

ESG and Corporates in India: An exploratory study with a Modified ESG score

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Abstract

The need to focus on sustainability is more evident now than ever. Thus, the UN SDGs have taken precedence in the objectives to be achieved by most corporations across the world. The investor perspective regarding sustainability and investment schemes has also gradually changed. The investors are choosing assets and portfolios which have an impact on society. Thus, the need to develop a scale for measuring ESG for the Indian market is pertinent. In this study, a scale with appropriate metrics for the Indian market would be developed. This scale would have investor and technology metrics. That would enable them to focus on investor psychology and Machine learning technological interventions. The impact of ESG and investor psychology on the asset returns of ESG-indexed stocks in the Indian context would be evaluated. The period of study is from November 2017 to March 2023, as this period allows the researcher to identify investor behaviour pertaining to ESG and return volatility during the pandemic. In this study, the standard ESG framework by the GIIN (Global Impact Investing Network) will be used with necessary modifications. The analysis would be done by using a simple GARCH model which would accurately give the return volatility linking ESG and investor psychology. The study would enable policymakers to focus on strategizing regulations for transparent ESG integration with the firms' goals. The impact of Machine learning techniques on ESG practices in corporations will be highlighted. The study would also focus on investors' impact on asset returns.

Keywords: ESG Scale, Sustainability, Corporate Governance, Pandemic, Investor Psychology

1. Introduction

Sustainability has been a way of life for decades now. It gained precedence recently due to the targets set by the United Nations (UN). Now it has different facets and strategies like Environment, Social, and Governance (ESG) investing, and Impact investing (II) (Meher et al., 2020). For long-term sustainability, green finance is seemingly an important investing strategy in the present day. A sustainable stock market that has a transparent reporting system with ease of access to data is of utmost importance (Hawaladar, 2016). It should help in developing sustainable investment products and responsible investment strategies.

Globally the influence of ESG factors on “investment decisions, CSR scores, and the value of firms” has been studied by Yoon Lee and Byun, 2008; Iqbal and Mallikarjunappa, 2010 and Birindelli et al., 2018. Numerous rating agencies with different scoring frameworks have been started across the globe. These agencies such as MCSI, CRISIL, etc. develop a framework where they build different metrics for ESG score calculation for the firms. India being an emerging market needs much to be done to reach its sustainability goals. The newer reporting system developed by SEBI might work favorably for the Indian market to reach its ESG goals in the long run.

The objective of this study is to develop a modified societal domain by introducing sentiment as a metric and calculate a composite modified ESG score for the Indian market. It also deals with analyzing the effect of three components of the modified ESG score on the volatility and performance of the selected stocks in India.

This paper is divided into five sections. The second section has a brief literature review leading to the identification of a

research gap. The third section describes the methodology used for this study. The empirical analysis leading to the conclusion and discussion of the study are done in the fourth and fifth sections respectively.

2. Literature review

The global climatic changes and depletion of all natural resources have led the various governing bodies to set rules for sustainable development (*EVOLVING ESG REPORTING LANDSCAPE IN INDIA**,2021). The integration of sustainability activities into the firms’ activities has been termed Corporate Social responsibility (European Commission, 2001). The use of these activities started a decade ago in India but gained precedence recently (DESA, 2016). The United Nations’ (UN) sustainability goals have helped other economies in setting up sustainable goals. The worldwide interest in sustainability and ESG has made firms across the world focus on their sustainability goals, and performance and provide investment opportunities. The terms like ESG, Impact investing, and green finance have caught the attention of investors. A special focus is being given to the consequences of CSR/ESG activities on the firm’s value and performance (Malik, 2015; Gilbert, 2019). Various studies have been done to estimate and understand how ESG information impacts the financial performance of a firm and investors’ decisions (Slager et al., 2012; Van Duuren et al., 2016). Huang (2019), Nguyen et al., (2022), Pu(2022) have studied the implications of ESG on financial performance using various statistical methods. Balabat (2012) and Alareeni and Hamran(2020), from their research, confirmed the positive effect of ESG on firms’ performance in the

Australian and US economies. The negative effect of ESG on the financial performance of a firm is assessed and confirmed by various studies (Freidman, 2007; Kruger, 2015; Capelle-Blamncard and Petit, 2019). Brammer et al (2006) captured the negative consequences of unrelated societal aspects on the financial performance of a firm. On the contrary, the focus on materiality and developing an appropriate measure is very important (Eccles and Strohle, 2020). The focus on the origin of the sustainability measurement scales leads to various roadblocks and opportunities. It paved the way for incorporating sentiment as a critical aspect of understanding and estimating the effect of ESG factors on the performance of stocks globally (Bapat et al., 2020).

