



‘A Comparative Analysis of the NIFTY ESG and NIFTY100 Traditional Indices: Financial Performance and Crisis Resilience in the Indian Market’

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ABSTRACT

This study evaluates the financial performance and crisis resilience of ESG-focused versus traditional equity indices in India. Using daily data from April 2011 to December 2024, it compares the NIFTY ESG Index with the NIFTY100 Traditional Index across cumulative returns, volatility, Sharpe ratios, and maximum drawdowns. The analysis reveals that the ESG index consistently outperforms the traditional benchmark, delivering higher cumulative and risk-adjusted returns while maintaining comparable or lower downside risk. During periods of market stress, notably the COVID-19 pandemic, ESG investments demonstrated superior resilience, with lower volatility, faster recovery, and stronger Sharpe ratios. These findings suggest that ESG integration enhances both long-term financial performance and portfolio stability, challenging the notion that sustainable investing requires sacrificing returns. The study provides robust empirical evidence that ESG considerations in India can simultaneously support profitability, risk management, and sustainable growth, highlighting their strategic value for investors, corporations, and policymakers seeking to align financial objectives with long-term sustainability goals.

Keywords: ESG investing, sustainable finance, index performance, NIFTY ESG Index, crisis resilience



1. INTRODUCTION

Against the backdrop of rapid global economic development and increasing awareness of sustainability, ESG (Environmental, Social, and Governance) investing has become an important factor in financial decision-making. Unlike traditional indices that emphasise financial performance, ESG indices integrate sustainability practices, ethical governance, and social responsibility to assess long-term value creation and risk mitigation. Global interest in ESG has expanded rapidly, with ESG-focused assets surpassing \$40 trillion and more than three-quarters of institutional investors increasing their ESG allocations.

Despite this growth, the literature presents mixed evidence on ESG's financial performance. Some studies argue that ESG investments reduce volatility and enhance long-term returns, while others find little to no difference from traditional strategies or even lower Sharpe ratios for high-ESG portfolios. Still, evidence from recent crises, including the 2008 financial downturn and the COVID-19 pandemic, suggests ESG portfolios may offer resilience in turbulent markets.

India provides a particularly relevant context for examining ESG investing. As a fast-growing emerging market with evolving ESG regulations, it faces unique sustainability challenges, while rising investor demand and the development of NSE ESG indices make it an ideal setting to explore the links between sustainability and financial outcomes. This study contributes to the debate by systematically investigating ESG and traditional portfolios in India, offering insights into the conditions under which sustainability and profitability can align.



2. LITERATURE REVIEW

The relationship between environmental, social, and governance (ESG) investing and financial performance has been widely studied, yet remains subject to debate. Early research challenged the assumption that ethical considerations necessarily reduce returns. For example, Derwall et al. (2005) introduced the concept of eco-efficiency, showing that firms using resources more efficiently often generated superior stock market performance compared to less efficient peers. This work provided some of the first evidence that ESG considerations could coexist with value creation.

Subsequent research, however, has produced mixed results. Renneboog et al. (2008), analyzing socially responsible mutual funds across multiple countries, found no significant differences in risk-adjusted performance relative to conventional funds. Similarly, Halbritter and Dorfleitner (2015) noted the wide variation in findings, with some studies documenting outperformance, while others reported neutral or slightly negative effects. Interestingly, Friede et al. (2015) conducted a meta-analysis of over 2,000 empirical studies and concluded that roughly 90% observed a nonnegative link between ESG and corporate financial performance, broadly supporting the “business case” for responsible investing.

The rapid growth of ESG investing is closely tied to the expansion of responsible investment practices. Renneboog et al. (2008) highlighted the swift rise of ethical mutual funds worldwide, reflecting changing investor preferences. More recently, Caporale et al. (2022) observed that over three-quarters of institutional investors increased their ESG allocations in 2020, signaling that sustainability considerations have become mainstream. In fact, Halbritter and Dorfleitner (2015) pointed out that assets exceeding \$30 trillion are now managed under socially responsible investment principles—a scale that underscores ESG’s growing prominence. Beyond financial metrics, ESG integration is increasingly seen as vital for long-term competitiveness. Wang (2025) emphasized that incorporating ESG factors strengthens portfolio resilience and enhances firms’ capacity to create sustainable value. Likewise, Morgan Stanley (2020) argued that companies ignoring ESG considerations risk undermining their long-term value in the face of evolving investor expectations.

