"Co-movements dynamics and spillovers among Socially Responsible Investment and International Capital Market: Evidence of Covid-19 Pandemic"

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Abstract

This study covers the literature on Socially Responsible Investment, its correlations, and co-movements. We include the dataset of 9 variables of SRI, Islamic and conventional indices; we find the cointegration and spill-over effects with the help of DCC for the time duration of 2018 to 2022 and break it into two durations i.e., Pre and during Covid19. The outcomes show the existence of cointegration among SRI, Islamic and conventional indices in Pre Covid19 and absence during Covid19, and having co-movements with common connections. Before the pandemic, DCC was inclined to spear, but during the pandemic, a diverse form appears at the same time extra variability is found in conditional covariance. Inclusively, stockholders can attain portfolio diversification assistance by investing in SRI, mainly during the Covid19 period.

Keywords: SRI, Islamic indices, DCC-GARCH, Cointegration, and Covid19.

The epidemic has culmination in societal and worldwide disparity and impaled benefits in environmental, social, and governance (ESG) investment. For explaining the environmental, social & governance funds some terminology is used like SRI (Socially Responsible Investment), responsible, impact, and sustainable investment. The outcomes of the paper confirm the presence of Cointegration among SRI, Conventional and Islamic indexes (in Pre Covid19) & co-movements with common connections. The key objective of this paper is to find out the cointegration and risk spillovers Pre and during Covid19 between the SRI, Islamic and Conventional stocks from 2018 to 2022. The Dynamic correlations incline to spear during the pandemic, but diverse forms arise during the Covid-19 period as there is further inconsistency in conditional covariances. Completely, portfolio managers can attain the benefit of the portfolio by involving SRI and Islamic indexes for a long time but these benefits incline to decrease during Covid-19.

2. Literature Review

S. No	Authors	Data and Year	Methodology	Findings
1.	Joanna Gorka, Katarzyna Kuziak (2022)	Dow Jones and S&P 500 (2007-2019)	GARCH, Copula	It is found that there is a high dependency among the variables during the calamity time and a lower dependency on risky values in steadying periods. Diversification profits change over time duration and it required separate analysis of calamity and steadiness time periods.
2.	Fateh Saci et.al. (2022)	SRI and Traditional Fund (2016-2019)	Regression	The outcomes reveal that there is irrelevant differentiation between the returns of China SRI and Traditional funds. With this, risk association with SRI is lower in comparison to traditional funds. The result shows SRI's has an optimistic effect on the returns of China market.
3.	Paresh Kumar et.al. (2022)	Debt Instruments, Islamic and Conventional Stock (2019-2020)	DCC-MGARCH	The outcomes suggest steady to the more fund increments and weaker profit throughout the pandemic. Stimulatingly, there is more corelation between Sukuk and Green Sukuk that suggest divergence benefits for risky tremors.
4.	Muhammad Arif et.al. (2021)	S&P, Dow Jones, Bloomberg Barclays, MSCI world (2008-2020)	VAR	The outcomes show highs and lows in connection among environment-sociable and conventional funds which indicates various different universal happenings like Oil and Eurozone debt Catastrophe that shows the link among the alternative investments.
5.	Nana Liu et.al. (2021)	Green Bonds & Clean Energy stocks (2011 to 2020)	Co-VAR and Copula	The results suggest that there is optimistic relationship and tail dependency among the green bonds and clean energy market. Whereas, clean energy market shows the risky down or rising movements that create spill overs which is asymmetric in green bond market. It is risky to green bond investors to invest their funds in economic events
6.	Yang Gao, Yangyang Li, Yaojun Wang (2021)	China Green Bond Index, Shanghai S.E Composite stock, Energy and Chemical stock, Industrial and Agricultural Index, Interbank and Repo market (2016-2020)	DCC-GJRGARCH	There are two-way dangerous spill overs found among GB's and stock market. But there is single way spill overs from commodity and stock market. So, that there are no significant risky spill overs among GBs, Forex and Monetary market.
7.	Linh Pham, Canh Phuc Nguyen (2021)	Green Bonds, VIX, OVX (2014-2020)	Markov Stitching	The outcome suggests that the relationship between GB's and uncertainty is having time variations and dependency. Throughout the period of less uncertainty, GB's and uncertainty are less connected to each other and GB's can be used as hedge security so,

