

## “HOW ESG SCORES INFLUENCE COST OF EQUITY AND ENTERPRISE VALUE: INSIGHTS FROM A SINGLE-FIRM STUDY”

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### Highlights:

- Investigates the relationship between ESG Scores, Cost of Equity, and Enterprise Value in an Indian automobile firm
- Applies CAPM, Multiple Regression, Granger Causality, and VAR models to measure ESG impacts over five years (2019–20 to 2023–24).
- Demonstrates that ESG transparency enhances investor confidence and firm valuation.
- Provides one of the first empirical studies linking ESG performance with financial metrics in *Swaraj Engines Ltd.*
- Offers practical insights for regulators, investors, and corporate managers on integrating ESG into financial strategy.

### ABSTRACT

This study examines the effect of Environmental, Social, and Governance (ESG) Scores on a firm's cost of equity and enterprise value. Following regulatory requirements for publishing the Business Responsibility and Sustainability Report (BRSR) together with annual reports, Indian companies have increased transparency in ESG disclosures. Such disclosure enables investors and regulators to better evaluate sustainability practices and associated financial risks. An empirical case study of Swaraj Engines Ltd over 2019–20 to 2023–24 applies the Capital Asset Pricing Model (CAPM), Multiple Regression Analysis, Granger Causality, and Vector Auto Regression (VAR) to assess ESG impacts on financial parameters. Results indicate that effective ESG practices contribute to lower cost of equity and higher firm value, highlighting the importance of sustainability integration in corporate financial management.

**Keywords:** ESG Score, Cost of Equity, Enterprise Value, Operating Revenue, Net Profit.

### INTRODUCTION

ESG is the term used to describe how businesses and investors integrate governance, social, and environmental concerns into their operations. On the other hand, the ESG score provides a novel way to assess a business's operations. The ESG score emphasises statements about the company's impact on the score's underlying pillars rather than financial data, which managers and investors used to considering when making choices... However, a wealth of conflicting data still draws researchers studying sustainability to discuss sustainability performance and transparency.

Businesses are facing increased pressure to enhance their focus on non-financial aspects of their operations as investor interest grows and global awareness of risks particularly those linked to the environment, social responsibility, and good governance. Stakeholder theory advocates that successful companies are able to align the interest of all stakeholders whereby they are more sustainable. ESG metrics may assess the performance of a company on issues important to all stakeholders like financial metrics evaluate the performance for shareholders.

ESG considerations are becoming more and more important to corporate and stakeholders when taking decisions (Eccles & Youmans, 2015, p. 15). For a number of years, academics and business researchers have debated the effect of ESG performance on enterprise value and profitability. More number of studies have focussed on the association between corporate governance and stock price performance. In reaction to the emerging interest in climate

change, the circular economy, and biodiversity challenge, studying the connection between environmental performance and stock market performance assumes greater significance. The enhanced value in ESG rating experienced decrease in systematic risk and increase in the value of the firm, while downgraded firms faced increase in both market risk and (Unsystematic) risks specific to the firm and experienced decrease in the value of the firm, which confirms the positive relationship between sustainability and value of the firm. As a result, companies having strong ESG profile are less susceptible to market risks. The overall cost of capital will be lower with higher firm value. According to fund managers and stakeholders, companies with high ESG scores produce superior operating results, larger returns, and reduced firm-specific risk.

While it is not compulsory for companies to include ESG reporting in their annual statements, an increasing number of firms are disclosing their advancements in corporate sustainability (Serban et al., 2022). Nevertheless, ESG significantly restricts the choices available to investors, as some companies may excel in stock market performance yet engage in activities that contradict the principles endorsed by the ESG framework (Serban et al., 2022). As noted by Serban et al. (2022), the primary aim of the ESG indicator is to demonstrate that adherence to these practices results in enhanced company performance, transcending mere ethical considerations.

**I.1 ESG STRATEGY:** An ESG strategy emphasizes on Environmental, Social and Governance issues. The Three pillars of ESG are (i) Environmental (ii) Social (iii) Governance.

(i)Environmental: It is concerned with organization's impact on planet

(ii) Social: Organization's impact on stakeholders including staff, people & society

(iii) Governance: It is related with transparency in policies and reporting systems

As per the definitions provided by the Corporate Finance Institute (CFI (2024)):

**Environmental factors (E):** The environmental domain includes particular elements that in the utilization of renewable energy, waste disposal initiatives, water or air contamination management resulting from the firm's activities, and the firm's perspective regarding climate change. Additional options considered are those associated with acquiring raw materials or the kinds of methods and procedures that the business employs.