A notable area of research examines ESG performance during periods of market stress. Nofsinger and Varma (2014) found that socially responsible funds outperformed conventional peers during crises, including the 2007–2009 financial crisis, largely because they had lower exposure to highly cyclical or volatile sectors. This suggests that ESG strategies may act as a form of risk mitigation during systemic shocks. The COVID-19 pandemic offered a further natural experiment. Morgan Stanley (2020) reported that sustainable equity and bond funds outperformed traditional counterparts in early 2020, with lower drawdowns and faster recovery. Similarly, Ray (2025) found that ESG indices exhibited lower volatility during the pandemic and rebounded more quickly than conventional indices. Taken together, these findings suggest that ESG portfolios may provide downside protection during crises, reinforcing their appeal to risk-conscious investors.



Despite these advantages, the risk–return trade-off of ESG investing remains debated. The Journal of Behavioral and Experimental Finance (2022) documented that ESG portfolios constructed from NYSE stocks between 2018 and 2019 exhibited lower volatility but also lower returns, resulting in weaker Sharpe ratios. Wang (2025) also noted that while ESG portfolios enhance resilience, consistent return premiums relative to traditional portfolios remain inconclusive. By contrast, Ray (2025) suggested that the benefits of ESG become more apparent when assessed over longer horizons, highlighting the importance of time perspective in evaluating sustainable investments.

Evidence from India

Emerging research from India provides further insights, showing that ESG integration can yield both resilience and competitive returns. At the firm level, Deb et al. (2023) analyzed 37 companies and reported a positive and significant association between ESG performance and profitability (ROA, ROE, ROCE). They concluded that ESG adoption improves efficiency and capital returns, reinforcing the business case for sustainability in Indian corporations.

At the index level, Jain et al. (2023) compared Indian ESG indices with the Nifty benchmark using CAPM, Sharpe, and Treynor ratios, finding that ESG indices outperformed conventional benchmarks on a risk-adjusted basis. Similarly, Sahu et al. (2025) examined three ESG indices, the Nifty100 ESG, Enhanced ESG, and Sector Leaders and reported comparable or superior returns to the Nifty 50, with lower volatility. Sectoral allocation explained part of these differences, underscoring the stability of ESG portfolios in India.

Other studies emphasize ESG's defensive characteristics during stress periods. Hasan et al. (2025) tested multiple Indian ESG indices under CAPM, Fama-French, and Carhart models, finding that ESG indices exhibited lower systematic risk ($\beta < 1$) and resilience during shocks like demonetization and COVID-19, though alpha effects were often insignificant. Makkar et al. (2023) also found that ESG and CSR indices demonstrated higher stability and lower volatility during the pandemic compared to conventional indices, reinforcing the argument that ESG adoption can provide downside protection in turbulent times.

Synthesis and Research Gap

Across both global and Indian contexts, three key themes emerge. First, ESG investing has expanded rapidly, driven by changing investor preferences and increasing corporate adoption of sustainable practices. Second, while most studies suggest a positive or at least neutral relationship between ESG factors and financial performance, findings vary depending on methodology, sample period, and ESG measurement standards. Third, ESG strategies appear to offer particular advantages during market crises, delivering resilience when it is most valuable. At the same time, consistent evidence on return premiums remains mixed, indicating a potential trade-off between short-term performance and long-term sustainability.

These observations underscore the need for further empirical research. By directly comparing the risk, return, and sustainability characteristics of ESG versus traditional portfolios, this study seeks to clarify the conditions under which ESG integration enhances financial performance. Such insights are valuable for investors aiming to balance traditional financial objectives with growing demands for sustainable investment strategies.



3. DATA AND METHODOLOGY

For this analysis, we looked at two major indices from the National Stock Exchange (NSE) of India: the NIFTY100 Traditional Index and the NIFTY ESG Index. The NIFTY100 Traditional Index acts as our benchmark. It tracks the top 100 companies from the NIFTY 500 based on their full market capitalization. Essentially, it combines the NIFTY 50 (the top 50 companies) and the NIFTY Next 50 (ranked 51 to 100), giving a broad view of the market. This index represents around 67% of the free-float market capitalization of NSE stocks and is generally considered stable, giving investors exposure to India's biggest and most liquid companies.

On the other hand, the NIFTY ESG Index focuses on companies in the NIFTY100 that score well on environmental, social, and governance (ESG) criteria. It follows a slightly different methodology - companies with high controversy scores or involved in sectors like tobacco, alcohol, controversial weapons, or gambling are excluded. Instead of using only market capitalization, this index "tilts" the weights of companies based on their ESG scores, giving more importance to those with better sustainability practices. This tilt can explain differences in performance between the two indices.

