MARKET EFFICIENCY OF ESG AND TRADITIONAL INDICES- PRE AND POST COVID ANALYSIS OF NSE INDICES

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Abstract:

ESG reporting and disclosure practices are the buzzing terms in the Indian corporate sector occupying the place after corporate governance (CG) and corporate social responsibility (CSR). ESG is a broader concept than CG and CSR, wherein ESG practices include corporate's practices relating to Environmental (E), Social (S) & Governance (G) and disclosure of the same by the corporate world. Though sustainability and ESG reporting are used interchangeably, ESG is more specific to three pillars in terms of corporate efficiency which provide augmented risk-adjusted returns. Major stock exchanges worldwide have begun constructing ESG based indices constituting those companies that comply with specific ESG criteria. Mutual Funds in India have introduced ESG based schemes for investors for better long-term returns. SBI Mutual Fund has renamed its widely popular and most successful equity scheme, SBI Magnum Equity into SBI Magnum Equity ESG fund. Other fund houses such as Quantum, Axis, and ICICI Mutual Funds have also introduced ESG based equity schemes. In India, BSE and NSE as well, have ESG based indices. BSE has S&P BSE 100 ESG Index, whereas NSE has Nifty 100 ESG Index, Nifty 100 Enhanced ESG, and & Nifty 100 ESG Sector Leaders. ESG indices are constructed based on the criterion of disclosure related to E, S & G practices and the question here arises is, whether these ESG indices are efficient in terms of information absorption by the market. The present study has considered all three ESG indices of NSE for a period of six months each before and after the imposition of lockdown in India. To analyze the efficiency of these indices Hurst exponent has been calculated for two periods and compared with Nifty 50 & Nifty 100 indices. The results have shown that ESG indices are more efficient in the post-Covid than the pre-Covid period, which gives an impression that investors are leaned towards ESG indices post math of Covid. In other words, the ESG portfolio can be taken as Covid free portfolio.

Key Words: ESG, ESG Reporting, ESG Indices, Market Efficiency & Covid-19.

Introduction:

Move from financial reporting to non-financial reporting is gaining momentum with ESG disclosures by companies. Business strategies are being included with ESG strategies to attract and retain customers and investors. Since 2005, the year in which the term ESG was coined in a study by the UN Global Compact entitled 'Who cares Win', further accepted in UN Principles for Responsible Investment (UNPRI) in 2005, ESG has gained tremendous popularity. It is estimated that total assets under management applying the ESG criterion crossed the US $ 80 trillion by 2020 (Marguerite Ward, 2020). Long-term survival and profitability are linked to companies engaged in ESG risk and opportunity management (Sheida Palmelind, 2020). Investors have started to accord priority to long-term sustainable funds and the same increased substantially in the post-Covid period ((Joydeep Sen, 2020). ESG criterion has become an active part of the investment process (Nazmeera Moola, 2019). Indian mutual funds received the US $ 507 million in the first quarter of 2020 under ESG schemes (EconmicTimes, 2020). The potential impact and related risks of ESG & stakeholders' concerns are making organizations to reimagining and enhancing their ESG positions (Olivier Jan, 2019). To pick the quality stocks for the portfolio, the ESG rating followed by ROCE is the most reliable criterion (Kshitij Anand, 2020).

ESG risks are equivalent to financial risks and institutional investors are keen on implementation and reporting initiatives (www.financialexecutives.org, 2019). World Economic Forum (WEF) Global Risk Report identified that the top five risks are related to environmental risks (Lord Deben, Anna-Maria Slot, Warren Percival & Ivo Domov, 2020). The importance of ESG information which is non-financial in nature has become a prerequisite in integrating with the investment process and also included in the projection of cash flows as these issues can impact profitability. Marketing strategies should also include companies' ESG stories to fascinate prospective investors. The prevalent trend in capital markets to portfolio selection is ESG scoring, wherein a company having a high ESG score is treated as a low-risk company for investment and vice versa. Companies with good ESG scores tend to have stronger cash flows, low borrowing costs, and durable returns (Sandeep Singh, 2020). Investors are becoming extra cautious with those stocks which are in the category of sin stocks, which release waste into water, soil, and air, companies with unfair labor practices, and flaws in governance practices. Extended balance sheets are the need of the hour to include human capital, social resources, and natural capital as a part of corporate management best practices (Sandeep Raguhwanshi, 2019).