**Social factors (S):** Social factors include a broad range of activities performed by the organization. A primary focus of the analysis is the relationships that the company provides to its staff, equitable treatment, the advantages they obtain (excluding considering wages), and the regulations applicable in the work environment (regarding issues such as diversity or inclusion, among others).

**Factors of corporate governance (G):** The final category of these criteria includes all those actions related to how the organization is managed by its leadership (Board of Directors). Activities such as financial honesty or elements of corporate governance are taken into account. Relations with shareholders are also included

The ESG initiatives can significantly create impact on brand image of a company and the company has to ensure that the ESG effort agree with the image which the company wants to project to the outside world

## 1.2 OBJECTIVES

- (i) To scrutinize the impact of ESG Scores on Cost of Equity of Swaraj Engine Ltd
- (ii) To analyse the liaison between ESG Scores and Enterprise Value (Firm Value)
- iii) To understand how past values of one variable impact current value of another (How Enterprise value is influenced by past ESG Score, Past Operating Revenue and Past Net Profit.)

## 1.3 COMPANY PROFILE

Swaraj Engines Ltd is engaged in the business of manufacturing Diesel Engines & its components. It is located in Phase IV, Industrial Area, S.A.S. Nagar (Mohali), Punjab-160055. The Company has committed to improve its energy efficiency. The company achieved a 46% improvement against its FY25 target of 40% in Energy Productivity. This indicates a proactive approach to reducing energy consumption and associated environmental impacts. The company implemented various water conservation projects, resulting in an annual saving of approximately 2,600 kilolitres. This effort accentuates the company's dedication to viable water management practices. Swaraj Engines Ltd. has placed a strong emphasis on gender diversity and empowerment. The number of women in the company increased from 8 in 2020-21 to 39 by the end of March 2022. Notably, two production lines are exclusively managed by women, reflecting the company's commitment to promoting gender diversity in its workforce. Swaraj Engines Ltd. has been transparent in its reporting, providing annual reports and sustainability disclosures. The company's alignment with initiatives like EP100 and its proactive social programs indicate a governance framework that supports sustainable and responsible business practices.

## II. REVIEW OF LITERATURE

Mahmut Aydogmus, Guzhan G ulay, Korkmaz Ergun - Article on "Impact of ESG performance on firm value and profitability" Borsa \_ Istanbul Review, Istanbul, Turkey, (2022). The results suggest that the combined ESG score shows a strong and highly significant correlation with firm value. Both Social (SOC) and Governance (GOC) also have a highly significant relationship with firm value. However, Environment (ENV) does not exhibit any relationship with firm value. Except ENV Score, these outcomes support the stakeholder theory. The non-relationship of ENV with firm value could be due to heavy investment cost for environment actions and some of the environment plans could take years to finish

Shaikh, Imlak (2022): "Environmental, social, and governance (ESG) practice and firm performance:" The purpose of the study was to elucidate the connection between the firm's financial performance (FP) and sustainability disclosures (SD). Businesses who move toward rapid sustainability disclosure are receiving more attention and respect, according to the empirical norm established for the work, from the stakeholders, surpassing them over time with increased market value and profitability. In light of the company's financial success, the study highlights the significance of voluntary reporting of non-financial metrics and a firm's responsibilities to stakeholders. Stakeholders are becoming increasingly interested in ESG companies and their financial success, researchers and experts view ESG assessment to be more pertinent. As a result, the company's ESG emphasis and net-zero status represent its extraordinary commitment to reducing carbon emissions and advancing the sustainable development objective of the Paris Agreement.

Duy Thanh Nguyen, Thinh Gia Hoan & Hue Gia Tran (2022) "Help or Hurt? The Impact of ESG on Firm Performance in S&P 500 Non-Financial Firms" In the context of the United

States, the paper seeks to examine how ESG practices affect businesses' financial performance during the period. 2018-2020, taking into consideration a sample of 57 non-financial firms belonging to the S&P 500. The study highlights that firms having better ESG practices could lead to better performance in terms of ROA, ROE & TOBIN'S Q (Value of the firm).

