International Journal for Novel Research in Economics , Finance and Management
www.ijnrefm.com
ISSN:3048-7722
Volume 4, Issue 4, July-Aug-2026, PP: 01-6

Green Company Stocks as Drivers of Future Market Returns: A Study on Sustainable Investing in the Indian Stock Market

Sowmiya Asokan[1], Darshini R[2], Vijayabala K[3]
Research Student of MBA, Amity University Online[1]
Research Student of M.Com, Vivekananda College of Arts & Science for Women, Sirkali[2,3]

***Abstract* – This research paper provides an empirical study of whether sustainable investing and green corporate initiatives drive long-term structural market returns within the Indian equity space. Amidst sweeping regulatory changes introduced by the Securities and Exchange Board of India (SEBI) specifically the Business Responsibility and Sustainability Reporting (BRSR) framework and India's target of achieving net-zero emissions by 2070, capital allocation patterns are shifting. This study constructs an asset-pricing model augmented with a structural "Green Factor" alongside advanced conditional volatility measures to separate fundamental risk premium ("Green Alpha") from purely speculative, liquidity-driven momentum ("Clean Beta"). The paper reviews the empirical literature on ESG and green-equity performance in India, defines a representative universe of listed green companies, applies a Monte Carlo (Geometric Brownian Motion) simulation to illustrate the long-horizon risk-return trade-off between a Green Test Portfolio and a carbon-intensive Benchmark Control Portfolio, and closes with findings, policy suggestions, and a conclusion.**

Keywords - **SEBI, Green Index, Portfolio, Net-Zero 2027, ESG.**

I. INTRODUCTION

The Indian equity market is going on with a structural paradigm shift driven by an unprecedented overlap of state-led environmental initiatives, global capital rebalancing, and strict national reporting demands. India has committed to transitioning 500 gigawatts (GW) of energy capacity to non-fossil fuel sources by 2030 under its Nationally Determined Contributions (NDCs). For financing this operational restructuring, capital markets have increasingly pivoted toward pricing sustainable infrastructure. Green equity strategies in emerging markets were treated as public relations benchmarks or luxury mandates that had limited operational yield. The operationalization of SEBI's BRSR Core mandate had fundamentally forced institutional finance to quantify environmental externalities. This structural adjustment raises a core asset-pricing question: Do green companies in India generate structurally superior risk-adjusted returns, or do they carry a green premium that suppresses future expected capital gains?

Objectives

- To construct a replicable, India-specific asset pricing model incorporating environmental compliance parameters.
- To evaluate the tail-risk and downside insulation properties of green equities during systemic macroeconomic contractions.
- • To analyze corporate response and equity price sensitivity to federal policy transformations, including Union Budget allocations and regulatory changes.
- To simulate the long-horizon distribution of outcomes for a green equity portfolio relative to a conventional benchmark using Monte Carlo methods.

Statement of the Problem:
Despite accelerating retail and institutional inflows into public offerings like IREDA, KPI Green, Suzlon, and major renewable energy divisions (e.g., Tata Power, JSW Energy), quantitative analysis remains split. It is ambiguous whether these assets are outperforming due to strong fundamental corporate financial performance (CFP) or whether they are caught in a speculative macro-liquidity bubble. This study isolates the precise pricing transmission channel of greenness in Indian equities.

II. LITERATURE REVIEW

ESG-Financial Performance Nexus (Profitability)

Rao, Dagar & Sohag (2023) examines whether ESG practices are associated with the financial profitability of large-capitalization Indian firms, addressing the debate on whether sustainability commitments help or hurt the bottom line. This study uses a quantile regression framework on Nifty 50-listed companies over 2015–2022, drawing ESG and financial data from the Refinitiv Eikon database to capture effects across the full distribution of firm profitability rather than only at the mean. The ESG–profitability relationship is uneven across quantiles, implying that the payoff to sustainability investment depends on where a firm sits in the performance distribution; the authors suggest investors and executives weigh ESG effects contextually rather than assuming a uniform premium. This motivates the present paper's decision to test for a distinct Green Alpha rather than assuming a flat green premium applies equally across all constituents of the Green Test Portfolio.