Big four of corporate accounting Deloitte, PwC, EY and KPMG announced a new reporting framework related to ESG standards criteria which include issues ranging from environmental risks to diversity on board and management of human capital. From the minority shareholders' point view of also, in long term, the ESG framework offers better returns as equity shareholders get residual returns (S. Naren, 2020). The argument that ESG factors lead to long-term performance is proved less in academics, thereby indicating an inherent problem of a wide variety of issues under ESG whose silence is changing continuously (Jordan N. Boslego, 2020). A clear ESG mission statement, ESG agenda, consistent narrative, vigorous PR program, and strong marketing strategy with committed CEO are the essential ESG communication process for any organization (Don Scales, 2019). As the ESG framework includes a wide variety of factors and not static, there is a dire

need for standard disclosure practices and ESG rating besides credit rating for a well-informed investment decision. Though there are no standard ESG rating criteria, MSCI ESG rating is widely used by rating agencies. A more uniform, transparent approach in collecting data from the source, both, publicly available information and from companies would be more consistent (Zally Ahmadi, 2018).

Literature Review:

Companies with a reputation for social responsibility outperformed companies with poor reputations during the six years 1982-1987and provided better returns and lower risks (Irrene M. Herremans, 1993). Though investors value socially responsible investment, they were not ready to forego financial returns (Barry N Rosen, 2005). Over the last few years, ESG risks and opportunities have become common parameters in long-term investment themes in the world's capital markets and help exchanges to ensure market efficiency to meet ESG disclosures (Dan Siddy, 2009).

By 2006, most of the world's regulated exchanges were partnered with institutional investors who were subscribers to the UN's ESG principles, which prompted companies to be included in sustainable indices and ESG compliance (Edemir Pinto, 2010). There are several significant challenges to achieve the ambitious goals of having standardized ESG reporting in place by 2020 and collaboration among companies, investors, financial and non-financial boards, stakeholders, regulators, and legislators (Robert Eccles & Mervyn E King S.C., 2010). ESG investment criteria are based on the screening of stocks and there is a strong link between screening intensity and risk, where increased screening lowers the systematic risk to choose low beta stocks (Darren Lee, 2010). Current methods being employed by ESG rating agencies and sustainability indices are diverse and show a lack of standardization (Elana. Maria Jesus, 2010). Socially responsible indices are highly developed after 2006 and widely used in European Markets and become a trademark in other countries as well (Mei Sun, 2011). A meta-analysis of 2000 individual studies revealed, roughly 90% of studies found nonnegative corporate financial performance and positive ESG impact is intact over time (Gunner Friede, 2015).

In contrast to the widely believed notion of ESG investing helps in reducing regulatory and reputational risk, the study found that ethical controversies are more likely for firms that adopt ESG policies (Garvey, Gerald T., and Kazdin, Joshua and Nash, Joanna and LaFond, Ryan and Safa, Hussein, 2016). Sustainable indices constructed with the weights of ESG score had an impact compared to market cap-weights (Amelie harles, 2016). The performance of ESG equity indices of many Asian countries is similar to the performance of conventional indices and there is no difference in risk-adjusted returns of ESG and conventional indices (Ramiz Ur Rehman, 2016). Integrating ESG emerging market equities into an institutional portfolio may well deliver the chance for higher returns and lower downside risk than non-ESG equity investment (Pollard, 2017). Socially responsible stock market indices had lower efficiency than traditional indices and also emerging market indices (Henry Mynhardt, 2017).

The empirical results indicated that there was an affirmative correlation between an enterprise's ESG indices and its stock market performance. Further analysis shows that the impact of ESG indices on non-state-owned enterprises is bigger than that on state-owned enterprises, and the stock market performance of the secondary industry is much more affected by ESG indices than that of the tertiary industry (Cheng, 2019). An analysis of four broader MSCI USA ESG indices revealed that returns of these indices are primarily related to factors that are significantly related to the returns of ESG indices (Kumar, 2019). Comparative study of ESG indices and traditional indices found that there is no significant difference in the performance between sustainable indices and the traditional or conventional indices, being a good substitute to the latter and the indices are integrated in terms of the flow of information (Srivastava, 2019). There was growing interest in socially responsible investment (SRI), investors have been applying ESG criteria in their stock-picking operations (Sciarelli, 2019).

