Spillover Effect Due To Macroeconomic Variables: Evidence From Volatility In BRICS Nations

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ARTICLE INFO	ABSTRACT
	The volatility driven by transitions in macroeconomic conditions presents a strong chance for quick gains. Since macroeconomic factors have a consistent knock on stock market returns, it is crucial to comprehend how the two are related to one another[1]. However, risk-averse investors should always use a long-term investing strategy because stock markets have a history of offering superior returns over the long run. This paper aims to study the GDP, FDI, Inflation, and money supply and their impact on the volatility in the BRICS nations. For analysis, the VECM and VAR models are prepared. The models state relationship among the GDP, FDI, Inflation, and money supply and Stock markets of Brazil, Russia, India, and China. However, in the case of South Africa, these economic variables have a dynamic correlation with its stock market index as is depicted through the VAR Model. **KEYWORDS:** GDP, INFLATION, FDI, MONEY SUPPLY, BRICS, VECM, VAR

1. INTRODUCTION

Global financial markets have made significant progress thanks to innovation and stock market expansion. An essential route for raising money for the economy and promoting growth is the stock market. The economy might be exposed to dangers as a result, though. Due to financial crises, the globe has seen some equity market collapses as well as very volatile equity market returns, like the financial crises in Asia during 1997-1998 and also the financial crises of 1007-2008. Such crashes result in lower company profitability, and a rise in business bankruptcies has a significant negative influence on economic expansion. Academics and practitioners have looked at the factors that affect stock returns in addition to other worries about the stock market's expansive range.

The unfavorable developments occurring in macroeconomic fundamentals are more likely to hurt emerging markets. The developed markets, however, may be able to withstand the dangers arising from macroeconomic factors.

Early in the 1990s, globalization was largely recognized, and the connections between international financial markets with emerging economies were initiated. Even though the economic situation of emerging economies like India was at its worst before the 1990s. The License Raj and the Gulf War were the major factors that were responsible for the bad financial status of the Indian economy. Moreover, the forex reserves were at the urge of getting finished. Banking economic reforms pave the way for the development of the economy. The doors opened and trade relations with other countries were established. However, there are always two sides to any event. It was a positive situation in a way but then due to this the volatility in the macroeconomic variables and stock markets increased. The impact of changes in macroeconomic variables of one country was quite evident in the other countries in the form of fluctuation in the stock prices of different sectors and policy changes. The flow of funds also led to increased variability in the markets. The effectiveness of the stock market in pricing the various instruments traded on the stock market determines how efficiently money is allocated. Stock Markets play a big role in directing money towards useful investment, as from the point of view of investors they have the capability of generating very high returns. According to earlier studies, in addition to political instability, macro indicators including the money supply, inflation, policy rate, fiscal deficit, and foreign exchange reserves have a notable impact on stock movement.

This paper aims to establish a comparison between emerging economies i.e., BRICS Nations. The reason for considering BRICS nations for the study is that these five are among the top developing countries in the world, which commonly are known as BRICS. Approx. 16% of global trade, 24% of total world GDP, and 41% of the overall world's population is accounted from BRICS nations. A worldwide power bloc and blossoming

investment market. Trade and investment between BRICS nations are expanding quickly, and a variety of industries are cooperating economically.

