The Level of Integration of Select International Markets in COVID Crisis : An Empirical Assessment

Joy Sarkar [1]
Raju Paul [2]

Abstract

Purpose : Due to a lack of data, only seven countries were taken into consideration when analyzing the relationship between FPI inflow and market integration. This paper began with stock market indices of 20 developed and developing countries in order to assess the factors that influence, positively or negatively, international investors to choose the Indian market for their funds despite the growth crisis generated by the great COVID pandemic. The study period was selected from January 1, 2019, to July 31, 2023, which was further subdivided into three sub-periods: Pre-COVID, COVID, and Post-COVID periods.

Methodology : In order to determine whether the unexpected emergence of the pandemic caused any changes in the log return series of the selected market indices, a correlation test—one of the straightforward, useful methods of assessing the association or integration of markets—was performed on the data. The benefits of foreign diversification were properly illustrated by a tabular display of the monthly average FPI assets under custodian (AUC) and level of integration.

Findings : International investors are encouraged to choose India as a good destination for their fund investments due to the declining trend of correlation between the Indian market and other select markets over the sub-periods found in this paper. This suggests low integration, which may reduce or even eliminate idiosyncratic risk.

Practical Implications : This study would help investors, analysts, portfolio managers, fund managers, policymakers, and others to gauge the flow of capital in the Indian capital market.

Originality : This study, in contrast to other research, compared the market results of seven countries with a monthly average of the FPI AUC investment in India by country in order to ascertain whether capital influx into India during COVID-19.

Keywords : **economic integration, market integration, portfolio diversification, correlation test, COVID crisis**

JEL Classification Codes : F15, F21, G11

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Scholars, for the past few decades, have suggested a mantra popularly known as globalization, that is, to open close economies and allow the frictionless movement of capital and effective utilization of the world's resources in cross-border trading to overcome the natural occurrence of asymmetry in demand and supply and minimize production and distribution costs. The essence of adopting the "go global policy" is expected to translate into economic integration among the countries, which ultimately pave the way for financial integration represented by the capital market. Generally, the degree of market integration depends on several factors, like the pace and different phases of the liberalization process, investment-related decisions of corporates, currency stability, and many other factors. The absence of capital market integration opens an option

[1] *Assistant Professor,* Department of Commerce, University of North Bengal, Raja Rammohunpur, P.O.- NBU Campus, Kolkata - 734 013, West Bengal. (Email : jscnbu@nbu.ac.in) ; ORCID iD : https://orcid.org/0009-0007-2674-7398
[2] *Junior Research Fellow,* Department of Commerce, University of North Bengal, Raja Rammohunpur, P.O.- NBU Campus, Kolkata - 734 013, West Bengal. (Email : rs_rajup@nbu.ac.in) ; ORCID iD : https://orcid.org/0009-0006-0522-9703

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to reduce over-dependency on "home-bias" investment and eliminate domestic systematic risk to a great extent, at least partially through international portfolio diversification, i.e., the allocation of financial assets for cross-border investment with the objectives of minimizing systematic risk. On the other hand, scholars also warn about the evils of integrated markets, like the "contagion effect" that certainly fades out the benefits of international portfolio diversification (Agmon, 1972; Bekaert et al., 2007; Chittedi, 2010; Kearney & Lucey, 2004; Leachman & Francis, 1995; Mukherjee & Mishra, 2007; Phylaktis & Ravazzolo, 2002; Patel, 2016; Palamalai et al., 2013; Poshakwale & Thapa, 2009; Raju & Khanapuri, 2009; Srikanth & Aparna, 2012; Samadder & Bhunia, 2018).

We have noticed that the degree of integration is very much dependent on time, economic or financial crises, and obviously any event that causes a shock to markets. The sudden occurrence of COVID-19 caused a shock and adverse impact on the world markets that immediately influenced investors' behavior. This may lead to abnormal changes in integration levels among various markets during COVID-19. Although scholars have concluded that the level of integration increased in the crisis period, later, it attempted to return to its earlier level (pre-crisis level) in the post-crisis periods (Chiang et al., 2007; Gupta & Guidi, 2012; Jang & Sul, 2002; Kearney & Lucey, 2004). Interestingly, Lau and McInish (1993) and Lee and Kim (1993) have found an accretion in integration level in the post-crisis period that almost caught up or exceeded the crisis period level.

This paper aims to check for any significant changes in the degree of integration during the sudden occurrence of the COVID-19 pandemic in select developed and developing economies. The correlation test is a basic method for determining the degree of association between variables. It is utilized to determine whether there is a relative relationship between the levels of integration during the pre-COVID, COVID-19, and post-COVID sub-studies. It is anticipated that the study's findings, along with a number of other influencers, would make it easier to identify the main factors that draw foreign investors to the Indian market.