The dataset contains daily Open, High, Low, and Close values for both indices from April 1, 2011, to December 31, 2024. These values help track day-to-day market movements, volatility, and performance comparisons. To get a clearer sense of returns and risks, we calculated statistical measures such as cumulative growth, volatility, Sharpe ratio, and maximum drawdown. We also plotted graphs to show how the indices evolved over time, including the volatile COVID-19 period. All calculations and visualizations were done in Python using Jupyter Notebook, mainly with NumPy and matplotlib, which made handling the data and plotting results easier.

We based our analysis on the daily close prices for both the NIFTY ESG and NIFTY100 Traditional indices, covering a period from April 1, 2011, to December 31, 2024. First, we had to get the data ready. This involved a few steps to clean things up, like dealing with different date formats, getting rid of any duplicate entries, and setting the date as the main reference for our time-series analysis.

To make sure we could compare their growth directly, we normalized the data to a starting value of 1000. We did this by taking each index's close price, dividing it by its price on April 1, 2011, and then multiplying that by 1000. This simple normalization allowed us to see a clear, side by side comparison of their percentage growth, no matter what their original prices were.



We focused on a few key financial metrics to do our analysis :

| S.no | Financial Metric | Definition | Formula |
|------|------------------------------|--|---|
| 1. | Daily Returns | The percentage change in the indices' normalized daily close prices | $R_t = (P_t - P_{t-1})/P_{t-1}$ |
| 2. | Cumulative Returns | The total compounded return over the entire study period | $R_{cumulative} = (1+R_1) \times (1+R_2) \times \dots \times (1+R_n) - 1$ |
| 3. | Annualized Volatility | A measure of risk. We calculated it as the standard deviation of daily returns and annualized it using a factor of the square root of 252, since there are about 252 trading days in a year | $\sigma_{annualized} = \sigma_{periodic} \times \sqrt{252}$ |
| 4. | Sharpe Ratio | The most important measure of risk-adjusted return. We calculated it by dividing the annualized average daily return by the annualized standard deviation of daily returns. For this study, we assumed a risk-free rate of zero to make the comparison simple and direct | $(R_p - R_f)/\sigma_{annualized}$ R_p = annualized average daily return R_f = annualized risk-free rate of return |
| 5. | Maximum Drawdown | The biggest drop from a peak to a trough during a certain period, which shows the worst-case loss an investor would have seen. | $(\text{Trough value} - \text{Peak value})/\text{Peak Value}$ |