2. LITERATURE REVIEW

Uncertainty is an inevitable part of stock markets. Economic policies formulated by the government together with advancements in finance and technology, are major contributors to the instability and unpredictability of any economy[2]. For a long time, macro and financial economists have found the link between macroeconomic factors and stock prices to be a fascinating topic[3]. The world economy has been erratic for a long time for an assortment of reasons. Such volatility may have both natural and man-made causes. Instability in the stock market is typically caused by a variety of factors, including political unrest, natural disasters, financial fragility, and disruptions in other macroeconomic components of the economy[4]. Many articles are written to understand and analyze the repercussions of this unending list of factors that have direct and indirect impacts on the working of financial markets. A few of them are described under. [5] in his paper "The Stock Market and Macroeconomic Variables in a BRICS Country and Policy Implications" the author made use of GARCH(Nelson,1991) Modelling. Growth rate of GDP and circulation of money and South African stock market index move together positively in the same direction. The real interest rate in the country, the nominal forex rate, the inflation rate, the fiscal deficit to GDP ratio, and the yield on US government bonds all have a negative repercussion on the U.S. stock market. [6] in his study "The Macroeconomic and Institutional Drivers of Stock Market Development: Empirical Evidence from BRICS Economies*:" the findings, show visibly that few selected variables are co-integrated with BRICS stock markets. Based on the analysis of long-run data it was found that few macroeconomic and institutional quality variables have a significant influence on stock market capitalization and a few chosen variables are found to have a short-run causal relationship through the test of non-causality in a heterogeneous panel setting. [1] sought to check the non-linear relation between stock prices and other significant macroeconomic factors. In the results, it was identified that there is no linear relationship among variables. [7] concludes there is a positive relation between GDP, FDI FIIs, and stock markets. However, Gold prices negatively affect the stock markets. Oil exporting countries have positive relationships while oil importing countries have a negative relationship. [8] In the study, the author made an effort to understand how stock markets in Pakistan are affected by interest rates, rate of exchange, GDP, and inflation. The output of the study put forward that the impact of these variables on the stock market is negligible in the short run although in the long run, the impact is very high. [9]identified the association ship and effect of macroeconomic variables on the share market of India. Except for Unemployment and inflation rest of the factors in the study (gold prices, gross domestic product, exchange rate, and forex reserve) have a positive relationship with the stock markets in India. In a study conducted by [8] The results show that the consumer price index has a negative effect on stock prices, whereas the GDP and exchange rate have a positive effect. The real effects of export, money supply M2, foreign direct investment, and oil prices were negligible. High levels of labor force participation, trade openness, and domestic investment all positively and significantly affect economic growth. On the other hand, developing countries' growth is adversely affected by inflation, money supply, and interest rates[10]. In a study conducted to determine the integrating orders of variables [11] applied Ng-Perron and Zivot-Andrews unit root tests & Autoregressive Distributed Lag (ARDL) bounds testing approach. As per the study, all the variables are co-integrated. The banking sector and economic growth of the country have had a positive impact on Stock markets, however, inflation, and FDI have a negative short-run impact. [12]in their study tried to analyze the impact of Macroeconomic indicators, government bonds, and sentiments of investors over the German stock markets. The results say that there is a significant impact of these factors over the crisis period rather than during the pre or post-crisis period. A reverse analysis to check how stock markets impact the movement of macro-economic variables, conducted by [13] concluded that stock market movements can be predicted by economic variables. The global equity index demonstrated that the growth of the stock market has a greater impact on the financial system of whole world than does the development of banks in the BRICS nations[14]. [15] concludes in his study that consumer price index, gold rates, exchange rates, and interest rates have a positive relation with indices in India. [16] in their study states that exchange rate, inflation, and economic growth have a positive impact on the stock indices whereas crude oil has a negative relationship with stock prices. There is a short as well as long-run one-sided causal impact from FDI and economic growth on stock prices in India. The stock market is relatively unstable, and occasionally variations in share prices can be attributed to economic issues. However, there are a few basic elements that all share a strong influence over the trend of the stock market. [17] The study also used contemporary macroeconomic factors, such as the SENTIX global index. As per the results analyzed by applying PANEL VAR and Granger Causality currency rates are positively influenced by market returns. However, markets show a negative response due to the change in consumer price inflation and foreign portfolio investments. The equities market, however, is vulnerable to the IIP of the BRICS economies[18]. The Russian-Ukrainian War, inflation, and the pandemic-induced contraction are all being recovered from by the broad-based recovery occurring now in the Indian economy across all sectors. In FY23, it is expected to resume its pre-pandemic growth trajectory. India's GDP is predicted to grow at a robust rate in FY24. The forecasted GDP for FY24 is between 6.8% and 6.8%.[19] In a study conducted on "Macroeconomic Response to BRICS Countries Stock Markets Using Panel VAR," the author concludes Exchange rates are positively impacted by market returns. On the other hand, changes in