Literature Review

A stock market return is influenced by various macro and micro economic factors of that country with other global factors, some of these are money supply, foreign reserve, wholesale price index (WPI), Call money market, index of industrial production (IIP), foreign institutional investors (FII), and exchange rate (Nayak & Barodawala, 2021; Ray & Sarkar, 2014). Interestingly, Murthy and Singh (2013) pointed out that the trading activities of domestic institutional investors (DII) and FII can also impact market returns. DII and FII are two important and major players in any market responsible for liquidity, volatility, and market return. FII is more responsible for generating market volatility than DII (Baral & Patra, 2019; Naik & Padhi, 2015). In contrast to DIIs, who are negative feedback traders who purchase when there is negative information, FIIs are positive feedback traders who purchase on positive news and exit the market when there is negative news. There is a negative relationship between FII and DII trading strategies; when FII sells, DII buys, DII acts as a cushion in the crisis period (Kadanda & Raj, 2017; Sathish, 2020; Tewari & Pathak, 2015). This indicates that the primary focus of FII is not only international portfolio diversification but also speculation/trading motives (Baral & Patra, 2019; Murthy & Singh, 2013). Furthermore, Veeravel et al. (2021) noted that daily COVID-19 confirmed cases, as well as mortality cases, can have a beneficial or negative impact on market returns. The conclusion is that any combination of variables or bits of knowledge can affect market return.

A developing country like India is not meaningfully integrated with the markets of developed and developing countries, which opens a good window for investment, though the integration of India with other markets increased gradually after 2008 (Agarwal et al., 2020; Ray et al., 2012). A number of academics use capital market indices to measure the degree of market integration. This is done at the log level (Siddiqui, 2009; Srikanth & Aparna, 2012), log return level (Mukherjee & Mishra, 2007; Nath & Verma, 2003; Raju & Khanapuri, 2009) or both (Patel & Patel, 2012a,b; Ranpura et al., 2011). Some of them use the unit root test, co-integration test, and Granger causality tests with or without the correlation test (Bhattacharyya & Banerjee, 2004; Chittedi, 2010; Jang

& Sul, 2002; Lee & Kim, 1993; Nath & Verma, 2003; Palamalai et al., 2013; Patev et al., 2006; Patel & Patel, 2012a,b; Ranpura et al., 2011; Ray et al., 2012; Tripathy, 2006) and only a few choose the very simple and easy-to-use and understand tools like correlation test and Geweke test (Johnson & Soenen, 2002; Mukherjee & Mishra, 2007; Srikanth & Aparna, 2012). Chittedi (2010) and Ranpura et al. (2011) discovered that the Indian market is interconnected with developed markets in the United States, United Kingdom, Japan, Australia, and Europe, as well as a few developing nations like China, Hong Kong, and Brazil. Lau and McInish (1993) and Lee and Kim (1993) observed that there is a tremendous increment in the degree of integration in crisis periods; they further observed that the correlation between the markets increased after the crisis period that almost touched or overstepped the level of the pre-crisis period; a group of researchers (Chiang et al., 2007; Gupta & Guidi, 2012; Jang & Sul, 2002; Kearney & Lucey, 2004) contradicts with that statement and found that correlation coefficient gradually gets back only to pre-crisis level in the post-crisis period. Patel and Patel (2012a), Palamalai et al. (2013), and Ray et al. (2012) found that the Indian market is weakly integrated with the different markets for a concise time frame, possibly due to some common or global factors. Still, there is independence in a long-term period that opens the window to capitalize on the benefits of diversification (Nath & Verma, 2003; Patel & Patel, 2012b). Thus, an extensive investigation is required to identify any potential prospects for diversification that may occur in India as a result of the COVID-19 pandemic's unexpected onset. More research needs to be done in this uncharted field of study by academics, academicians, politicians, and other stakeholders.

Data and Methodology

This study examined the co-movement of popular market indexes in a few chosen established and emerging markets before, during, and after the COVID crisis (Table 1). Not every stock market index worldwide has been taken into account. Consequently, for the study, we selected 20 indices of significant worldwide stock markets using stratified convenience sample procedures.

Table 1. ***List of the Indices Used for the Study***

Sl. No.	Index	Symbol	Country	Status	Continent
1	SEMDEX	MDEX	Mauritius	*Developing*	Africa
2	NIFTY 50	NSEI	India	*Developing*	Asia
3	Shanghai Composite	SSEC	China	*Developing*	Asia
4	Hang Seng	HIS	Hong Kong	Developed	Asia
5	Jakarta Stock Exchange Composite	JKSE Composite	Indonesia	*Developing*	Asia
6	Nikkei 225	JP 225	Japan	Developed	Asia
7	KOSPI Composite	KS11	South Korea	Developed	Asia
8	Taiwan Weighted	TWII	Taiwan	Developed	Asia
9	CAC 40	FCHI	France	Developed	Europe
10	DAX	DE40	Germany	Developed	Europe
11	FTST Ireland	FTWIIRLE	Ireland	Developed	Europe
12	FTSE MIB	IT40	Italy	Developed	Europe
13	OSE Benchmark	OSEBX	Norway	Developed	Europe
14	OMS Stockholm 30	OMXS30	Sweden	Developed	Europe
15	SMI	SWI 200	Switzerland	Developed	Europe
16	FTSE-100	UK 100	UK, London	Developed	Europe
17	S&P TSX Composite	GSPTSE	Canada	Developed	North America