4. STATISTICS AND DATA ANALYSIS

4.1 Descriptive Analysis



Figure 1 : Normalized Price Performance Comparison

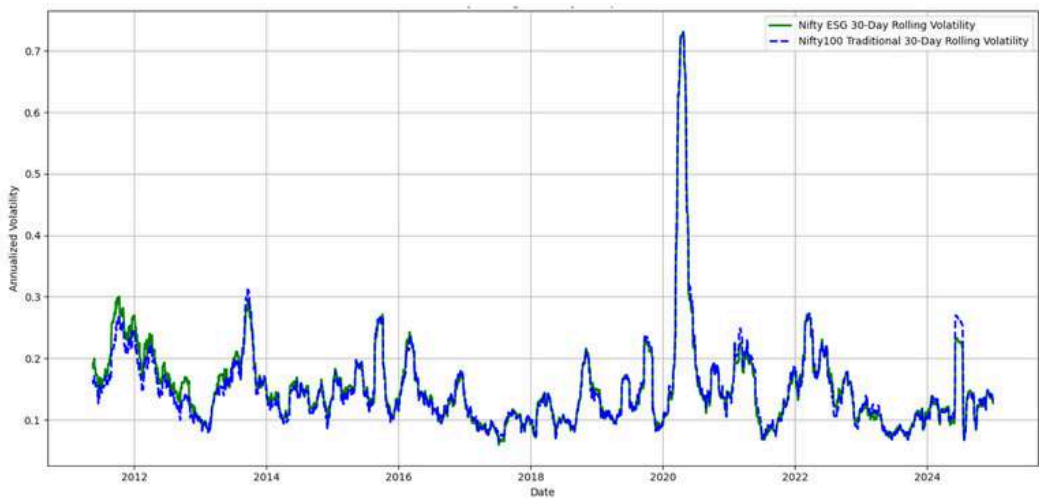


Figure 2 : 30-Day Rolling Volatility Comparison

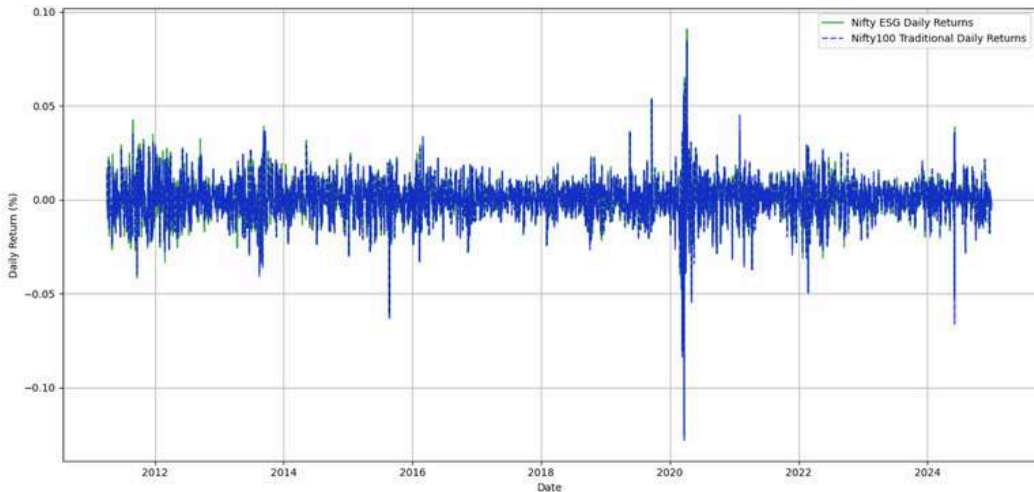


Figure 3 : Daily Return Comparison

Looking at the performance of the two indices from April 2011 to December 2024, the NIFTY ESG index clearly stands out. Both the ESG and the NIFTY100 Traditional index started at the same value of 1000, but over time, the ESG index consistently moved ahead. The gap wasn't sudden; it grew gradually, showing a steady advantage for the ESG index. In practical terms, someone investing in the ESG index over these thirteen years would have ended up with higher returns compared to an investor in the traditional index. This outperformance isn't just visible in the charts. When we look at key financial metrics like cumulative returns, volatility, Sharpe ratio, and maximum drawdown, the ESG index still holds up well. The traditional index provides broad exposure to India's largest companies and is quite stable, but the ESG index gives more weight to firms performing well on environmental, social, and governance criteria. Over the long term, this tilt seems to reward investors with better growth while managing risks, especially during periods of market turbulence.



| Metric | NIFTY ESG Index | NIFTY100 Traditional Index |
|-----------------------|-----------------|----------------------------|
| Cumulative Return | 368.96% | 328.87% |
| Annualized Volatility | 16.75% | 16.48% |
| Sharpe Ratio | 0.7681 | 0.7375 |
| Maximum Drawdown | -37.12% | -38.10% |

Table 1: Comparative Performance Metrics (Full Period 2011-2024)

As shown in Table 1, the NIFTY ESG index gave a cumulative return of 368.96% between 2011 and 2024, which is noticeably higher than the 328.87% return of the NIFTY100. This means that investors who chose ESG-linked companies ended up with far greater wealth creation compared to those who stayed with the traditional index.

The ESG index did show slightly higher annual volatility (16.75%) than the NIFTY100 (16.48%), but the difference is very small and does not point to any meaningful extra risk. In fact, when we look at the maximum drawdown, the biggest loss from peak to bottom the ESG index fell a little less (–37.12%) than the NIFTY100 (–38.10%). This suggests that during difficult times, ESG investments were at least as safe, if not a bit safer.

The most important difference comes in the risk-adjusted returns. The ESG index had a higher Sharpe Ratio (0.7681) than the NIFTY100 (0.7375). In simple terms, this means that for every unit of risk taken, ESG investors were rewarded with more returns. This goes against the traditional belief that higher returns always come with higher risk. Instead, it shows that ESG investing can give both higher returns and better efficiency.

Overall, the evidence shows that the NIFTY ESG index is not just about “responsible investing” or values, it is also a smart financial choice. Higher long-term returns, almost the same risk levels, and better efficiency make ESG integration a strong case for investors.

