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Choice between Sustainable versus Conventional Investments—Relative Efficiency Analysis from Global and Regional Stock Markets

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Abstract: We use the daily data from 1 October 2010 to 1 March 2021 on the stock prices of several global, regional, and country-specific ESG indices of the Dow Jones Sustainability Index family (DJSI) and MSCI family to analyse the relative performance of sustainable indices (ESG) and corresponding conventional benchmarks. In terms of classic risk and return characteristics and modern portfolio metrics, we report mixed evidence with some sustainability indices marginally outperforming the traditional benchmarks and others staying at parity. Regionally, the evidence is heterogeneous; the Pan Arab, the Middle East (including Israel), the United States, Emerging Markets, and Europe indices reported a slightly superior performance and those belonging to Asia Pacific, Emerging Africa, and Latin America marginally underperformed compared to their conventional counterparts. The findings of this study imply that sustainable investments appear to be an encouraging investment option, although their progress has not been substantial. For an appreciable outperformance of sustainable investments, a more conducive regulatory framework should be established, including robust incentivizing policies concerning tax rebates or low capital costs.

Keywords: socially responsible investments; sustainability indices; ESG indices; portfolio performance

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1. Introduction

Owing to glaring environmental, social, and governance (ESG) challenges, the United Nations 2030 Agenda set up 17 Sustainable Development Goals (SDGs), constituting a multilateral endeavour to restructure the global economy in a sustainable way. Sustainable investments, or investments that incorporate ESG (environmental, social, and governance) concerns in their portfolio selection and management criteria, are critical to achieving these goals [1]. Sustainable investment is primarily promoted and developed by stock exchanges through ESG disclosure, preparation, the promotion of mindfulness, and products [2]. Sustainability indices comprise portfolios of shares from local, regional, or global corporations based on ESG factors [3]. Investors are more likely to hold equities with high ESG ratings as market volatility grows, pushing up the worth of resources with ESG qualities [4,5].

ESG investing has exploded in popularity, especially following the global financial crisis of 2008 [6]. As a result, ESG equity mutual funds have drawn record net flows [7]. The Global Sustainable Investment Alliance (GSIA) has indicated that since 2020, global sustainable investment has USD 35.3 trillion of assets under management, revealing the continued acceptance of sustainable investments [5,8]. Amid the 2020 pandemic, money flow into sustainable investment ventures soared to new heights. Companies with high ESG appraisals have earned comparatively higher stock returns and experienced lower levels of unpredictability [9,10].

Appropriate information about an asset class's risk, return, and trading features is expected to generate attention and eventually lead to more investments [11]. As a result, it is crucial to examine how sustainable investments are performing compared to conventional stock indices. Studies reveal that socially responsible investments (SRIs), through nonfinancial traits, provide advantages in terms of greater returns and lower levels of risk during turbulent periods and would help to meet the United Nations' climate change mitigation targets [12–15]. Companies undertaking environmentally responsible endeavours are more transparent about their sustainability as environmentally conscious companies are less vulnerable to systemic threats [16]. ESG indices are based on social obligation criteria to screen and select their components and companies that are part of ESG indices report transparently and prompt a lower level of data deviation and higher market proficiency. As a result, ESG indices may be less susceptible to market fluctuations. SRIs are likely to increase as investors become progressively aware of ESG aspects and a more favourable administrative structure is developed [17].

Keeping this in perspective, this study attempts to answer the question about whether the sustainable investment portfolios perform better, worse, or the same as those of conventional investments? We test the null hypothesis that no efficiency performance difference exists between sustainable and conventional investments against the alternative that there is an efficiency performance difference between the two. We will examine the relative performance of sustainable investment portfolios against the market benchmarks in a diverse set of countries or country groups. (One aspect of future research could be to examine the long-running relationship between conventional and ESG investments using methods such as Fourier Engle-Granger Cointegration, Bayer-Hanck Cointegration, and Markov switching regression tests (See Athari, et al. [18]).

Although some studies have attempted to explore the performance of ESG investment portfolios, the evidence reported is largely inconclusive, and these studies are mainly focussed on developed countries. In addition, most of the earlier studies have resorted to a single ESG index at the global, regional, or country level. Unlike the previous studies [19,20], to take into account the sensitivity of estimated results, we used the daily stock prices of several global, regional, and country-specific ESG indices and corresponding standard market indices of the Dow Jones Sustainability Index family (DJSI) and MSCI family from 1 October 2010 to 1 March 2021. The selected indices measure the portfolio performance of companies belonging to diverse industries, country groups, and geographical locations.

For a comprehensive empirical exercise, both conventional risk and return indicators and some prominently applied performance criteria have been incorporated owing to their merits. First, based on various assumptions about return probability distributions and several portfolio theories, these measures provide a comprehensive and unbiased evaluation of portfolio performance. Second, incorporating different risk indicators in the performance measurement offers a valuable guide to making rational investment decisions subjective to the degree of risk aversion of respective investors. Finally, these ratios are substantially used by financial market practitioners and are believed to be appreciably robust. Finally, for the robustness of estimated results throughout the study period, we conducted a rolling window procedure like that of Miralles-Quirós, et al. [21] and Cunha, et al. [22].

By exploring a broader range of markets and applying advanced efficiency metrics, this study offers new insights and a more nuanced understanding of the comparative performance of sustainable investments and conventional investments across different regions. Our findings might provide significant policy implications for several stakeholders, like financial sector players, the business community, and academicians. The findings document a marginal wedge between the performance of sustainability investment portfolios and corresponding traditional market benchmarks and thus imply that the sustainable investments appear to be an encouraging investment option, although their progress has not been substantial. The results demand a reconsideration of portfolios to choose investment opportunities featured with high risk-adjusted returns. In fact, for financial market practitioners, an outperformance would lure investors towards sustainable investments

and raise the corporate ESG standards of invested companies. This paper expands the contours of our knowledge on sustainable finance and can direct the research community for future research.

The rest of this paper is organized as follows. Section 2 provides a comprehensive summary of the relevant literature, and Section 3 discusses the data and our econometric methodology. The empirical findings are discussed in Section 4, and the robustness of the results is provided in Section 5. Finally, the paper's conclusions are presented along with policy prescriptions in Section 6.

2. Literature Review

Several studies have been conducted to explore the determinants of sustainable investments and examine the relative desirability of ESG investments from conventional benchmarks. McLachlan and Gardner [23] reported that socially mindful investors are fundamentally unique from traditional investors regarding their choices. Hood, et al. [24] argued that one's choice of social investments might vary depending on demographic characteristics like gender, age group, religious beliefs, etc. Some studies reveal that social standards have a remarkable effect on investors' choices of investment, which eventually influence stock returns, and that cash streams in SRI funds are more skewed to positive returns [25,26].

Numerous studies examine the resilience and financial performance of the energy industry in relation to financial and ESG efficiency. Using a profitability regression model, Dospinescu and Dospinescu [27] determined the main variables affecting the financial results of Romanian energy businesses. The effect of the financial crisis on energy businesses listed on the Bombay Stock Exchange was evaluated by Tarczynska-Luniewska, et al. [28], with particular attention paid to the companies' risk exposure and resilience methods. Amidst the COVID-19 epidemic, Bilbao-Terol, et al. [29] assessed the financial and environmental sustainability of clean energy equities, concluding that these investments fulfilled ESG standards and yielded favourable returns. Taken collectively, these investigations shed light on the sustainability, resilience to crises, and profitability of energy enterprises in various markets and circumstances.

The studies dealing with the comparative evaluation of these sustainable versus conventional investment options establish evidence either in favour of or against sustainable investments or reach broadly neutral conclusions. Gil-Bazo, et al. [30] record that the US SRI fund outperformed conventional funds by considering both gross and net returns. In addition, to a certain degree, there are no marked contrasts in administrative costs between SRI and conventional funds. Oikonomou, et al. [31] reveal that depending on the optimization technique utilized, there are considerable economically essential changes in risk, risk-adjusted returns, diversification, and the intertemporal stability of SRI portfolios. Balcilar, et al. [19] suggested that incorporating socially responsible investing into traditional asset portfolios provides diversification benefits and that sustainability indices could not be maintained at a strategic distance from total financial shocks. By adding a social responsibility objective to the Markowitz model, Utz, et al. [32] found little evidence that social responsibility, which was included as a third factor, significantly impacts the financial performance of allocated assets.

However, some studies document substantial evidence in favour of SRI as a viable investment choice. Leite and Cortez [33] and Statman [34], reveal that SRIs perform better than traditional investments, and SRI bond funds beat their conventional counterparts by a wide margin. In comparison, Bauer, et al. [35], through a conditional multi-factor model, found that socially responsible funds in the United Kingdom outperform conventional funds significantly. Similarly, Gutsche and Ziegler [36] uncovered that investors appreciate nonfinancial and contextual variables when choosing sustainable investments and relatively sustainable assets have performed better during black swan events. Athari [37] finds that there is an inverted U-shaped, non-linear relation among the stability of the banking sector in GCC countries and the sum of sovereign environmental, social, and

governance (ESG) characteristics. According to the results, in order to accomplish their stability and sustainability goals, governments should take a balanced approach to figuring out how much money is best to invest in sustainability projects. Expanding upon this work, Athari [37] highlight the non-linear, convex relationship between individual sovereign environmental responsibility and the banking sector's profitability, while an inverse, concave relationship is found between individual sovereign social and governance activities and profitability. Furthermore, the strong non-linear inverted U-shape for the combined sovereign ESG–stability nexus supports the idea that sovereign ESG choices have a major impact on profitability through financial stability.