				green bonds can be used to hedge towards the ambiguity. These divergences are less during the high uncertainty situation
8.	Muhammad Abubakr Naeem et.al. (2021)	Green Bonds and Commodities (2009-2020)	Time and Frequency domain spill overs framework	The outcomes shows that proof of irregular spill overs between the investment transversely period and dissimilar occurrence sequences. Spill overs for commodities have strong connections with Green Bonds. During the irregular spill overs optimistic return spill overs in short run, on the other hand pessimistic return spill overs grasps in two-time horizons but it is extra marked in the short run. GB's market through feasible environmental strategies, it attracts extra investors to achieve the target of green economy.
9.	Vanita Tripathi and Amanpreet Kaur (2020)	SRI of BRICS nation (1st Sept. 2019- 31st Mar. 2020)	ARCH-GARCH	It is found that SRI outperform in respect of risk and return throughout epidemic time in diverse markets conditions in BRICS nations.
10.	Takashi Kanamura (2020)	MSCI Green Bonds, S&P Bonds and Crude Oil(2014-2018)	DCC-GARCH	The results shows that the performance of Green bonds Asset are sophisticated in comparison of Conventional bonds asset act but the dominance is rotting over time ended.

3. Data & Methodology

We collect the data from the MSCI index from the time period of 1st April 2017 to 31st March 2022, i.e. divided into two-time duration Pre-Covid19 and during-Covid-19.

SRI	**Islamic**	**Conventional**
MSCI Asia Pacific Ex Japan SRI (MAPJSI index)	MSCI AC Asia Pacific Islamic Ex Japan Index (MAPIJ index)	MSCI AC Asia Pacific Ex Japan Index (MAPJ index)
MSCI Europe SRI (MESI index)	MSCI Europe Islamic Index (MEI index)	MSCI Europe Index (ME index)
MSCI USA SRI (MUSI index)	MSCI USA Islamic Index (MUI index)	MSCI USA Index (MU index)

Table 4. Descriptive Statistics during Covid19

	MAPJSI	MESI	MUSI	MAPIJ	MEI	MUI	MAPJ	ME	MU
Mean(%)	-0.004	-0.012	0.007	-0.021	-0.016	-0.006	-0.021	-0.022	0.000
Max.(%)	3.850	3.589	4.207	2.681	3.938	3.793	2.357	3.702	3.901
Min.(%)	-4.527	-5.726	-5.632	-2.613	-5.749	-5.136	-2.742	-6.107	-5.612

SD	0.541	0.508	0.665	0.482	0.539	0.632	0.469	0.533	0.648
Skewness	-1.798	-2.672	-1.042	-0.769	-2.264	-1.063	-1.085	-2.866	-1.340
Kurtosis	29.169	39.882	24.024	11.318	35.194	22.053	11.981	41.700	24.348
N. Obvs	521	521	521	521	521	521	521	521	521

Table 4. Descriptive Statistics during Covid19

	MAPJSI	MESI	MUSI	MAPIJ	MEI	MUI	MAPJ	ME	MU
Mean(%)	0.047	0.031	0.054	0.034	0.036	0.046	0.027	0.033	0.051
Max.(%)	2.300	2.734	2.871	1.600	1.845	2.601	2.161	2.619	2.987
Min.(%)	-2.007	-1.932	-2.534	-1.759	-1.939	-2.722	-1.624	-2.254	-2.606
SD	0.426	0.520	0.514	0.450	0.505	0.463	0.462	0.534	0.495
Skewness	-0.141	-0.158	-0.248	-0.196	-0.442	-0.170	-0.107	-0.276	-0.165
Kurtosis	5.820	5.778	5.983	3.963	5.170	7.441	4.558	6.193	6.942
N. Obvs	521	521	521	521	521	521	521	521	521

Descriptive Statistics are shown in Table 3 and Table 4 as Pre Covid19 and During Covid 19. In this, we analyze that all the indices of Pre Covid19 incline to perform better than During Covid19 indices. SRI index outperforms as compared to Islamic and Conventional indexes in both time periods. Islamic and Conventional Index performance is mostly the same in all regions, however Islamic and Conventional indexes are not differentiated from each other. The period of Pre Covid 19 of all indexes shows a bad recital with high volatility as compared to During Covid19.

4. Methodology

DCC GARCH

Table 5 shows the outcomes of the DCC-GARCH model. Our analysis of pre-Covid-19 shows the spillover effects among the indices in the short as well as in long run also in both the time period α measures is relatively less mostly in the case of each index taken in the study which indicates that the markets are quite stable. As joined with the β parameters, every market reveals that α is quite less response to market shockwaves and high perseverance in conditional volatility (β more than 0.8). Solitary, the Asia Pacific SRI index & USA Islamic, and USA conventional vary through comparatively higher α and a quite lesser β.