A modification of Baker and Wurgler's (2006) sentiment analysis method has been employed by the firms to recalibrate these issues pertaining to ESG and CPF (corporate financial performance). ESG and stock market correlation have been captured by multiple researchers (Lins et al 2017; Nofsinger and Varma, 2014), who looked at stockholder trust as a subsequent result of successful ESG operations. The aspect of behavioral finance, especially ESG sentiment might have helped in evaluating the effect of ESG-related activities and CPF (Garcia, 2013; Li et al, 2014). A change has to be introduced to accurately measure the effect of ESG on firms' returns. This would ultimately modify the scoring methodology according to the Indian context. In India, ESG activities, measuring framework, and implementation are in nascent stages. The SEBI has laid out regulations for reporting and transparency, which are yet to be implemented. The effect of all the domains of ESGs on returns and volatility of the stock is also studied (Meher et al., 2020). It is also imperative to understand

if these factors are sufficient to understand corporate performance (Lee et al., 2013). The focus on ESG scores and the emotion or the public sentiment associated with it is believed to be reflected in the stock's performance, especially the returns (Freide et al., 2013; Nagy et al., 2013).

From the existing literature and research, it is evident that the influence of ESG factors and investors' sentiment on stock volatility has been studied individually. But in the Indian context, a scoring model for ESG with sentiment metric is unavailable. Hence, to understand the combined impact of these factors on the Indian stock market is to be studied. In this study, their combined impact is studied and that might aid in making an investment decision for the potential investors.

3. Research Methodology

The present study has a qualitative and analytical approach. The data for this study is collected from secondary sources like BSE, CRISIL, Bloomberg, and Yahoo Finance. The data was narrowed down to firms that were used for constructing the BSE ESG 100 index. The sample was chosen from a period of November 2017 to 2022, as this ESG reporting has been started in India since 2012, but gained momentum in reporting after SEBI started the BBR in 2015 (ESG And India, 2023).

3.1 Data collection:

The present study has the data for sentiment metrics collected from Twitter. It was collected from 2017-2023. In India, the S&P BSE ESG index has been developed since 2017. Despite the presence of various social media platforms available for data collection, Twitter has been chosen as it provides an application Twitter Developer

platform, which allows the researcher to gain access to data that is specific. It has tools specifically designed for data collection for different purposes as well. Twitter is a platform, where despite diverse age groups and backgrounds express opinions that can be used for sentiment analysis. With the recent uprise in sustainable practices and investment instruments, there is a surge in Twitter regarding sustainability. Hence, Twitter API is considered a perfect platform to access data for sentiment factor construction.

The ESG scores are directly accessed from the Bloomberg and CRISIL platforms. These platforms are pioneers in ESG scoring in India. CRISIL provides direct ESG scores in all three domains (environment, social, and governance) from 2021. Bloomberg, on the other hand, provides access to ESG data and also scores. Thus, making these data sources, perfect for ESG data collection. The period of study is 2017-2023, as it covers the impact of a financial crisis and also the data related to ESG was explicitly available since 2017 in India (*EVOLVING ESG REPORTING LANDSCAPE in INDIA**, 2021).

In this study, first, a modified ESG score is calculated by adding a new metric to the societal domain. The investor sentiment metric is calculated by employing a Twitter sentiment analysis with the help of R software programming language. The data for the sentiment analysis is collected from secondary sources such as Twitter and news articles. Once relevant search words such as '#ESGIndia', '#Sustainability', '#KotakESG', '#TCSESG', '#Impactinvesting', '#sentiment', etc., are used for collecting relevant Twitter data and analysis. The sentiment score for each tweet is calculated using different packages available in R. The sentiment score constructed is then adjusted with the

existing societal score by CRISIL for each company. Only the top scorers in the ESG segment are considered. The composite scores are estimated for the top ESG scorers and then return volatility is calculated with the help of the Capital Asset Pricing Model (CAPM). A portfolio composed of the leaders of the modified ESG score is used for further analysis. Panel data regression analysis is used for testing the effects of modified ESG scores on the volatility of the portfolio constructed. The Return on Assets (ROA) ratio is used for estimating financial performance (Aydoğmuş et al., (2022)). Correlation and regression tests are used to assess the significance of the new metric on the performance of the stocks. The unmodified ESG score is also simultaneously used the all the tests to compare and contrast the modified and unmodified scores.