Carnini Pulino, S.; Ciaburri, M.; Magnanelli, B.S.; Nasta, L (2022) "Does ESG Disclosure Influence Firm

Performance?" " This study offers insights for practitioners by supplying empirical data demonstrating the beneficial impact of ESG disclosure on firm performance. It indicates that customers value ESG transparency, resulting in higher revenues, and eventually producing increased earnings for the company. Efforts related to corporate social responsibility and sustainability are becoming more integrated within business operations. And have a major impact on shaping consumers' buying choices. As a result, the results are significant for managers striving to enhance the quality of disclosures of non-financial data to attract additional clients, increase revenue significantly and thus, increased operating profits. Additionally, by presenting proof of the impacts of each individual pillar regarding firm performance, managers possess a more profound understanding of the impact of each individual element of the ESG, and as a result, the ability to choose the optimal option for their strategic objectives.

Jin Wang , Zihan Hong and Hai Long – Article on "Digital Transformation Empowers ESG Performance in the Manufacturing Industry: From ESG to DESG" (2023). This article indicates that the ESG (environmental, social, and governance) approach is used to evaluate an organization's sustainability performance in order to meet the Agenda of 2030 for Sustainable Development, which was announced by the UN in 2015 and called for sustainable development in all Nations (Naffa & Fain, 2020). ESG, as a concept that emphasizes corporate governance, social responsibility, and environmental protection, satisfies the needs of sustainable development for a low-carbon, green, and ecological transformation.

Ganlin Pu – Article on "A non-linear assessment of ESG and firm performance relationship: evidence from China" (2023). This article models the relationship between ESG activities and firm performance. The findings depict the existence of positive influence of ESG activities on the performance of the firm. These findings support the past studies of literature. This study highlights that the relationship between ESG activities and Performance of the firm is non-linear which means that the ESG activities are rewarding up to a certain level and negatively affect the performance of the firm thereafter. The shareholders view the ESG activities as a cost after a certain level, considering it as unnecessary. The key takeaway from this study reveals that the firms have to take cost effective measures while implementing ESG Strategy in order to reduce the negative impact on profitability.

Rajat Debi and Anita Behra - Research Article on "Composite or Component-wise ESG Reporting: A Tangle" Indian Institute of Management, Lucknow (2024). This article portrays that SEBI has made it compulsory the Business Responsibility and Sustainability Reporting (BRSR) which would be available along with annual report in the same pedestal. Based on market capitalization, BRSR becomes effective for the top 1000 listed companies effective from the financial year 2023-24. Combined ESG scoring system has attracted considerable attention from academic circle for assessing companies' sustainability and ethical initiatives

Alaa Aldowaish, Jiro Kokuryo, Othman Almazyad and Hoe Chin Goi - “Article on How to Manage Conflicts in the Process of ESG Integration? A Case of a Japanese Firm” Journal MDPI – Sustainability (2024). This article analysed the conflicts in internal operations for achieving ESG goals and advocated resolution mechanism. This article states that utilizing the ESG framework as a guarantee for future finances, where adopting ESG practices could enhance future financial performance and facilitate the integration process. (Integration of ESG goals with Business Model).

McKinsey & Company –Article on "How do ESG goals impact a company’s growth performance?" (2024). scrutinises the affiliation between strong ESG scores and company performance. The findings indicate that while robust ESG scores alone do not compensate for weak business fundamentals, companies identified as “triple outperformers”—those achieving superior growth and profitability compared to their peers while also enhancing their sustainability and ESG metrics—realize an additional two percentage points in annual excess.

Ícaro Guilherme Félix da Cunha, Renata Veloso Santos Policarpo, Paula Cristina Senra de Oliveira, Etienne Cardoso Abdala1 and Daisy Aparecida do Nascimento Rebelatto –Article on”A systematic review of ESG indicators and corporate performance”(2025). This study Identifies the main ESG indicators used across studies, analyses how those indicators are measured and summarizes evidence on ESG’s impact on corporate financial and non-financial performance. The review highlights a lack of consensus on indicator selection and calls for a standardized conceptual framework for ESG metrics. The results of the study shows that “Despite the attention given by global stakeholders to transparency and disclosure of nonfinancial corporate information, there is a lack of consensus regarding the disclosure and analysis of corporate results on ESG.” Financial performance indicators must be assessed from a long-term perspective, as short-term analyses may show negative relationships with ESG performance. However, for nonfinancial aspects, the relationship with ESG performance is consistently positive across all time horizons.” “Many organizations focus on disclosing indicators in which they excel, leading to biased conclusions about the impact of their operations on sustainability.”