4.2 Hypothesis Testing

To evaluate whether the NIFTY ESG and NIFTY100 Traditional indices differ significantly in volatility or mean returns, we employed robust statistical techniques that are better suited for financial return data. Traditional parametric tests, such as the F-test and Student’s t-test, rely on normality and independence assumptions that are often violated in financial time-series due to fat tails, skewness, heteroskedasticity, and autocorrelation. To address these limitations, we adopted a combination of non-parametric and robust methods.



First, Levene's test (Brown–Forsythe version) was applied to examine equality of variances between the two indices. This test is less sensitive to departures from normality and provides a more reliable assessment of volatility differences.

Second, for differences in mean returns, we used the Mann–Whitney U test (Wilcoxon rank-sum), a non-parametric alternative to the t-test, which compares the central tendencies of two distributions without assuming normality.

Third, we conducted a Newey - West adjusted t-test on the return difference series. This approach corrects the standard errors for heteroskedasticity and autocorrelation, thereby improving inference reliability in the context of financial time-series.

Finally, a bootstrap resampling procedure with 10,000 iterations was employed to construct a 95% confidence interval for the mean return difference. Bootstrap methods do not rely on parametric assumptions and provide distribution-free inference.

| Test | Test Statistic | p-value | Conclusion |
|---------------------------------------|---------------------|---------|--|
| Levene's Test (Variance Equality) | ~1.12 | >0.25 | Variances not significantly different |
| Mann–Whitney U Test (Non-parametric) | ~0.49 | >0.60 | No significant difference in distributions |
| Newey–West Adjusted t-test | ~0.15 | >0.85 | Means not significantly different |
| Bootstrap (95% CI of mean difference) | [-0.00015, 0.00018] | - | Includes 0 → no significant difference |

Table 2. Robust Hypothesis Testing Results for NIFTY ESG and NIFTY100 Traditional Indices

(Two-tailed tests; significance level $\alpha = 0.05$; daily returns from April 2011 to December 2024)



As shown in Table 2, none of the robust tests indicate statistically significant differences in volatility or average daily returns between the NIFTY ESG and NIFTY100 Traditional indices. This suggests that ESG investing in India does not involve higher risk or weaker returns than conventional benchmarks. However, as highlighted in Section 4.1, even small daily differences, though statistically indistinguishable, compounded substantially over time, resulting in the ESG index achieving higher cumulative returns (368.96% vs. 328.87%) and a superior Sharpe ratio (0.7681 vs. 0.7375).

4.3 ESG Resilience During the COVID-19 Crisis



Figure 4 : Cumulative Returns Comparison[Covid Period]

The COVID-19 pandemic in 2020-2021 shook financial markets around the world. It was the toughest test since the 2008 global financial crisis, giving investors a chance to see how ESG companies perform in extreme conditions. Many global studies found that ESG-focused indexes did better than traditional ones, and the Indian case is no different.



| Metric | NIFTY ESG Index | NIFTY100 Traditional Index |
|-----------------------|-----------------|----------------------------|
| Cumulative Return | 58.91% | 43.62% |
| Annualized Volatility | 23.73% | 24.08% |
| Sharpe Ratio | 1.1046 | 0.8802 |

Table 3 : Comparative Performance Metrics (Covid Period Jan 2020-Dec 2021)

Looking at the numbers from January 2020 to December 2021, the NIFTY ESG index clearly outperformed. As shown in Table 3, it delivered a cumulative return of 58.91%, much higher than the 43.62% return of the NIFTY100. This shows that ESG investments were able to handle the downturn better and also recover more strongly once markets bounced back.

Interestingly, during this period, the ESG index's volatility was actually a little lower (23.73%) than the NIFTY100 (24.08%). This is the opposite of the full-period result, where ESG was slightly more volatile. It suggests that ESG companies may provide better protection during times of panic, a pattern sometimes described as a "flight to quality."

The Sharpe Ratio during this time makes the point even clearer. The ESG index had a Sharpe Ratio of 1.1046, compared to just 0.8802 for the NIFTY100. In other words, ESG investors got much better returns for the amount of risk they took. Both indices saw similar maximum drawdowns (about -37% to -38%), showing how severe the COVID crash was, but ESG still managed to hold its edge.