foreign portfolio investment and consumer price inflation typically cause the market to respond negatively. On the other hand, the BRICS economies' economic growth (IIP) has an impact on the equities market[18]. In the results of a study, it has been determined that exports, as a part of foreign commerce, significantly influenced the expansion of the economy of the country under review. It has also been demonstrated that there is an enhanced relationship between overseas trade and economic growth.[20]. For Brazil, Russia, and India, there is a negative correlation between GDP growth rate and inflation although for China and South Africa, there is a positive correlation. Furthermore, For Brazil, Russia, and China, there is a negative correlation between the real interest rate and GDP growth rate; in fact for India and South Africa, there is a positive correlation. For South Africa, Brazil, and Russia, there is a positive association between GDP growth rate and real effective exchange rate; for India and China, there is a negative correlation[21]. One study in which inflation and real income growth rate are the macro variables that contribute to the rise in income disparities. As the interest rates increase it leads to an increase in the income disparity of the people[22]. A study conducted to analyze the impact of the financial crises of 2007-08, concludes that multiple variables can affect the state of the financial system as a whole. They have an impact on the macroeconomic domain (inflation, lending facility interest rates) as well as the microeconomic domain (profitability, capital adequacy, demand and supply factors, etc.). This investigation demonstrated how the external context company has modified its financial activity amid the financial crisis. Factors that are external to a corporate house may also impact their functioning[23]. The manufacturing industry will benefit from a lower exchange rate since it will find it easier to import machinery and plants to support production[24]. Stock market fluctuations may also be triggered by external factors that impact the discount rate, market capital flows, or future cash flows, such as the price of gold, energy, or foreign stocks. The price increase of crude oil, a crucial industrial raw material, will have an impact on corporate profits for countries that import it. In addition, it may raise the price of other raw materials, resulting in inflation and raising the financial burden on businesses, which could eventually depress the stock market[25]. A study concludes there is a high connection between individual G7 stock markets and instant news which influences the uncertainty. The connection was strongest during the pandemic. In the short term, these connections are weak on a low scale[26]. In this study for Brazil, India, and South Africa— The exchange rate return and the stock return differential are found to be positively correlated, supporting the UEP hypothesis[27]. The finding of one another study states a significant quantile-varying co-integration relationship between the three economic factors and U.S. equity prices. It is discovered that the index of industrial production in the United States has the biggest impact on the stock market for maximum period[28]. The development and return of the stock market are found to be co-integrated with the macroeconomic variables, according to study results. The study discovered that the money supply, inflation rate, and human capital all had negative effects on stock market development, but foreign direct investment and interest rate had positive effects [29]. It is analyzed that in the short run, FDI, the Consumer Price Index, and the exchange rate vary in bull, bear, and normal markets in a study to investigate the short- and long-term impacts of variables on the E7 stock indices. With the exception of IIP, the effect changes over time for all other variables.[30].

3. OBJECTIVES OF THE STUDY

The BRICS aim to boost, expand, and quicken cooperation between the member countries and within the group for more equitable, sustainable, and mutually beneficial growth.
BRICS takes into account each member's growth, development, and anti-poverty goals to ensure that associations are derived from the economic strengths of the individual nation and to minimize rivalry when it is viable. Hence, studying the major variables of these nations and their repercussions on the respective stock markets is a dominant requisite. The pivotal intent of the study are as follows:
1. To measure the influence of some designated macroeconomic indicators on BRICS capital markets.
2. To make a comparative analysis of India's response to global market conditions vis a vis other emerging nations.

4. METHODOLOGY

The data on GDP, inflation rate, FDI, Money Supply, and Indices (Chinese BOVESPA, Russian, Indian Bombay Stock Exchange, Chinese Shanghai Stock Exchange (SSE) Composite Index, and South African FTSE) was drawn for a period of 20 years from 2001 to 2021. Prices of the indices were acquired from www.investing.com. Macroeconomic indicators data was taken from the www.worldbank.org.
This paper will focus on identifying how stock markets are affected by variations in macroeconomic variables. According to the stationarity test, the time series property known as stationarity states that a variable's value does not change over time, meaning that variations in time do not affect a variable's value. To check the interrelationship between different variables VAR and VECM models are formulated.

5. ANALYSIS AND INTERPRETATION

5.1 Stationarity Check

To precisely evaluate and forecast the future and to learn the actual status of the relationships among the variables trends and seasonality must have no influence on the data. For this, as an initial step, we need to check the stationarity of the data. For stationarity check Augmented Dickey-Fuller Test is applied.

