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An Empirical Study on The Stock Market Movements of BRICS Economies

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ABSTRACT

The study is designed to analyze the stock market movement of BRICS nations. Stock market indices act as a barometer for the economy.Any kind of volatility in one economy will have a cascading impact on other economies due to international trade relations. This study intends to analyze the trends and patterns of select stock market indices, their association with each other in long term as well as short term and also to examine the factors that influence the stock market movements. Daily data from 1st April 2013 to 31st March 2018 is used in the following study. Augmented Dickey Fuller test, Johansen Co-integration test and Wald's test have been used for the purpose of the study. The result of Augmented Dickey Fuller test is showing Stationary among various stock market indices of various BRICS nations. The present study also indicates how these stock market indices are co-integrated with each other. The findings of the study shows that there exists no long term association between BRICS and only short term association exist.

KEYWORDS: Trends, patterns, volatility, association, stock market movements

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INTRODUCTION

BRICS is the acronym for an association of five major emerging economies: **Brazil, Russia, India, China** and **South Africa**. In the recent years, developing countries have increasingly emerged as regional and global growth engines, reflecting higher growth in economic activity and trade, as compared to the developed economies[1]. The study on BRICS economies has attracted the attention of policy makers, practitioners and academics. The reason is the rapid global growth and market boom in emerging markets. BRICS is considered to be the fastest growing economies in world due to which investors are eyeing on investing in emerging economies rather than developed economies. These 5 global powers are incrementally increasing their global engagements. Brazil, Russia, India, China and South Africa (BRICS) – the five emerging global powers from the continents of Asia, Africa and Latin America – are incrementally increasing their global engagements. Even in the G-20 forum, BRICS are playing a key role in shaping macroeconomic policy after the recent financial crisis. The group of these five nations occupies 40 per cent of global population, 30 per cent of the land mass and nearly 25 per cent of the GDP in PPP terms[2]. According to an estimate by Goldman Sachs, the original four BRIC countries are expected to represent 47 per cent of the global GDP by 2050, which would dramatically change the list of world's 10 largest economies. Stock market plays a key role in the growth and development of any economy. Hence it becomes pertinent here to study the stock market movements of BRICS.

Table No.1: BRICS Countries and their Indices

Sr. No.	Country	Region	Stock Exchange	Index Selected	Abbrn. Used
1.	Brazil	South America	BM & FBOVESPA	BOVESPA Index	BOVESPA
2.	Russia	Europe	Moscow Interbank Currency Exchange	MICEX Index	MICEX
3.	India	Asia	Bombay Stock Exchange	Sensex	Sensex
4.	China	Asia	Shanghai Stock Exchange	SSE composite	SSE
5.	South Africa	Africa	Johannesburg Stock Exchange	FTSE/JSE Index	FTSE/JSE

LITERATURE REVIEW

Venkatesh[3]has studied on the trends, similarities, different patterns and movement of Brics economies. Kumar[4] has established a causality relationship among various stock market indices and has shown that the indices are co-integrated with each other. Nashier[5] examined the integration of BRICS with US and UK stock markets. The results of this study will affect the policyholder in response to financial interactions across the border. Tripathi & Kumar[6]studies the long term

relationship between inflation and stock market performance of BRICS using panel data from 2000 to 2013. This study examines any long-term relationship and co-integration between stock index values and inflation rates. There may be a short-term relationship between inflation and equity revenues. In this context, correlation has a negative relationship between the stock index and inflation rates for Russia and has a positive relationship with India and China.

Naidu & Subbarayudu[7] suggests that BRICS' economies stock market movements affect other European markets. Kishor & Singh[8] has analysed the stock return volatility effect of BRICS nations. Data has been taken from 2007 to 2013which also include the 2008 financial crisis year and it has various impact on emerging nations of the world. To study the volatility of stock market it has used GARCH model. And also has effect of US media news in BRICS. If any news comes from US it has an effect on S&P 500 as well as return generated by the BRICS Economics. The study has found that BRICS stock market Except Brazil and China stock indices have been affected by the news of US stock market. This study is important to foreign and domestic institutional investors. Gambhir & Bhandari[9]mainly focused on understanding the relationship of BRIC nations and provides information that is related to the stock market co-integrations to the investors. To understand the relationship of various stock indices the data which is used as time series data and various tools to analysis the results like Augmented Dickey and Fuller test, Phillips-Perron Unit root test method. To evaluating the long term relationship among the stock markets co-integration test has been used. The findings of the study shows that interdependency exists among the stock market which is increasing over and period of time and no clear direction of relationship exists. Bhatia &Binny[10]studies volatility in the Indian and China markets and evaluates the interconnection between the markets. Stock Market Indexes for India and SSE to China were used to study BSE Sensex from April 2004 to March 2012. To pinpoint about the volatility between India and China is examined by applying Granger causality test and the results has come that volatility is highest in year 2008 in the both countries but Indian market has more volatile than china's market and returns were more than china's stock market.