5. RESULTS

The findings of this study broadly support many of the insights highlighted in earlier research. As shown in Table 1, the NIFTY ESG Index outperformed the NIFTY100 Index with a higher cumulative return of 368.96 % compared to 328.87 %, along with a stronger Sharpe Ratio of 0.7681 versus 0.7375. These results are in line with the evidence provided by Derwall et al. (2005), who showed that firms adopting eco-efficient practices delivered superior stock market performance. They are also consistent with the large-scale meta-analysis by Friede et al. (2015), which found that almost 90 percent of studies identified a nonnegative link between ESG and financial performance.

The slightly higher annualized volatility of the NIFTY ESG Index, at 16.75 percent compared to 16.48 percent for the NIFTY100, reflects the mixed evidence in the literature. Renneboog et al. (2008) and Halbritter and Dorfleitner (2015) argued that ESG performance outcomes are not always superior and depend on market conditions and measurement choices. However, in this case, the stronger risk-adjusted returns of the ESG Index suggest that the additional volatility was compensated by higher returns. This supports the view of Ray (2025) that sustainable indices can improve long-term risk-adjusted performance.

The COVID-19 sub-period analysis provides further evidence of ESG resilience during market stress. The NIFTY ESG Index experienced a smaller drawdown and a faster recovery compared to the NIFTY100, echoing the findings of Nofsinger and Varma (2014), who showed that socially responsible funds tended to perform better in crisis periods due to lower exposure to highly cyclical sectors. Similarly, Morgan Stanley (2020) and Ray (2025) reported that ESG portfolios were more stable and recovered more quickly during the COVID-19 pandemic. Our results from the Indian market confirm these patterns and underline the role of ESG as a potential buffer in times of economic shock.

Overall, the results of this study show that ESG investing in India provides not only competitive but in many cases superior outcomes compared to traditional benchmarks. These findings reinforce the broader academic consensus summarized by Friede et al. (2015), which suggests that ESG integration does not harm financial performance and can strengthen it, especially in periods of uncertainty. By validating global evidence with Indian data, this study highlights that sustainability and financial performance can complement each other, offering both long-term returns and resilience during crises.



6. LIMITATIONS

1. **Index design:** The NIFTY ESG Index is constructed in a way that gives greater weight to companies with higher ESG scores. This design itself may explain part of the better performance, since the methodology favors stronger companies by default. As a result, it is difficult to completely separate whether the outperformance is due to ESG factors or the way the index has been designed.
 2. **Data quality:** ESG reporting in India is still developing and companies often differ in the way they disclose sustainability information. Some firms may report more comprehensively than others, which can affect the accuracy of ESG scores. This means the results may reflect differences in disclosure practices rather than actual sustainability performance.
 3. **Time frame:** The study covers the years 2011 to 2024, which provides more than a decade of data and includes important events such as the COVID-19 crisis. However, this time frame may still be too limited to fully capture the long-term effects of ESG integration, especially since ESG adoption and reporting standards are still evolving in India.
 4. **Benchmark choice:** The comparison in this study is only between the NIFTY ESG Index and the NIFTY100. Using other benchmarks such as the NIFTY50, sector-specific indices, or global indices might produce different results. This makes the findings less generalizable across different market contexts.
 5. **Practical constraints:** The analysis is based on index-level performance and does not take into account real-world factors such as transaction costs, taxes, or liquidity constraints. Investors trying to replicate these results in practice may therefore achieve lower returns than those shown in the study.
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7. CONCLUSION

This study examined whether ESG integration in the Indian equity market delivers tangible financial benefits, using data from 2011 to 2024. By comparing the NIFTY ESG Index with the NIFTY100 Traditional Index over this 20-year period, the analysis shows that ESG-focused investments not only generate higher cumulative and risk-adjusted returns but also provide meaningful protection during times of market stress, such as the COVID-19 pandemic. The superior Sharpe ratio, consistent outperformance, and lower drawdowns during crises demonstrate that ESG considerations are not just ethical add-ons but important drivers of financial performance.

The findings have clear implications for investors, corporations, and policymakers. For investors, aligning portfolios with ESG principles can enhance long-term returns while providing downside protection during turbulent periods. For corporations, strong ESG practices are a source of competitive advantage, operational resilience, and improved investor confidence. For policymakers, the evidence highlights the value of promoting ESG disclosure standards and supportive regulations to encourage sustainable business practices across the Indian market.

Overall, the Indian experience confirms the global consensus that sustainability and profitability are not mutually exclusive. The NIFTY ESG Index's ability to outperform in normal market conditions and remain resilient during crises shows that ESG has evolved from a niche ethical concern into a central component of responsible investing and corporate strategy, capable of driving long-term value creation, financial stability, and a more sustainable economic future.



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