Table 1.1_Augmented Dickey-Fuller Test Results for Brazil, India & China

	Brazil				Russia				India			
	AT LEVEL		AT FIRST DIFFERENCE		AT LEVEL		AT FIRST DIFFERENCE		AT LEVEL		AT FIRST DIFFERENCE	
	t-Stat	Prob.	t-Stat	Prob.	t-Stat	Prob.	t-Stat	Prob.	t-Stat	Prob.	t-Stat	Prob.
INDEX	0.51	0.98	-3.41	0.02	-2.72	0.24	-10.17	0.00	-1.14	0.90	-5.72	0.00
GDP	-3.93	0.33	-4.65	0.01	-3.88	0.13	-5.56	0.00	-0.81	0.35	-6.00	0.00
INFLATION	-3.09	0.13	-5.12	0.00	-4.37	0.62	-5.11	0.00	-1.44	0.82	-3.79	0.04
FDI	-0.06	0.65	-5.82	0.00	-2.79	0.22	-5.52	0.00	-2.27	0.43	-4.75	0.01
MONEY SUPPLY	-2.54	0.31	-3.10	0.05	-3.19	0.12	-4.52	0.00	-1.78	0.67	-4.007	0.030

Test results as mentioned in table 1.1, all series i.e, Index, GDP, Inflation, FDI, and Money Supply are non-stationary at level and stationary at first difference for Brazil, Russia and India.

Table 1.2_Augmented Dickey-Fuller Test Results for Brazil, India & China

	China				South Africa			
	AT LEVEL		AT FIRST DIFFERENCE		AT LEVEL		AT FIRST DIFFERENCE	
	t-Stat	Prob.	t-Stat	Prob.	t-Stat	Prob.	t-Stat	Prob.
INDEX	-3.26	0.10	-5.26	0.00	-3.50	0.07	-4.76	0.01
GDP	-3.26	0.10	-4.42	0.01	-4.85	0.61	-5.33	0.00
INFLATION	-0.36	0.54	-7.75	0.00	-1.64	0.73	-5.87	0.00
FDI	-2.68	0.25	-4.79	0.01	-2.98	0.16	-4.05	0.02
MONEY SUPPLY	-3.23	0.11	-4.57	0.01	-1.30	0.86	-2.95	0.06

Test results as mentioned in table 1.2, all series i.e, Index, GDP, Inflation, FDI, and Money Supply are non-stationary at level and stationary at first difference for China and South Africa.

5.2 Co-integration Test

We have to first check the series for stationarity. After performing the Unit root test, we will probably get three different outcomes.
1. Either all the series are stationary at level, I (0).
2. All the series are stationary at the first difference, I (1).
3. Series when integrated into different orders, means there is a combination of I (0) and I(1) series.

When all series are integrated at level, it means in the short run there is some relation, so it is assumed that in the long run, they will establish some relation, this can be checked and analyzed by performing an OLS test.
When series are all integrated at first difference we can establish a long run relationship which is important to do. Then we have to perform either the Engel Granger Co-integration test or the Johansen Co-integration test. As a next step, we have to estimate the model for error correction. Then stationarity of the residual series at the level is checked. If the residual series is stationary at the level, the series has a long-run relationship between the variables, and thus, VECM can be estimated.
Johansen Co-integration uses two types of statistics.
1. Trace and 2. Max Eigenvalue statistics.
HO: There is no Co-integrating equation.
H1: HO is not true.

Table 1.2_ Johansen Co-Integration Test Results

COUNTRY	Hypothesized No. of CE(s)	Trace Statistic	0.05 Critical Value	Prob.**	Max-Eigen Statistic	0.05 Critical Value	Prob.**
BRAZIL	None *	152.12	69.82	0.00	79.46	33.88	0.00
	At most 1 *	72.66	47.86	0.00	38.01	27.58	0.00
	At most 2 *	34.65	29.80	0.01	24.92	21.13	0.01
	At most 3	9.73	15.49	0.30	9.32	14.26	0.26
RUSSIA	None *	91.74	69.82	0.00	41.50	33.88	0.01
	At most 1 *	50.24	47.86	0.03	28.33	27.58	0.04
	At most 2	21.91	29.80	0.30	13.56	21.13	0.40
	At most 3	8.35	15.49	0.43	8.09	14.26	0.37
INDIA	None *	101.57	69.82	0.00	43.37	33.88	0.00
	At most 1 *	58.20	47.86	0.00	27.81	27.58	0.05
	At most 2 *	30.39	29.80	0.04	20.55	21.13	0.06
	At most 3	9.84	15.49	0.29	8.60	14.26	0.32
CHINA	None *	124.40	69.82	0.00	52.17	33.88	0.00
	At most 1 *	72.24	47.86	0.00	42.88	27.58	0.00
	At most 2	29.35	29.80	0.06	19.92	21.13	0.07
	At most 3	9.44	15.49	0.33	9.39	14.26	0.26
SOUTH AFRICA	None *	151.16	69.82	0.00	102.69	33.88	0.00
	At most 1 *	48.47	47.86	0.04	21.28	27.58	0.26
	At most 2	27.19	29.80	0.10	16.01	21.13	0.22
	At most 3	11.18	15.49	0.20	7.95	14.26	0.38