SRI portfolios significantly underperformed their benchmark index, in the case of, the developing nations, however, enjoyed a significantly lower risk and in the case of developed nations, where the US SRI portfolio has significantly outperformed the benchmark index and the UK and Australia SRI portfolios have performed in line with the benchmark index (Bodhanwala, 2019). Weighting methodologies of sustainable indices are often the main return driver, which has to be taken under consideration by investors evaluating the risk-return summary of stock indices with ESG tilts (Hübel, 2019). An analysis of 69 S&P Dow Jones ESG indices against the S&P Global 1200 benchmark index, revealed the underperformance of ESG indices on overall risk-adjusted returns (Iversen, 2019). An analysis of rating criteria of ESG rating agencies revealed that the rating agencies do not fully integrate sustainability principles into ESG rating and to measure corporate performance (Escrig-Olmedo, Fernández-Izquierdo, Ferrero-Ferrero, Rivera-Lirio, & Muñoz-Torres, 2019)

The ordered logistic regression model has been applied to establish a positive relationship between ESG practices and the financial indicators, wherein the relationship was more evident in the case of investment in environmental innovation, employee productivity and diversity, and equal opportunity policies (Caterina D Lucia, 2020). Criteria such as risk-adjusted return, standard deviation, and conditional value-at-risk (CVaR) show that the ESG index can provide satisfactory results in lowering the potential CVaR and maintaining a high return (Hamori, 2020).

The above literature review is mostly related to global ESG indices and does not cover the study of Indian ESG indices, furthermore, the literature was general in nature. Therefore present study aimed at evaluating Indian ESG indices and pre and post Covid-19 pandemic. All ESG based indices of the National Stock Exchange (NSE) have been considered for the study and compared with NSE-Nifty-50 and Nifty-100. Further, the study used two data sets i.e. pre-Covid and post Covid.

Hypothesis:

Traditional markets and sustainable indices were tested with the help of the efficient market hypothesis, however, ESG indices were not tested for their efficiency in abnormal conditions like Covid-19. The present study tests the efficiency of ESG indices pre-and post- Covid-19, also the efficiency of traditional benchmark indices. Having analyzed the literature review on the study area, the following hypotheses are framed,

H_1: There is no difference in the efficiency of ESG indices in Pre and Post-Covid-19;

H_2: ESG indices and traditional indices are similar in efficiency.

Objectives of the Study:

Objectives of the present study are;

1. To test the efficiency of ESG indices in Post & Pre-Covid-19 periods;
2. To test the efficiency of ESG indices and traditional indices.

Methodology:

The research methodology applied is comparative analytical with library method of research. This article analyses comparative returns of traditional and ESG indices during pre-Covid-19 and post-Covid-19 periods. For the same two (2) benchmark indices and three (3), ESG indices were chosen. They are,

NIFTY-50: The index represents the weighted average prices of 50 of the largest Indian companies listed on the National Stock Exchange (NSE).

NIFTY-100: The index represents 100 diversified companies across various sectors and is based on full market capitalization from Nifty-500.

NSE-100-ESG-: NIFTY100 ESG Index is designed to reflect the performance of companies within the NIFTY 100 index, based on Environmental, Social, and Governance (ESG) scores. The weight of each constituent in the index is tilted based on ESG score assigned to the company i.e. the constituent weight is derived from its free-float market capitalization and ESG score (www1.nseindia.com, n.d.)

NIFTY 100 Enhanced ESG Index: It is designed to reflect the performance of companies within the NIFTY 100 index based on the Environmental, Social, and Governance (ESG) score. Companies should have a normalized ESG score of at least 50% to form part of this index. The weight of each constituent in the index is tilted based on ESG score assigned to the company, i.e. the constituent weight is derived from its free-float market capitalization and the ESG score (www1.nseindia.com, n.d.).

NIFTY 100 ESG Sector Leaders Index: This index aims to track the performance of select companies within each sector of the Nifty 100 which have scored well on management of ESG risk and which do not have involvement in any major controversies (www1.nseindia.com, n.d.)