In the Indian stock market, Tripathi and Bhandari [38] found that socially responsible companies outperform conventional companies by producing substantial returns. Likewise, Kempf and Osthoff [39] showed that the social and environmental ratings of SRI funds are higher than those of conventional assets. Studies looking at the return of portfolios built on specific ESG criteria, like employee satisfaction [40] and eco-efficiency [41], found positive outcomes. These investigations revealed that SRI investors with a long-term perspective, who stay steadfast and hold SRI portfolios over long periods, will probably be compensated with higher returns. In recent years, there has been a widespread acknowledgement of SRI, which has prompted the prominence of socially capable stocks [42]. These studies point out that SRI stocks perform better in the long run and socially responsible mutual equities have a lower volatility pattern than traditional equity funds [25,43].

Some studies have reported that socially responsible investments do not outperform traditional investment funds in terms of returns [44,45]. Comparative outcomes also corroborate that the risk-adjusted returns of SRI funds do not differ significantly from those of their conventional peers [17,35]. Several studies report that incorporating sustainability criteria has no appreciable effect on portfolio return and SRI portfolio returns are not statistically different from those of purported portfolios. This result is the same for portfolios [46], stock indices [47], trusts [48], and mutual funds [49]. One possible explanation is that SRI portfolios, particularly mutual funds, are primarily overseen as regular funds [50]. SRI portfolios might perform differently in different settings due to their multidimensional and contextual nature. Distinctive screening systems might influence the financial performance of SRI portfolios [51,52]. Child [53] and Crifo and Mottis [54] report that heterogeneity makes SRI more engaging to a wide range of investors with distinctive interests.

Some selected studies have established that portfolios based on ESG criteria have a negative impact on financial performance. These studies have documented that ESG-based stock selection lowers the stock's book-to-market ratio and that returns for companies with a high ESG score are lower than market returns [55,56]. Similarly, Renneboog, et al. [17] found that sustainable investment funds fall short of their equivalent benchmarks. Between 1987 and 2009, Climent and Soriano [57] employed a CAPM-based approach and found that environmental funds underperformed conventional funds with comparable attributes. Conversely, low-sustainability-focused funds have underperformed [58,59]. Similarly, Cunha, et al. [22] found a diverse performance of sustainable investments worldwide; however, the authors pointed out that SRI constitutes a promising opportunity for investors.

The above review highlighted that the evidence reported is mainly inconclusive, and the existing body of literature is not very substantial. In addition, most earlier studies have resorted to single ESG indexes at the global, regional, or country level for comparison, especially for developed countries. Therefore, we attempted to examine the portfolio performance of ESG or SRI companies compared to that of conventional benchmarks belonging to diverse industries and geographical locations, both developed and developing.

Specifically, this study attempts to answer the following question: do sustainable investment portfolios perform better, worse, or the same as conventional investments? We test the null hypothesis that no efficiency performance difference exists between sustainable versus conventional investments against the alternative that there is an efficiency performance difference between the two.

3. Data and Methodology

3.1. Data

For the comparative analysis of ESG and standard market indices, we used daily stock prices of several global, regional, and country-specific ESG indices and corresponding standard market indices of the Dow Jones Sustainability Index family (DJSI) and MSCI family. The selected indices measure the portfolio performance of companies belonging to diverse industries. The companies selected for both index families are based on broad ESG criteria. The geographical coverage of companies for the global, regional, and country-specific indices is varied. All the prices are listed in US dollars; as a result, a common denominator nullifies the effect of exchange rates on the portfolio performance. For the risk-free rate, three-month US treasury bill rate has been used, and finally, for an overall market performance analysis, we opted to use NASDAQ1200. The data period ranges from 1 October 2010 to 1 March 2021. The data have been sourced from Bloomberg and the start and end date for a specific index is guided by availability (the names of the indices, geographical coverage of the companies included in these indices, and exact sample period are given in Table A1 in Appendix A).

For a comprehensive and systemic analysis, we have grouped our ESG and corresponding traditional indices into global and regional indices. The global indices group comprises companies from different countries covering a large part of the world economy. In comparison, the regional group consists of indices of companies from an individual economy or companies from different countries representing a regional block.

Tables A2 and A3 in Appendix A report the statistical properties of the indices over the sample period. Most indices have a positive sample mean across the sample period, and the Jarque-Bera (JB) tests show that all the indices follow the non-normal distribution. Mishra, et al. [60] suggests that statistical tests to examine normality at times are overly sensitive to a large sample size. To account for this sensitivity issue, we have also used a graphical method to test the normality of the indices. Figures A3 and A4 corroborate the statistical findings of JB test. The results conform with the properties of financial data. However, this violates the Sharpe ratio assumption. Nevertheless, Eling and Schuhmacher [61] show that for a comparative performance evaluation, the non-normal distribution of the return series does not change the ranking of the performance. Further, following Favre and Galeano [62], we have implemented the Sharpe ratio with modified risk measures, VaR and CVaR. These two modified Sharpe ratio measures account for the non-normal distribution.

3.2. Methodology

First, we have calculated the return for all price indices as the first differences of the daily price series in logarithms. Second, both conventional risk and return indicators, as well as some prominently applied performance criteria, like Jensen's alpha [63], Sharpe ratio [64], and modified Sharpe ratio [65,66], Treynor ratio [67], Sortino ratio [68], and Omega ratio [69,70], have been employed for a robust analysis. Jensen's performance index or expost alpha, given by Equation (1), measures the excess return of a given portfolio (in this study, instead of a given portfolio, we evaluate ESG and corresponding traditional market indices) over the theoretical expected return, predicted by a market model like the capital asset pricing model (CAPM), concerned mainly with systematic risk. It can be used on a standalone basis or for comparative purposes.

$$JM_{i,T} = R_{i,T} - \left(R_{f,T} + \beta_{i,T}\left(R_{m,T} - R_{f,T}\right)\right) \quad (1)$$

where $JM_{i,T}$ is the Jensen's alpha for index i in period T; $R_{i,T}$ is the return of index i in period T; $R_{f,T}$ is the risk-free rate of return; $\beta_{i,T}$ is the beta for index i in period T representing systemic risk, and $R_{m,T}$ is the return of the market portfolio (benchmark index) in period T. The alpha measure highlights that portfolios with substantial levels of risk tend to have higher expected returns than those exposed to low levels of risk. The values of alpha can be both positive and negative, indicating whether a given portfolio is able to beat the market benchmark or not. The positives imply the portfolio has outperformed the

market, and the negatives connote an underperformance. (Even within the set of positive values, the portfolios with higher alpha values perform substantially better than others; however, for set of negative values, the portfolios with lower negative values (smaller absolute value) perform well).

The Sharpe ratio (Equation (2)) is defined as a wedge between the return of a given portfolio over a risk-free return per unit of total risk (both systematic and idiosyncratic) measured by the standard deviation of the portfolio.

$$Sharpe\ Ratio = \frac{\overline{R}_{i,T} - R_{f,T}}{\sigma_{i,T}} \tag{2}$$

$$Modified\ Sharpe\ Ratio = \frac{\overline{R}_{i,T} - R_{f,T}}{VaR_{i,T}} \tag{3}$$

where $\overline{R}_{i,T}$ is the mean return of index i for period T; $R_{f,T}$ is the risk-free rate of return; $\sigma_{i,T}$ is the standard deviation of the index i for period T; and $VaR_{i,T}$ is the historical value at risk in period T. Representing the additional return that a portfolio receives per unit of additional risk, it is also called the reward-to-volatility ratio, for it highlights how well the return compensates for risk. It takes positive and negative values; the portfolio with a higher positive Sharpe has performed well, and vice versa. It may, however, be noted that the precision of the Sharpe ratio depends mainly on the statistical properties of returns which are bound to vary across portfolios over time [71] (Lo, 2002). Instead of considering total risk, the modified Sharpe ratio (Equation (3)) considers value at risk (VaR) or historical VaR due to their merits over the conventional measure of risk. (However, here we may note that it is not always true that future performance depends on the past performance; therefore, this could be considered a limitation of the modified Sharpe ratio.) Having substantial recognition among researchers and policy planners [62], VaR measures the downside risk, which is more relevant for risk-averse investors and can be applied for non-normally distributed asset returns, a phenomenon likely observed in several financial markets.

On the other side, Treynor's reward-to-volatility ratio (Equation (4)) measures the portfolio risk premium per unit of systematic risk, measured by beta.

$$TR_{i,T} = \frac{\overline{R}_{i,T} - R_{f,T}}{\beta_{i,T}} \tag{4}$$

where $TR_{i,T}$ is Treynor ratio for index i in period T; $\overline{R}_{i,T}$ is the mean return of index i for period T; $R_{f,T}$ is the risk-free rate of return; and $\beta_{i,T}$ is the beta for index i in period T representing systemic risk. Although the three ratios differ concerning the measure of risk used in their denominators, they connote the same thing, i.e., the market exposure. However, unlike Jensen's alpha, these three ratios cannot be used on a standalone basis.

The Sortino ratio (Equation (5)) also measures the risk-adjusted return of a portfolio, but unlike the Sharpe ratio, it penalizes only the returns falling below a user-specified target or acceptable rate of return. In the equation, $R_{i,T}$ is the return of index i in period T; MAR is the "Minimum Acceptable Return"; and σ_{MAR} is the downside risk (downside deviation) of the index return in period T.

$$Sortino\ Ratio = \frac{R_{i,T} - MAR}{\sigma_{MAR}} \tag{5}$$

Thus, while the Sharpe ratio takes both upside and downside risk at par, the Sortino ratio considers only the downside risk. (The Sortino and Sharpe ratio will give identical results in case the return distributions of the portfolio are nearly symmetrical, and the target return is close to distribution median. However, if skewness increases and targets vary from the median, the two ratios will yield dissimilar results.) Finally, the Omega ratio (Equation (6)) is the probability-weighted ratio of gains versus losses of a portfolio for some

threshold return target. Its value is calculated as the ratio of the probability of obtaining a return higher than the minimum threshold or expected return and the probability of obtaining a return lower than it [72]. The higher the value of this ratio, the more likely the portfolio fetches more gains than losses and would be highly preferred. Omega is used alternatively for the Sharpe ratio; however, the latter considers only the first two moments of the return distribution, and the former considers all moments due to its construction. As a result, the Omega ratio highlights all the statistical properties of return distribution and is not based merely on a mean-variance framework like in the case of Sharpe. (Like the modified Sharpe, it does not require assumptions like the quadratic utility function of investors and the normality of asset return distribution (Cunha et al. 2020)) [22].

$$\Omega_{i,T}(R_{MIN}) = \frac{\int_{R_{MIN}}^{b} (1 - F(X))dX}{\int_{a}^{R_{MIN}} F(X)dX} \quad (6)$$

where $\Omega_{i,T}(R_{MIN})$ is Omega ratio for index i in period T for a minimum expected return of R_{MIN} and $F(X)$ represents the cumulative distribution function of the return of index i for the interval $[a, b]$ over the period T.

