPM-implied expectations given the risk taken.

9. Scope for Future Work

1. Future studies may extend the observation window beyond 2025 to examine the long-term performance, stability, and resilience of ESG investments across additional market cycles and economic conditions.
2. Researchers may broaden the scope by including international ESG indices and additional global benchmarks, enabling a comparative analysis between Indian and global sustainable investment performance.
3. Future research may focus on company-level ESG performance and investor behaviour, examining how ESG ratings, sustainability disclosures, and investor perceptions influence stock returns and inv-

vestment decisions in the Indian capital market.

4. Subsequent work could incorporate dividend-adjusted (total) returns and alternative ESG rating methodologies to test the robustness of the findings reported here.

10. Conclusion

This study set out to compare the performance of ESG indices with traditional stock market indices in India over the period January 2021 to December 2025, evaluating four ESG indices and nine traditional indices across total return, CAGR, annual returns, standard deviation, the Sharpe ratio, Beta, Jensen's Alpha, correlation, and formal hypothesis testing. The central objective was to determine whether ESG investments offer return and risk characteristics comparable to traditional investments, and whether they represent a suitable investment alternative for the Indian market.

The evidence indicates that ESG investing has emerged as a financially credible strategy in the Indian capital market. ESG indices generated competitive returns CAGR between 12.48 and 13.98 percent, comparable to NIFTY 50 and SENSEX while carrying substantially lower risk, with average annualised volatility of 13.99 percent against 19.42 percent for traditional indices, a difference confirmed as statistically significant by both Levene's test and the variance-ratio F-test. Risk-adjusted performance measures reinforce this picture: BSE 100 ESG achieved the strongest Sharpe ratio among ESG indices, positive Jensen's Alpha was observed for most ESG indices, and beta values below one across the ESG group point to consistently defensive characteristics relative to the broader market.

Correlation analysis further shows that ESG indices track the movement of major market benchmarks such as NIFTY 50 and SENSEX closely, while lower correlations with certain sectoral indices notably NIFTY IT and NIFTY Pharma point to potential diversification value when ESG holdings are combined with select sectoral exposure. The independent-samples t-test confirms that ESG and traditional indices produced statistically indistinguishable average returns, meaning that the lower risk profile of ESG investments was not achieved at the expense of return.

Overall, the study concludes that ESG investing in India is not solely a values-driven or socially responsible choice but a financially sound one: ESG indices deliver competitive returns, lower volatility, favourable risk-adjusted performance, and greater stability across changing market conditions relative to the broader traditional index universe. As regulatory disclosure requirements mature and investor awareness of sustainability considerations continues to grow, ESG-based investment products are likely to play an increasingly significant role in the Indian financial market, and investors, asset managers, and policymakers alike have reason to continue supporting their development.

References

1. Bombay Stock Exchange. (n.d.). BSE India. <https://www.bseindia.com>
2. GRFCG. (2023). ESG and corporate financial performance. Global Review of Finance and Corporate Governance. <https://grfcg.in>
3. IISPPR. (2025). Comparative analysis of NIFTY ESG and NIFTY 100. Indian Institute of Social and Public Policy Research. <https://iisppr.org.in>

4. Indian Journal of Marketing. (2023). ESG vs. conventional indices during COVID-19. Indian Journal of Marketing. <https://indianjournalofmarketing.com/index.php/IJF/article/view/172736>
5. Jain, N. (2023). A comparative study of performance of ESG indices with parent index in Indian stock market. ResearchGate. <https://www.researchgate.net/publication/357127666>
6. MDPI Risks Journal. (2019). ESG and financial performance. Risks, 7(1), 15. <https://www.mdpi.com/2227-9091/7/1/15>
7. National Stock Exchange of India. (n.d.). NSE India. <https://www.nseindia.com>
8. ProQuest. (2022). ESG disclosure and firm value. ProQuest Dissertations and Theses. <https://search.proquest.com>
9. Securities and Exchange Board of India. (n.d.). Business Responsibility and Sustainability Reporting (BRSR) framework. <https://www.sebi.gov.in>
10. Springer. (2019). Sustainability and financial markets. In Springer Book Chapter Series. https://link.springer.com/chapter/10.1007/978-3-032-00447-5_22
11. Springer. (2024). ESG and market efficiency. Asia-Pacific Financial Markets. <https://link.springer.com/article/10.1007/s10690-024-09506-2>
12. Springer. (2025). ESG investing trends in emerging markets. In Springer Book Chapter Series. https://link.springer.com/chapter/10.1007/978-981-96-6366-8_28
13. SSRN. (2021). ESG investing and market outcomes. SSRN Electronic Journal. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3807952