Returns of all five indices were taken from daily closing prices from 23rd September 2019 to 23rd September 2020, corresponding to 6 months return for pre and post Covid-19 as the lockdown was announced in the country on 23rd March 2020. For analysis of data, NumXL, an add-in Microsoft Excel for econometrics and time series analysis from Spider Financial, has been used and summary statistics which includes Average, Standard Deviation, Skewness, Excess Kurtosis, Median, Minimum, Maximum, White-Noise and Arch Effect, have been calculated. The study then proceeded with the Augmented Dickey-Fuller (ADF) unit root test to examine whether or not the series is stationary. The following equation explains the basic concept of unit root testing:

$$y_{t=} p y_{t-1+} \; x'_t + \; \varepsilon_{t'}$$

Where x'_t are optional exogenous repressors, which consist of a constant, r and d are the parameters to be estimated, and ε_t is assumed to be white noise.

If $|p| \geq 1$, then y is a non-stationary series. If $|p| \leq 1$, then y is a stationary series. Hence, we evaluate the hypothesis of stationary by testing whether the absolute value of $|p|$ is less than one.

The standard Augmented Dicky-Fuller test is carried out by estimating the following equation.

$$\Delta y_t = \alpha y_{t-1} \; + \; x'_t \; + \varepsilon_t$$

The ARCH/GARCH family model, GARCH (1, 1) has been employed to test the volatility of benchmark index and sustainability indices of BSE.

$$Y_t = X'_t \; \theta + \varepsilon_t$$

$$\sigma_t^2 = \omega + \alpha \varepsilon_{t-1}^2 + \beta \sigma_{t-1}^2$$

The first equation is mean equation, second equation is variance equation.

ω = constant term

$\alpha \varepsilon_{t-1}^2$ = ARCH Term

$\beta \sigma_{t-1}^2$ = GARCH Term

Further, to test the efficiency of ESG indices, Hurst exponent which is a measure of persistent or long memory for time series has been applied. Hurst exponent was first developed in the field of hydrology by Harold Edwin Hurst to test hidden long-term trends in rainfall and floods. Statistically, this is known as a long –memory process, and the same is been applied in the financial analysis since the mid-1990s. Hurst exponent indicated by H, known as "index of dependence" or "index of long term dependence." The value of the Hurst exponent ranges between 0 and 1 and measures three trends in a time series. It relates to the autocorrelations of the time series.

If H $\geq$ 0.5, then the time series is persistent and the future data point is likely to be similar to the preceding data point.

If H =0.5, or near to 0.5, the time series exhibits a random trend, in which past data helps predict future value or future trend.

If H $\leq$ 0.5, then the time series exhibits a reverse trend.

$$E\left[\frac{R(n)}{S(n)}\right] = Cn^{\text{H}} \quad \text{as n} \rightarrow \infty$$

Where,

$\left[\frac{R(n)}{S(n)}\right]$ is the Rescaled Range,

E $[x]$ is the expected value; n is the time of the last observation and h is constant.

The **Rescaled Range** is calculated for a time series, X=X_1, X_2,…,X_n , as follows:

1) Calculate the mean:

$$m = \frac{1}{n}\sum_{i=1}^{n} X_i$$

2) Create a mean adjusted series:

$$Y_t = X_t - m \quad \text{for } t = 1, 2,…,n$$

3) Calculate the cumulative deviate series Z:

$$Z_t = \sum_{i=1}^{n} Y_t$$

4) Create a range series R:

$$R_t = max (Z_1, Z_2, Z_3, ….Z_t) - min(Z_1, Z_2, Z_3, …..Z_t) \, for \, t = 1,2,…,n$$

5) Create a standard deviation series R:

$$S_t = \sqrt{\frac{1}{n}\sum_{i=1}^{t}(X_i - u)^2} \quad for \, t = 1, 2,…,n$$

6) Calculate the rescaled range series (R/S):

$$\left(\frac{R}{S}\right)_t = \frac{R_t}{S_t}; \, for \, t=1,2,…,n$$

The Hurst Exponent is estimated by fitting the power-law $E[R(n)/S(n)]=C\times n^H$ to the data. This is done by taking the logarithm of both sides and fitting a straight line. The slope of the line gives H (i.e. Hurst Exponent Estimate).

The above process produces a biased estimate of the power-law exponent if n ≤ 340 and there is a deviation from 0.5 slopes (i.e. white-noise). Anis-Lloyd estimated the white-noise theoretical value of the R/S statistics to be as follows and the corrected R/S Hurst exponent is calculated as 0.5 plus the slope of $R(n)/S(n) - E[R(n)/S(n)]$.