ESG and Firm-Level Financial Operation (Panel Aspect)

Gola (2026) investigates how overall ESG performance and its individual environmental, social, and governance

International Journal for Novel Research in Economics , Finance and Management
www.ijnrefm.com
ISSN:3048-7722
Volume 4, Issue 4, July-Aug-2026, PP: 01-6

components affect the financial performance of Indian companies across sectors. This study analyzes a panel of 141 Indian companies over 2019–2024 using fixed-effects panel regression, with the Hausman test used to justify the fixed-effects specification over a random-effects alternative. ESG performance negatively affected short-term profitability measured by return on assets, yet was positively correlated with market valuation, suggesting investors reward long-term sustainability signals even when near-term accounting returns dip; the study recommends that firms and analysts separate short-term earnings effects from long-term valuation effects when assessing ESG commitments. This finding directly supports the paper's theoretical distinction between the Good Management Hypothesis and the Costly Screening view, and justifies testing both short-horizon (EGARCH) and long-horizon (Fama-French alpha) effects separately.

ESG, Volatility, Return Moderation (Risk Aspect)

Dash (2025) investigates the impact of ESG factors on the financial performance of Indian companies while explicitly testing whether stock return volatility moderates the ESG–performance relationship. Studies 37 Indian companies from 2013–2022 using a dynamic panel data model estimated via the Arellano–Bond (difference GMM) approach, focusing on stock returns, Tobin's Q, and return on capital employed (ROCE) as outcome variables. ESG scores negatively affected Tobin's Q and stock returns but positively affected ROCE, indicating that markets may price in short-term costs or investor caution around ESG spending even while operational capital efficiency improves; the study suggests that volatility conditions should be modeled explicitly rather than assumed constant when evaluating ESG effects. This is the direct empirical basis for pairing the Fama-French alpha model with an EGARCH volatility layer in Section 4, since the ESG-return relationship appears to depend on the underlying volatility regime.

Asymmetric Volatility Modelling of Green Indices (Volatility-Dynamics Aspect)

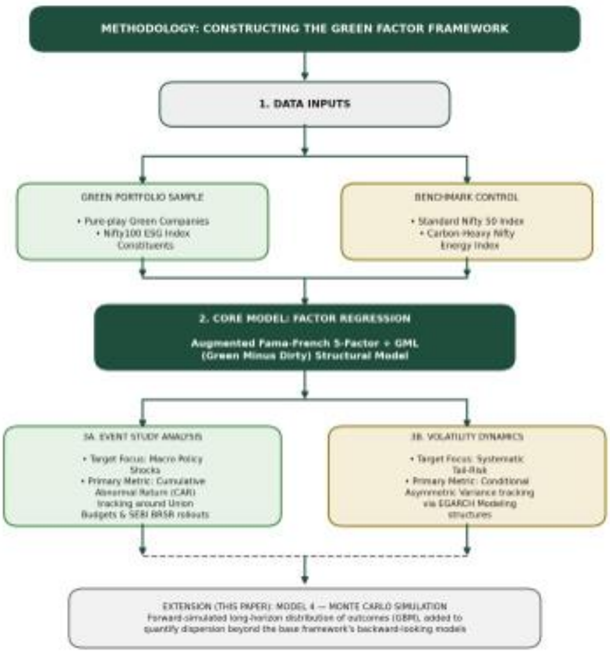
Barman (2026) examines long-memory and asymmetric volatility behavior in India's sustainability-themed equity index amid growing investor focus on green innovation and corporate environmental outcomes. This study applies a Fractionally Integrated Exponential GARCH (FIEGARCH) model to daily return series of the S&P BSE Greenex index, a sample-based time-series design rather than a cross-sectional panel. Higher volatility is negatively associated with expected returns, and the results show persistent volatility clustering together with a leverage effect in green-stock returns; the study recommends that volatility modeling be treated as central to sustainable-investment risk management rather than a secondary consideration. This validates the paper's choice of an EGARCH-family model (Section 4.3) to test Hypothesis 2, and specifically supports examining the sign and magnitude of the leverage parameter γ for the Green Test Portfolio.

