Asymmetric Effects of Sustainability Indices in Emerging Asian Countries

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Abstract

Sustainable investing has become quite popular in emerging Asian countries as many developing economies are adopting it in their financial markets. This study aimed to analyze the asymmetric effect on the volatility of sustainability indices of five Asian emerging countries, that is, Korea, India, China, Indonesia and Malaysia, along with a developed nation's sustainability index, that is, USA using the exponential GARCH model. The paper also examined the movement of indices alongside each other using the correlation coefficient. The results indicated that even though the indices were correlated, there was an asymmetric impact on the volatility of the indices of emerging Asian countries. This will enable Asian investors to make better decisions regarding their portfolio diversification and selection.

Keywords : sustainability indices, sustainability investing, EGARCH, Asian emerging countries

JEL Classification : G10, G11, G15

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The concept of sustainability has gained much awareness in people that every one of us is trying to lead a sustainable life in one way or another. From switching to eco-friendly products, reducing the use of plastic, and lowering human carbon footprint to supporting brands and companies who have tried their best to contribute more towards sustainable living is yet another move towards sustainability. The importance of sustainability in capital markets has also become quite evident, as investors are also trying to get involved with companies who are into sustainability. This has brought about consequences for investment activities and the mission of the global stock exchanges. As a result, a new type of investment called sustainability investment (SI) was created, with the primary objective of including environment, social, and corporate governance (ESG) factors in traditional investment activities (De Souza Cunha & Samanez, 2013). According to the 2018 "Global Sustainable Investment Review" report, sustainable investing continued to grow in Europe by 11% from 2016 to 2018 reaching $14.1 trillion, the US with a 38% growth from $ 8.7 trillion at the beginning of 2016 to $12.0 trillion at the starting of 2018, and Japan's sustainable investments' growth quadrupled from 2016 to 2018 from just 3% of total professionally managed assets in the country to 18%. This growth made Japan the third-largest country engaged in sustainable investing, after Europe and the US.

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With the growth of sustainable investing, the importance of studying the concept of sustainability in capital markets becomes more crucial as companies need to know how it is impacting their growth.

The purpose of this study is to analyze the asymmetric effect on the volatility of SRI indices of five Asian emerging markets along with a developed nation's (the USA) SRI index. This will enable Asian investors to make better decisions regarding their portfolio diversification and selection. We have chosen five emerging Asian countries – India, China, Indonesia, Malaysia, and Korea, and their sustainability indices, respectively.

Emerging market sustainability indices are still at a growing stage as compared to developed nations and have many limitations. Irrespective of these limitations, sustainability indices help in motivating companies to implement responsible practices within the organization. Emerging markets need to start sustainability indices, considering the markets are still in their initial growth phase, in such a way that it improves the impact on sustainability practices and development of financial markets (Vives & Wadhwa, 2012). As a result, a limited number of studies have been conducted on the sustainability indices of Asian emerging countries, but a lot of studies have been done on sustainability indices of other countries and nations and their importance in other parts of the world. This paper aims to examine the asymmetric effects of sustainability indices in Asian emerging countries.

According to the CFA Institute, under the PRI (Principles for Responsible Investment) initiative, a survey was conducted in Asia Pacific countries in which respondents answered that ESG issues do affect the share prices, and they also expected that this effect would be more in the coming years with climate change and other environmental problems being on the rise. Individual and institutional investors are becoming more aware and are considering ESG factors as a criteria for investment. Because of this, asset management firms also become players of sustainable investing as they would have to design and manage the portfolios of these investors (Tularam et al., 2010).

Review of Literature

Sustainability indices for different markets and regions of the world have been established to encourage the growth of sustainability. These indices prove to be useful to investors to identify companies that suit their investment preferences, particularly those who are into sustainability investing (Miralles-Quiros & Miralles-Quiros, 2017). Sustainable investing practices are generally affected by factors like the investor's character, the performance of the index, market conditions, and other factors. A study done on comparing the sustainable indices of Europe, Asia, and United States concluded that European and American funds outperformed in the long run; whereas, only European portfolios outperformed in the short-run (Hill et al., 2007).