The above-discussed metrics were chosen due to their merits. First, based on various assumptions about return probability distributions and several portfolio theories, these provide a comprehensive and unbiased evaluation of portfolio performance. Second, incorporating different risk indicators in the performance measurement offers a valuable guide to making rational investment decisions subjective to the degree of risk aversion by respective investors. Finally, these ratios are substantially used by financial market practitioners and are believed to be appreciably robust. We use R Software (4.0.4) [73] and R Package "Performance Analytics" [74] to compute the performance metrics analysed in this paper.

4. Results and Discussion

4.1. Global Indices Performance

4.1.1. Classic Return and Risk Analysis

Table 1 reports the results of the return and risk dynamics of several global sustainability indices and their corresponding market benchmarks for each year of the study period (except for the ACW and ACWESG Index due to data unavailability for the initial three years) and the full sample. We found mixed evidence with some sustainability indices outperforming the traditional benchmarks and others at parity. WESG performed almost at parity compared to WI in terms of risk and return for the whole period. The former reported a total return of 2.300% and a later return of 2.350%, whereas the standard deviation of WESG was 18.180% and that of WI was 18.280%. Likewise, SPGESG, a composite index of seven headline indices from both developed and developing countries, reported a similar pattern for risk and return compared to that of SPG.

On the contrary, with a total return of 9.800% and associated risk of 15.030% for the total sample, ACWESG, composed of a mix of 23 developed and 27 emerging market economies, was found to outperform its traditional counterpart ACW, with a return of 7.550% and risk of 15.200%. Compared to the risk-free rate of return (0.435%) and overall market performance rate (10.020%), the performance of all the global sustainability indices was superior to that of the risk-free rate of return; however, their performance was inferior as compared to that of NASDAQ. Thus, a portfolio featuring additional nonfinancial screening restrictions performs better than a risk-free investment option due to the exclusion of highly leveraged companies and the selection of financially more robust and profitable companies [75]. However, squeezing the size of the asset menu leads to less diversity and lower returns compared to a more diversified market portfolio like NASDAQ [46,76].

Table 1. Risk (standard deviation) and return of indices (%age per annum). NA: Not Available, as data is not available.

Index		WI	WESG	ACW	ACWESG	SPG	SPESG	NASDAQ	RF
2011	R	−9.830	−9.690	NA	NA	−9.940	−10.030	−4.940	0.040
	σ	21.740	21.300	NA	NA	22.030	21.760	25.430	0.000
2012	R	12.350	10.970	NA	NA	12.750	12.850	14.740	0.060
	σ	12.990	12.710	NA	NA	12.930	13.010	15.050	0.000
2013	R	23.680	24.540	NA	NA	22.270	21.460	37.610	0.040
	σ	10.050	10.100	NA	NA	9.870	10.020	12.280	0.000
2014	R	2.520	2.450	3.236	35.420	2.420	2.140	12.370	0.020
	σ	9.200	9.110	10.320	9.980	9.270	9.090	14.190	0.000
2015	R	−3.600	−3.820	−5.090	−3.050	−4.200	−5.080	4.250	0.040
	σ	13.260	12.950	13.060	12.750	13.420	13.460	16.920	0.000
2016	R	4.770	4.140	4.780	7.010	5.140	5.520	6.210	0.220
	σ	13.060	13.010	13.040	12.950	13.100	13.160	15.930	0.000
2017	R	20.080	18.620	21.600	23.070	20.790	20.030	27.890	0.650
	σ	5.840	5.740	5.740	5.610	5.910	5.900	9.620	0.010
2018	R	−11.300	−10.380	−12.010	−9.430	−11.340	−10.660	−6.030	1.350
	σ	12.900	12.670	12.590	12.350	12.960	12.870	21.040	0.010
2019	R	24.740	25.330	23.630	26.800	24.530	25.770	33.870	1.440
	σ	10.310	10.130	10.010	9.800	10.150	10.100	15.730	0.010
2020	R	9.210	8.660	9.940	11.590	8.500	8.440	34.740	0.250
	σ	29.460	29.360	28.020	27.890	28.760	28.780	35.900	0.020
2021	R	23.570	22.640	25.690	28.690	25.210	22.940	37.450	0.040
	σ	13.880	13.580	13.780	13.630	14.100	13.120	22.040	0.000
Total	R	2.350	2.300	7.550	9.800	6.740	6.650	10.020	0.435
	σ	18.280	18.180	15.200	15.030	15.450	15.390	22.650	0.037

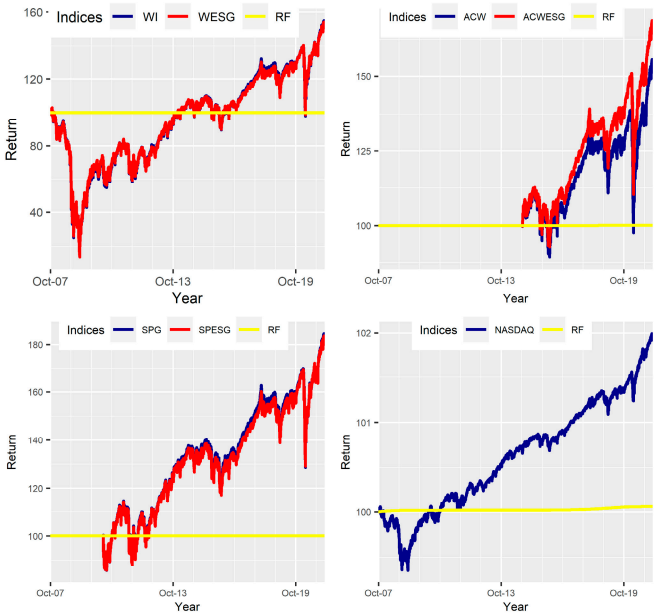


Figure 1. A comparative plot of daily return of market indices and ESG indices (rebased on 100 at the beginning of the sample).

Annually, the performance has followed a random pattern for all the global sustainability indices. In some years, their performance is marginally better than the market benchmarks, whereas, in others, it is dismal (Figure 1). However, ACWESG performed superior to its benchmark for most of the years of the study period. Moreover, compared to the beginning year, 2011, the returns of all the global sustainability indices were found to be higher at the end of the study period, 2021, except for ACWESG, for which the initial period of 2014 documented a higher return of 35.420% compared to that in 2021. As shown in Figure 2, the total performance also points out that ACWESG has outperformed its benchmark ACW concerning both return and risk. However, the other two global sustainability indices reported the same performance.

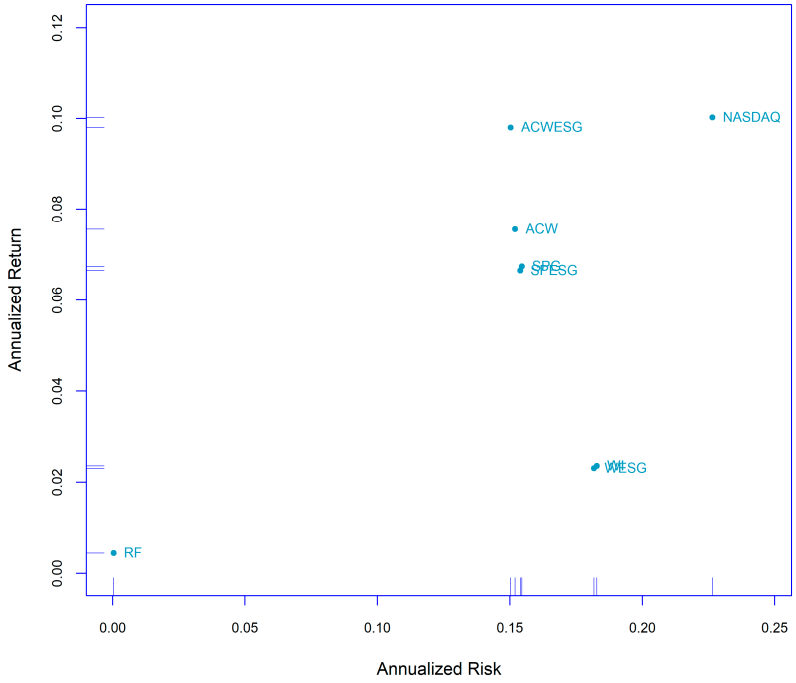


Figure 2. Risk and return chart for the full sample period.

4.1.2. Performance Measure Analysis

In Table 2, several performance evaluation criteria have reported a similar or marginal outperformance of global sustainability indices compared to their benchmarks. Jensen's alpha highlights that none of the indices, either for sustainability or corresponding benchmarks, were able to beat the market. ACWESG performed better than ACW, whereas, for the other two global indices, their Jensen's alpha values almost coincide, reflecting no distinction in terms of performance. The negative signs imply that global sustainability indices could not fetch their required return compared to risk-adjusted returns derived from CAPM [22]. The Treynor and Sharpe measure also highlight that the performance of global sustainability indices is at par with that of their traditional counterparts, except for ACWESG, which reported a superior performance. This could be attributed to the almost-similar high total risk associated with both the categories of indices.

Table 2. Performance of the market and ESG indices based on various performance metrics.