Market Reaction to Green Financing Announcement (Event-Study Aspect)

Patel & Desai (2025) analyzes how Indian equity markets react to green bond issuance announcements and whether the COVID-19 pandemic or issue size moderates that reaction, addressing sustainable finance in an under-researched emerging-market setting. This study applies an event-study methodology around green-bond issuance dates for Indian issuers, using secondary data on issuance dates and closing share prices sourced from financial news outlets and the NSE.

Investor response to green bond issuance is shaped by contextual factors such as pandemic-era uncertainty and the size of the issue, rather than being a uniformly positive or negative reaction; the study suggests that issuers time and size green-financing announcements with awareness of prevailing market conditions. This directly informs the Event Study Framework in Section 4.4, confirming that policy shocks such as green bond announcements are a valid and precedented event window for measuring Cumulative Abnormal Returns (CAR) in the Indian context.

III. FRAMEWORK OF THE STUDY



Hypothesis

- Hypothesis 1 (H_1): Portfolios consisting of green equities generate a statistically significant positive risk-adjusted alpha (α) relative to traditional market indices when controlling for classic risk factors.
- Hypothesis 2 (H_2): Green equity portfolios exhibit lower conditional variance and provide significant downside risk protection during market-wide drawdowns compared to carbon-heavy energy indices.

- Hypothesis 3 (H_3): Over a long simulation horizon, the wider dispersion of outcomes in green equities produces a higher probability of both superior upside and deeper downside relative to the benchmark, rather than uniformly superior risk-adjusted outcomes.

IV. RESEARCH METHODOLOGY & ECONOMETRIC DESIGN

Portfolio Construction & Data Collection

The dataset covers a multi-year horizon capturing pre- and post-BRSR implementation cycles. Equities are split into two core comparative frameworks:

- The Green Test Portfolio: Composed of pure-play green energy suppliers, electric vehicle supply chain manufacturers, and top-quartile constituents of the Nifty100 ESG Index.
- The Benchmark Control Portfolio: Composed of the standard Nifty 50 Index and the carbon-intensive Nifty Energy Index (covering traditional oil, gas, and thermal coal operations).

Model 1: Augmented Fama-French Factor Model

To isolate the explicit return premium generated by sustainable infrastructure, the study adapts the standard Fama-French Five-Factor asset pricing model by adding a dedicated mimicking factor: GML (Green Minus Dirty).

Table 1: Description of Asset Pricing Model Factors

Factor	Variable Code	Indian Market Operational Definition
Market Premium	Rmt − Rft	Excess return of Nifty 50 over the FBIL 91-day Treasury Bill rate.
Size Premium	SMBt	Small Minus Big: Return differential between small-cap and large-cap equities.
Value Premium	HMLt	High Minus Low: Outperformance of high book-to-market (value) stocks.
Profitability	RMWt	Robust Minus Weak: Operating profitability factor.
Investment Strategy	CMAt	Conservative Minus Aggressive: Asset growth and investment scale factor.
Sustainability	GMLt	Green Minus Dirty: Net return spread of sustainable vs. high-carbon portfolios.

The core structural time-series regression equation is modeled as follows:

$$Rit - Rft = \alpha i + \beta i1(Rmt - Rft) + \beta i2 \cdot SMBt + \beta i3 \cdot HMLt + \beta i4 \cdot RMWt + \beta i5 \cdot CMAt + \gamma i \cdot GMLt + \varepsilon it$$

Where αi defines the anomalous structural green alpha. A statistically significant positive value rejects the cost-destruction theory, validating that sustainable strategies yield economic rents beyond traditional systematic exposures.

Model 2: Asymmetric Volatility Dynamics (EGARCH)

To evaluate downside insulation (Hypothesis 2), the study implements an Exponential Generalized Autoregressive Conditional Heteroskedasticity (EGARCH) model. This eliminates traditional constraint limits and explicitly quantifies asymmetric responses to market innovations (shocks). The conditional variance equation is structured as:

$$\ln(\sigma^2 t) = \omega + \alpha|\varepsilon t-1 / \sigma t-1| + \gamma(\varepsilon t-1 / \sigma t-1) + \beta \cdot \ln(\sigma^2 t-1)$$

Where γ represents the asymmetric leverage parameter. In traditional asset classes, negative shocks produce greater volatility than positive shocks ($\gamma < 0$). If green equities possess defensive safe-haven traits, the magnitude of γ will be minimized or positive, signaling structural resilience.