Kishor & Singh[2] took up this study study to establish relationship and linkages among BRICS economics and also found the effect of one stock index of one country on the other countries stock indices. The causes and effect relationship among various indices are founded by the ADF, Unit root test and Granger Causality. So the study shows that there is a significant and positive correlation among Nifty and other BRICS indices. And no long term relationship was founded among Nifty and other stock indices. Anbarasu & Selvaraju[11]analyzes the performance of the stock market movement on the secondary platform. Several indices are selected to study the BOVESPA of Brazil, MICEX for Russia, BSE for India, HKEx for Hong Kong and South Africa to study the stock movement,

such as the JSE, on BRICS Stock Exchange. Historical data has been taken to study share market prices from 2013 to 2014 and tools used to analyze stock prices Descriptive Statistics, ADF Unit Root Examination and Corelogram Analysis. Wang et al[12]investigate the impact of the US stock market on the co-movements among the BRIC stock markets using conditional Granger causality. The findings show that this study has important role for the investors and policymakers.

Gupta[13] focused on the formation of dependence between the emerging stock markets of BRIC countries. This study aims to provide a better theoretical approach to the BRICS countries' stock market and to find out which countries are more affiliated with the prices between India and other countries in BRICS. Various tools are used to evaluate data on stock indices - the Shapiro Wilx W test, which has found the relationship between BRICS countries using BRICS using the generality of data testing and BRICS.Kiranmai[14]established the relationship of the stock market among BRICS economics and the volatility on the markets. To study the stock indices, study consists a period of 13 years data from 2004 to 2016 and secondary sourced has been used to study. Various statistical tools like correlation, Regression and ANOVA have been used to found the results.Hsing[15]found that South African stock market indices were positively influenced by the GDP growth rate. Macro-economic variables like GDP, money supply and its impact on the US stock market were studied. Nasr et al[16]found that positive and negative rating changes in some BRICS countries have some major implications for both the markets. Any negative changes in risk rating have higher impact on stock market movement and returns. It clearly suggest that not all BRICS nations have same effect of how they react to ratings changes and how they interact with global market indicators so it has different view for individuals and institutes.

OBJECTIVES& RESEARCH METHODOLOGY

This study intends to analyze the trends and patterns of select stock market indices, their association with each other in long term as well as short term and also to examine the factors that influence the stock market movements. The other objectives include the study of stationary of the data and also to analyze the movement of BSE – Sensex with other indices of BRICS nations. Purposive sampling technique is adopted for the selection of samples. The Sample size consist of 5 countries stock market indices of BRICS nations. That is IBOVESPA, MICEX, BSE SENSEX, SSE and FTSE/JSE .The sample period consists of last 5 years daily data from 1st April 2013 to 31st March 2018.The data is mainly sourced from secondary source from websites like yahoo finance, investing.com, and various international and national journals. Since the data is time series in nature, the statistical package e-views has been used for conducting various tests like Augmented Dickey Fuller test, Johansen Co-integration test and Wald's test.

Johansen Co-integration Test

H_0: There is no long term association among the indices selected for the study.

H_1: There is long term association among the indices selected for the study.