Indices	JA	TR	Sharpe Ratio (σ^2)	Sharpe Ratio (VaR)	Sharpe Ratio (ES)	Sortino Ratio			Omega		
						−1%	0%	1%	0%	1%	−1%
WI	−0.047	0.027	0.104	1.081	0.534	1.805	0.019	−0.680	1.044	0.083	9.669
WESG	−0.046	0.027	0.102	1.060	0.531	1.829	0.018	−0.683	1.044	0.083	9.841
ACW	−0.119	0.106	0.453	4.629	1.765	2.206	0.046	−0.731	1.119	0.053	14.616
ACWESG	−0.096	0.144	0.607	6.318	2.543	2.263	0.059	−0.733	1.151	0.053	15.333
SPG	−0.179	0.091	0.410	4.089	1.642	2.340	0.042	−0.727	1.101	0.061	13.486
SPESG	−0.176	0.091	0.405	4.075	1.656	2.359	0.042	−0.729	1.101	0.060	13.662
NASDAQ			0.421	4.150	1.947	1.477	0.046	−0.592	1.107	0.142	6.710

Note: JA and TR refer to Jensen's alpha and Treynor ratio, respectively. Annualized Sharpe ratio was measured assuming three different measures of risk, namely standard deviation, historical value at risk (VaR), and expected shortfall (ES) (also known as conditional value-at-risk (CVaR)). The latter two measures are based on more robust measures. To calculate the Sharpe ratio, we have used TB3M as a risk-free rate at the 95% percentile. To compute the Sortino and Omega ratio, we have used −1%, 0%, and 1% as the minimum expected benchmark returns.

The modified Sharpe values based on VaR and CVaR show that WESG and SPESG marginally underperformed their market benchmarks. In contrast, ACWESG outperformed the traditional benchmarks and NASDAQ1200, for example, when a simple Sharpe ratio using the standard deviation as a measure of risk was used. The Sortino results document the superior performance of global sustainability indices like WESG, ACWESG, and SPESG as compared to their benchmarks when calculated at ±1.0%; however, their performance is similar for 0% minimum expected benchmark returns. Finally, concerning the Omega ratio, their performance is almost similar at levels of 0% and 1% minimum expected returns; however, the global sustainability indices outperform their traditional counterparts at the level of −1% minimum expected returns, although the difference is minimal. Overall, the results indicate no definite difference with respect to the performance of global sustainability indexes from their corresponding benchmarks.

4.2. Regional Indices' Performance

4.2.1. Classic Return and Risk Analysis

For the entire period, Tables 3 and 4 report that the Asia Pacific Sustainability Index (SPAEME) underperformed compared to its respective market benchmark (SPAEM) in terms of both risk and return. The former reported a risk and return combination of 0.064% and 0.161% and later 0.077% and 0.159%, respectively. The return of the sustainability index was even lower than the risk-free rate of return (0.435%). These results are in line with those of Cunha, et al. [22].

Table 3. Risk (standard deviation) and return of indices (%age per annum).

Year		SPAEM	SPAEME	SPPAC	SPPACE	MEM	MEME	SP500	SP500E	MSEM	MSEME
2011	R	−0.2088	−0.2124	−0.1358	−0.1661	−0.2257	−0.1515	−0.027	−0.0166	−0.1784	−0.1311
	σ	0.2203	0.2265	0.1318	0.1256	0.2261	0.2149	0.2338	0.2284	0.2971	0.2902
2012	R	0.1895	0.1948	0.0329	0.0914	0.1402	0.2023	0.126	0.1241	0.126	0.187
	σ	0.1422	0.1507	0.0865	0.0802	0.148	0.1389	0.1276	0.124	0.2082	0.2054
2013	R	0.0306	−0.019	0.2155	0.3537	−0.0587	0.0036	0.2906	0.2715	0.2052	0.2594
	σ	0.1385	0.1502	0.0784	0.098	0.1345	0.1345	0.1109	0.1078	0.1428	0.1414
2014	R	0.1093	0.1344	−0.0275	0.0516	−0.0527	0.0421	0.1076	0.1088	−0.0917	−0.0614
	σ	0.1068	0.1147	0.1656	0.1698	0.1128	0.1131	0.114	0.1106	0.1245	0.122

Table 3. *Cont.*

Year		SPAEM	SPAEME	SPPAC	SPPACE	MEM	MEME	SP500	SP500E	MSEM	MSEME
2015	R	−0.0973	−0.1103	−0.1842	−0.1483	−0.181	−0.1347	−0.0192	−0.0294	−0.0664	−0.0021
	σ	0.1663	0.1653	0.1681	0.1338	0.1617	0.1606	0.1556	0.1559	0.1744	0.1689
2016	R	0.0476	0.0662	0.0278	0.0595	0.0701	0.1179	0.0868	0.0907	−0.0581	−0.0414
	σ	0.1565	0.1563	0.1355	0.1153	0.1744	0.1746	0.1312	0.1306	0.2096	0.2055
2017	R	0.4079	0.3744	0.0018	0.0015	0.3406	0.4008	0.1932	0.1857	0.2157	0.2468
	σ	0.0872	0.0827	0.0714	0.0651	0.093	0.0957	0.0669	0.0673	0.0914	0.0907
2018	R	−0.1427	−0.1083	0.0589	−0.0166	−0.1786	−0.1635	−0.0768	−0.0736	−0.182	−0.1404
	σ	0.1605	0.1462	0.091	0.071	0.1584	0.1682	0.1719	0.1727	0.141	0.1382
2019	R	0.1978	0.1678	0.0773	0.0579	0.1476	0.1909	0.2812	0.2983	0.1927	0.2601
	σ	0.1159	0.1161	0.1034	0.0736	0.1165	0.1184	0.1252	0.1252	0.1172	0.1155
2020	R	0.2234	0.1408	−0.0514	−0.055	0.1251	0.1652	0.0943	0.1063	−0.0136	0.0524
	σ	0.2257	0.2294	0.2299	0.1928	0.2432	0.2475	0.3477	0.3496	0.2996	0.2903
2021	R	0.6102	0.6137	0.3563	0.2547	0.3869	0.5705	0.2618	0.2381	0.1164	0.0763
	σ	0.211	0.1969	0.081	0.0778	0.2002	0.2129	0.1653	0.1601	0.1417	0.1389
Full Sample	R	0.0775	0.0649	−0.0344	−0.0052	−0.0124	0.047	0.0997	0.1005	0.0266	0.0736
	σ	0.1595	0.1611	0.1602	0.1535	0.2081	0.2025	0.1767	0.1754	0.1939	0.1899

Table 4. Risk (standard deviation) and return of indices (%age per annum).

Year		SPMEA	SPMEAE	MSEuropeE	MSEurope	SPEurope	SPEuropeE	SPLA	SPLAE	NASDAQ
2011	R	−0.2299	−0.2257	−0.1627	−0.1737	−0.1711	−0.1876	−0.2529	−0.259	−0.0494
	σ	0.2846	0.3216	0.291	0.2928	0.2932	0.3042	0.27	0.303	0.2543
2012	R	0.1286	0.1159	0.1379	0.1315	0.1351	0.132	0.0332	−0.0098	0.1474
	σ	0.2166	0.2428	0.2054	0.2066	0.2072	0.2138	0.1853	0.2281	0.1505
2013	R	−0.0871	−0.0508	0.2169	0.2067	0.2139	0.2118	−0.1754	−0.1838	0.3761
	σ	0.2049	0.2197	0.1419	0.138	0.1384	0.148	0.1742	0.196	0.1228
2014	R	0.0084	0.0436	−0.0905	−0.0942	−0.089	−0.0927	−0.1712	−0.1669	0.1237
	σ	0.1816	0.2051	0.1222	0.1237	0.1248	0.1274	0.2159	0.2577	0.1419
2015	R	−0.2706	−0.318	−0.0328	−0.0681	−0.0709	−0.0757	−0.3521	−0.3692	0.0425
	σ	0.2415	0.2869	0.1689	0.1793	0.1807	0.1795	0.2433	0.2658	0.1692
2016	R	0.0685	0.1458	−0.0771	−0.0544	−0.0531	−0.0569	0.2382	0.2678	0.0621
	σ	0.2868	0.3366	0.208	0.2033	0.2034	0.2159	0.2765	0.2947	0.1593
2017	R	0.2322	0.3251	0.2059	0.2202	0.2181	0.2201	0.1896	0.2374	0.2789
	σ	0.1742	0.2037	0.0905	0.0859	0.0866	0.0956	0.1771	0.1817	0.0962
2018	R	−0.2324	−0.2573	−0.1704	−0.1823	−0.1818	−0.1712	−0.1097	−0.0829	−0.0603
	σ	0.2731	0.3205	0.1385	0.1413	0.1415	0.1407	0.2284	0.245	0.2104
2019	R	0.0423	0.0975	0.217	0.192	0.1954	0.203	0.1346	0.1572	0.3387
	σ	0.1648	0.2087	0.1165	0.1176	0.1174	0.1148	0.1924	0.2076	0.1573
2020	R	−0.0877	−0.0921	0.0256	−0.0142	−0.0154	−0.0241	−0.2397	−0.2589	0.3474
	σ	0.271	0.355	0.2905	0.2947	0.2964	0.2999	0.4748	0.4881	0.359
2021	R	0.5724	0.7868	0.0592	0.1158	0.1219	0.0757	−0.4457	−0.5763	0.3745
	σ	0.1156	0.2005	0.1388	0.1454	0.1447	0.1391	0.2817	0.3002	0.2204
Full Sample	R	−0.0318	−0.018	0.0391	0.0294	0.0118	0.0085	−0.0845	−0.0938	0.1002
	σ	0.2318	0.2784	0.1984	0.1987	0.1954	0.2013	0.2577	0.2798	0.2265

On contrary, in Pan Arab, the sustainability index (SPPACE) documented a return rate of −0.005% compared to its benchmark rate of −0.034% (SPPAC). Even the standard deviation of the former is reported to be lower (0.153%) than the latter (0.160%). The relative marginal outperformance of the sustainability index in the region is due to a

favourable institutional setup for sustainable investments and more emphasis on respective governments towards Sharia screening investment. The MSCI sustainability index (MEME), representing 15 developed markets of Europe coupled with Israel and the Middle East, also slightly outperformed the corresponding market benchmark (MEM) with respect to both risks (0.202% vs. 0.208%) and returns (0.047% vs. −0.012%). The US Sustainability Index (SP500E) has also portrayed a slightly superior performance than its market benchmark (SP500) in terms of risk and return for the entire period. This indicated the participation of sustainable investments in the overall investment scenario in the US region, although the difference is not very encouraging [77].