Table 5. DCC-GARCH Model before Covid19

	ω	α	β
MAPJSI	0.0070**	0.3212***	0.6664***
MESI	0.0092*	0.1749**	0.7880***
MUSI	0.0088**	0.2706***	0.7175***
MAPIJ	0.0097	0.1333	0.8152**

MEI	0.0074*	0.1685***	0.8119***
MUI	0.0096**	0.2457***	0.7259***
MAPJ	0.0070*	0.1182**	0.8461***
ME	0.0092*	0.1820**	0.7868***
MU	0.0075**	0.2878***	0.7111***

Table 6. DCC GARCH Model during Covid19

	ω	α	β
MAPJSI	0.0099*	0.1579*	0.7914***
MESI	0.0078*	0.1056*	0.8684***
MUSI	0.009	0.1050*	0.8597**
MAPIJ	0.0055	0.0469*	0.9244***
MEI	0.0045	0.0643*	0.9176***
MUI	0.0093	0.1402*	0.8155***
MAPJ	0.016	0.1170*	0.8066***
ME	0.0069	0.0769*	0.8988***
MU	0.0132*	0.1858*	0.7701***

As per DCC estimates α measures are relatively high in each index that shows the markets are not stable during Covid-19 when there is a lockdown situation in the economy once the lockdown is removed α measures come to lesser and show stability but when the second wave of Covid-19 arises α is again unstable and high. As joined with the β parameters, every market reveals that α is quite less response to market shockwaves and high perseverance in conditional volatility (β more than 0.9). Solitary, the Asia Pacific and USA SRI index and USA conventional vary through comparatively higher α and a quite lesser β.

Table 7. DCC results before Covid19

	Asia Pacific	**Europe**	**USA**
COR(S-I)	0.58***	0.97***	0.96***
COR(S-C)	0.52***	0.98***	0.98***
COR(I-C)	0.95***	0.98***	0.96***
Lamda1	0.06	0.06***	0.15***
Lamda2	0.51	0.82***	0.71***

Table 8. DCC results during Covid19

	Asia Pacific	**Europe**	**USA**
COR(S-I)	0.45***	0.94***	0.87***
COR(S-C)	0.52***	0.97***	0.96***
COR(I-C)	0.89***	0.96***	0.91***
Lamda1	0.010	0.02**	0.07***

Lamda2	0.96***	0.96***	0.85***

Cointegration Analysis

Tables 10 to 12 state the outcomes of VECM test analysis for joint connections between SRI, Conventional and Islamic indexes. In equation first, the SRI is constrained to be zero. By seeing the ΔMAPJSI (by variation in SRI indices) we find it is more than the equilibrium and we suppose it is a dropdown that is precisely what we receive, the coefficient is -0.0000212 through quicker alteration speed.

In Table 11. We originate one equation of cointegration in the Europe index. The error rectification terms are substantial only while contemplating the SRI stocks (ΔMESI) and Islamic stocks (ΔMEI) analogue. By seeing the (ΔMESI) the cointegration equation shows SRI indices are less than the equilibrium as collated with the Islamic analogue & we find the optimistic indication of error rectification terms in equation (0.01175).

In Table 12. A diverse shape arises in the USA. The error rectification terms are considerable once seen in the variation in the SRI index (ΔMUSI), the presence of a common connecting association is found, and relatively the connectedness turns from Islamic and Conventional indexes towards the SRI. In this, SRI indices are observed as more than the equilibrium.

Table 10. VECM (Vector Error Correction Model) analysis, MSCI Asia Pacific Indices (Pre Covid19)

	Δ(MAPJSI)	Δ(MAPIJ)	Δ(MAPJ)
CointEq1	-2.12E-05	1.68E-06	-7.53E-06
Δ(MAPJSI(-1)	-0.17276***	0.206935***	0.095231***
Δ(MAPJSI(-2)	0.251931***	0.121908***	0.05956**
Δ(MAPJSI(-3)	0.103725	0.048168	0.022754
Δ(MAPJSI(-4)	-0.13393**	-0.11744***	-0.04265**
Δ(MAPIJ(-1)	1.070488***	0.644914***	0.298111***
Δ(MAPIJ(-2)	0.100634	0.148442	0.070267
Δ(MAPIJ(-3)	-0.17552	-0.13173	-0.04368
Δ(MAPIJ(-4)	0.443917	0.267818	0.131817*
Δ(MAPJ(-1)	-2.35106***	-1.84595***	-0.84679***
Δ(MAPJ(-2)	-0.1365	-0.226	-0.11407
Δ(MAPJ(-3)	0.402959	0.439622	0.159664
Δ(MAPJ(-4)	-0.69546	-0.4755	-0.25691
C	-0.02707	-0.49771	-0.23031