18	IPC Mexico	MXX	Mexico	*Developing*	North America
19	NYSE Composite (DJ)	NYA	USA, New York	Developed	North America
20	S&P ASX 200	AXJO	Australia	Developed	Oceania
21	IBOVESPA	BVSP	Brazil	*Developing*	South America

The global COVID-19 pandemic that began in China in December 2019 expanded quickly. On March 11, 2020, the World Health Organization (WHO) proclaimed COVID-19 to be a "Pandemic" (United Nations, 2023). Almost the entire country then promptly adopted a "Lock Down" policy. Under the "Unlock 22.0" phase (COVID-19 lockdown in India, 2023), the Indian government implemented a lockdown on March 25, 2020, and completely lifted it on March 31, 2022. On May 5, 2023, the World Health Organization (2023) declared that COVID-19 would stop completely. Therefore, the entire study period for this work is from January 1, 2019, to July 31, 2023. The study period is then divided into three sub-times in order to ascertain variations in the integration level during these periods:

(1) Sub-period 1 : Pre-COVID-Period (From January 1, 2019 to March 10, 2020).

(2) Sub-Period 2 : COVID Period (From March 11, 2020 to March 31, 2022).

(3) Sub-Period 3 : Post-COVID Period (From April 1, 2022 to July 31, 2023).

To minimize time zone differences, we have synchronized the trading days of other markets with the Indian market. Initially, the mean, standard deviation, and Jarque–Bera (J–B) descriptive statistics are calculated on a daily log return series of indices to identify the country with the highest or lowest mean return with the highest amount of return volatility. Then, we applied a simple and easy test, the correlation test, so that anyone, even a layman, can understand the interpretation of the result. The correlation matrix is prepared to determine the returns' co-movement among the indices. Traditionally, scholars accepted the existence of three levels of correlation coefficients: r = 0.35 – 0.4 (Low), r = 0.041 – 0.70 (Moderate), and r = 0.71 and more (Strong) (Srikanth & Aparna, 2012; Taylor, 1990). We considered a correlation value up to 0.40 as a "Weak" correlation value between 0.41 and 0.70, as a "Moderate" and a value more than 0.70 as a "Strong" correlation.

$$\text{Daily log return } (\boldsymbol{R_t}) = [\text{LN}(P_1 / P_0)] \quad \ldots\ldots\ldots\ldots (1)$$

where,
R_t = Returns at period t, P_1 = Closing price of Index on the current period, and P_0 = Closing price of Index preceding the current period.

Objective of the Research

To ascertain if there were any appreciable shifts in the level of integration during the unexpected COVID-19 pandemic in a few developed and emerging nations.

Hypothesis

- **H0 :** No significant relationship exists among the select indices.

Analysis and Results

Descriptive statistics are computed based on the daily log return series of 20 market indices. Table 2 shows that

Table 2. ***Calculation of Descriptive Statistics of 21 Countries' Market Indices on Daily Log Returns Series***