This study helps in understanding the effect of investor sentiment and psychology on ESG stocks in the Indian market. The major factors impacting the returns and causing volatility in the portfolio constructed are environmental, modified societal, and governance. This study quantifies their impact and helps in investment decision-making for investments. The newer policies and reporting schemes are yet to be implemented in India, which would allow for more transparency in data availability.

The present study is restricted to a smaller portfolio of top-scoring ESG companies in the Indian stock market. The research had certain shortcomings because of the lack of availability of daily ESG data and a proper reporting system. The transparency of the data available is also a bigger roadblock.

The daily data on the ESG factors are not available, thus making it difficult to compute the daily volatility of the market.

The study focuses on investor sentiment's impact on the ESG score and its imminent impact on the stock market.

4. Empirical Analysis and Results

In this study, it is assumed that the listed firms which have higher ESG scores are better investment choices for a potential investor. It is observed that investors are interested in sustainability and are focused on the firms which have imbibed sustainable practices. Multiple studies by Cohen (2023) and Andries et al (2022) have tried to evaluate the effect of ESG factors on returns and risk. Escrig-Olmedo et al., (2019) focused on risk handling by companies that are highly relevant in emerging markets like India. It is believed that a firm with more sustainable practices can mitigate risks well. This study tests this by assessing the impact of scores of all three domains on the returns of the stocks chosen.

In this study, a metric has been introduced to modify the societal metric. The sentiment metric has been added to the societal scoring domain. In this study, an existing framework by the CRISIL rating agency has been used. For sentiment metric development, Twitter sentiment analysis has been performed using R programming language. This programming language has helped in evaluating the scores and categorizing the tweets into Positive, Negative, and Neutral.

In this study, the scoring framework is adopted from CRISIL. The key features they have used in their scoring system are followed and additions were made in the societal sector, by incorporating investor sentiment. The scores given by CRISIL and Bloomberg for the leaders in the market are

taken. To assess the sentiment, we used sentiment analysis from R, to assess the sentiment of investors regarding sustainability, ESG practices by top listed companies in India. To the existing score, these scores are added and modified. The modified scores for all the leaders are evaluated and ranked appropriately. Any addition or deletion of companies is reflected in the portfolio.

In this study, the metrics for the environment and governance have not been changed or modified. Hence the same score for these domains is used. For the societal domain, a sentiment metric is added. Sentiment helps in quantifying the investors' psychology and perception towards the existing ESG practices, investment, and government policies regarding the aspect.

4.1 Modified ESG score calculation:

The scores of Environment and Governance from CRISIL/Bloomberg have been used without any modification. The only modification made in the study is the addition of a sentiment metric to the societal domain by using sentiment analysis. A composite score is constructed using the modified ESG score and a portfolio is constructed. The portfolio consists of firms whose modified cumulative score is higher than 55.

4.2 Sentiment Metric Calculation:

For sentiment metric computation, data is collected from Twitter and news articles of the firms which are categorized as leaders by the CRISIL and Bloomberg rating agencies. For the collection of data, different and appropriate keywords are used. This collected data is further processed for the removal of special characters, white space,

etc., by employing different commands in the R language. The cleaned data is used for sentiment analysis. The data, for example, “each tweet is categorized as positive, negative, or neutral”-Bapat et al(2022). The tweets from each category are enumerated. The data sample is restricted as it is collected for certain firms in the Indian context. The present study had a sample size of 1840 tweets, which are found to be relevant for the study undertaken.

From the analysis, it is observed that the most repeated positive sentiment score is 1.131 and the negative sentiment score is -0.671.