Of the total world socially responsible investments (SRIs), Europe and the US hold a majority portion, even for the current practice of institutional investors [78,79].

As far as emerging markets are concerned, the sustainability index (MSEME) presented a relatively feeble outperformance compared to its benchmark (MSEM): the former reported a risk and return combination of 0.073% and 0.189%, and the benchmark reported a risk and return of 0.026% and 0.193%, respectively. The outperformance of the former index, even in economic turmoil, like the Chinese slowdown (2015) or the Brazilian recession (2014–2016), may be due to the conducive policy initiatives and regulations concerning sustainable investments. The pension funds and central banks of countries, like Brazil, Chile, and Colombia, among others, were required to disseminate the public information about the treatment and incentives of sustainable investments [80]. The relative preference of local investors in emerging markets to promote social and environmental standards has contributed favourably to the superior performance of the MSEME index [81].

The return performance of the Middle East and African Sustainability Index (SPMEAE) is slightly better than the benchmark (SPMEA). However, the risk of the former is higher (0.278%) than that of the latter (0.231%). Even the performance of the Latin American Sustainability Index (SPLAE) is inferior to that of its counterpart (SPLA) with respect to both risk and return. The former had a risk and return combination of −0.093% and 0.275%, whereas the latter reported −0.084% and 0.257%, respectively.

Finally, with respect to Europe, the two different indices, S&P and MSCI, have reported somewhat different results, in which the sustainability index of the former (SPEuropeE) performed almost like its benchmark (SPEurope) in terms of both risk and return. In contrast, the latter (MSEuropeE) slightly outperformed its benchmark (MSEurope) in terms of risk and return. The risk and return outperformance of the Europe Sustainability Index has also been documented by Cunha, et al. [22] and could be ascribed to conducive policies and regulations, like providing information about the merits and incentives of sustainable investments [82]. As in the case of the global sustainability indices, the performance of the regional sustainability indices is not very distinctive or substantial compared to their corresponding market benchmarks. A synoptic view of Figures A1 and A2 (in Appendix A) also documents the same dynamics with respect to various regional sustainability indices in terms of their respective risk and return characteristics.

4.2.2. Performance Measure Analysis

A marginal outperformance was reported for the Jensen's alpha value in the case of SPPACE, MEME, SP500E, MSEME, and MSEurope compared to their benchmarks. However, the SPAEME, SPMEAE, SPEurope, and SPLAE indices performed worse than their benchmarks, although the magnitude of difference between them was not substantial. Except for the MEME sustainability index, all the other indices, either the market benchmarks or the sustainability ones, were not found to earn any excess return compared to the risk-adjusted returns derived from a CAPM model. The regions of Pan Arab, Europe (including Israel and the Middle East), the US, and Asia were found to possess a very low systematic risk as reported in [22,83], and this contributed to their superior performance compared to that of other regions, like Asia Pacific, Africa, and Latin America.

The Jensen, Sharpe, and Treynor measures also show a slightly better performance of SPPACE, MEME, SP500E, MSEME, SPMEAE, and MSEuropeE compared to their bench-

marks. In contrast, SPAEME, SPEuropeE, and SPLAE marginally underperform their market counterparts. The relative underperformance of SPAEME, SPEuropeE, and SPLAE could be attributed to their relatively high level of total risk, whereas the total risk of other sustainability indices was relatively less. The modified Sharpe value using VaR or CVaR measures of risk almost showed a similar performance pattern to that of the Sharpe ratio based on the standard deviation. The results highlight that even after taking more realistic measures of risk (which consider the non-normal nature of the return distribution) to calculate the performance, the difference between the sustainability and the corresponding benchmarks is lower.

When calculated at −1% and 0% levels of minimum expected returns, Sortino reported that the performance of SPPACE, MEME, SP500E, MSEME, and MSEuropeE is relatively better than the market benchmarks. On the other hand, SPAEME, SPMEAE, SPEuropeE, and SPLAE performed worse than their market counterparts. However, at the higher level of minimum expected returns of 1%, the performance of most of the regional sustainability indices is inferior when comparing their Sortino ratio with their corresponding benchmarks. The same pattern has also been reflected according to the Omega ratio. The various performance ratios again highlight that the performance of sustainability indices across several regions is not prominently more varied than the corresponding market benchmarks.

5. Robustness Analysis

To ensure the robustness of estimated results, we conducted a rolling window procedure like that in Miralles-Quirós, et al. [21] and Cunha, et al. [22] (this approach takes into account different events that occurred during the sample period, including the recent COVID-19 pandemic). Instead of creating subsamples from the whole sample, we adopt a growing window approach to re-estimate the performance metrics. However, we only report the rolling Sharpe ratio and rolling Omega for the global and regional indices. First, we re-estimate the performance metrics by taking the first hundred observations. We increase the estimation window by one observation and repeat the estimation until we reach the last observation. Figures 3 and 4 highlight that the global sustainability performance is almost coinciding with the corresponding market indices except for ACWESG, documenting some marginal incidents of outperformance, like that reported in Table 2. Similarly, Figures 5 and 6 almost corroborated the performance dynamics for various regional sustainability indices, as documented in Table 5. The results further show that even during the current pandemic, the comparative performance of the traditional and ESG indices shows the same pattern.

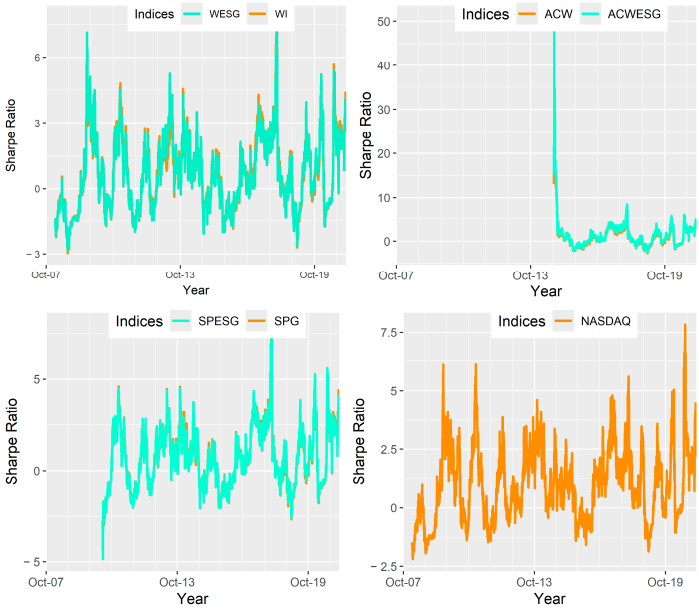


Figure 3. Rolling Sharpe ratio for global market.

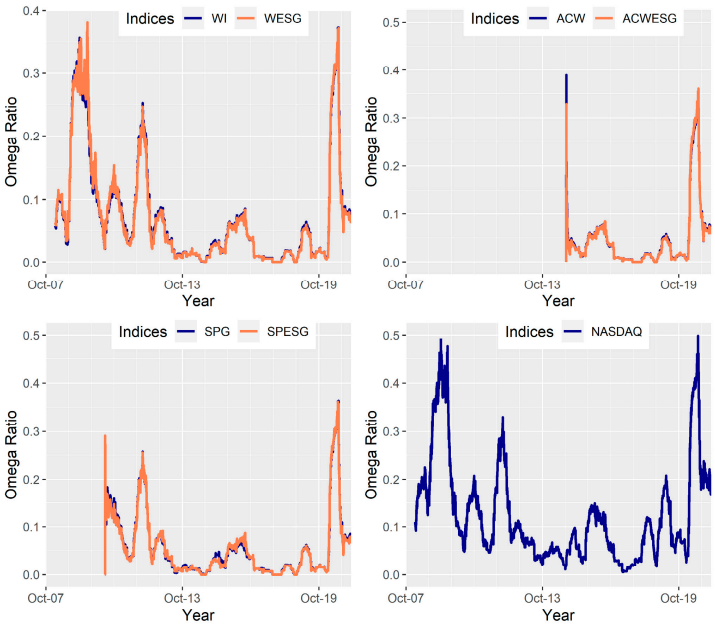


Figure 4. Rolling Omega ratio for global market.

Table 5. Performance of the market and ESG indices based on various performance metrics.