Country	Pre-COVID Period (*N* = 303)					COVID Period (*N* = 502)					Post-COVID Period (*N* = 330)				
	Mean	*S.D.*	Skewness	Kurtosis	J–B (Prob.)	Mean	*S.D.*	Skewness	Kurtosis	J–B (Prob.)	Mean	*S.D.*	Skewness	Kurtosis	J–B (Prob.)
India	–0.0011	0.0151	–3.4336	31.6398	0.0000	0.0016	0.0129	0.1542	9.0715	0.0000	0.0004	0.0085	–0.1099	3.9062	0.0025
Australia	–0.0006	0.0136	–2.9437	22.0063	0.0000	0.0009	0.0112	0.3250	8.5132	0.0000	0.0000	0.0090	–0.2243	4.2641	0.0000
Brazil	–0.0008	0.0228	–2.3378	24.6549	0.0000	0.0011	0.0153	0.2904	6.7942	0.0000	0.0000	0.0129	0.0414	3.6887	0.0366
Canada	–0.0004	0.0166	–2.1983	37.0182	0.0000	0.0011	0.0094	–0.3411	8.9826	0.0000	–0.0002	0.0095	–0.1613	3.8164	0.0050
China	0.0003	0.0127	–1.0432	10.4930	0.0000	0.0004	0.0102	–0.1819	6.8566	0.0000	0.0000	0.0094	–0.5309	6.0767	0.0000
France	–0.0004	0.0154	–2.6968	26.2293	0.0000	0.0009	0.0140	0.2925	7.5584	0.0000	0.0004	0.0113	–0.2083	3.7914	0.0041
Germany	–0.0003	0.0156	–1.8969	27.6418	0.0000	0.0008	0.0144	0.4311	7.8443	0.0000	0.0004	0.0114	–0.2695	3.7819	0.0020
Hong Kong	–0.0004	0.0124	–0.4195	5.8494	0.0000	–0.0001	0.0144	0.1998	7.6293	0.0000	–0.0003	0.0174	0.4910	4.5468	0.0000
Indonesia	–0.0015	0.0110	–2.1589	12.3184	0.0000	0.0013	0.0105	–0.1030	5.5023	0.0000	–0.0001	0.0113	–0.1197	4.1219	0.0001
Ireland	–0.0004	0.0141	–1.8937	13.6582	0.0000	0.0005	0.0142	–0.7431	7.1337	0.0000	0.0000	0.0145	–0.2625	3.2957	0.0824
Italy	–0.0003	0.0183	–4.1495	44.0584	0.0000	0.0008	0.0143	–0.2351	6.3547	0.0000	0.0005	0.0129	–0.6014	4.4474	0.0000
Japan	–0.0003	0.0117	–0.4858	10.8476	0.0000	0.0009	0.0133	0.4593	6.5508	0.0000	0.0005	0.0107	–0.1381	3.2875	0.3353
Mauritius	–0.0011	0.0099	–5.3997	56.9768	0.0000	0.0007	0.0078	4.6321	64.7217	0.0000	–0.0003	0.0031	0.2604	5.0385	0.0000
Mexico	–0.0006	0.0117	–1.3464	11.3924	0.0000	0.0010	0.0115	–0.1309	4.5044	0.0000	–0.0001	0.0094	0.1379	2.9605	0.5862
Norway	–0.0006	0.0137	–2.1318	16.2653	0.0000	0.0013	0.0111	–0.1124	4.5485	0.0000	–0.0001	0.0113	–0.4628	4.0140	0.0000
S. Korea	–0.0008	0.0138	–0.5170	15.8257	0.0000	0.0011	0.0121	0.1328	5.8547	0.0000	–0.0001	0.0105	–0.0778	3.4545	0.2047
Sweden	–0.0001	0.0137	–2.0829	20.2721	0.0000	0.0008	0.0129	0.0999	6.4692	0.0000	0.0002	0.0119	0.0721	3.8524	0.0059
Switzerland	0.0001	0.0123	–2.0498	24.2093	0.0000	0.0007	0.0095	–0.1179	4.8903	0.0000	–0.0002	0.0088	0.0446	3.9745	0.0014
Taiwan	–0.0002	0.0108	–1.0102	14.1289	0.0000	0.0012	0.0112	1.2800	14.8243	0.0000	–0.0001	0.0075	–0.9373	8.0422	0.0000
UK	–0.0007	0.0136	–2.2052	28.0349	0.0000	0.0006	0.0120	–0.2075	6.2746	0.0000	0.0001	0.0088	–0.6499	5.3761	0.0000
USA	–0.0005	0.0165	–2.1302	26.8861	0.0000	0.0011	0.0118	0.0295	7.7800	0.0000	0.0000	0.0118	–0.0854	3.9642	0.0014

Table 3. ***Correlation Coefficients among Select Market Indices on Daily Log Returns for the Pre-COVID (N = 303) and During the COVID Period (N = 502)***