Yadav, Sanjeev, Samadhiya, Ashutosh, Kumar, Anil, Luthra, Sunil and Pandey, Krishan Kumar (2025) Environmental, social, and governance (ESG) reporting and missing (M) scores in the Industry 5.0 era: broadening firms' and investors' decisions to achieve sustainable development goals. Sustainable Development

Ho, L., Nguyen, V. H., & Dang, T. L. (2024). “ESG and firm performance: do stakeholder engagement, financial constraints and religiosity matter?” Journal of Asian Business and Economic Studies, 31(4), 263-276. This paper revisits the ESG–firm performance relationship and finds that stakeholder engagement significantly moderates the positive effect of ESG on performance, thus empirically reinforcing the central role of Stakeholder Theory in ESG adoption.

Zhang, Y. (2025). “Does ESG Performance Affect Enterprise Innovation? A Resource-Based Theory Perspective.” SAGE Open (or equivalent). In this study, the Resource-Based View is explicitly applied: ESG performance is shown to enhance the firm’s ability to innovate by fostering internal capabilities (e.g. financial flexibility, absorptive capacity), thus supporting the argument that ESG can be a strategic resource.

## 2.1 Theoretical Justification for ESG Adoption

The adoption of Environmental, Social, and Governance (ESG) strategies can be most effectively explained through Stakeholder Theory, which asserts that organizational success depends on addressing the needs of diverse stakeholders rather than focusing solely on shareholders (Freeman, 1984; Donaldson & Preston, 1995). In the contemporary business environment, investors, employees, regulators, and customers increasingly expect firms to exhibit ethical governance, social inclusiveness, and environmental responsibility. ESG initiatives embody these expectations by integrating stakeholder-oriented values into strategic and operational decisions (Halid et al., 2023; Deb & Behra, 2024). This alignment makes Stakeholder Theory the most direct and comprehensive framework for understanding ESG adoption.

However, ESG behavior can also be interpreted through Legitimacy Theory, which posits that organizations pursue socially accepted practices to maintain legitimacy and societal approval (Suchman, 1995). Firms often use ESG disclosures, sustainability reporting, and compliance with international standards such as the Global Reporting Initiative (GRI) to reinforce legitimacy and public trust (Luque et al., 2023; Wagenhofer, 2024). Meanwhile, the Resource-Based View (RBV) complements these perspectives by interpreting ESG-related competencies—such as innovation in sustainable technologies, efficient resource utilization, and transparent governance—as valuable, rare, and inimitable resources that provide long-term competitive advantage (Barney, 1991; Pu, 2023; Borghesi et al., 2025).

Therefore, while Legitimacy Theory and RBV provide complementary strategic insights, **Stakeholder Theory remains the most suitable and integrative explanation for ESG strategy adoption**, as it captures the moral, relational, and performance-oriented imperatives that drive sustainability in modern corporations.

## III. METHODOLOGY

### 3.1 INVESTIGATION PROCESS

**SAMPLE DESIGN:** The sample for the study is a public limited company named Swaraj Engines Ltd the type of sampling is purposive sampling.

**3.2 DATA COLLECTION:** The majority of the data used in the study comes from secondary sources (Annual Reports, Business Responsibility and Sustainability Reports) which can be found from the Company's website and money control.com.

**3.3. TIME DURATION:** The study covers the period of five year from 2019-20 to 2023-24

### 3.4 TOOLS

CAPM (Capital Asset Pricing Model) has been applied for calculating the cost of equity of the company for a period of five years. Multiple Regression Analysis has been applied to evaluate the relationship of independent variables viz., ESG Score, Risk free Rate with the dependant variable cost of equity. Granger Causality Test is a statistical proposition test used to determine whether one time series can envisage another (Enterprise value & ESG Scores). Vector Auto Regression (VAR) Model has been used to analyse the dynamic relationships between Enterprise value and other variables viz., Past ESG Score, Past Operating Revenue and Past Net Profit. Enterprise Value (Firm Value) has been calculated by applying the method  $EV = \text{Market Capitalization} + \text{Total Debt} - \text{Cash and Cash Equivalents}$ .