Most of the research done on sustainability indices focused on analyzing the performance of sustainable investments, which are listed in the sustainability indices of the country, and comparison with the benchmark and conventional & sectoral market indices within the country. Socially Responsible Investing (SRI) patterns differ from person to person, and people focus more on sustainable practices from a holistic point of view. Investors look into the overall social performance of firms than specific products and policies, and they consider that SRI investing is mostly linked to environmental factors (Berry & Junkus, 2013). Even though SRI market funds are meagre, they are in a high growth state in many countries. Nowadays, banks, investment advisors, and other financial institutions provide specialized services on sustainable investing practices as more and more investors are investing in such avenues (Schröder, 2004). Some researchers focused on estimating the performance of Socially Responsible Investment (SRI) using performance attribution analysis (Chegut et al., 2011).

When comparing the performance of socially responsible indices with conventional indices and other benchmarks, it was found that socially responsible indices were more vulnerable to conventional indices than other benchmark socially responsible indices (Cortez et al., 2009). Some studies stated that SRI investments are comparatively neutral, that is, they are neither weak nor strong when compared with conventional investments.

When comparing the performance of the Brazilian Corporate Sustainability Index (ISE) with the country's sectoral indices, it was found that there was not much difference between the risks and returns of the ISE as compared with the sectoral indices, even though it might have a lower diversifiable risk and high liquidity. This means that sustainable investing did not have a satisfactory financial performance in the Brazilian Stock Market (De Souza Cunha & Samanez, 2013). Also, another paper concluded that there was not much difference between the returns of the Indian sustainability index (ESG India Index) as compared to the country's two market indices (Nifty and the S&P CNX 500). Still, it did show that the ESG India Index was less volatile as compared to Nifty (Sudha, 2014).

In the same way, it was concluded that SRI stock indices showed the same performance as the conventional benchmarks, but had a different risk-return feature (Schröder, 2007). Sustainable indices were also proved to be less riskier than conventional indices, taking into consideration the US, Europe, and Asia-Pacific indices (Ben Ameur & Senanedsch, 2014). A study also concluded that the firms forming a part of the Spanish Sustainability Index (FTSE4Good IBEX Index) earned higher returns and the profits were not lower than the gains made by the firms that were not socially responsible (Charlo et al., 2015).

SRI indices are also being used as measures for ensuring that companies follow CSR policies. A specific index such as FTSE4Good was created to meet the CSR criteria. Several studies have been conducted on FTSE4Good indices regarding responsible corporate behavior and financial performance (Collison et al., 2008 ; Slager, 2015). Studies proved that certain Asian countries performed well in environmental CSR practices, while certain Asian countries fell below the average (Baughn et al., 2007). This stated that Asian countries have a mixed impression regarding CSR practices and policies. There is evidence from the US stock market that SRI indices have a substantial impact on stock returns; thus, there is a relation between SRI indices and stock market returns (Galema et al., 2008).

Globalization has led to co-movements of stock market indices; by analyzing co-movements, investors can diversify their portfolios in the global market to make more profit and diversify the risk. Geographically and economically related countries show a higher degree of co-movements (Madaleno & Pinho, 2012). There are hardly a few studies that focused on the interlinkages of sustainability indices of various markets. Such reviews can help SRI investors to diversify their portfolios.

Socially responsible investors and conventional investors cannot be classified based on certain factors or elements, even though they are different from each other as proper measures are not yet adopted to classify them (McLachlan & Gardner, 2004). People often consider ESG and SRI both as the same, but there are differences. SRI investing is a broader term than ESG investing (Chong & Philips, 2016). About 90% of the studies showed that ESG and corporate financial performance (CFP) had a positive relationship, which prolonged for a period (Friede et al., 2015).

International portfolio diversification in the case of stock market returns is profitable only in the case of the short run, and this study was done through wavelet analysis of co-movements of stock market returns across the globe (Rua & Nunes, 2009). No significant research has been done on SRI indices of Asian emerging countries, which help Asian investors to diversify their portfolios. Studies suggest that investing in SRI globally is not a cost advantage, but has a significant impact on the performance by the actions taken by the investors (Revelli & Viviani, 2015).

In the Indian context, a study about measuring the performance of the Indian ESG index and comparing it with the country's market indices was done along with volatility analysis, in which it was concluded that there was not much difference regarding the performance, but the ESG index appeared to be less volatile as compared to the market indices of the country (Sudha, 2014).