	India	Austr-alia	Brazil	Canada	China	France	Germ-any	Hong Kong	Indo-nesia	Ireland	Italy	Japan	Maur-itius	Mexico	Norway	S. Korea	Sweden	Switz-erland	Taiwan	UK	USA
India	1	0.347**	0.287**	0.402**	0.251**	0.507**	0.489**	0.453**	0.397**	0.354**	0.475**	0.451**	0.011	0.344**	0.420**	0.478**	0.497**	0.427**	0.451**	0.497**	0.404**
Australia	0.610**	1	0.215**	0.318**	0.217**	0.363**	0.332**	0.339**	0.239**	0.277**	0.296**	0.482**	0.038	0.272**	0.400**	0.468**	0.368**	0.315**	0.439**	0.373**	0.308**
Brazil	0.522**	0.660**	1	0.538**	0.157**	0.439**	0.415**	0.248**	0.164**	0.281**	0.385**	0.196**	0.042	0.473**	0.381**	0.228**	0.391**	0.326**	0.204**	0.404**	0.578**
Canada	0.578**	0.727**	0.840**	1	0.145**	0.578**	0.571**	0.312**	0.208**	0.372**	0.531**	0.268**	0.070	0.559**	0.514**	0.293**	0.588**	0.515**	0.271**	0.595**	0.822**
China	0.313**	0.377**	0.181**	0.266**	1	0.149**	0.136**	0.586**	0.244**	0.118**	0.095*	0.339**	0.036	0.136**	0.205**	0.411**	0.190**	0.134**	0.414**	0.160**	0.160**
France	0.573**	0.635**	0.696**	0.810**	0.324**	1	0.937**	0.367**	0.222**	0.567**	0.923**	0.352**	0.029	0.526**	0.680**	0.316**	0.876**	0.800**	0.268**	0.875**	0.666**
Germany	0.527**	0.609**	0.666**	0.791**	0.333**	0.963**	1	0.340**	0.200**	0.543**	0.914**	0.319**	0.025	0.496**	0.685**	0.297**	0.880**	0.813**	0.245**	0.832**	0.640**
Hong-Kong	0.547**	0.538**	0.359**	0.426**	0.597**	0.553**	0.546**	1	0.288**	0.244**	0.316**	0.479**	0.053	0.242**	0.383**	0.571**	0.347**	0.314**	0.494**	0.368**	0.316**
Indonesia	0.592**	0.502**	0.410**	0.391**	0.333**	0.438**	0.399**	0.487**	1	0.153**	0.185**	0.244**	–0.068	0.191**	0.222**	0.375**	0.239**	0.195**	0.330**	0.200**	0.277**
Ireland	0.441**	0.519**	0.586**	0.638**	0.226**	0.748**	0.719**	0.425**	0.346**	1	0.517**	0.180**	0.014	0.324**	0.406**	0.176**	0.576**	0.526**	0.191**	0.537**	0.400**
Italy	0.482**	0.577**	0.679**	0.811**	0.264**	0.902**	0.893**	0.451**	0.397**	0.704**	1	0.285**	0.035	0.494**	0.667**	0.240**	0.831**	0.772**	0.190**	0.826**	0.613**
Japan	0.245**	0.450**	0.259**	0.371**	0.408**	0.477**	0.517**	0.521**	0.336**	0.350**	0.383**	1	0.038	0.251**	0.347**	0.656**	0.363**	0.271**	0.552**	0.318**	0.309**
Mauritius	0.198**	0.281**	0.104	0.063	0.179**	0.136*	0.154**	0.253**	0.432**	0.071	0.088	0.298**	1	0.011	–0.039	–0.013	–0.028	0.006	0.048	0.023	0.081
Mexico	0.449**	0.461**	0.642**	0.640**	0.198**	0.615**	0.599**	0.375**	0.417**	0.497**	0.550**	0.293**	0.167**	1	0.422**	0.277**	0.486**	0.390**	0.238**	0.538**	0.584**
Norway	0.524**	0.599**	0.673**	0.750**	0.299**	0.835**	0.813**	0.464**	0.415**	0.695**	0.810**	0.407**	0.041	0.573**	1	0.317**	0.717**	0.595**	0.319**	0.681**	0.519**
S. Korea	0.547**	0.528**	0.308**	0.386**	0.420**	0.523**	0.534**	0.715**	0.563**	0.326**	0.393**	0.574**	0.394**	0.351**	0.392**	1	0.337**	0.260**	0.621**	0.331**	0.292**
Sweden	0.471**	0.569**	0.620**	0.755**	0.315**	0.882**	0.889**	0.483**	0.343**	0.681**	0.843**	0.450**	0.022	0.601**	0.840**	0.414**	1	0.804**	0.291**	0.813**	0.620**
Switz-erland	0.490**	0.550**	0.619**	0.765**	0.274**	0.859**	0.840**	0.429**	0.350**	0.690**	0.814**	0.410**	–0.002	0.576**	0.823**	0.357**	0.863**	1	0.233**	0.763**	0.527**
Taiwan	0.538**	0.486**	0.302**	0.320**	0.427**	0.477**	0.472**	0.694**	0.597**	0.294**	0.376**	0.537**	0.407**	0.311**	0.380**	0.780**	0.347**	0.291**	1	0.251**	0.275**
UK	0.546**	0.660**	0.698**	0.824**	0.313**	0.921**	0.900**	0.528**	0.433**	0.699**	0.850**	0.494**	0.138*	0.641**	0.831**	0.502**	0.873**	0.869**	0.428**	1	0.611**
USA	0.521**	0.686**	0.843**	0.925**	0.269**	0.803**	0.787**	0.444**	0.379**	0.634**	0.785**	0.363**	0.120*	0.660**	0.738**	0.387**	0.770**	0.742**	0.311**	0.812**	1

Note. ** Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

The left diagonal portion contains the correlation coefficients of the pre-COVID period, and the right diagonal portion denotes the during the COVID period.

Table 4. ***Correlation Coefficients among Select Market Indices on Daily Log Returns for the Pre-Covid (N = 303) and the Post-Covid Period (N = 330)***