The total number of positive, negative, and neutral data categorizations has been tabulated below:

TABLE 1: Data scores and categorization according to the sentiment analysis:

	Positive scored data	Negative scored data	Neutral scored data
Number	1175	337	337

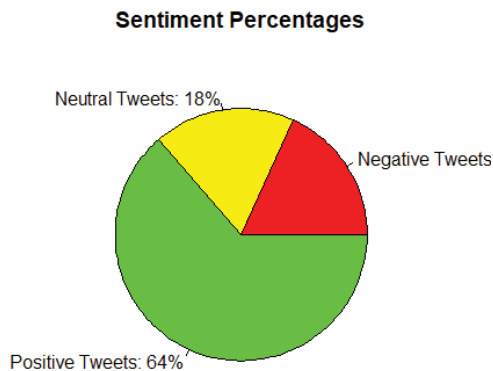


FIG 1: The pie-chart of tweets and their categorization from sentiment analysis. It represents the percentage of positive, negative and neutral tweets from the collected data.

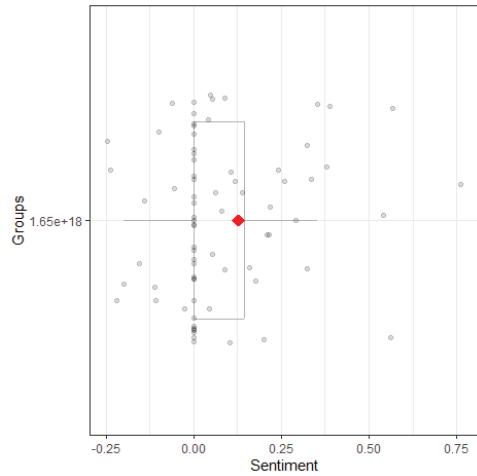


FIG 2: The above figure represents the sentiment and its score concentration

4.2.1 Metric calculation:

The first part of this study is to evaluate the sentiment scores for Twitter data using the Rstudio software language. The data is collected using different search words like SEBI, BRSR, RBI, sustainability, KotakESG, TCS ESG, and WiproESG etc., The data collected pertains to the top scores of CRISI ESG scores in India. The top firms like Axis bank, Kotak Mahindra, TCS, Tech Mahindra Wipro etc., the collected data is processed and then analyzed using different sentiment packages from the R software.

Once the scores for the data points are assigned, the composite sentiment score for the data is evaluated. The stock prices and Twitter data are also collected for these companies in the Indian context from 2017 to 2022. In India ESG, sustainability practices started from the year 2017. The effect of ESG on the financial performance of these firms can also be analyzed by employing statistical and econometric methods. The method for sentiment analysis using R is adopted from Bapat et.al (2022)

The scores computed from the RStudio sentiment analysis as positive, negative, and neutral have been assigned weights. The weight allocation is as follows:

“Positive score = +1

Neutral sentiment = 0

Negative sentiment = -1” – (Bapat et al., 2022)

To compute the composite score, the initially computed sentiment scores to the Twitter data are multiplied by the weights assigned. After the composite scores are calculated for all the tweets, then an aggregate sentiment score for the data has been computed. The aggregate scores for the positive and negative sentiments are calculated. A composite score for the sentiment with both positive and negative segments is analyzed. This composite score is added to the existing societal domain of the CRISIL ESG/Bloomberg ESG scores. The composite sentiment score evaluated from the data collected is then adjusted with the existing societal score from the CRISIL ESG scores and Bloomberg ESG scores. The investor sentiment metric is added for each company and then the final ESG score is calculated. Once this is done, the top-scoring firms (modified composite ESG score ≥ 55) are chosen for the portfolio construction and their returns are calculated.

4.3 Portfolio construction:

In this study, the initial stocks were chosen from the firms that had higher ESG scores. Then a modified ESG score is calculated by adding the sentiment. The composite ESG score is evaluated and then the firms are ranked again in descending order. The firms with the highest cumulative ESG score after modification are identified. The firms were ranked according to their ESG scores and then weights were assigned.

$$W = W1/ (W1+W2+W3+...Wn) \dots\dots\dots(1)$$

According to the weights assigned, the portfolio is constructed and its returns are calculated using the CAPM model. The stock returns are calculated for a period of 5 years (from 2017 to 2022). The following formula is used to assess the returns:

$$R_i = R_f + \beta (R_m - R_f) \dots\dots\dots(2)$$

where

R_i =expected return

R_f =risk-free rate

β = portfolio beta

$(R_m - R_f)$ =market risk premium

In this study, the assessment of the impact of ESG factors on portfolio performance and volatility is done by using panel regression analysis. This method is adopted from Ahmed et al., (2022) and Meher et al., (2020).