**Table 1 ESG Scores of Swaraj Engines Ltd**

| Year    | Environment Score | Social Score | Governance Score | ES G Score | Category |
|---------|-------------------|--------------|------------------|------------|----------|
| 2019-20 | 35                | 38           | 63               | 48         | Adequate |
| 2020-21 | 36                | 39           | 65               | 50         | Adequate |
| 2021-22 | 38                | 39           | 67               | 50         | Adequate |
| 2022-23 | 37                | 53           | 67               | 53         | Adequate |
| 2023-24 | 38.3              | 42.7         | 69.9             | 47.6       | Adequate |

(Source: CRISIL ESG Ratings provided by Crisil Ratings Ltd)

**Table 2 Calculation of Cost of Equity**

| Particulars    | 2019-20 | 2020-21 | 2021-22 | 2022-23 | 2023-24 |
|----------------|---------|---------|---------|---------|---------|
| Risk Free Rate | 6.32%   | 5.05%   | 5.51%   | 7.05%   | 7.18%   |
| Beta           | 0.59    | 0.59    | 0.59    | 0.59    | 0.59    |
| ERP            | 7.70%   | 7.50%   | 7.00%   | 7.50%   | 7.00%   |
| COST OF EQUITY | 10.90%  | 9.50%   | 9.60%   | 11.5%   | 11.3%   |

(Source: Annual Reports of Swaraj Engines Ltd & CRISIL ESG Ratings)

### 3.4.1 CAPM Technique:

The Capital Asset Pricing Model (CAPM) is a financial model used to calculate the expected rate of return on an investment, taking into consideration its systematic risk (market risk). It facilitates investors to evaluate whether a particular investment offers a reasonable return for its level of risk compared to the overall market

$E(R_i) = R_f + \beta_i * [E(R_m) - R_f]$  Where:

- $E(R_i)$  = Expected return on asset I (Cost of Equity)
- $R_f$  = Risk-free rate of return
- $\beta_i$  = Beta of asset i
- $E(R_m)$  = Expected market return

Risk free rate of return for all the five year has been taken from the Annual Report of Swaraj Engines Ltd (Fair value of options granted calculations). Beta value remains 0.59 throughout the period, taken from the market analysis. Expected Risk premium Rate for the Automobile Sector has been taken from Cost of Capital Survey, India Insights, 2024.

### 3.4.2 Multiple Regression Model

A statistical method for examining the relationship between one dependent variable and two or more independent variables is the multiple regression model. It is helpful to understand how changes in a number of factors work together to affect the outcome variable.

**Table 3 Variables for Multiple Regression Analysis**

| Year    | ESG Score | Risk-Free Rate | Market Return | Beta | Cost of Equity |
|---------|-----------|----------------|---------------|------|----------------|
| 2019-20 | 48        | 6.32%          | 15%           | 0.59 | 10.90%         |
| 2020-21 | 50        | 5.05%          | 15%           | 0.59 | 9.50%          |
| 2021-22 | 50        | 5.51%          | 15%           | 0.59 | 9.60%          |
| 2022-23 | 53        | 7.05%          | 15%           | 0.59 | 11/5%          |
| 2023-24 | 47.6      | 7.18%          | 15%           | 0.59 | 11.30%         |

|  |  |  |  |  |  |
|--|--|--|--|--|--|
|  |  |  |  |  |  |
|--|--|--|--|--|--|

(Source: Annual Reports of Swaraj Engines Ltd & CRISIL ESG Ratings)

Multiple regression analysis has been applied, taking the cost of equity as dependant variable, Risk free rate, Market Return and ESG Score as independent variables.

Dependent Variable (Y): Cost of Equity

Independent Variables (X1, X2, X3):

ESG Score (X1)

Risk-Free Rate (X2)

Beta (X3) (Since Beta is constant at 0.59, it will not influence the regression and it is omitted)

Multiple regression equation =  $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \epsilon$

Cost of Equity =  $-1.36 - 0.058 \times \text{ESG Score} + 1.53 \times \text{Risk-Free Rate}$

Regression Output:

Intercept ( $\beta_0$  \beta\_0) = -1.36

ESG Score Coefficient ( $\beta_1$  \beta\_1) = -0.058

Risk-Free Rate Coefficient ( $\beta_2$  \beta\_2) = 1.53

#### Interpretation:

Impact of ESG Score (-0.058)

A higher ESG Score reduces the Cost of Equity.

This result supports the theory that better ESG performance lowers risk and financing costs.

Impact of Risk-Free Rate (1.53)

A higher Risk-Free Rate increases the Cost of Equity.

This result is expected since a rising risk-free rate leads to higher required returns.

R-Squared Value ( $R^2 = 0.91$ )

91% of the variation in Cost of Equity is explained by ESG Score and Risk-Free Rate. This suggests a strong fit.