Table 11. VECM (Vector Error Correction Model) analysis, MSCI Europe Indices (Pre Covid19)

	Δ(MESI)	Δ(MEI)	Δ(ME)
CointEq1	0.011754	0.01352	0.00992
Δ(MESI(-1)	0.358462	0.251236	0.374798
Δ(MESI(-2)	0.409703	0.203384	0.442908
Δ(MESI(-3)	-0.08434	-0.05836	-0.03624
Δ(MESI(-4)	-0.59248*	-0.35761*	-0.6335*
Δ(MEI(-1)	1.226241***	0.829437***	1.353291***
Δ(MEI(-2)	-0.92956**	-0.6302**	-0.9769**
Δ(MEI(-3)	0.466966	0.222353	0.445459
Δ(MEI(-4)	-0.41728	-0.26365	-0.36718
Δ(ME(-1)	-1.04461***	-0.71356***	-1.13937***
Δ(ME(-2)	0.318171	0.277863	0.335572
Δ(ME(-3)	-0.09916	-0.00629	-0.12278
Δ(ME(-4)	0.870316**	0.53574**	0.869753**
C	-0.24515	-0.21451	-0.65463

Table 12. VECM (Vector Error Correction Model) analysis, MSCI USA Indices (Pre Covid19)

	Δ(MUSI)	Δ(MUI)	Δ(MU)
CointEq1	-0.19425***	-0.14135***	-0.17925**
Δ(MUSI(-1)	-0.23687	-0.12247	-0.21525
Δ(MUSI(-2)	-0.11337	0.032014	-0.03934
Δ(MUSI(-3)	-0.14364	-0.06864	-0.12789
Δ(MUSI(-4)	-0.18302	-0.23221	-0.3572
Δ(MUI(-1)	0.219799	0.129962	0.283106
Δ(MUI(-2)	-0.33488	-0.19533	-0.33828
Δ(MUI(-3)	0.019498	-0.00218	0.021628
Δ(MUI(-4)	-0.02998	0.035735	0.06265
Δ(MU(-1)	-0.14044	-0.06805	-0.17803
Δ(MU(-2)	0.524179	0.225129	0.456103
Δ(MU(-3)	0.254899	0.143582	0.239146
Δ(MU(-4)	0.142378	0.168619	0.262826
C	0.580955	-0.1082	0.244242

In Table.13, the VAR estimates demonstrate that ΔMESI (1) and ΔMUSI (1) index has an optimistic underlying result on ΔMAPJSI, but ΔMAPJSI has no substantial underlying consequences on ΔMESI (1) and ΔMUSI (1). In Table.14, the VAR estimates demonstrate that ΔMEI (1) and ΔMUI (1) index has an optimistic underlying result on ΔMAPIJ, but ΔMAPIJ has no substantial underlying consequences on ΔMEI (1) and ΔMUI (1). In Table.15, the VAR estimates demonstrate that ΔME (1) and ΔMU (1) index has an optimistic underlying result on ΔMAPJ, but ΔMAPJ has no substantial underlying consequences on ΔME (1) and ΔMU (1).

Conclusion

Generally, dynamic correlations have a tendency to spear in the course of the pandemic, whereas there is further inconsistency in conditional covariance at any time during the pandemic period. It means that portfolio managers want to be more careful to consist of SRI and Islamic stocks in a varied portfolio. Institutional investors can take advantage of the benefits of diversification by including SRI and Islamic indexes because during the pandemic long-term dynamic correlations have the tendency to decrease. By rare exemption, our outcomes show the extensive contributory association among SRI, Islamic and conventional stocks pre Covid-19. When we involve Asia-Pacific and Europe provinces, the conventional stocks lay beneath the long-run equilibrium in comparison to SRI whereas the Islamic stocks stand more than such equilibrium which means portfolio managers it shows that portfolio manager gets profit by including more Islamic and SRI index and less conventional index in their portfolio in short time duration. We found the co-movement in Asia-Pacific, whereas in Europe we find connectedness between conventional and SRI indexes to the Islamic index. We also discover the joint connecting association, with the relatively same extent, among the Islamic and conventional indices in the USA.

This study unlocks the paths intended for more study. The DCC-GARCH method mainly finds dynamic correlations between marketplaces and offers suggestions for portfolio divergence chances**.** Future studies can discourse that problem by adding recent wavelet conversions to improve the study of the effect of diverse asset prospects on portfolio diversification profits (Gencay, Selcuk, & Whitcher, 2001).

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