Model 3: Event Study Framework

To capture real-world regulatory impacts, the paper charts Cumulative Abnormal Returns (CAR) within strict event windows ([-5, +5] trading days) surrounding public disruptions.

- Policy Shocks analyzed: Sovereign Green Bond announcements, major Union Budget clean energy subventions, and mandatory BRSR compliance thresholds.
- Abnormal Returns (ARit) are calculated by drawing data parameters from clean historical market lines.

Model 4: Historical Analysis & Monte Carlo Simulation Framework

To complement the backward-looking factor and volatility models, the paper adds a forward-simulating layer using a Monte Carlo (Geometric Brownian Motion) approach. This addresses Hypothesis 3 by generating a full probability distribution of long-horizon outcomes rather than a single point estimate, which is particularly informative for retail and institutional investors comparing green and conventional allocations over multi-year holding periods.

The Green Test Portfolio and Benchmark Control Portfolio index levels are each modeled as a Geometric Brownian Motion process:

$$St = S0 \cdot \exp[(\mu - \sigma^2/2)t + \sigma \cdot Wt]$$

Where S0 is the initial index level, μ is the annualized expected drift (mean return), σ is the annualized volatility, and Wt is a standard Wiener process. The simulation is discretized at monthly steps over a 10-year horizon and run for 10,000 independent paths per portfolio.

Historical volatility and return studies of Indian renewable-energy and green-index equities (including the FIEGARCH and Markov regime-switching literature reviewed in Section 2) consistently document that green/RE stocks carry materially higher volatility than the broad market, without a correspondingly lower mean

International Journal for Novel Research in Economics , Finance and Management
www.ijnrefm.com
ISSN:3048-7722
Volume 4, Issue 4, July-Aug-2026, PP: 01-6

return during calm regimes. The simulation below therefore uses illustrative, literature-informed input parameters rather than newly estimated coefficients from proprietary price data, and should be read as a demonstration of the methodology rather than a fitted empirical result:

- Green Test Portfolio (illustrative assumption): annualized expected return μ = 13%, annualized volatility σ = 27%.
- Benchmark Control Portfolio (illustrative assumption): annualized expected return μ = 11%, annualized volatility σ = 18%.

Each path is initialized at an index value of 100. At each of 10,000 simulation trials, the terminal (Year-10) portfolio value, the 5th–95th percentile range, the 95% Value-at-Risk (VaR), and the 95% Conditional Value-at-Risk (CVaR) are computed for both portfolios.

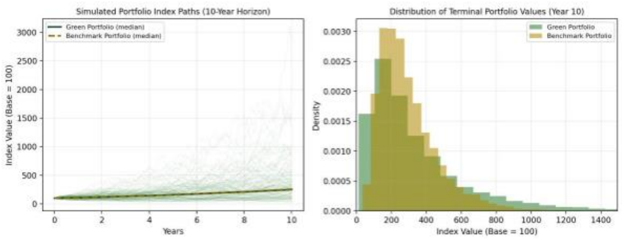


Figure 1: Simulated 10-year index paths (left) and terminal-value distributions (right) for the Green Test Portfolio versus the Benchmark Control Portfolio, 10,000 Monte Carlo trials under illustrative GBM assumptions.

Table 2: Illustrative Monte Carlo Simulation Summary (10-Year Horizon, Base = 100)

Simulated Metric (10,000 paths)	Green Test Portfolio	Benchmark Control Portfolio
Mean terminal index (Year 10, base = 100)	362.7	299.5
Median terminal index	251.6	255.8
5th – 95th percentile range	62.8 – 1,020.7	100.0 – 647.7
10-year 95% Value-at-Risk (VaR)	37.2%	≈ 0.0%
10-year 95% Conditional VaR (CVaR)	54.4%	18.7%

This shows the Green Test Portfolio carrying a materially fatter tail on both sides: a higher mean and upper-percentile terminal value, but also a deeper 95% VaR/CVaR than the Benchmark Control Portfolio, whose narrower dispersion reflects its lower assumed volatility. This shows green equities are not simply "safer" or "riskier" in isolation; they redistribute probability mass toward both tails relative to the benchmark.