For panel regression analysis, the data is converted into panel data, and R software was employed for further analysis. The three independent variables- The Environment, Modified Society, and Governance factors and the dependent variables – Portfolio Returns. For panel regression analysis, there are two methods: Fixed and random methods. In order to choose one, a Hausman test was conducted.

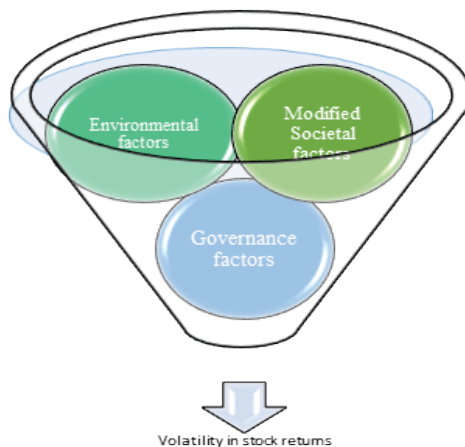


FIG 3: It depicts the independent and dependent variables used for panel data regression analysis

In this study, both the fixed method and random effect method have been performed by using the palm function in the R programming language. These results are stored accordingly and the Hausman test is used for the identification of a better and more appropriate model. The results from the Random effect method and Hausman test are tabulated in Table 2 and Table 3 respectively. Table 2 shows the coefficients, standard error, and probability values of intercept and independent variables with the help of the Swamy-Arora transformation. The estimates show that Governance hurts stock returns. The other two factors (Environment and Modified society) impact positively stock returns. The probabilities of all three components are not significant, which supports the lack of proper explanatory variables in the scale for Indian companies. The model fit, R-squared, and adjusted R-squared values are also on the lower side, which only proves the inefficiency of the factor in assessing their impact on the returns.

The serial correlation of the variables was tested using the Durbin -Watson correlation test, which was insignificant, as the probability was greater than 0.05. This indicates the absence of correlation in the panel data.

4.3.1 Hausman test and Durbin-Watson test for serial correlation

To choose an appropriate model for panel data analysis, a Hausman test is performed. It is a statistical hypothesis test in

econometrics, which evaluates the consistency of one estimate.

The hypothesis for the Hausman test is as follows:

H0: The random effect model is consistent

H1: the fixed effect model is consistent

The results from the Hausman test are tabulated in the following table:

TABLE 2: Hausman test results

	Chi sq	df	p-value
Value	3.9203	3	0.2702

The results prove that the random effect model is consistent and we accept our null hypothesis. One can establish that the effect of the independent variables on the dependent variables might vary in different periods. The volatility of the chosen stocks and ESG-modified components are better explained by the random model as the p-value is 0.2702.

The results from the random effect model are tabulated as follows:

TABLE 3: Random effect model results

	Estimate	Std Error	z-value	p-value
Intercept	3.8928508	1.06147357	0.3667	0.7138
XED	0.605215	0.702580	0.8614	0.3890
XMSD	0.085276	1.271553	0.0671	0.9465
XGD	-0.984818	1.124905	-0.8755	0.3813

TABLE 4: R- squared values of the random effect model

Total Sum of Squares	107740
Residual Sum of Squares	105270
R-Squared	0.02293
Adj. R-Squared	-0.01371
Chisq	1.87746
p-value:	0.59822

From the regression analysis, we can infer that the three domains have a specific

directional link between the independent and dependent variables; the independent variables in this study are three domains of ESG- environment, society, and governance. The estimates show that Society and the environment have impacted stock returns positively. The insignificant probabilities of all the factors prove that the data in India is not sufficient to assess their impact on the returns of the stocks. The positive relationship between the environment and societal domain reinforces that these factors might improve the stock volatility but the governance factor’s negative impact states otherwise. The lack of relationship between the variables amongst themselves, data unavailability, and the insignificant values from the random effect model (Table 3, 4) prove that these factors cannot be considered appropriate measures of stock return volatility in the Indian market (Meher et al., 2020; Ahmed et al., 2022).

The serial correlation of the variables was tested using the Durbin -Watson correlation test, which was insignificant, as the probability was greater than 0.05. This indicates the absence of correlation in the panel data. The results are tabulated in Table 5.