Indices	JA	TR	Sharpe Ratio (σ^2)	Sharpe Ratio (VaR)	Sharpe Ratio (ES)	Sortino Ratio			Omega		
						−1%	0%	1%	0%	1%	−1%
SPAEM	−0.2370	1.0487	0.4597	4.3582	2.4656	2.6486	0.0477	−0.7104	1.1004	0.0732	12.6635
SPAEME	−0.2430	0.9172	0.3778	3.6019	2.0572	2.6417	0.0412	−0.7092	1.0855	0.0755	12.6373
SPPAC	−0.5516	−1.1827	−0.2394	−2.5337	−2.5337	1.6158	−0.0105	−0.7249	0.9667	0.0477	11.7780
SPPACE	−0.5076	−0.3341	−0.0606	−0.6625	−0.6625	1.8209	0.0035	−0.7413	1.0108	0.0469	13.6284
MEM	−0.0573	−0.1650	−0.0803	−0.8370	−0.4664	1.5875	0.0038	−0.6389	1.0083	0.1095	7.6587
MEME	0.0061	0.4590	0.2099	2.2181	1.2716	1.7332	0.0285	−0.6399	1.0627	0.1106	8.2749
SP500	−0.1164	0.4940	0.5404	5.6905	2.6582	1.9803	0.0540	−0.6813	1.1322	0.0834	10.7725
SP500E	−0.1037	0.5019	0.5490	5.8476	2.8782	2.0036	0.0548	−0.6844	1.1341	0.0820	11.0012
MSEM	−0.2596	0.1777	0.1169	1.1166	0.4598	1.7567	0.0198	−0.6529	1.0441	0.1049	8.6057
MSEME	−0.2106	0.5615	0.3657	3.5192	1.4566	1.8603	0.0403	−0.6541	1.0905	0.1044	9.2038
SPMEA	−0.2935	−0.3151	−0.1532	−1.4180	−0.7809	1.4419	−0.0019	−0.5947	0.9961	0.1482	5.7895
SPMEAE	−0.2965	−0.1611	−0.0781	−0.7383	−0.4491	1.1590	0.0064	−0.5303	1.0129	0.2096	4.4797
MSEuropeE	−0.0968	0.2687	0.1784	1.7286	0.7879	1.7740	0.0252	−0.6440	1.0550	0.1133	8.1846
MSEurope	−0.1049	0.1907	0.1292	1.2402	0.5739	1.7507	0.0210	−0.6450	1.0460	0.1118	8.0879
SPEurope	−0.2537	0.0610	0.0404	0.3884	0.1724	1.7420	0.0135	−0.6539	1.0298	0.1039	8.3280
SPEuropeE	−0.2701	0.0356	0.0231	0.2231	0.0962	1.6656	0.0122	−0.6439	1.0270	0.1112	8.0030
SPLA	−0.3357	−0.5051	−0.3414	−3.2140	−1.3198	1.1520	−0.0178	−0.5674	0.9624	0.1670	5.1160
SPLAE	−0.3502	−0.5372	−0.3475	−3.2556	−1.4763	1.0556	−0.0178	−0.5400	0.9632	0.1960	4.4664
NASDAQ			0.4215	4.1501	1.9475	1.4767	0.0461	−0.5921			

Note: JA and TR refer to Jensen's alpha and Treynor ratio, respectively. Annualized Sharpe ratio has been measured assuming three different measures of risk, namely standard deviation, historical value at risk (VaR), and expected shortfall (ES) (also known as conditional value at risk (CVaR)). The latter two measures are based on more robust measures. To calculate the Sharpe ratio, we have used TB3M as a risk-free rate at the 95% percentile. To compute the Sortino and Omega ratio, we have used −1%, 0%, and 1% as the minimum expected benchmark returns.

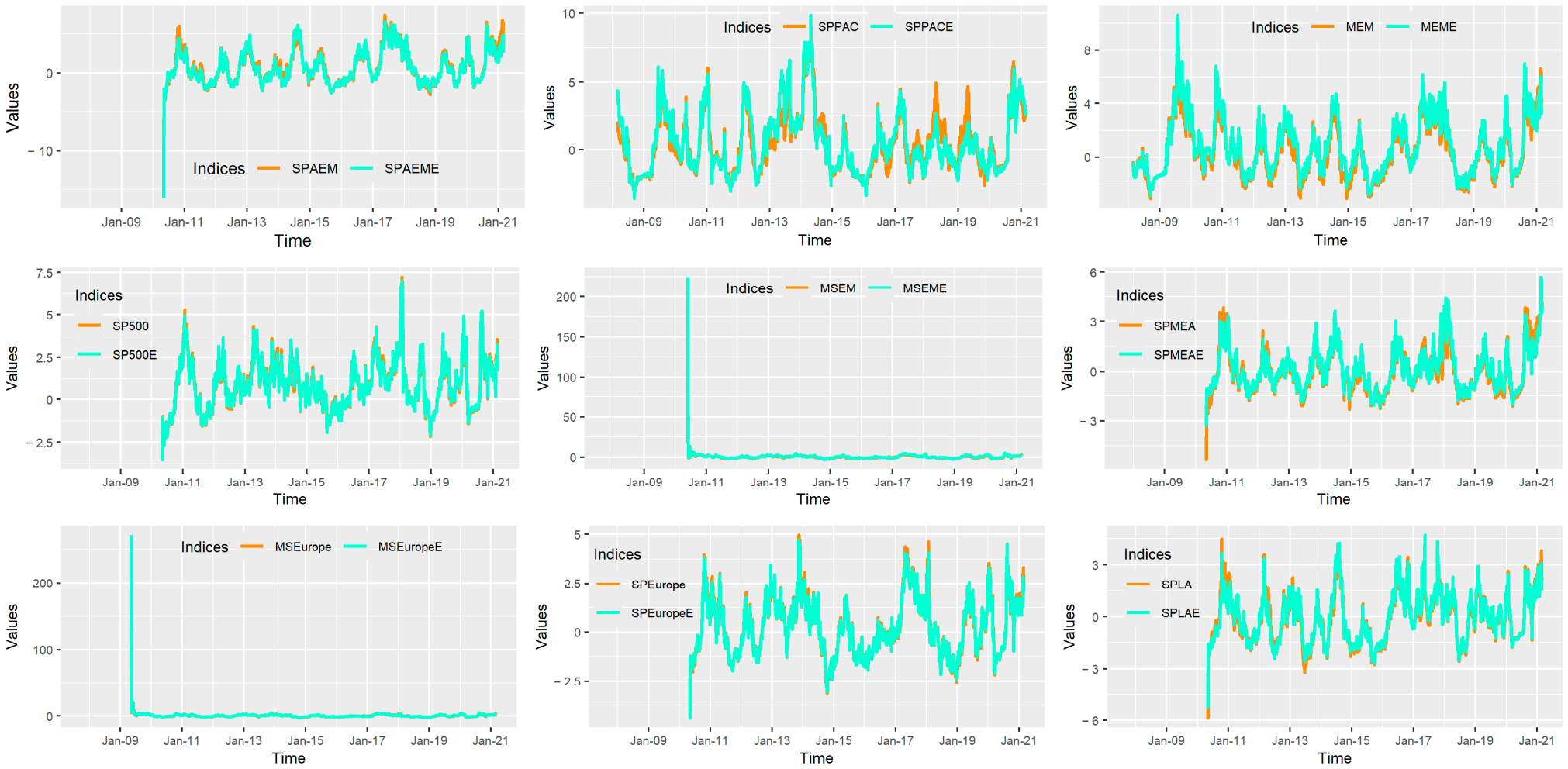


Figure 5. Rolling Sharpe ratio for regional markets.



Figure 6. Rolling Omega ratio for regional markets.

Our analysis revealed the heterogeneity of the evidence, with some indices—such as Pan Arab, the Middle East (including Israel), the United States, Emerging Markets, and Europe—reported to have a marginally better performance than their conventional counterparts, while those from Asia Pacific, Emerging Africa, and Latin America underperformed. This result is consistent with the findings published by [22] Cunha et al. (2020), who noted that while the performance of sustainable investments is still uneven globally, there is a promising chance for investors to combine sustainable investment practices with superior risk-adjusted returns in some areas. By contrast, [84] Yue et al. (2020) found no conclusive evidence to support the claim that sustainable funds can yield better returns than benchmark indexes or standard funds.

6. Conclusions

The glaring environmental, social, and governance (ESG) challenges necessitated the inclusion of sustainability concerns in the portfolio structures of investors. A robust examination of the relative performance of sustainable investments vis-a-vis their market benchmarks would be highly warranted to motivate investors and promote sustainability goals. To fill this void, we used data on daily stock prices of several global, regional, and country-specific ESG indices of the Dow Jones Sustainability Index family (DJSI) and MSCI family from 1 October 2010 to 1 March 2021. In terms of classic risk and return characteristics and the modern portfolio metrics, mixed evidence has been reported at the global level. Some sustainability indices are found to surpass the performance of traditional benchmarks marginally, and others are found to be at parity. However, the evidence is heterogeneous with respect to regional sustainability indices, wherein some regional indices, like Pan Arab, the Middle East (including Israel), the United States, Emerging Markets, and Europe, were reported to have a slightly superior performance compared to their benchmarks. In contrast, the indices belonging to Asia Pacific, Emerging Africa, and Latin America performed worse than their benchmarks, although the magnitude of difference between them was not very appreciable. A rolling window framework established the robustness of the estimated results.

The findings of this study have important implications for a range of stakeholders. Investing in ESG-engaged stocks can give stock market practitioners a strong platform for profit and growth. Some markets may be given priority by fund and portfolio managers in an effort to increase long-term performance. In fact, for the financial market practitioners, an outperformance would lure investors towards sustainable investments and raise the corporate ESG standards of invested companies. Moreover, regulators and government representatives can use the findings to monitor and control businesses' social and environmental obligations besides developing public policies. For socially conscious investing, it is imperative to make sustainability indices more widely available across asset classes and geographical areas. With so many options for diversification in the sustainable asset market, investors may allocate a larger share of their financial resources to the primary objective of mitigating global warming. To fully realize the benefits of sustainable investing, authorities have to support the creation of more ESG indices and execute strict ESG guidelines for the business world. According to recent research, women and millennials exhibit a greater inclination towards socially responsible investing, which warrants special attention.

However, to ensure a satisfactory outperformance of sustainable investments, a more conducive regulatory framework inclusive of robust incentivizing policies with respect to tax rebates or low capital costs should be executed.

The present study does have certain limitations which could be addressed in future research. First, the sample period is limited to March 2021, and second, it varies for the individual indices. These two issues could be addressed in future research. Moreover, future research should be built upon by exploring additional key areas which are not feasible to address in the present study. We recommend analysing how sustainable and conventional investments perform across different phases of economic cycles (expansion, peak, recession, and recovery); determining if one type of investment is more resilient in certain phases;

and using factor models (e.g., Fama-French factors, Carhart four-factor model) to attribute the performance differences between sustainable and conventional investments to specific risk factors such as size, value, momentum, and market risk. Moreover, an examination of the role of the institutional framework of the respective economies in influencing the relative performance of ESG indices is warranted.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Details of indices.