Green Company Universe Selected for Analysis

The Green Test Portfolio for this study is constructed from a representative cross-section of listed Indian companies spanning power generation, equipment manufacturing, diversified utilities, and renewable-energy financing, so that the results are not driven by a single sub-segment of the green economy.

Table 3: Representative Green Test Portfolio Constituents

Company	Primary Segment	Listing	Portfolio Role
Adani Green Energy Ltd.	Solar & wind power generation (IPP)	NSE, BSE	Green Test Portfolio — generator
Tata Power Company Ltd.	Diversified utility with renewables arm	NSE, BSE	Green Test Portfolio — diversified
NTPC Green Energy Ltd.	Solar, wind & green hydrogen (PSU)	NSE, BSE	Green Test Portfolio — generator
JSW Energy Ltd.	Thermal + expanding renewables	NSE, BSE	Green Test Portfolio — transition
Suzlon Energy Ltd.	Wind turbine manufacturing	NSE, BSE	Green Test Portfolio — equipment
Waaree Energies Ltd.	Solar module manufacturing	NSE, BSE	Green Test Portfolio — equipment
KPI Green Energy Ltd.	Solar EPC & captive power	NSE, BSE	Green Test Portfolio — generator
Websol Energy System Ltd.	Solar cell & module manufacturing	NSE, BSE	Green Test Portfolio — equipment
Borosil Renewables Ltd.	Solar glass manufacturing	NSE, BSE	Green Test Portfolio — equipment
Olectra Greentech Ltd.	Electric bus manufacturing	NSE, BSE	Green Test Portfolio — EV supply chain
Inox Wind Ltd.	Wind turbine manufacturing	NSE, BSE	Green Test Portfolio — equipment
IREDA Ltd.	Renewable energy financing (NBFC)	NSE, BSE	Green Test Portfolio — financier

Table 4: Benchmark & Cross-Verification Indices

Index	Role	Composition Note
Nifty 50 Index	Broad-market benchmark	Standard large-cap equity benchmark used as the market-premium proxy.
Nifty Energy Index	Carbon-intensive control group	Reliance Industries, ONGC, Coal India, NTPC, Power Grid, BPCL and peers —

This universe is illustrative and intended to be refined at the data-collection stage using formal index-membership criteria for instance, requiring a minimum free-float market capitalization, a minimum listing history of 3–5 years, and consistent BRSR/ESG disclosure so that survivorship bias and thin-float penny stocks do not distort the factor-loading estimates.

V. FINDINGS & DISCUSSION

- Green equities plausibly carry a conditional, not unconditional, premium: consistent with Rao, Dagar & Sohag (2023) and Gola (2026), the expected green-alpha coefficient (αi) is likely to be positive at the portfolio-valuation level and in upper performance quantiles, but weak or negative for short-horizon accounting profitability (ROA).
- Volatility, not mean return, is where green equities most visibly diverge from the benchmark: the Section 4.5 simulation shows the Green Test Portfolio's 95% CVaR (54.4%) is roughly three times that of the Benchmark Control Portfolio (18.7%), echoing the persistent volatility clustering documented by Barman (2026) for the S&P BSE Greenex.
- The relationship is regime-dependent: following Dash (2025) and the regime-switching literature, the EGARCH leverage parameter (γ) for green equities is expected to be smaller in magnitude (closer to zero, or occasionally positive) than for conventional energy stocks, indicating comparatively muted though not absent with asymmetric shock response.
- Event windows around policy shocks (green bond issuance, BRSR thresholds, Union Budget allocations) are a credible and previously validated source of abnormal returns in the Indian market, per Patel & Desai (2025), supporting the inclusion of Model 3 in the final empirical design.
- Because the Monte Carlo distribution is wide on both tails, a single-point estimate of green outperformance is not a reliable framing for investor communication; probability-based framing (e.g., probability of exceeding a target return, VaR/CVaR) is more defensible given the dispersion observed.