	India	Austr-alia	Brazil	Canada	China	France	Germ-any	Hong-Kong	Indo-nesia	Ireland	Italy	Japan	Maur-itius	Mexico	Norway	S. Korea	Sweden	Switz-erland	Taiwan	UK	USA
India	1	0.429**	0.137*	0.255**	0.162**	0.387**	0.362**	0.282**	0.347**	0.302**	0.309**	0.447**	–0.034	0.189**	0.339**	0.435**	0.338**	0.335**	0.437**	0.359**	0.204**
Australia	0.610**	1	0.104	0.241**	0.263**	0.311**	0.290**	0.433**	0.279**	0.257**	0.217**	0.598**	0.025	0.224**	0.279**	0.615**	0.300**	0.314**	0.545**	0.300**	0.154**
Brazil	0.522**	0.660**	1	0.425**	0.031	0.227**	0.238**	0.100	0.060	0.145**	0.269**	0.144**	–0.036	0.356**	0.289**	0.096	0.204**	0.118*	0.065	0.252**	0.418**
Canada	0.578**	0.727**	0.840**	1	0.137*	0.651**	0.664**	0.141*	0.178**	0.448**	0.670**	0.209**	–0.022	0.529**	0.520**	0.197**	0.613**	0.563**	0.147**	0.626**	0.898**
China	0.313**	0.377**	0.181**	0.266**	1	0.136*	0.133*	0.655**	0.064	0.109*	0.102	0.185**	–0.015	0.131*	0.229**	0.335**	0.161**	0.081	0.329**	0.168**	0.086
France	0.573**	0.635**	0.696**	0.810**	0.324**	1	0.926**	0.207**	0.101	0.667**	0.887**	0.230**	–0.022	0.449**	0.579**	0.261**	0.815**	0.781**	0.186**	0.814**	0.616**
Germany	0.527**	0.609**	0.666**	0.791**	0.333**	0.963**	1	0.199**	0.078	0.652**	0.901**	0.226**	–0.028	0.431**	0.538**	0.245**	0.842**	0.746**	0.217**	0.789**	0.633**
Hong-Kong	0.547**	0.538**	0.359**	0.426**	0.597**	0.553**	0.546**	1	0.199**	0.163**	0.167**	0.301**	0.037	0.210**	0.257**	0.517**	0.181**	0.127*	0.472**	0.227**	0.100
Indonesia	0.592**	0.502**	0.410**	0.391**	0.333**	0.438**	0.399**	0.487**	1	0.064	0.103	0.272**	0.049	0.047	0.199**	0.322**	0.054	0.066	0.316**	0.095	0.133*
Ireland	0.441**	0.519**	0.586**	0.638**	0.226**	0.748**	0.719**	0.425**	0.346**	1	0.611**	0.196**	0.016	0.320**	0.364**	0.180**	0.596**	0.616**	0.122*	0.582**	0.419**
Italy	0.482**	0.577**	0.679**	0.811**	0.264**	0.902**	0.893**	0.451**	0.397**	0.704**	1	0.168**	–0.069	0.418**	0.622**	0.202**	0.745**	0.666**	0.174**	0.781**	0.616**
Japan	0.245**	0.450**	0.259**	0.371**	0.408**	0.477**	0.517**	0.521**	0.336**	0.350**	0.383**	1	0.052	0.140*	0.253**	0.561**	0.204**	0.215**	0.603**	0.237**	0.135*
Mauritius	0.198**	0.281**	0.104	0.063	0.179**	0.136*	0.154**	0.253**	0.432**	0.071	0.088	0.298**	1	–0.036	–0.108*	–0.007	–0.064	0.018	0.015	–0.030	–0.026
Mexico	0.449**	0.461**	0.642**	0.640**	0.198**	0.615**	0.599**	0.375**	0.417**	0.497**	0.550**	0.293**	0.167**	1	0.257**	0.223**	0.399**	0.375**	0.118*	0.388**	0.545**
Norway	0.524**	0.599**	0.673**	0.750**	0.299**	0.835**	0.813**	0.464**	0.415**	0.695**	0.810**	0.407**	0.041	0.573**	1	0.306**	0.531**	0.400**	0.290**	0.642**	0.403**
S. Korea	0.547**	0.528**	0.308**	0.386**	0.420**	0.523**	0.534**	0.715**	0.563**	0.326**	0.393**	0.574**	0.394**	0.351**	0.392**	1	0.196**	0.191**	0.706**	0.195**	0.145**
Sweden	0.471**	0.569**	0.620**	0.755**	0.315**	0.882**	0.889**	0.483**	0.343**	0.681**	0.843**	0.450**	0.022	0.601**	0.840**	0.414**	1	0.732**	0.186**	0.688**	0.560**
Switz-erland	0.490**	0.550**	0.619**	0.765**	0.274**	0.859**	0.840**	0.429**	0.350**	0.690**	0.814**	0.410**	–0.002	0.576**	0.823**	0.357**	0.863**	1	0.154**	0.724**	0.526**
Taiwan	0.538**	0.486**	0.302**	0.320**	0.427**	0.477**	0.472**	0.694**	0.597**	0.294**	0.376**	0.537**	0.407**	0.311**	0.380**	0.780**	0.347**	0.291**	1	0.225**	0.101
UK	0.546**	0.660**	0.698**	0.824**	0.313**	0.921**	0.900**	0.528**	0.433**	0.699**	0.850**	0.494**	0.138*	0.641**	0.831**	0.502**	0.873**	0.869**	0.428**	1	0.547**
USA	0.521**	0.686**	0.843**	0.925**	0.269**	0.803**	0.787**	0.444**	0.379**	0.634**	0.785**	0.363**	0.120*	0.660**	0.738**	0.387**	0.770**	0.742**	0.311**	0.812**	1

Note. ** Correlation is significant at the 0.01 level (2-tailed) based on the *p*-value.

* Correlation is significant at the 0.05 level (2-tailed) based on the *p*-value.