TABLE 5: The results of the Durbin-Watson serial correlation test

DW coefficient	p-value
2.1156	0.6166

4.4 Estimating the Significance of the sentiment metric

A comparative analysis is done to analyze the significance of the new sentiment metric added to the societal domain. For the same, panel data regression is done again, to determine if unmodified ESG scores affect the yearly returns of the

constructed portfolio. The same procedure is applied. In order to assess, if the model has fixed or random effects, the Hausman test is performed. To assess the correlation among the variables Durbin-Watson correlation test is performed. For the calculations R- programming language is used. The results are tabulated as follows:

The hypothesis for the Hausman test is as follows:

H0: The random effect model is consistent

H1: the fixed effect model is consistent

TABLE 6: Hausman test result for the unmodified ESG score and yearly returns:

	Chi sq	df	p-value
Value	3.23266	3	0.3566

From the p-value, we can infer that the random effect model is better suited to explain the volatility of the stocks and the ESG score.

The results from the random effect value are as follows:

TABLE 7: Random effects model with unmodified ESG score:

	Estimate	Std Error	z-value	p-value
Intercept	3.93358	1.0262	0.3833	0.7015
XED	0.605190	0.699602	0.8650	0.3870
XMSD	0.09915576	1.280235	0.07751	0.9388
XGD	-0.999723	1.180452	-0.8469	0.3971

TABLE 7: R-squared values of the ESG score with returns

Total Sum of Squares	107740
Residual Sum of Squares	105270
R-Squared	0.02294
Adj. R-Squared	-0.0136
Chisq	1.8779
p-value:	0.5979

The results of Table 6 and Table 7, show the slight variation in the p-value of modified ESG scores and unmodified ESG scores. The insignificant values of the regression statistics, especially R-squared prove poor relationship between the variables. This clearly suggests the lack of appropriate data availability in India regarding ESG scores, reporting frameworks, and sustainability frameworks.

TABLE 8: Consolidated data of random effect method and r-squared values

	P-value
MESG	0.9465
ESG	0.9383
MESG R-SQUARED	0.02293
ESG R-SQUARED	0.02294

From the panel data regression, the study could not clearly identify the significance of the newly added sentiment metric, hence relevant statistical tests are employed to check for the significance of the sentiment factor. Both the regression analyses clearly showcase the need for improving the ESG scoring methods in the Indian context, as the modified ESG score, as well as the unmodified one, could not impact the volatility of the stock returns. Despite evidence from other countries suggesting that firms with better ESG scores have better stock prices during a financial crisis (Zhou and Zhou, 2022).

In order to clearly distinguish and prove the significance of the new metric added to the societal domain, the panel regression analysis is performed with the same data. From the results, it is evident that panel regression could not clearly identify the significance of the sentiment factor on the returns of the constructed portfolio. Hence, methods and approaches used by different researchers like Velte (2017),

Balatbat (2012), and Ahmed et al., (2021) have been incorporated and two different approaches have been used to identify the significance of the new sentiment metric added to the societal domain. The differentiation between modified ESG scores and unmodified ESG scores is also captured with these tests. To analyze the significance of the sentiment metric on the returns of the portfolio, two methods inspired by different researchers have been employed. In the first method, the Capital Asset Pricing Model (CAPM) is used with modifications to assess the returns. The composite ESG and modified ESG (MESG) scores are added to the CAPM equation and returns are calculated. These returns are regressed with the linear regression analysis to estimate the effect of the ESG and Modified ESG scores on the returns.

Test 1:

In the first statistical test proposed, CAPM modified model is used to calculate the returns of the constructed portfolio using ESG score as an

The modified CAPM with unmodified ESG composite factor is:
 $R_i = R_f + \beta (R_m - R_f) + \text{ESG} \dots \dots \dots (3)$

TABLE 9: The values of β , R_f , C ESG factor and CMESG factor

Composite ESG factor (CESG)	Composite M ESG factor (CMESG)	Risk-free Return	Portfolio Beta
1.774	1.777	0.07	0.6615

The CAPM returns for each year of the top-scoring firms have been calculated using the modified CAPM equation, and the following results are observed:

1. In the first modification of the CAPM equation for calculating returns, the original ESG composite score is used.

The expected returns are calculated for each year and then a regression analysis is done to understand the link between the dependent and independent variables. the results are tabulated in Table 10

TABLE 10: Regression analysis of ESG score and modified CAPM

<i>Regression Statistics of ESG and CAPM</i>	
Multiple R	0.016020923
R Square	0.00025667
Adjusted R Square	-0.011935322
Standard Error	23.97503823
Observations	84