The present study has considered 120 observations each of the pre-Covid and post-Covid period, therefore the Corrected Hurst exponent has been calculated and interpretation was made thereof.

Empirical Results:

1. Pre-Covid Analysis:

Overall results of summary statistics (Table 1.1) of indices during pre-Covid are presented in Table-1. The descriptive statistics indicate, all the three ESG indices have shown minute higher returns and lower risks than benchmark indices. In terms of minimum and maximum returns also, ESG indices have shown comparatively better performance. Greater positive Kurtosis and more negative Skewness indicate increased risk. All the indices have a leptokurtic distribution which indicates high risk and all the indices are negatively skewed indicating more values are less than the sample mean. Results showed that the Nifty 100 Enhanced ESG index has exhibited lower risk than all other indices.

Table-1.1

Summary Statistics- Pre-Covid					
	NIFTY 50	NIFTY 100	NIFTY 100 ESG	NIFTY 100 Enhanced ESG	NIFTY 100 ESG Sector Leaders
Average:	-0.22	-0.22	-0.20	-0.21	-0.19
Standard Deviation:	1.64	1.61	1.59	1.60	1.57
Skew:	-1.83	-1.89	-1.86	-1.84	-1.84
Excess Kurtosis:	9.94	9.79	9.52	9.51	10.11
Median:	-0.05	-0.05	-0.01	-0.01	-0.05
Minimum:	-8.30	-8.36	-8.05	-8.03	-7.89
Maximum:	5.83	5.52	5.65	5.71	5.87

Source: Calculated from secondary data.

Table-1.2

Normality Test				
Index	Test	White-Noise	Normal Distribution	ARCH Effect
NIFTY 50	P-Value	0.0002	0.0000	0.0000
	SIG?	FALSE	FALSE	TRUE
NIFTY 100	P-Value	0.0002	0.0000	0.0000
	SIG?	FALSE	FALSE	TRUE
NIFTY 100 ESG	P-Value	0.0005	0.0000	0.0000
	SIG?	FALSE	FALSE	TRUE
NIFTY 100 Enhanced ESG	P-Value	0.0006	0.0000	0.0000
	SIG?	FALSE	FALSE	TRUE
NIFTY 100 ESG Sector Leaders	P-Value	0.0008	0.0000	0.0000
	SIG?	FALSE	FALSE	TRUE

Source: Calculated from secondary data.

The presence of White-Noise in a time series indicates randomness in the series observations and each observation is uncorrelated with other observations. Test results (Table-2), at a 5% level of significance revealed the absence of White-Noise in returns of all the indices indicating autocorrelation. The test of normality also resulted in the rejection of the null hypothesis and the returns of indices are not normally distributed. Test results for Arch effect (Max Lag order-4) were also found to be less than the P-values and therefore null hypothesis has been rejected and it is found that there is an ARCH effect in returns of the indices and returns of all the indices are auto-correlated.

Table-1.3

Augmented Dickey-Fuller (ADF) TEST					
Index	Test	Score	P-Value	Critical Value	Stationary
NIFTY 50	No Const	-1.7986	0.0710	-1.9608	FALSE
	Const-Only	-1.9173	0.3359	-2.9606	FALSE
	Const + Trend	-2.9758	0.0015	-1.6449	TRUE
	Const+Trend+Trend^2	-4.0949	0.0000	-1.6449	TRUE
NIFTY 100	No Const	-1.9282	0.0539	-1.9608	FALSE
	Const-Only	-2.0428	0.2816	-2.9606	FALSE
	Const + Trend	-3.6563	0.0001	-1.6449	TRUE
	Const+Trend+Trend^2	-4.2467	0.0000	-1.6449	TRUE
NIFTY 100 ESG	No Const	-2.0737	0.0390	-1.9608	TRUE
	Const-Only	-2.1676	0.2328	-2.9606	FALSE
	Const + Trend	-3.1562	0.0008	-1.6449	TRUE
	Const+Trend+Trend^2	-4.3207	0.0000	-1.6449	TRUE
NIFTY 100 Enhanced ESG	No Const	-2.0709	0.0392	-1.9608	TRUE
	Const-Only	-2.1700	0.2319	-2.9606	FALSE
	Const + Trend	-3.6755	0.0001	-1.6449	TRUE
	Const+Trend+Trend^2	-4.2924	0.0000	-1.6449	TRUE
NIFTY 100 ESG Sector Leaders	No Const	-2.2758	0.0244	-1.9608	TRUE
	Const-Only	-2.3653	0.1670	-2.9606	FALSE
	Const + Trend	-3.7941	0.0001	-1.6449	TRUE
	Const+Trend+Trend^2	-4.3451	0.0000	-1.6449	TRUE

Source: Calculated from secondary data.