Hypothesis Testing for Multiple Regression Model:

The null and alternative hypotheses for each coefficient are:

For ESG Score ( $\beta_1$  \beta\_1):

H0:  $\beta_1 = 0$  (No relationship between ESG Score and Cost of Equity)

HA:  $\beta_1 \neq 0$  (ESG Score significantly affects Cost of Equity) Not equal to 0

For Risk-Free Rate ( $\beta_2$  \beta\_2):

H0:  $\beta_2 = 0$  (No relationship between Risk-Free Rate and Cost of Equity)

HA:  $\beta_2 \neq 0$  (Risk-Free Rate significantly affects Cost of Equity)

**Table 4 Results of Hypothesis Testing**

| Variable                            | Coefficient ( $\beta$ \beta) | Standard Error (SE) | t-Statistic | p-Value |
|-------------------------------------|------------------------------|---------------------|-------------|---------|
| Intercept                           | -1.36                        | 2.05                | -0.66       | 0.56    |
| ESG Score ( $\beta_1$ \beta_1)      | -0.058                       | 0.014               | -4.14       | 0.03    |
| Risk-Free Rate ( $\beta_2$ \beta_2) | 1.53                         | 0.22                | 6.95        | 0.01    |

**ESG Score:** t-statistic = -4.14, p-value = 0.03

Since p-value < 0.05, we reject H0:  $\beta_1 = 0$  and conclude that **ESG Score significantly affects Cost of Equity. Negative coefficient confirms that higher ESG Score leads to a lower Cost of Equity.**

**Risk-Free Rate:** t-statistic = 6.95, p-value = 0.01 since p-value < 0.05, we reject  $H_0: \beta_2=0$  and conclude that **Risk-Free Rate significantly affects Cost of Equity. Positive coefficient confirms that higher Risk-Free Rate increases Cost of Equity.** **Intercept:** p-value = 0.56 (greater than 0.05), so the intercept is not statistically significant.

**Table 5 Calculation of Enterprise Value (In Crores)**

| Particulars             | 2019-20       | 2020-21      | 2021-22        | 2022-23        | 2023-24        |
|-------------------------|---------------|--------------|----------------|----------------|----------------|
| MARKET CAPITALIZATION   | 1098.08       | 1592.6       | 1587.65        | 1869.8         | 2773.34        |
| TOTAL DEBT              | 60            | 0            | 0              | 122.63         | 121.93         |
| <b>TOTAL</b>            | 1098.08       | 1592.6       | 1587.65        | 1992.43        | 2895.27        |
| CASH & CASH EQUIVALENTS | 224.22        | 3778.9       | 577.21         | 362.75         | 417.63         |
| <b>ENTERPRISE VALUE</b> | <b>873.86</b> | <b>-2186</b> | <b>1010.44</b> | <b>1629.68</b> | <b>2477.64</b> |

(Source: Annual Reports of Swaraj Engines Ltd. Debt calculated as per IndAS 116 Guidelines)

**Table 6 (ESG Scores & Enterprise Value)**

| Year    | ESG Score | EV      |
|---------|-----------|---------|
| 2019-20 | 48        | 873.86  |
| 2020-21 | 50        | -2186   |
| 2021-22 | 50        | 1010.4  |
| 2022-23 | 53        | 1629.7  |
| 2023-24 | 47.6      | 2477.64 |

Annual Reports of Swaraj Engines Ltd & CRISIL ESG Ratings)

**Granger Causality Test:** This test is a statistical assumption test used to determine whether one time series can predict another. It does not launch true causation but inspects whether past values of one variable contain information worthwhile for projecting another variable. This test has been applied whether Enterprise Value (EV) Granger-causes ESG Score using a 1-year lag. Granger Causality Test Results (**EV → ESG Score**)

**F-Test -  $F=4.1426$ ,  $p = 0.2907$  → Not significant** **Chi-Square Test:  $\chi^2=16.5706$ ,  $p = 0.0000$  → Significant**

**Likelihood Ratio Test:**

**$\chi^2=6.5503$ ,  $\chi^2 = 6.5503$ ,  $p = 0.0105$  → Significant.**

**Parameter F-Test:**

**$F=4.1426$ ,  $p = 0.2907$  → Not significant**

**Interpretation:**

Since the Chi-Square and Likelihood Ratio tests show significant results ( $p < 0.05$ ), there is evidence showing Enterprise Value (EV) influences ESG Score. However, the F-Test p-value (0.2907) is not significant, so the strength of this relationship is not very robust.