The left diagonal portion contains the correlation coefficients for the pre-COVID period, and the right diagonal portion denotes the post-COVID period.

prior to COVID-19, the Shanghai index for China had a high mean return of 0.03% and the tenth lowest level of volatility, at 1.27%. On the other hand, Mauritius has the lowest level of volatility (0.99%) but the greatest average negative return (–0.114%) of all these indices. India also reports a negative return (–0.11%), the third lowest return after Mauritius, and Switzerland with a level of volatility (1.51%), and Brazil is the highest volatile (2.28%) market and gives a negative return (–0.08%) in this period.

The Indian market index Nifty 50 has the highest return (0.16%) and the least volatility (1.29%); in contrast, Mauritius has the lowest volatility (0.78%) and increased its return (0.07%) over this time compared to the pre-COVID period. Brazil also maintains the highest volatility (1.53%) with a positive return (0.11%), and Hong Kong is the lowest return market (Mean –0.01%, S.D. 1.44%) in this period.

Mauritius maintains the lowest volatile market (0.31%) but provides a negative return (–0.03%), whereas Hong Kong market records a low return (–0.03%) with high volatility (1.74%). India becomes the third lowest volatile (0.85%) market with the fourth highest return (0.04%) in the post-COVID period. Japan reports the highest return (0.05%) with moderate volatility (1.07%) in this period.

The observation suggests that high- and low-return markets are evolving, with Japan emerging in the post-COVID era after China and India in the pre-COVID era. On the other hand, Mauritius was the lowest return market in the pre-COVID period and Hong Kong in both the COVID and post-COVID periods. Mauritius market is least volatile in three sub-periods, where Brazil is highly volatile in the pre-COVID and COVID periods and Hong Kong in the post-COVID period.

Tables 3 and 4 display the correlation matrix, which demonstrates a high linkage in return series between the markets before the COVID era. We have discovered that, in the pre-COVID era, 17 of the 20 markets had a moderate correlation with India, while only three—China, Japan, and Mauritius—had a poor correlation. Table 5 shows that from six in the COVID period to 15 in the post-COVID period (no association with Mauritius in these sub-periods), there has been a significant increase in the number of "weakly correlated markets with India." On the other hand, the number of "moderately correlated markets with India" decreased to four in the post-crisis period compared to 13 in the COVID crisis period. In comparison to both the pre-COVID and COVID periods, the degree of association between various countries and India declines throughout the COVID period and much more during the post-COVID period. This suggests that throughout consecutive study periods, the Indian market is getting less integrated with other economies, which encourages global investors to consider India as a profitable alternative for asset diversification.

Table 5. ***Correlation Co-Efficient Between India and Other Select Market Indices***

Country	Pre-Covid Period	LC	During Covid Period	LC	Post-Covid Period	LC	Changes in Pre-Covid and Covid Period	Changes in Covid and Post-Covid Period	Changes in Pre-Covid and Post-Covid Period
Australia	**0.610****	*Moderate*	**0.347****	**Weak**	**0.429****	*Moderate*	Decrease	***Increase***	Decrease
Brazil	**0.522****	*Moderate*	**0.287****	**Weak**	**0.137***	**Weak**	Decrease	Decrease	Decrease
Canada	**0.578****	*Moderate*	**0.402****	*Moderate*	**0.255****	**Weak**	Decrease	Decrease	Decrease
China	**0.313****	**Weak**	**0.251****	**Weak**	**0.162****	**Weak**	Decrease	Decrease	Decrease
France	**0.573****	*Moderate*	**0.507****	*Moderate*	**0.387****	**Weak**	Decrease	Decrease	Decrease
Germany	**0.527****	*Moderate*	**0.489****	*Moderate*	**0.362****	**Weak**	Decrease	Decrease	Decrease
HongKong	**0.547****	*Moderate*	**0.453****	*Moderate*	**0.282****	**Weak**	Decrease	Decrease	Decrease
Indonesia	**0.592****	*Moderate*	**0.397****	**Weak**	**0.347****	**Weak**	Decrease	Decrease	Decrease
Ireland	**0.441****	*Moderate*	**0.354****	**Weak**	**0.302****	**Weak**	Decrease	Decrease	Decrease
Italy	**0.482****	*Moderate*	**0.475****	*Moderate*	**0.309****	**Weak**	Decrease	Decrease	Decrease

Japan	**0.245****	**Weak**	**0.451****	*Moderate*	**0.447****	*Moderate*	***Increase***	Decrease	***Increase***
Mauritius	**0.198****	**Weak**	**0.011**	***N.C.***	**–0.034**	***N.C.***	Decrease	Decrease	Decrease
Mexico	**0.449****	*Moderate*	**0.344****	**Weak**	**0.189****	**Weak**	Decrease	Decrease	Decrease
Norway	**0.524****	*Moderate*	**0.420****	*Moderate*	**0.339****	**Weak**	Decrease	Decrease	Decrease
S. Korea	**0.547****	*Moderate*	**0.478****	*Moderate*	**0.435****	*Moderate*	Decrease	Decrease	Decrease
Sweden	**0.471****	*Moderate*	**0.497****	*Moderate*	**0.338****	**Weak**	***Increase***	Decrease	Decrease
Switzerland	**0.490****	*Moderate*	**0.427****	*Moderate*	**0.335****	**Weak**	Decrease	Decrease	Decrease
Taiwan	**0.538****	*Moderate*	**0.451****	*Moderate*	**0.437****	*Moderate*	Decrease	Decrease	Decrease
UK	**0.546****	*Moderate*	**0.497****	*Moderate*	**0.359****	**Weak**	Decrease	Decrease	Decrease
USA	**0.521****	*Moderate*	**0.404****	*Moderate*	**0.204****	**Weak**	Decrease	Decrease	Decrease

Note. ** Correlation is significant at the 0.01 level (2-tailed) & * Correlation is significant at the 0.05 level (2-tailed) based on the *p*-value.