Name of Indices				Geographical Coverage of Companies	Sample Period
ESG Indices		Standard Market Indices			
Name	Abbreviated Name	Name	Abbreviated Name		
S&P GLOBAL 1200ESG	SPGESG	S&P Global 1200 Index	SPG	This index is constructed as a composite of seven headline indices, namely, S&P 500, S&P Europe, S&P TOPIX 150, S&P/TSX 60, S&P/ASX All Australian 50, S&P Asia 50, and S&P Latin America 40, representing the companies both from developed and developing countries.	30 April 2010 to 1 March 2021
MSCI ACWI ESG Leaders Index	ACWESG	MSCI ACWI Index	ACW	Includes large- and mid-cap stocks across 23 Developed and 27 Emerging Markets	15 October 2014 to 1 March 2021
MSCI World ESG Leaders Index	WESG	MSCI World Index	WI	The MSCI World Index captures large- and mid-cap representation across 23 Developed Market countries.	1 October 2007 to 1 March 2021
S&P Asia Pacific Emerging LargeMidCap ESG Index (USD) TR	SPAEME	S&P Asia Pacific Emerging LargeMidCap (US Dollar) Total Return	SPAEM	This index consists of companies from emerging economies, namely, China, India, Malaysia, Thailand, and the Philippines.	30 April 2010 to 1 March 2021
S&P/Hawkamah ESG Pan Arab index	SPPACE	S&P Pan Arab Composite Index	SPPAC	This includes stocks of 50 best-performing companies from the MENA region.	30 November 2007 to 1 March 2021
MSCI Europe + ME ESG Leaders Gross Total Return USD Index	MEME	MSCI Europe & Middle East USD	MEM	It consists of stocks of large- and mid-cap companies across 15 Developed Market countries in Europe together with Israel in the Middle East.	1 October 2007 to 1 March 2021
S&P 500 ESG Index	SP500E	S&P 500 INDEX	SP500	Includes large-cap companies of the US.	30 April 2010 to 1 March 2021
MSCI EM ASIA ESG LEADERS Index	MSEME	MSCI EM Asia Index	MSEM	The index captures the performance of large- and mid-cap companies across nine Emerging Market countries.	26 May 2010 to 1 March 2021

Table A1. *Cont.*

Name of Indices				Geographical Coverage of Companies	Sample Period
ESG Indices		Standard Market Indices			
Name	Abbreviated Name	Name	Abbreviated Name		
S&P Mid-East and Africa Emerging LargeMidCap ESG Index (USD) TR	SPMEAE	S&P Mid-East and Africa Emerging LargeMidCap (US Dollar)	SPMEA	Constitutes large- and mid-cap companies from the Middle East and Emerging Africa	30 April 2010 to 1 March 2021
MSCI Europe ESG Leaders Index	MSEuropeE	MSCI Europe Index	MSEurope	The MSCI Europe Index captures large- and mid-cap representation across 15 Developed Market countries in Europe.	1 May 2009 to 1 March 2021
S&P Europe 350 ESG Index (USD)	SPEuropeE	S&P Europe 350 Index	SPEurope	Consists of 350 leading blue-chip companies drawn from 16 developed European markets.	30 April 2010 to 1 March 2021
S&P Latin America Emerging LargeMidCap ESG Index (USD) TR	SPLAE	S&P Latin America LargeMidCap (US Dollar)	SPLA	It consists of large-cap and mid-cap companies from Brazil, Chile, Colombia, Mexico, and Peru.	30 April 2010 to 1 March 2021
MSCI EM ESG Leaders Net Total Return Index	MSEME	MSCI Emerging Markets Index	MSEM	MSCI Emerging Markets Index captures large- and mid-cap representation across 27 Emerging Market (EM) countries	26 May 2010 to 1 March 2021

Table A2. Descriptive statistics of global indices.

Statistics	ACWESG	ACWI	SPESG	SPG	WESG	WI
Mean	0.0461	0.0381	0.0350	0.0354	0.0222	0.0225
Maximum	8.5299	8.3924	8.5533	8.7306	11.9722	12.3318
Minimum	−9.3690	−9.5133	−9.7147	−9.4944	−9.7615	−9.9151
Skewness	−1.1609	−1.2071	−0.7708	−0.7840	−0.3692	−0.3986
Kurtosis	23.8640	23.2247	16.7421	16.3876	16.5898	16.9646
Jarque-Bera	29,232.87	27,519.57	21,576.18	20,500.20	25,885.48	27,341.58
p-Value	0.000	0.000	0.000	0.000	0.000	0.000
Observations	1592	1592	2708	2708	3354	3354

Table A3. Descriptive statistics of regional indices.

Statistics	Mean	Maximum	Minimum	Skewness	Kurtosis	Jarque-Bera	Probability	Observations
MEM	0.004	12.952	−9.995	−0.396	14.283	17,879.6	0.000	3354
MEME	0.026	13.435	−8.745	−0.310	13.297	14,872.4	0.000	3354
MSEM	0.018	8.536	−14.015	−0.948	13.917	13,760.0	0.000	2690
MSEME	0.035	8.196	−13.587	−0.928	13.554	12,871.4	0.000	2690
MSEUROPE	0.019	8.236	−13.190	−0.701	11.179	8487.6	0.000	2958
MSEUROPEE	0.023	8.677	−13.640	−0.705	11.872	9945.6	0.000	2958
SP500	0.044	8.968	−12.765	−0.860	19.266	30,185.9	0.000	2708
SPEUROPE	0.012	8.206	−13.158	−0.770	12.427	10,295.4	0.000	2708
SPEUROPEE	0.011	8.588	−14.123	−0.818	13.667	13,139.5	0.000	2708
SPLA	−0.022	11.490	−16.281	−0.972	14.411	15,120.1	0.000	2708
SPLAE	−0.023	11.106	−16.033	−0.778	11.566	8553.0	0.000	2708
SPMEA	−0.002	6.671	−12.817	−0.572	7.358	2290.3	0.000	2708
SPMEAE	0.008	8.042	−9.819	−0.366	6.121	1159.4	0.000	2708
SPPAC	−0.009	8.020	−15.794	−3.451	48.130	287,638.0	0.000	3312
SPPACE	0.003	9.393	−13.652	−2.476	41.599	208,982.4	0.000	3312
SP500E	0.044	9.146	−12.769	−0.836	19.783	32,095.8	0.000	2708
SPAEM	0.035	4.829	−6.078	−0.518	6.842	1786.5	0.000	2708
SPAEME	0.030	4.986	−6.323	−0.463	6.841	1761.2	0.000	2708

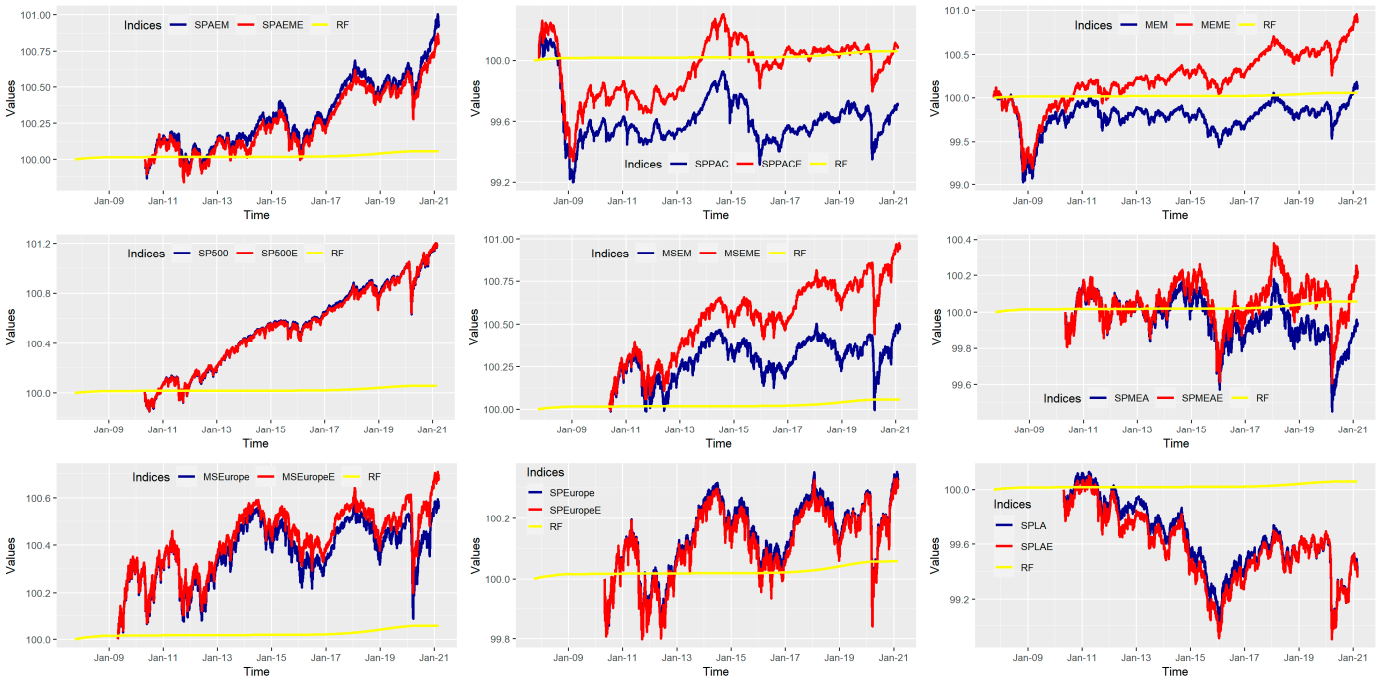


Figure A1. A comparative plot of the daily return of market indices and ESG indices (rebased on 100 at the beginning of the sample).