2. In the second modification, MESH composite score is added to the original CAPM equation for return calculation. The returns are calculated using the following equation

$$R_i = R_f + \beta (R_m - R_f) + MESH \dots \dots \dots (4)$$

TABLE 11: Regression analysis of MESH score and modified CAPM

<i>Regression Statistics of MESH and CAPM</i>	
Multiple R	0.00942
R Square	0.00088737
Adjusted R Square	-0.01211
Standard Error	23.97705
Observations	84

It can be concluded from the results of Table 10 and Table 11 there is a (minute but noticeable) increase in the variation when the sentiment metric is added to the ESG score. This proves that the new sentiment added to the ESG score has an impact on the returns of the portfolio constructed.

Test 2:

The second used in this study is the comparison of the ROA (Return on Assets) with

the ESG and MESH scores. Correlation and Regression analysis are performed to understand and identify the influence of newly added investor sentiment metrics on the financial performance of the firm.

To evaluate the significance of the sentiment metric added, a Correlation test is performed between the ROA, ESG and MESH.

ROA is used to measure the efficiency of a firm to generate profit. It is a clear indicator of the financial performance of a firm. Thus, this ratio is chosen to reflect the financial performance of the portfolio constructed. The method was adopted and modified from Velte’s (2017) Whelan et al., (2015) and Aydoğmuş et al., (2022) methods.

A correlation test is first performed to which proves that MESH is correlated with ROA. The results are tabulated in Table 12

TABLE 12: Correlation test of the ROA, MESH, and ESG scores

	ROA	Composite Modified ESG scores	Composite ESG scores
ROA	1		
Composite Modified ESG scores	0.3161	1	
Composite ESG scores	0.2011	0.717453407	1

After the correlation test, a regression analysis is performed between the variables and it is evident from the R square values that MESH scores have more influence on the financial performance (Tables 13, 14). Despite being very minute, the difference still persists. The minute significance is attributed to the lack of appropriate data and time period. The regression statistics for ESG and MESH are as follows:

TABLE 13: *Regression Statistics of MESH AND ROA*

<i>Regression Statistics</i>	
Multiple R	0.201109613
R Square	0.040445076
Adjusted R Square	0.039517834
Standard Error	2.987056359
Observations	14

TABLE 14 *Regression Statistics of ESG AND ROA*

<i>Regression Statistics</i>	
Multiple R	0.316508969
R Square	0.100177928
Adjusted R Square	0.025192755
Standard Error	2.892589589
Observations	14

5. Conclusion

In this paper, a panel data regression is performed to estimate the effect of the ESG scores on stock volatility. The regression analysis is conducted for both modified and unmodified ESG scores. From both the test results, it is found that two factors have a positive relationship with stock volatility and one factor has a negative relationship. It can be inferred that a reliable model with the existing data cannot be appropriately formed for Indian companies. There is a lack of transparency and clarity in the ESG reporting system globally as well (Jonsdottir et al., 2022). It could also account to lower investor awareness in India about ESG as these practices, products, strategies and all the regulatory policies are still in a nascent stage in India.

Despite constructing a portfolio with higher ESG scores, the insignificance of the random effect model, Hausman test

and Durbin -Watson test only proves that in the Indian context, just a better ESG might not be a good investment pick. The significance of the sentiment metric was tested by modifying the CAPM equation and calculating returns accordingly. The financial performance was also checked in this study to ascertain the significance of the newly added sentiment metric in the given study. The relationship between ROA and the modified ESG scores confirmed the effect of the sentiment metric on the ROA. It is evident from the low R-squared values that these models are not a good fit. This is attributed to the dearth of data availability and transparency (Pulino et al., 2022).

The need for relevant, accessible data is the need. It can only be done with the help of proper reporting and disclosure systems (Pulino et al., 2022). The major pitfall in this study is the inconsistent measuring systems across all the levels for ESG. The varied methodologies, metrics, ratings, and definitions hindered the authenticity of the reporting and score calculation (Bruno, 2018; Meher, 2020). These issues might be resolved as SEBI has introduced a new reporting system BSRB which promises to provide transparency in reporting (*BUSINESS RESPONSIBILITY & SUSTAINABILITY REPORTING FORMAT SECTION A: GENERAL DISCLOSURES*, 2021).

The present study considers only the top-scoring ESG firms in the Indian context with only one new metric. Further research can be done by collecting data from different economies with different impacting variables.

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