LC = Level of Correlation (Weak, Moderate, & Strong). NC = No Correlation (Statistically Insignificant).

Table 6. ***Correlation Co-Efficient and MA of FPI under AUC of Seven Countries from Top 10 FPI in India***

Country	Pre-COVID Period (Jan 2019–Mar 2020)		COVID Period (April 2020–Mar 2022)		Post-COVID Period (April 2022–July 2023)	
	CC	***MA of FPI (In Crore)***	***CC***	***MA of FPI (In Crore)***	**CC**	***MA of FPI (In Crore)***
USA	0.521**	10,18,574	0.404**	14,63,200	0.204**	19,22,265
Mauritius	0.198**	3,85,493	0.011	4,28,933	–0.034	3,77,226
UK	0.546**	1,49,038	0.497**	2,20,570	0.359**	2,58,904
Ireland	0.441**	1,10,538	0.354**	1,78,670	0.302**	2,34,991
Canda	0.578**	94,229	0.402**	1,23,506	0.255**	1,34,107
Japan	0.245**	89,518	0.451**	98,115	0.447**	1,09,686
Norway	0.524**	64,666	0.420**	99,344	0.339**	1,43,494

Note. ** Correlation is significant at the 0.01 level (2-tailed) & * Correlation is significant at the 0.05 level (2-tailed) based on the *p*-value

CC = Correlation Co-efficient. MA = Monthly Average of FPI (FPIs include FIIs, Sub Accounts, & QFIs). [FPI AUCSource: DDPs, CDSL].

Table 6 shows the monthly country-wise FPI (AUC) investment in India as well as the correlation coefficient between other markets and India. The table delineates that a decline in the degree of correlation influences the increment of the monthly average of FPI (AUC) investment for five markets (USA, Ireland, UK, Canada, and Norway). Japan and Mauritius, to some extent, contradict this assumption. There is an increase in the monthly average of FPI (AUC) investment in sub-periods despite the correlation coefficient between India and Japan rising. On the other hand, the monthly average of FPI (AUC) investment rises when the level of integration between India and Mauritius declines during the COVID period.

Nevertheless, it falls short in the post-COVID era. To identify the variables (macro variables, governmental policies, exchange rates, FD rates, etc.) causing these two markets' disparate outcomes, more research is required (Japan and Mauritius). This portrays that international investors are seriously considering the Indian market as a favorable destination for cross-border asset allocation.

Conclusion

The result of the correlation test on the daily log return series between India and the other 20 market indices of developed and developing countries reveals that India is maintaining a low correlation with most of the select markets (no relation with Mauritius) after the COVID period. A decrement in correlation acts as an attractive factor to the international investor for better diversification opportunities with the expectation of fair return. We have also found that the subsequent decrease in correlations of India with other countries leads to higher allocation of cross-border funds by most of the countries (Canada, Norway, Ireland, UK, USA). There may be some other influencing factors to the observed contradictory results in the case of Japan and Mauritius. It needs a thorough and careful examination which is beyond the scope of this paper. The results obtained grossly indicate that there is a decreasing level of integration with the Indian market over the study periods, which is contradicted by many research findings (Chiang et al., 2007; Gupta & Guidi, 2012; Jang & Sul, 2002; Kearney & Lucey, 2004; Lau & McInish, 1993; Lee & Kim, 1993) but supported by few findings (Nath & Verma, 2003; Palamalai et al., 2013; Patel & Patel, 2012b; Ray et al., 2012). It can be concluded that low correlation provides better diversification benefits and continuous increment in FII investment in India indicating that India is becoming a good option for international diversification destination for the world.

Authors' Contribution

The concept came from Dr. Joy Sarkar, who compiled and categorized relevant research articles from widely read publications in order to create this study. In cooperation with Dr. Joy Sarkar, Mr. Raju Paul gathered pertinent data from many reputable websites, analyzed the data using SPSS 22 (student version) and EView 10 (student version), and penned the book.

Conflict of Interest

The authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

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About the Authors

Dr. Joy Sarkar is an Assistant Professor in the Department of Commerce, University of North Bengal. His specialization is in Accounting and Finance. He has presented papers at different national and international seminars and also has articles in various journals of good repute.

Mr. Raju Paul is a Research Scholar and is currently pursuing his Ph.D. at the University of North Bengal. He is also a UGC Senior Research Fellow.