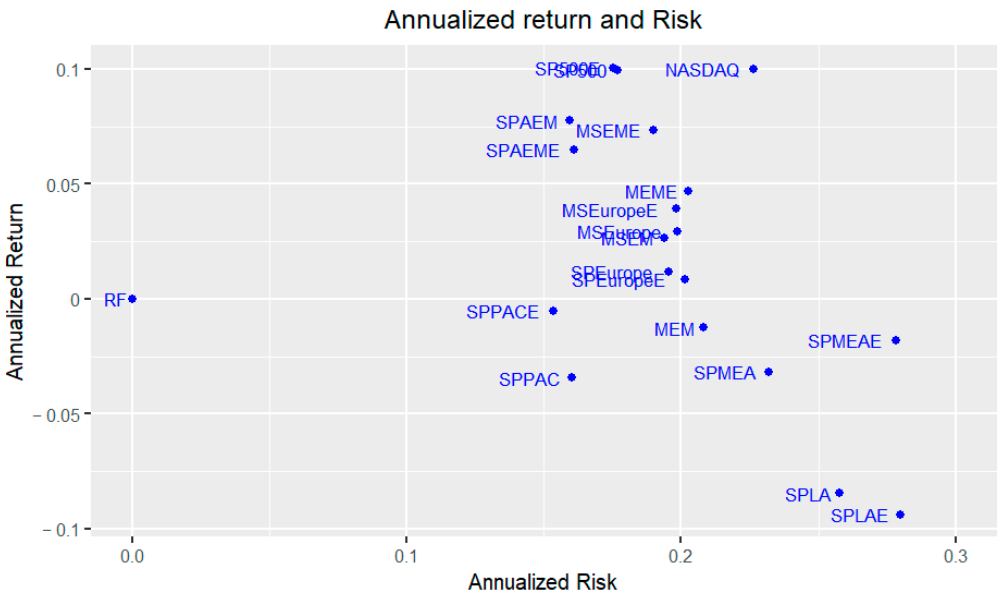


Figure A2. Risk and return chart for the full sample period.

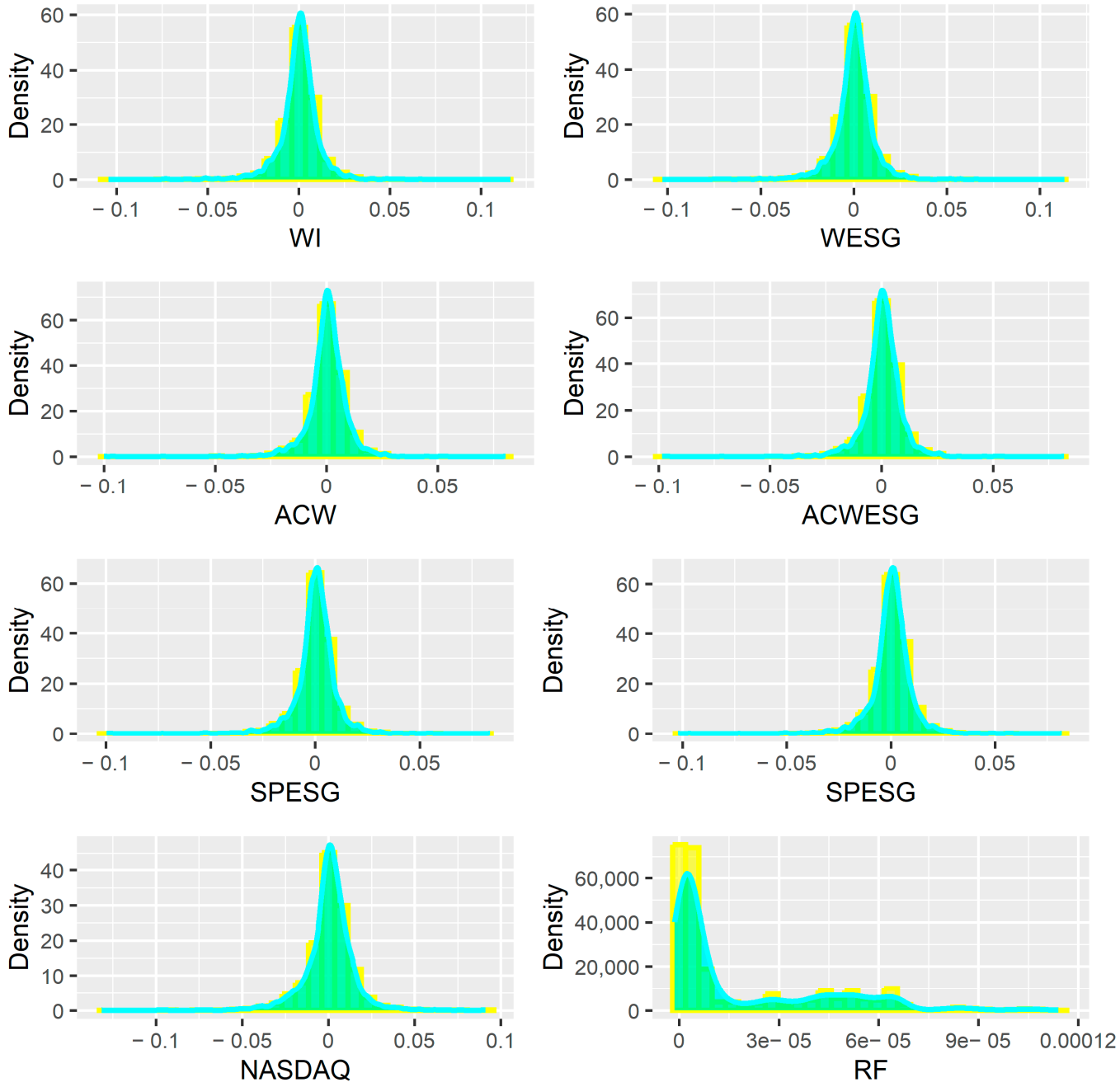


Figure A3. Density plot of global indices.

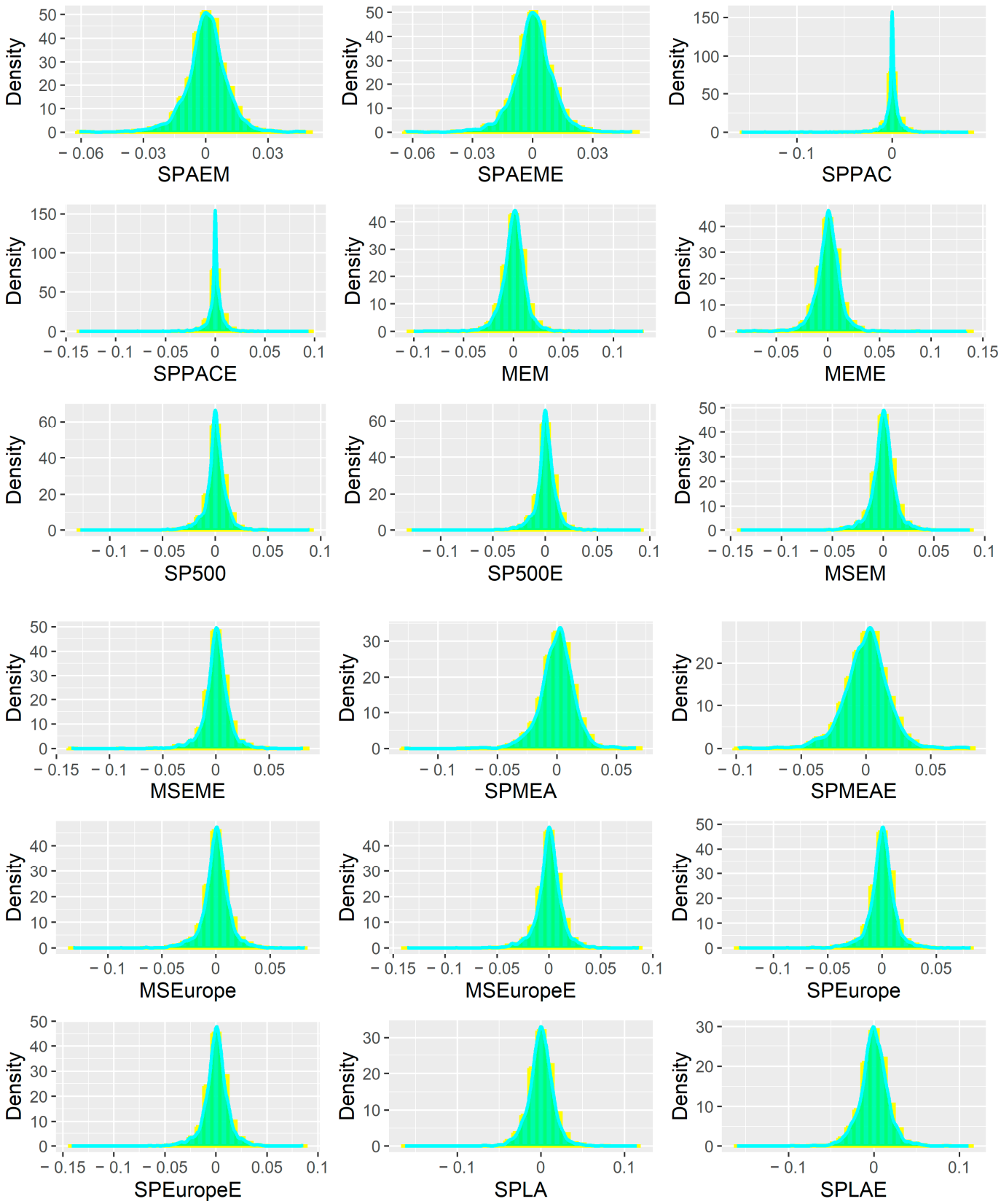


Figure A4. Density plot of regional indices.

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