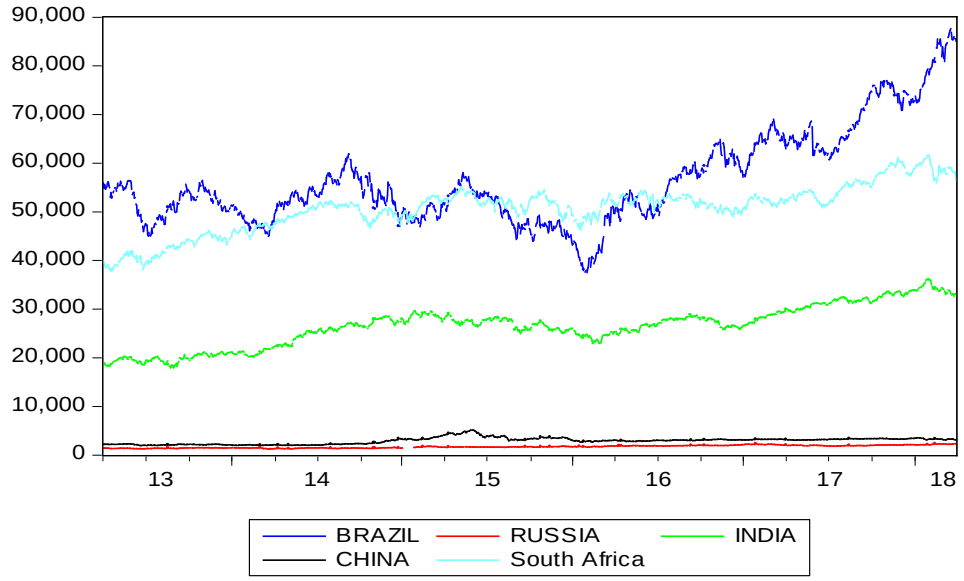
Wald's Test

H_0: There is no short term causality of various indices on BSE.

H_1: There is short term causality of various indices on BSE.

The complete data set is from 2013 to 2018 represent the BRICS nation stock market movement graph. This is shown below.

Figure No. 1: Stock Market Movement of BRICS Nations (2013-2018)



Augmented Dickey-Fuller Test:

ADF is conducted to check the stationarity of the data. For all the 5 indices of BRICS nations' stationarity of the data is checked and then the co-integration test is conducted.

In time series statistical analyses one of the features of processes evolving through time causing problems in inference is known as a Unit root. If 1 is a root of any linear stochastic process then its' called unit root and it will be non-stationary. ADF t-statistic is used to make the time series data stationary or non-stationary. The variance and mean are fluctuating when a time series is non-stationary.

$$\Delta X_t = \alpha + \beta t + (\rho - 1)X_{t-1} + \sum_{i=1}^{k-1} \varphi_i \Delta X_{t-i} + \varepsilon_t$$

Where: **t** is the time index,

α is an intercept constant called a drift,

β is the coefficient on a time trend,

γ is the coefficient presenting process root, i.e. the focus of testing,

p is the lag order of the first-differences autoregressive process,

$\mathbf{e_t}$ is an independent identically distributes residual term.

$\mathbf{Y_1}$, $\mathbf{Y_2}$… Y_N will have unit root when the coefficient **γ** is zero

Augmented Dickey- Fuller test or Unit Root Test: Following are some data which shows the results such as unit root exists for BRICS nations or Unit root does not exist for BRICS nations.

Table No.2: Unit Root Test for BRICS

Country	Level				1st Difference			
	Intercept		Trend & Intercept		Intercept		Trend & Intercept	
	t-Statistic	Prob	t-Statistic	Prob	t-Statistic	Prob	t-Statistic	Prob
Brazil	-0.053818	0.9523	-1.582158	0.7998	-35.67095	0.000	-35.72464	0.000
Russia	-0.334191	0.9173	-3.228533	0.0793	-32.90573	0.000	-32.90852	0.000
India	-1.308817	0.6274	-2.168220	0.5064	-17.87764	0.000	-17.87363	0.000
China	-1.932832	0.3172	-2.121681	0.5326	-7.076612	0.000	-7.088529	0.000
South Africa	-2.205232	0.2046	-3.327253	0.0623	-25.70738	0.000	-25.70860	0.000

Augmented Dickey-Fuller or unit root test helps to find out whether data is stationarity or the data is of non-stationarity in nature. This is the first step in time series analysis to check the stationarity of the time series data. The hypothesis is set to test the existence or non- existence of unit root for BRICS countries. Augmented Dickey fuller has been used in the following study. Initially the indices are test for the presence of unite root using ADF test. The lag truncation parameter is based on Akaike Info Criterion with a lag length of 4 was applied for the test on a confidence level of 5%. The result shows that at 'intercept' and 'trend & intercept' none of the indices are significant to reject the null hypothesis. Hence the data is stationary in nature and a unit root does not exist.