A study about the SRI markets of five different countries to find out the spillover and linkages among them was done by using the VAR (vector autoregressive) approach in which it was concluded that there was integration among the markets, but at a low level (Roca et al., 2010). Another study aimed at finding out the relationship

between the Australian SRI market with other SRI markets of the world by using a MV GARCH – DCC model approach to help investors diversify their portfolio (Tularam et al., 2010). A detailed analysis of the returns and volatilities among SRI markets of three regions was done by using a VAR-GARCH approach along with how this linkage among these markets can be used for portfolio optimization (Miralles - Quiros & Miralles-Quiros, 2017).

GARCH models are used by various researchers to find out the relationship between various indices to find out the volatility of the market. Various studies have been done on domestic market indices with foreign country indices (Shabarisha & Madegowda, 2020 ; Varughese & Mathew, 2017) among future market returns of different stock market exchanges (Kaur & Singh, 2019) and various other researchers focused on the volatility of various stocks within the stock market (Amudha & Muthukamu, 2018). The asymmetric effects of sustainability indices in Asian countries is an area unexplored and hence the need for this research.

Methodology

This paper focuses on analyzing the asymmetric effect on the volatility of SRI indices of five developing Asian countries with the SRI index of a developed nation (USA) using the EGARCH model based on 2018's market returns. We considered the closing prices of SRI indices of emerging Asian countries, that is, India, China, Malaysia, Indonesia, South Korea, and the sustainability index of the developed nation, that is, the USA. Market returns are calculated by taking the natural log of the indices' closing prices by using the following equation :

$$r_t = \ln \frac{P_t}{P_{t-1}} \qquad \text{..........(1)}$$

where, r_t is the natural log return of the indices for time t, P_t is the closing price at time t, and P_{t-1} is the corresponding price in the period at time $t-1$.

The data collected is of the year 2018 as few countries adopted these indices recently. Most of the Asian developing countries are in the process of adopting it, hence resulting in a lack of availability of data from Asian developing countries. The reason for taking USA's sustainability index is because it adopted the SRI index at a very early stage, and it is the second-largest country engaged in sustainable investing ; hence, we are taking it as a benchmark.

GARCH family models are often used in financial time series data to find out the volatility clustering and one of the GARCH asymmetric models, that is, the exponential (E) GARCH model is used in this paper to find out the asymmetric effect in the volatility of the indices. The EGARCH model was developed by Daniel B. Nelson to record the symmetries of the market through the following equation :

$$\ln (\sigma^2_t) = \omega + \beta_1 \ln (\sigma^2_{t-1}) + \alpha_1 \left\{ \left| \frac{\varepsilon_{t-1}}{\sigma_{t-1}} \right| - \sqrt{\frac{\pi}{2}} \right\} - \gamma \frac{\varepsilon_{t-1}}{\sigma_{t-1}}. \qquad \text{........(2)}$$

The σ^2_t is the log of the conditional variance (returns), which is the dependent variable. The γ is the coefficient, which is known as the asymmetry or leverage term. The hypothesis $\gamma < 0$ or $\gamma > 0$ shows the presence of asymmetric effects. If $\gamma \neq 0$, then there is asymmetric effect. The model says that if $\varepsilon_{t-1} > 0$, it depicts good news, and if $\varepsilon_{t-1} < 0$, then it's bad news. Both the good news and bad news have a different impact on the conditional variance.

Analysis and Results

We have considered the sustainability indices of five Asian emerging countries, that is, China (SSE Social

Responsibility), India (S&P BSE 100 ESG), Indonesia (IDX SRI – Kehati), Korea (DJSI Korea), and Malaysia (FTSE4GOOD Bursa Malaysia), and the USA (DJSI USA Composite) as our data for analysis. The closing prices of the indices were taken for the year 2018, which is one-year data. The prices were converted to returns by taking the natural log of the closing prices in which the analysis was done. All the data were collected from Investing.com and DJSI. The graphs of the returns of the individual countries are shown in Figure 1.