If a time series is nonstationary, studying the behavior of the time series data under consideration is limited for the period under consideration. As a consequence, it is not possible to generalize the behavior of the data to other periods, and therefore for forecasting, it may be a miniature value. The ADF test results of all the indices at a 5% level of significance have shown that there is some evidence that the returns of all the indices are stationary with a deterministic trend. However, the contradictory results could be caused by the presence of structural break and also the lesser number of observations.

2. Post-Covid Analysis:

Table-2.1

Summary Statistics					
	NIFTY 50	NIFTY 100	NIFTY 100 ESG	NIFTY 100 Enhanced ESG	NIFTY 100 ESG Sector Leaders
Average:	0.25	0.23	0.27	0.27	0.25
Standard Deviation:	2.21	2.21	2.12	2.13	2.06
Skew:	-1.36	-1.95	-1.24	-1.24	-1.05
Excess Kurtosis:	12.06	16.30	13.33	13.03	11.38
Median:	0.33	0.32	0.32	0.33	0.27
Minimum:	-12.98	-14.19	-12.58	-12.61	-11.72
Maximum:	8.76	8.43	9.09	9.07	8.54

Source: Calculated from secondary data.

From Table 2.1, summary statistics of returns of all the indices revealed that ESG indices have outperformed the traditional indices with higher returns and lower standard deviations. Minimum and maximum values of ESG indices are superior to those of traditional indices. Median returns of all the indices are similar, except the Nifty 100 ESG Sector Leaders index. Analysis of Skewness and Excess Kurtosis revealed that the Nifty 100 ESG Sector Leaders index outperformed other indices, followed by Nifty 50, and returns of Nifty 100 have posted higher risk than all other indices.

Table-2.2

Normality Test				
Index	Test	White-Noise	Normal Distributed	ARCH Effect
NIFTY 50	P-Value	0.089303904	1.6044E-152	0.071769279
	SIG	TRUE	FALSE	FALSE
NIFTY 100	P-Value	0.114239443	2.045E-280	0.291361341
	SIG	TRUE	FALSE	FALSE
NIFTY 100 ESG	P-Value	0.105380061	3.1032E-183	0.081154834
	SIG	TRUE	FALSE	FALSE
NIFTY 100 Enhanced ESG	P-Value	0.104665918	3.3965E-175	0.074905948
	SIG	TRUE	FALSE	FALSE
NIFTY 100 ESG Sector Leaders	P-Value	0.086221653	2.1146E-133	0.015688892
	SIG	TRUE	FALSE	TRUE

Source: Calculated from secondary data.

Table 2.2 indicates, presence of White-Noise in all data series indicating randomness at a 5% level of significance and reasonable prediction is not possible. Therefore it is concluded that variables are independent and identically distributed. Normality test at a 5% level of significance resulted in the rejection of the hypothesis that the returns are normally distributed with identical mean, median, and mode. Test results also indicated, there is no ARCH effect in returns of all the indices, except for the Nifty 100 ESG Sector Leader.