After this step test has conducted on the first difference, and indices are taken or revised series is tested for the presence of the unit root again using ADF test. From the calculation it is seen that the 'intercept' and 'trend & intercept' values are significant to reject the null hypothesis. ADF

statistics for the Brazil stock return (-35.67095), Russian stock return (-32.90852), Indian stock return (-17.87764), china stock exchange (-7.076612) and South African stock return (-28.70738) Hence the null hypothesis is rejected. It can be concluded that the indices are non-stationary at level i.e. unit root exists and unit root does not exist at 1st difference indicating that the data becomes stationary. This makes the indices an ideal candidate for co integration testing.

Johansen Co-integration Test:

Having all the time series integrated of the same order, the Johansen co-integration test is applied to know the nature of the integration among the stock indices. Johansen test is conducted on BRICS data from 2013 to 2018. This test is very sensitive to lag length criteria. And this method suggests two tests one is trace test and another is maximum Eigen value test. Johansen test hypothesis shows whether there is long term association among the BRICS or no long term association among the BRICS nations'.

Johansen Co-integration Test for BRICS:

Following data shows the Johansen test results which are drive from the BRICS nation's stock market indices.

Sample (adjusted): 4/01/2013 3/28/2018

Included observations: 1098 after adjustments

Trend assumption: Linear deterministic trend

Series: BRAZIL RUSSIA INDIA CHINA SOUTH_AFRICA

Lags interval (in first differences): 1 to 4

Unrestricted Co-integration Rank Test (Trace)

Hypothesized		**Trace**	**0.05**	
No. of CE(s)	**Eigen value**	**Statistic**	**Critical Value**	**Prob.****
None	0.020817	50.48462	69.81889	0.6166
At most 1	0.013458	27.38674	47.85613	0.8392
At most 2	0.006648	12.50940	29.79707	0.9127
At most 3	0.004711	5.185470	15.49471	0.7888
At most 4	7.55E-07	0.000829	3.841466	0.9781

Trace test indicates no co-integration at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug - Michelis (1999) p-values

From the above table, it is clear that there is no co integrating equations at 5% level of significance. The 'p' value is greater than 5% and hence the null hypothesis is accepted stating that there is no long term association between the indices selected for the study.

Wald Test:

Dependent Variable: INDIA

Method: Least Squares

Sample: 4/01/2013 3/28/2018

Included observations: 1196

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-11833.80	447.2270	-26.46038	0.0000
BRAZIL	0.109452	0.006004	18.23040	0.0000
RUSSIA	0.419529	0.242542	1.729714	0.0839
CHINA	1.010571	0.086810	11.64115	0.0000
SOUTH_AFRICA	0.561326	0.014474	38.78098	0.0000
R-squared	0.893409	Mean dependent var		26479.52
Adjusted R-squared	0.893051	S.D. dependent var		4192.229
S.E. of regression	1370.990	Akaike info criterion		17.28863
Sum squared resid	2.24E+09	Schwarz criterion		17.30989
Log likelihood	-10333.60	Hannan-Quinn criter.		17.29664
F-statistic	2495.625	Durbin-Watson stat		0.065711
Prob(F-statistic)	0.000000			

Above table has been used to calculate the Wald test that shows short term causality among the selected indices. In the Wald test INDIA is dependent variable and others are independent variables. From the above table, it is clear that there exists short term causality among the BRICS indices at 5% level of significance. The 'p' value is less than 5% and hence the null hypothesis is rejected stating that there is short term causality of the selected indices on BSE

CONCLUSION

From the analysis it can be found that there is an upward movement of indices of Brazil, India and South Africa. For the rest of the two indices that is, Russia and China the trend is almost stagnant. Johansen's co-integration test is used to study the long term association of BRICS nation and found that BRICS nations does not have any long term association except South Africa and India between 1st April 2013 to 31St march 2018.Furthermore the findings of the study concluded that BRICS nations have Short term causality between 1st April 2013 to 31st March 2018. Policy makers, institutional and retail investors can benefit from the above observations.

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