

An Empirical Study on Movement of Stock Market of BRIC Economies- Are they Co-Integrated?

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Abstract

The major objective of this article is to assist the BRICS nations' foreign investment decision-making process, as well as the creation or changes in policies by these nations' characteristics. The context is crucial for foreign investors considering diversification advantages internationally, as well as policymakers responding to the aforesaid economies' growth. This study examines the interconnections between the stock indexes of the BRIC economies. The goal of the research is to look at the long-term link between stock market indexes. From January 2010 to December 2020, the researcher utilized the index's monthly closing price. To get the ADF at the first-order difference, all of the data is utilized in its raw form. The co-integration method is employed to determine the connection between stock indexes. The causal influence on stock market indices is studied using Granger causality. The sample considers countries such as Brazil, Russia, India, and China. The goal of the research is to look at the long-term link between stock market indexes. It is found that Sensex has the highest return among others, followed by SHCOMP, MOEX and BOVESPA. It is also found that the standard deviation of MOEX is high, followed by SENSEX, SHCOMP and BOVESPA. From the causality analysis, it is found Bi-directional relationship between India and China stock market. Whereas in the case of the other two markets, i.e., Brazil and Russia, the relationship with the Indian stock market are neither Uni-directional nor Bi-directional.

Keywords: ADF test, BRIC, Granger causality, Johansen co-integration test

Introduction

Foreign and local investors now have more chances because of globalization and trade liberalization. Foreign inflows to the home country have been facilitated by international liberalization. The elimination of barriers has resulted in the internationalisation of products and services for foreigners. The present international financial markets have become increasingly integrated as a result of greater economic interdependence. Over time, they are highly linked and interwoven. In addition, international investors can now invest in the common stock exchanges. Several investors were able to increase their fortune by searching for new investment possibilities across the world. Investors and regulators will find it simple to comprehend information about the international stock system to make financial decisions regarding future investments and risk assessment. The fact of poor yields from various financial markets has regularly been cited to support portfolio international diversification. Return improvement is another motivation for investors to explore global investments. The returns on securities issued by nations with greater rates of growth are projected to be better. As a result, both individual and institutional investors sought to diversify their exposure by investing globally. Before liberalization, investors were unable to participate in the world's well-developed equities markets. Investors may now get an edge by trading in emerging and well-developed equities markets all around the world.

Deregulation allowed funds to be put in global markets, but it also led overseas markets to lead and lag one another. The major objective of this article is to assist the BRICS nations' foreign investment decision-making process, as well as the creation or changes in policies by these nations' characteristics. The context is crucial for foreign investors considering diversification advantages internationally, as well as policymakers responding to the aforesaid economies' growth. The goal of this research is to determine the movements of the stock markets in the BRIC countries. The author chose four stock markets from the BRIC economies for this reason. Brazil, Russia, India, and China are among them. This research will look into the stock market integration of the BRIC economies.

Literature Review

In his study of the integration of developed and developing markets, Korajczyk (1996) found that market segmentation is higher in emerging markets than in advanced economies. The outcome is that established country stock exchanges are better integrated than developing market stock exchanges. Sharma et al. (2013) investigate the interrelationships between the BRIC stock indexes and discover that the stock exchanges of Brazil, Russia, India, and China are all impacted by one another. Dasgupta (2014) also discovers that among the selected indices from Brazil, Russia, India, and China (BRIC), one cointegrating vector exists, indicating a short-term bidirectional Granger link between the Indian and Brazilian financial markets. The Chinese market is also revealed to be a key driver for the Brazilian market, and the Brazilian market, in turn, is a driving force for the Russian market. Finally, he thinks that India is the most important of the four markets, as it has a significant influence on both the Brazilian and Russian economies. Naidu and colleagues (2014) the interaction between the BRIC nations from 1997 to 2014 and found little evidence of integration. They then repeat the process for the years 2009 through 2014. The findings suggest cointegration between the nations. However, the outcome may vary based on the period used. Jitin & Jitender (2011), on the other hand, conclude that stock prices in BRIC countries are moving in lockstep, which both validates and contradicts Naidu et al. findings (2014).