Figure 1. *Individual Graphs of Countries' Returns*
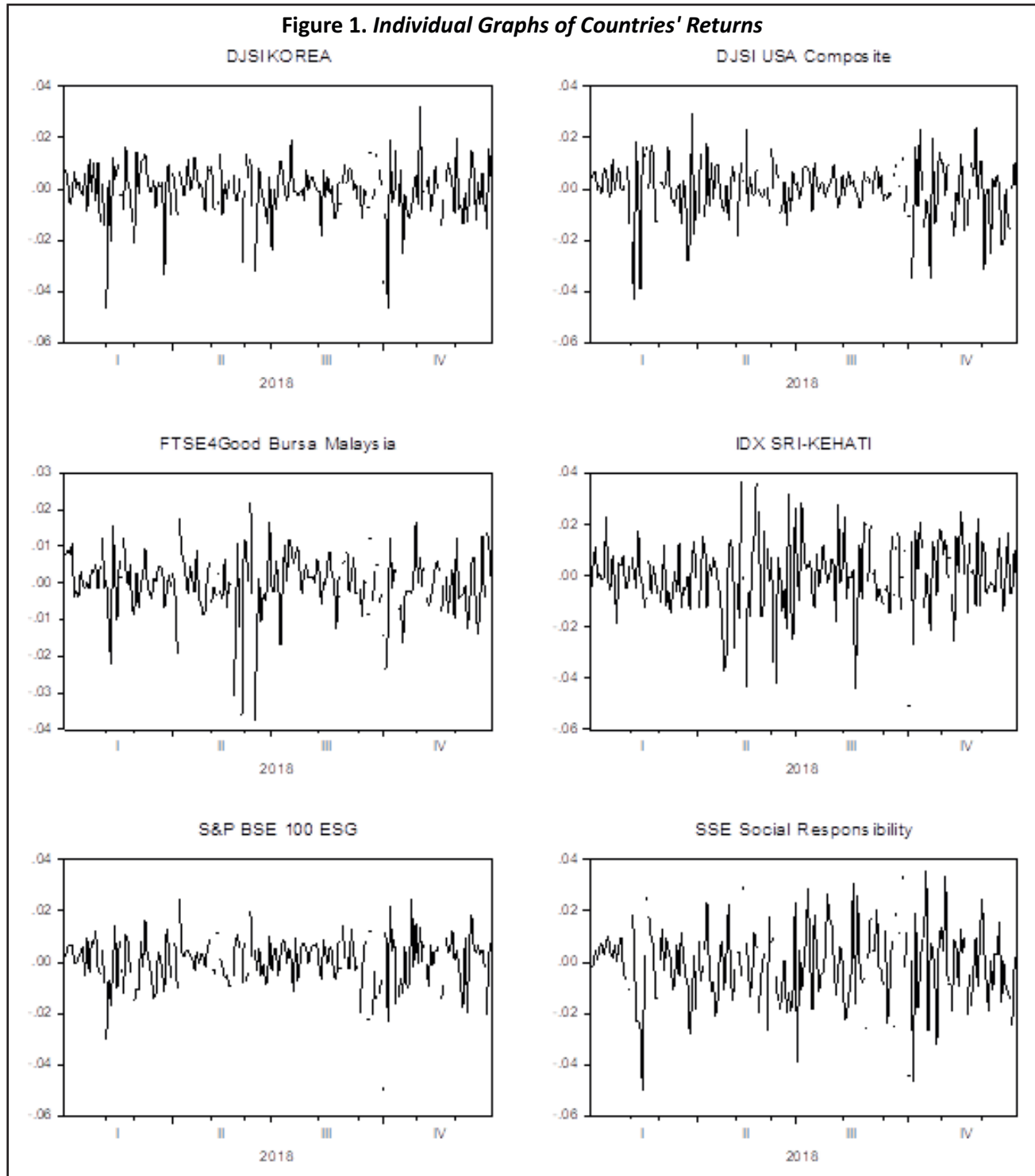
Descriptive statistics results are shown in Table 1. It is used for explaining the basic features of financial time series data. The results depict that S&P BSE 100 ESG (India) index has the highest mean followed by IDX SRI – Kehati (Indonesia) index, DJSI USA Composite (USA), FTSE4Good Bursa Malaysia (Malaysia), DJSI Korea (Korea), and SSE Social Responsibility (China). Indices showing higher mean and variance indicate that they have high expected returns and risks. Standard deviation is the measurement of volatility, in which it is observed that SSE Social Responsibility (China) has the highest volatility followed by IDX SRI – Kehati (Indonesia) index, DJSI USA Composite (USA), DJSI Korea (Korea), S&P BSE 100 ESG (India), and FTSE4Good Bursa Malaysia (Malaysia). Low volatility indicates that the indices are less risky, but the probable returns will also be low.