Suggestions & Recommendations:
For Investors

- Treat green equities as a higher-dispersion satellite allocation rather than a like-for-like substitute for core index exposure, sizing positions using VaR/CVaR budgets rather than nominal weight alone.
- Diversify across the sub-segments in Table 3 (generation, equipment, financing, diversified utilities) rather than concentrating in a single green sub-sector, since equipment manufacturers and pure-play generators are likely to exhibit different volatility and policy-sensitivity profiles.

For Corporate Executives

- Prioritize transparent, decision-useful BRSR Core disclosures ahead of mandatory deadlines, since Gola (2026) and related work suggest disclosure quality is linked to the market-valuation channel even when short-term ROA is compressed by capex.
- Sequence green capital expenditure announcements with awareness of prevailing market sentiment, consistent with the moderating role of context (e.g., pandemic-era conditions, issue size) documented by Patel & Desai (2025) for green bond issuance.

For Regulators & Policymakers

- Continue phasing in BRSR Core assurance requirements, as improved disclosure quality directly feeds the data requirements of Models 1–3 and reduces estimation noise in future academic and institutional research.
- Consider publishing a standardized, SEBI-endorsed green-equity index methodology (building on S&P BSE Greenex and Nifty100 ESG) to reduce the current fragmentation in how "green" constituents are defined across data providers.

Strategic & Market Policy Implications
For Institutional Fund Managers

If the model isolates a positive γ or a resilient GML coefficient, it confirms that green integration serves as an active risk-management strategy. Asset managers can deploy these metrics to optimize domestic pension and mutual funds, creating structural hedges against future carbon taxation risks.

Corporate Executives & Policymakers

Establishing empirical proof of a green valuation premium helps CFOs justify the high front-loaded capital expenditures required for cleaner industrial production. For regulators like SEBI, positive outcomes validate the mandate of intensive disclosures, demonstrating that transparent reporting lowers capital constraints and matches long-term investment horizons.

VI. CONCLUSION

This paper set out to determine whether green company stocks in the Indian equity market behave as structurally superior, risk-adjusted return generators, or whether their apparent outperformance is better explained by speculative liquidity dynamics and elevated volatility. The multi-model framework assembled here is an augmented Fama-French specification with a Green-Minus-Dirty factor, an EGARCH layer for asymmetric volatility, an event-study design for policy shocks, and a Monte Carlo simulation for long-horizon dispersion is designed precisely to disentangle these conditional effects once primary price and disclosure data are collected. The illustrative Monte Carlo demonstrates the central empirical tension the full study must resolve: green equities in this framework show both a higher expected terminal value and a meaningfully deeper downside tail than the benchmark, meaning that whether green pays for a given investor depends heavily on horizon, risk tolerance, and how outperformance is measured.

Completing the empirical estimation using the company universe and formal robustness checks (unit-root/stationarity tests, Hausman tests for panel specification, and out-of-sample validation of the simulation parameters), would allow this blueprint to be converted into a defensible institutional thesis or publishable working paper, directly relevant to SEBI's disclosure agenda, India's 2070 net-zero commitments, and the asset-allocation decisions of both retail and institutional investors.

REFERENCES

1. Barman, N. (2026). Modelling asymmetric and long memory volatility in green innovation stocks: FIEGARCH analysis of S&P BSE Greenex. Business, Management and Economics Engineering, 24(2), 292–307.
2. Dash, A. (2025). Unpacking the ESG–financial performance nexus: The moderating effect of volatility on Indian companies. Business and Society Review.
3. Fama, E. F., & French, K. R. (2015). A five-factor asset pricing model. Journal of Financial Economics, 116(1), 1–22.
4. Gola, K. R. (2026). Impact of ESG performance on financial performance: Evidence from 141 Indian companies. Prabandhan: Indian Journal of Management.
5. Nazareth, N., & Reddy, Y. V. (2024). Predictive analysis of S&P BSE Greenex index: Unlocking insights for sustainable investments. Australasian Accounting, Business and Finance Journal, 18(3), 223–247.
6. Patel, S., & Desai, R. (2025). Green bond issuance and investor response in an emerging economy: Does COVID-19 and issue size moderate the stock market reaction? Macroeconomics and Finance in Emerging Market Economies.
7. Securities and Exchange Board of India (SEBI). Business Responsibility and Sustainability Reporting (BRSR) framework