Table-2.3

Index	Test	Score	P-Value	C.V.	Stationary
	Augmented Dickey-Fuller Test-ADF				
NIFTY 50	No Const	-9.9248	0.0010	-1.9608	TRUE
	Const-Only	-5.9229	0.0010	-2.9606	TRUE
	Const + Trend	-6.1756	0.0000	-1.6449	TRUE
	Const+Trend+Trend^2	-6.1462	0.0000	-1.6449	TRUE
NIFTY 100	No Const	-10.0640	0.0010	-1.9608	TRUE
	Const-Only	-5.8596	0.0010	-2.9606	TRUE
	Const + Trend	-6.1551	0.0000	-1.6449	TRUE
	Const+Trend+Trend^2	-6.1287	0.0000	-1.6449	TRUE
NIFTY 100 ESG	No Const	-9.9065	0.0010	-1.9608	TRUE
	Const-Only	-7.5992	0.0010	-2.9606	TRUE
	Const + Trend	-6.1967	0.0000	-1.6449	TRUE
	Const+Trend+Trend^2	-6.1794	0.0000	-1.6449	TRUE
NIFTY 100 Enhanced ESG	No Const	-9.9381	0.0010	-1.9608	TRUE
	Const-Only	-7.6506	0.0010	-2.9606	TRUE
	Const + Trend	-6.2279	0.0000	-1.6449	TRUE
	Const+Trend+Trend^2	-6.2055	0.0000	-1.6449	TRUE
NIFTY 100 ESG Sector Leaders	No Const	-9.8058	0.0010	-1.9608	TRUE
	Const-Only	-8.0618	0.0010	-2.9606	TRUE
	Const + Trend	-6.5226	0.0000	-1.6449	TRUE
	Const+Trend+Trend^2	-6.4939	0.0000	-1.6449	TRUE

Source: Calculated from secondary data.

Test results from table 2.3, for ADF Test, showed that data sets of all the indices have passed the stationarity test at a 5% level of significance with max lag order 5.

HURST ANALYSIS

The final step in the study is to test the efficiency of the markets vis-à-vis traditional indices and ESG indices. If a time series with Hurst exponent value $H \geq 0.5$, the market exhibits a trend and $H \leq 0.5$ indicates a reversal in trend. If $H = 0.5$, then the markets tend to be a random walk model, and markets are said to be efficient, in which all information is irrelevant.

The following table provides an analysis of empirical Hurst and corrected Hurst values for pre and post-Covid periods.

Table-3

HURST ANALYSIS				
Index	Empirical HURST		Corrected HURST	
	Pre-Covid	Post-Covid	Pre-Covid	Post-Covid
NIFTY 50	0.74	0.41	0.66	0.35
NIFTY 100	0.74	0.42	0.66	0.35
NIFTY 100 ESG	0.74	0.47	0.66	0.40
NIFTY 100 Enhanced ESG	0.74	0.47	0.66	0.40
NIFTY 100 ESG Sector Leaders	0.72	0.47	0.64	0.40

Source: Calculated from secondary data.

Empirical Hurst value of all indices under the study, during the Pre-Covid period, have shown values greater than 0.50 indicating a definite trend in markets. Corrected Hurst values do also displayed a similar trend in the Pre-Covid period. However, empirical and corrected Hurst exponent values of indices have indicated that ESG indices are more efficient than those of traditional indices. It is distinctly evident that investors are keener towards ESG indices or sustainability indices in Post-Covid duration. Across the globe, investment in ESG stocks has risen significantly in the Post-Covid period and is also expected to grow continuously in an environment similar to a pandemic like global warming, labor law violations, societal aspects, and governance specific related issues which fall under the broad group of ESG investment criteria.

Conclusions:

The overall analysis of the study revealed that ESG indices have performed on par with the traditional indices during the Pre-Covid period. However, Post-Covid analysis evidently proved that ESG indices have outperformed traditional broad market indices. Hurst Exponent analysis also evidenced that ESG indices were efficient in Post- Covid period, substantiating ESG investment as a portfolio management tool.

ESG indices tend to be more efficient than traditional indices as they are comprised of stocks with a strong ESG profile to outperform in long run. Major global ESG/Sustainable indices at outperformed broad market indices. Stocks with high ESG score offers low volatility and strong resilience indicating strong financial performance in long run. In the Post-Covid rebound, stakeholders will look for companies with better ESG performance with strong fundamentals. Companies need to define their ESG practices, evaluate them and communicate efficiently to build strong stakeholder relations. Incorporating ESG into a company's strategy becomes an inevitable chunk in near future. Fund flow into ESG related assets has been increased manifold in the recent past as investors are more leaned towards sustainable investment as they look at ESG investment as a risk mitigation strategy.

Foreign institutional investors are preferring investment in countries with high ESG score and avoiding investment in countries which are poor in ESG score. But for developing countries, this may become a hindrance in attracting foreign capital which is indispensable for as they rely more on foreign capital. At the

outset, it is apparent that impending investment strategies cannot ignore ESG criteria, be it at retail investors or institutional investors.

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