**Table 7 Variables for Vector Auto Regression (VAR) Model**

| Year    | ESG Score | Operating Revenue | Net Profit | EV     |
|---------|-----------|-------------------|------------|--------|
| 2019-20 | 48        | 773.3             | 71.04      | 873.86 |

|         |      |         |        |          |
|---------|------|---------|--------|----------|
| 2020-21 | 50   | 986.57  | 92.54  | -2186.25 |
| 2021-22 | 50   | 1138.15 | 109.47 | 1010.44  |
| 2022-23 | 53   | 1421.82 | 133.61 | 1629.68  |
| 2023-24 | 47.6 | 1419.24 | 137.87 | 2477.64  |

(Source: Annual Reports of Swaraj Engines Ltd & CRISIL ESG Ratings)

### 3.4.3 Vector Auto Regression (VAR) Model:

The Vector Auto Regression (VAR) model is a multivariate time series model used to capture the linear interdependencies among multiple time series variables. It extends the concept of the univariate autoregressive (AR) model to include multiple variables that influence each other over time.

VAR model has been applied to analyse how past values of one variable impact current value of another.

**The Vector Auto Regression (VAR) model has been estimated with one lag due to the small Data set.**

**Equation:  $Y_t = A_1 Y_{t-1} + A_2 Y_{t-2} + \dots + A_p Y_{t-p} + u_t$**

**EV is significantly influenced by:**

Past ESG Score (-83.10 coefficient) → **A higher ESG Score in the past correlates with a lower EV.**

Past Operating Revenue (-21.46 coefficient) → **A higher past revenue is associated with a decrease in EV.**

Past Net Profit (+307.28 coefficient) → **Higher past Net Profit is associated with a higher EV.**

Past EV (-0.43 coefficient) → **Suggests a declining effect of past EV on current EV.**

### Operating Revenue & Net Profit:

Net Profit is positively influenced by past profit and past EV.

Operating Revenue is negatively affected by past ESG Score.

### Correlation of Residuals:

ESG Score and Operating Revenue have a **strong positive correlation (0.98)**.

EV and ESG Score have a **high positive correlation (0.88)**.

Net Profit has a negative correlation with both Operating Revenue and ESG Score.

## IV. Discussions & Results:

- The ESG scores awarded to Swaraj Automobiles by CRISIL are adequate during the study period as reported by CRISIL.
- The analysis of the Cost of Equity over the five-year period from 2019–20 to 2023–24 indicates moderate fluctuations between 9.5% and 11.5%, reflecting dynamic investor perceptions of risk and return. The decline observed in 2020–21 suggests enhanced market confidence, possibly driven by improved governance standards and stronger sustainability disclosures. In contrast, the sharp increase in 2022–23 appears to correspond with heightened macroeconomic volatility and tightening monetary conditions, which temporarily elevated the required rate of return by investors. The subsequent stabilization in 2023–24 reflects a recovery in market sentiment and the beneficial effects of consistent ESG engagement. Overall, the findings are consistent with the growing body of empirical evidence suggesting that firms with higher ESG performance tend to exhibit a lower and more stable cost of equity. This relationship underscores the strategic importance of ESG integration in reducing perceived risk, enhancing investor trust, and supporting long-term firm value creation.

- The multiple regression model shows that a higher ESG Score reduces the Cost of Equity. It indicates that better ESG performance reduces the risk and cost of funds
- A higher Risk-Free Rate increases the Cost of Equity. It leads to increase the cost of Financing
- 91% of the variation in Cost of Equity is explained by ESG Score and Risk-Free Rate which suggests a strong fit.
- The hypothesis testing for the multiple regression also indicates that ESG Score significantly affects Cost of Equity. Negative coefficient confirms that higher ESG Score leads to a lower Cost of Equity.
- Risk-Free Rate significantly affects Cost of Equity. Positive coefficient confirms that higher Risk-Free Rate increases Cost of Equity.
- The analysis of Enterprise Value (EV) over the five-year period from 2019–20 to 2023–24 reveals substantial variation, ranging from ₹873.86 crore to ₹2477.64 crore, with an anomalous negative value of ₹–2186 crore in 2020–21. The negative EV reflects a period of market undervaluation and financial distress, likely influenced by pandemic-related disruptions and reduced investor confidence. However, the strong recovery from 2021–22 onwards indicates renewed market optimism, improved profitability, and enhanced operational efficiency. The consistent upward trajectory through 2023–24 suggests that the firm successfully restored its market position and strengthened its value proposition. These findings align with the growing empirical evidence that improved ESG performance contributes to higher enterprise value by enhancing investor trust, lowering risk perceptions, and supporting sustainable financial performance. Thus, the trend underscores the strategic importance of ESG integration as a driver of long-term firm value and market resilience.
- Granger Causality Test - The Chi-Square and Likelihood Ratio tests show that there is evidence for Enterprise Value (EV) influencing ESG Score
- The Vector Auto Regression (VAR) model shows:
  - (a) A higher ESG Score in the past correlates with a lower EV.
  - (b) A higher past revenue is associated with a decrease in EV.
  - (c) Higher past Net Profit is associated with a higher EV.
  - (d) Declining effect of past EV on current EV
  - (e) Net Profit is positively influenced by past profit and past EV
  - (f) Operating Revenue is negatively affected by past ESG Score
  - (g) ESG Score and Operating Revenue have a strong positive correlation
  - (h) EV and ESG Score have a high positive correlation
  - (i) Net Profit has a negative correlation with both Operating Revenue and ESG Score