Singh and Kaur (2016) split their data sample into two halves, the first covering the years 2004-2013 and the second covering the years 2007-2013. They discover no BRIC co-movements in any of the samples. Still, pairwise co-movements between Brazil, Russia, and China are found when India is excluded during the economic meltdown and the years that ensue. Mohammad and Velmurugan (2017) establish that the BRICS nations have a one-way cause-and-effect connection and no long-term links between them. This is supported by Jegadeeshwaran and Sangeetha (2018), who find that some, but not all, of the BRICS markets, have a unidirectional connection. This means that investors may diversify their portfolios by including some of the BRICS countries in their portfolios. The findings of these studies provide insight into this set of stock exchanges and how they could be suitable for a multi-national, mixed long-term investment.

Objectives of the Study

- To explore the long-run association ship among the selected Asian countries.
- To examine the causal relationship between the stock indices.

Research Methodology

The BRIC nation's stock indexes are included in Table 1. The study includes the daily closing price of the indexes, which include 132 data from January 2010 to December 2020. Monthly data are used to establish the link between the stock markets of the BRIC nations and the researcher has utilized in the current study descriptive statistics, the VAR model, Johansen co-integration and Granger causality.

Table 1: Representation of Stock Market and their Indices of BRIC Economies

Countries	Stock markets	Indices
Brazil	São Paulo Stock Exchange	BOVESPA
Russia	Moscow Exchange	MOEX
India	Bombay Stock Exchange	SENSEX
China	Shanghai Stock Exchange	SHCOMP

Source: Compiled by Author

Data Analysis and Interpretation**Table 2: Descriptive Statistics of Stock Indices Returns**

Indices Name	Mean	Maximum	Minimum	S.D.	JB Value	Probability
BOVESPA	0.00103	0.1031	-0.09407	0.01440	03160.39	0
MOEX	0.00036	0.1129	-0.40961	0.01976	70061.01	0
SENSEX	0.00086	0.1944	-0.13793	0.01869	71130.19	0
SHCOMP	0.00028	0.1703	-0.12763	0.01533	2151.10	0

Source: Author's calculation

Descriptive statistics is carried out to examine the behavior of the stock returns of the selected stock market. It analyzes the mean, range, standard deviation, skewness and kurtosis—table analyses the stock market indices of four countries. Among the selected stock market indices, all the stock market has the positive mean value. It shows all markets give positive returns to the investors. The SENSEX represents the maximum daily return of 19.44 percent, followed by SHCOMP 17.03, MOEX 11.29, and BOVESPA 10.31 Percent, respectively. The maximum daily standard deviation of MOEX is 1.97 percent.

The researcher has used different equity market data for the study. The researcher to test the stationary of the data. Here they used two tests for analyzing the stationery, such as Phillip.

Perron test. The PP test has been applied to know about the stationary of different equity markets. The results are presented in Table 3.

Table 3: Stationarity Test of Stock Returns of BRIC Indices

Indices	PP Test at level		PP Test at 1st Difference	
	t-Value	P-Value	t-Value	P-Value
BOVESPA	0.4884	0.9864	-43.8455*	0*
MOEX	-2.079	0.2533	-46.8397*	0.0001*
SENSEX	-1.237	0.6602	-48.0381*	0.0001*
SHCOMP	-1.66	0.4515	-48.8842*	0.0001*
Critical Values			1%	-3.432
			5%	-2.862
			10%	-2.567

Source: Author's Calculation

Table 3 explains the stationarity of the data at the level and first difference. All the data are non-stationary at a level with intercept in both tests. The researcher is taking the first difference to make data non-stationary to stationary. However, after first-order difference with intercept, the data are stationary at 1,5 and 10 percent significance level in the PP test.

Table 4: VAR Analysis

Lag	Log L	LR	FPE	AIC	SC	HQ
0	-172185	NA	3.20E+49	142.3691	142.393	142.3778
1	-115867	112124.1	2.09E+29	95.88863	96.15197*	95.9844
2	-115643	445.6565	1.88E+29	95.78547	96.28821	95.96829
3	-115545	191.7334	1.89E+29*	95.78786*	96.53	96.05778*
4	-115476	137.1453	1.93E+29	95.81286	96.79441	96.16981
5	-115415	118.7358	2.00E+29	95.8454	97.06634	96.2894
6	-115356	114.5527	2.07E+29	95.8795	97.33984	96.41056

Source: Author's Calculation

Table 4 presents the result of the VAR lag order selection criteria. The VAR statistics confirm the Schwarz and Akaike information criterion significance at lag three, which confirms that it is the suitable lag value to test the co-integration among

the stock indices of BRIC economies.