All the Asian SRI indices and the USA index show negative skewness, which signifies a long-left tail, that is, the stock market indices have higher negative stock returns than positive returns. This effect means that the possibility of getting a decline in the returns is higher than a rise in returns. Since the kurtosis values are all positive, it means that the distribution is fat-tailed. Jarque – Bera values indicate that the null hypothesis (data is normal) is rejected, which means that the data is not normal.

The stationarity results of the data are shown in Table 2. Augmented Dickey – Fuller (ADF) and Phillips – Perron (PP) unit root tests are conducted to find out the stationarity of the data. The null hypothesis, which says that the data has a unit root, is rejected, which means that the data is stationary at level. Therefore, the EGARCH model can be implemented for analyzing the data.

Correlation coefficient results of the indices are shown in Table 3. The correlation coefficient measures the relationship between the indices with each other. It shows how the indices move alongside each other and the strength of this movement. The values indicate a positive correlation, that is, upward direction among the indices

Table 1. *Summary Statistics of the Returns*

	DJSI Korea	DJSI USA Composite	FTSE4Good Bursa Malaysia	IDX SRI – Kehati	S&P BSE 100 ESG	SSE Social Responsibility
Mean	−0.000820	−0.000235	−0.000329	−0.000193	0.000157	−0.001257
Median	−4.22E-05	0.000371	0.000206	−0.000529	0.001830	0.000354
Maximum	0.032226	0.029054	0.022164	0.036996	0.024680	0.035958
Minimum	−0.046895	−0.042896	−0.037508	−0.050892	−0.049525	−0.050254
Std. Dev.	0.010813	0.011388	0.008549	0.014378	0.009734	0.014885
Skewness	−1.119278	−0.735696	−1.016586	−0.451862	−0.897465	−0.277806
Kurtosis	6.472960	4.805247	6.237911	4.176158	6.009043	3.580240
Jarque–Bera	141.5602***	44.97326***	121.2064***	18.24221***	101.7895***	5.351303*

Note. ***, ** , and * represent the levels of significance of 1%, 5%, and 10 %, respectively.

Table 2. *Results of Unit Root Test on the Natural Logarithm of Indices*

Country	Index	ADF	PP
Korea	DJSI Korea	−14.74770***	−14.90077***
USA	DJSI USA Composite	−13.93309***	−13.93305***
Malaysia	FTSE4Good Bursa Malaysia	−7.683644***	−12.14413***
Indonesia	IDX SRI – Kehati	−14.09004***	−14.39317***
India	S&P BSE 100 ESG	−8.312218***	−14.46459***
China	SSE Social Responsibility	−13.25691***	−13.36552***

Note. ***, ** , and * represent the levels of significance of 1%, 5%, and 10 %, respectively.

Table 3. *Correlation Coefficients*

	DJSI Korea	DJSI USA Composite	FTSE4Good Bursa Malaysia	IDX SRI– Kehati	S&P BSE 100 ESG	SSE Social Responsibility
DJSI Korea	1.000					
DJSI USA Composite	0.287	1.000				
FTSE4Good Bursa Malaysia	0.468	0.230	1.000			
IDX SRI – Kehati	0.148	0.128	0.084	1.000		
S&P BSE 100 ESG	0.494	0.145	0.372	0.132	1.000	
SSE Social Responsibility	0.472	0.150	0.334	0.153	0.264	1.000

Note. ***, ** , and * represent the levels of significance of 1%, 5%, and 10 %, respectively.

ranging from weak to moderate. This means that the indices are moving in the same direction, but the strength of the correlation is weak to moderate. The results obtained after running EGARCH are shown in Table 4.

The ω represents the constant, α is the ARCH term, and β the GARCH term, which shows the short-term volatility, and γ is the leverage effect. If $\alpha + \beta = 1$, then it means that any effect (either good news or bad news) will lead to a significant change in future values. This indicates that the impact on the conditional variance (returns) will continue for a more extended period.

From the results obtained, the DJSI USA Composite index has an $\alpha + \beta$ value of 1.155868, which means that the volatility persists for a more extended period. S&P BSE 100 ESG index also has a significant $\alpha + \beta$ value.

If the leverage effect (γ) is positive and significant, then it means that the good news or positive shocks have more impact on the volatility of the indices as compared to the bad news or negative shocks and vice versa.

The γ values are negative and significant, which means that there are asymmetric shocks on the daily returns of the sustainability indices. From the results, it indicates that negative shocks or bad news have more impact on the volatility of the returns of the indices than positive shocks or good news.