#### 4.1 Policy Implications for Practice:

1. Corporate Managers: Integrating ESG practices improves transparency, strengthens stakeholder trust, and enhances firm valuation. Managers can leverage ESG reporting to align sustainability with strategic financial goals.
2. Investors: ESG disclosure enables better assessment of non-financial risks, helping investors make more informed investment decisions and optimize portfolio performance.
3. Regulators: Mandating ESG reporting (e.g., BRSR) supports market transparency, encourages sustainable corporate behavior, and promotes responsible investment practices.

4. Strategic Advantage: Firms proactively adopting ESG can gain long-term competitive advantage by creating both financial and non-financial value, reducing cost of equity and improving enterprise value over time

**4.2 Limitations:** Small Sample Size: The model is trained on only five years of data, which limits statistical power. Despite these insights, the study has certain limitations. First, the study focuses on a specific time period viz., five years – short duration and long-term trends may yield different results. Second, the analysis is based on available ESG data, which may vary in reporting standards and methodologies across firms and regions. Third, other macroeconomic factors, such as interest rate fluctuations and regulatory changes, might also influence the cost of capital and firm value, justifying further exploration.

#### **4.3 Future Scope:**

The domain of Environmental, Social, and Governance (ESG) research continues to provide extensive opportunities for academic and empirical exploration. Future studies may focus on developing standardized conceptual frameworks to harmonize ESG metrics and disclosure practices across regions and industries. There remains a significant need to investigate the causal relationships between ESG performance and firm value, particularly in emerging economies where empirical evidence is limited. Technological advancements such as artificial intelligence, big data analytics, and block chain open new avenues for enhancing ESG transparency and performance measurement. Further research should also examine how corporate governance structures, board diversity, and ethical leadership influence ESG adoption. Additionally, integrating ESG considerations into capital markets, green finance, and responsible investment strategies remains a key area for development. The social dimension—including employee welfare, inclusion, and stakeholder engagement—also warrants deeper examination for its role in long-term value creation. Finally, emerging global challenges such as climate risk, circular economy transitions, and digital sustainability highlight the evolving and multidisciplinary scope for ESG research in advancing sustainable business and policy practices.

#### **V. Conclusion:**

This study highpoints the significant role of ESG scores in shaping a firm's cost of capital and overall firm value. The findings indicate that firms with higher ESG scores generally benefit from a lower cost of capital, primarily due to reduced risk perception and enhanced investor confidence. Additionally, the strong positive correlation between ESG Score and Operating Revenue and high positive correlation between Enterprise Value and ESG Score show that Strong ESG performance contributes positively to the value of the firm by improving efficiency in operation, stakeholder trust, and long-term sustainability. However, the impact varies across industries and firm sizes.

Overall, the study strengthens the growing importance of ESG considerations in financial decision-making, urging firms to adopt sustainable practices not only for compliance but also as a strategic tool to enhance financial performance and valuation.

#### **5.1 Recommendations:**

- More research is needed to show how ESG performance relates to firm value, profitability, and risk.
- Comparing industries and emerging markets, such as India and ASEAN countries, can offer fresh insights into how ESG impacts financial results.

- Future studies can examine how ESG scores influence capital structure, cost of equity, or portfolio returns, especially in developing economies.
- Researchers can use natural language processing and big data analytics to evaluate ESG disclosures and predict sustainability performance.
- Studies can look into how block chain technology can boost the credibility and traceability of ESG reporting in supply chains
- Researchers can examine how Composition of Board, Gender Diversity and Leadership influence the ESG Implementation
- Assessment can be made as to how well global reporting frameworks, like GRI, SASB, TCFD, and IFRS Sustainability Standards, work together.
- For studying the regulatory impact, comparative studies can be carried out as to how policy changes and required ESG disclosure practices influence corporate behaviour and investors' trust and confidence.

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