The number of co-integration relationships among the underlying variables is examined by the Johansen and Juselius test. The Johansen and Juselius co-integration test was used to exploring

the long-run association ship between the selected equity markets indices. These analyses have the two tests, i.e., Trace test and Maximum Eigenvalue test, presented in Table 5.

Table 5: Relationship of BRIC Economies stock market in the Long-Run

Hypothesized CEs	Trace Test			Maximum Eigenvalue Test			
	Eigenvalue	Statistic	Critical Values	P-Value**	Statistics	Critical Values	P-Value**
None *	0.225257	4330.941	197.3709	0.0001	617.8967	58.43354	0.0001
At most 1 *	0.208641	3713.044	159.5297	0.0001	566.5214	52.36261	0.0001
At most 2 *	0.19867	3146.523	125.6154	0.0001	536.2087	46.23142	0.0001
At most 3 *	0.186447	2610.314	95.75366	0.0001	499.5598	40.07757	0.0001
At most 4 *	0.182879	2110.754	69.81889	0.0001	488.9637	33.87687	0.0001
At most 5 *	0.17123	1621.791	47.85613	0.0001	454.6937	27.58434	0.0001
At most 6 *	0.158934	1167.097	29.79707	0.0001	419.0383	21.13162	0.0001

Source: Author's Calculation

Table 5 shows the result of the long-run equilibrium relationship between the Sensex and MOEX, SHCOMP and BOVESPA. The Trace test and Maximum Eigenvalue test confirms that the Asian continent stock exchange indices have a long-run relationship with the Sensex index. It was statistically proved by the Trace test and Maximum Eigenvalue P-values.

The Granger causality test is used to determine the unidirectional and bidirectional causal flow between the equity stock market indices. Granger causality test is followed for determining and forecasting the one market to another market. It tells about the casual flow between the variables. Table 7 presents the analyses of the Granger causality test between the selected variables of the study.

Table 6: Causal relationship analysis of BRIC economies stock market

Null Hypothesis	F-Statistic	Prob.
BOVESPA does not Granger Cause SENSEX	0.4123	0.2105
SENSEX does not Granger Cause BOVEPSA	11.0091	0.5900
MOEX does not Granger Cause SENSEX	1.90019	0.0829

SENSEX does not Granger Cause MOEX	9.91880	0.1022
SHCOMP does not Granger Cause SENSEX	1.74201	0.0017
SENSEX does not Granger Cause SHCOMP	20.3110	0.0153

Source: Author's Calculation

As per the analysis found in Table-6, it is clear that in the case of BOVESPA and MOEX, the causality between these two-stock markets with SENSEX does not exist. Both Brazil stock market and Russian stock market do not granger cause Sensex as well, as SENSEX does not granger cause both of them. There is neither a Bi-directional nor Un-directional relationship found with SENSEX. However, in the case of SHCOMP, it is a granger cause the SENSEX and Vice-Versa. This means there is a Bi-directional relation found between the Indian and China stock market during the study period.

Conclusion

This study observed the co-integration of BRIC economies by undertaking the monthly data set for ten years from January 2010 to December 2020. From the descriptive statistic, it is found that Sensex has the highest return among others, followed by SHCOMP, MOEX and BOVEPSA. It is also found that the standard deviation of MOEX is high,

followed by SENSEX, SHCOMP, and BOVEPSA. From the causality analysis, it is found Bi-directional relationship between India and China stock market. Any economic change was happening in one country affects both country's markets either positively or negatively. So, this is a good condition for the global investors (FDI & FII) and Domestic investors for investing their investments in India because of the market returns. Whereas in the case of the other two markets, i.e., Brazil and Russia, the relationship with the Indian stock market are neither Uni-directional nor Bi-directional. This research is relevant for policymakers in responding to increasing financial interactions across borders. The findings of this research are contradicted by Sharma et al. (2013), who have found that BRICS stock markets are not closely interlinked, implying diversification opportunities for the investors. In this study, a Bi-directional relationship between India and China is detected.

Similarly, the results are partially contradicted the results of (Berzanna, 2017) who found no relation among the BRIC economies. Still, in the results, the relationship between India and China is significant. The value of this research for the government agencies is that the economic dynamics and political changes of China followed by India must be reacted on the short-term period when dealing with policy responses regarding the other BRICS countries in special, and thus, the emerging countries in general.

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