Table 4. *Results of EGARCH (1,1)*

Parameter	DJSI Korea	DJSI USA Composite	FTSE4Good Bursa Malaysia	IDX SRI – Kehati	S&P BSE 100 ESG	SSE Social Responsibility
			EGARCH (1,1)			
ω	−15.25483	−1.117576	−15.70891	−15.37280	−1.456551	−1.779937
α	0.330492	0.256292	−0.020818	0.350593	0.057152	0.088542
γ	−0.189834*	−0.228802***	−0.498271***	−0.172641***	−0.272204***	0.168234***
β	−0.547727	0.899576	−0.570427	−0.748944	0.854599	0.803585
$\alpha + \beta$	−0.217235	1.155868	−0.591245	−0.398351	0.911751	0.892127
AIC	−6.756012	−6.347807	−7.056480	−5.688654	−6.812191	−5.821495
SIC	−6.590520	−6.182314	−6.890988	−5.523161	−6.646699	−5.656003
			ARCH – LM			
F–statistic	0.421088	0.240432	0.775770	0.026010	2.679745	0.376757
Obs**R*-squared	0.424473	0.242588	0.780596	0.026272	2.670576	0.379872
Prob. *F*(1,196)	0.5172	0.6244	0.3795	0.8720	0.1032	0.5401
Prob. Chi–Square(1)	0.5147	0.6223	0.3770	0.8712	0.1022	0.5377

Note. ***, ** , and * represent the levels of significance of 1%, 5%, and 10 %, respectively.

Lastly, the results of the ARCH – LM show that the *p*-value is insignificant, which means that the null hypothesis says that there is no heteroskedasticity in the residuals is accepted.

Managerial and Theoretical Implications

From the results, we can see that there is an asymmetric effect on the daily returns of the indices with the negative shocks or bad news impacting their volatility as compared to the good news. Finding out the correlation of the indices with each other can also help investors as well as companies to diversify their portfolios. As we can see from the results of the correlation test, there is a positive correlation, but the strength is moderate to weak. This implies that whatever impacts one country's sustainability index will have very little effect on the other. This means that the investors or companies can choose to invest in different countries because if they incur loss from one, they would gain from the other. With more investors being inclined towards sustainability, the companies can also see if their business should go in such a direction. Being more aware of this will help the companies grow and stay in trend to meet the everyday changes in the market and thus sustain themselves in the long run.

Conclusion

This paper analyzes the asymmetric effect of sustainability indices of emerging Asian countries, that is, DJSI Korea (Korea), FTSE4Good Bursa Malaysia (Malaysia), IDX SRI – Kehati (Indonesia), S&P BSE 100 ESG (India), SSE Social Responsibility (China) and along with a developed nation's index, that is, DJSI USA Composite (USA) by using the exponential GARCH model. The returns of the indices of five Asian emerging countries along with the USA's index for the year 2018 is used for the study. The results show that there is an asymmetric effect on the volatility of the returns of the indices with more bad news impacting it than the good news.

The relationship between the indices is also tested to find out if they move in tandem with each other by using the correlation coefficient test. The results show that there is a positive correlation between the indices, but at a weak to moderate level. This means that whatever impacts one country has a negligible effect on the other country. This provides a scope for the investors to diversify their portfolios and invest in the sustainable stocks of these countries.

Hence, it can be concluded that even though the indices are correlated, there is an asymmetric impact on the volatility of the indices of the emerging Asian countries' sustainable indices along with the USA's index, where bad news has a more impact than good news.

Limitations of the Study and Scope for Further Research

The data taken for this study is only one year's data as the SRI indices have just been developed in these nations recently. There is scope for further study, which can be done by using multiple GARCH family models to find out the volatility clustering and asymmetric effect of countries' sustainable indices. Moreover, much research has been done on conventional indices, however, very few studies are available on SRI indices, which widens the scope for further research.

Authors' Contribution

The authors conceived the idea of the research topic. Mr. Gregory George Ninan extracted research papers and generated concepts useful to the study design. The numerical computations were done by him using Eviews 10 version. Dr Anuradha P. S. verified the analytical methods and administered the study. Ms. Heibha Passah wrote

the manuscript in consultation with the other authors. Gregory and Heiba incorporated the changes suggested by the reviewers. Dr. Anuradha verified and supervised the entire process.

Conflict of Interest

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