If the trace value/Max Eigenvalue has a value that is more than the Critical value then reject the null hypothesis, which means co-integration exists among the series. In the above table we can see that, Brazil has three co-integrating equations as per both trace statistics and Max-eigenvalue. However, Russia and China have two co-integrating equations both as per trace statistics and Max-eigenvalue. Test results as per the table 1.2, India and South Africa have 2 co-integrating equations as per trace value and one co-integrating equation as per max-eigenvalue.

The residual series Brazil, Russia, India, and China are I(O) so, VECM is estimated for these nations. However, the South African Residual series is not stationary at a level which means the basic conditions for ECM are not fulfilled. As a result, the VAR model is estimated for SA.

5.3 Vector Error Correction Model (VECM)
Using the VECM model, co-integrated variables are examined. It provides a way to understand the variables of the system's short- and long-term behavior.

Table 2.1_VECM_BRAZIL

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1359.05	1863.79	0.73	0.48
D(BRAZIL_BROADMONEY)	1349.82	540.50	2.50	0.03
D(BRAZIL_FDI)	-1030.52	1831.79	-0.56	0.58
D(BRAZIL_GDP)	2563.27	744.95	3.44	0.00
D(BRAZIL_INFLATION)	57.42	516.28	0.11	0.91
ERROR_BRAZIL(-1)	-0.72	0.25	-2.90	0.01

Error Correction term corrects the disequilibrium of the system. The coefficient of Error Correction term as shown in table 2.1, is negative and significant which is -0.72 hence, the long-run adjustment is possible. The negative sign gives a validity that both dependent and independent variables have long-run relationships. As ECT is 0.72 which is the momentum of adjustment in the direction of the equilibrium means 72 percent correction will take place in a year. Rest all the coefficients are short term as they are differenced.

R-squared	0.660556	Durbin-Watson stat	1.602495

Table 2.2_VECM_RUSSIA

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-132.79	87.62	-1.52	0.15
D(RUSSIA_FDI)	279.89	79.86	3.50	0.00
D(RUSSIA_BROADMONEY)	67.20	20.50	3.28	0.01
D(RUSSIA_GDP)	34.91	20.23	1.73	0.11
D(RUSSIA_INFLATION)	-41.96	21.52	-1.95	0.07
ERROR_RUSSIA(-1)	-1.09	0.27	-4.01	0.00

R-squared	0.77441	Durbin-Watson stat	1.754884

The coefficient of the Error Correction term as shown in table 2.2, is negative and significant which is -1.09 hence, a rapid long-run adjustment is possible. As the value of the Coefficient of ECT is more than 1, there will be fluctuations in the pattern before the adjustment towards the equilibrium.

Table 2.3_VECM_INDIA

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1245.07	1225.17	1.02	0.33
D(INDIA_BROADMONEY)	980.14	597.27	1.64	0.12
D(INDIA_FDI)	-5058.40	1893.57	-2.67	0.02
D(INDIA_GDP)	38.56	469.96	0.08	0.94
D(INDIA_INFLATION)	-579.27	800.68	-0.72	0.48
ERROR_INDIA(-1)	-0.33	0.30	-1.09	0.29

R-squared	0.412687	Durbin-Watson stat	1.478739

The coefficient of the Error Correction term as shown in table 2.3, is negative and significant which is -0.33 hence, the long-run adjustment is possible. As ECT is 0.33 33 percent correction will take place in a year.

Table 2.4_VECM_CHINA

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-76.94	200.37	-0.38	0.71
D(CHINA_BROADMONEY)	27.04	28.38	0.95	0.36
D(CHINA_FDI)	-399.82	315.25	-1.27	0.23
D(CHINA_GDP)	110.25	113.91	0.97	0.35
D(CHINA_INFLATION)	211.85	102.88	2.06	0.06
ERROR_CHINA(-1)	-0.89	0.32	-2.74	0.02

R-squared	0.500734	Durbin-Watson stat	1.958211

The coefficient of the Error Correction term as shown in table 2.4, is negative and significant which is -0.89 hence, the long-run adjustment is possible. As ECT is 0.89 89 percent correction will take place in a year.

All the above models too seem fit as Durbin Watson is more than R-squared.

5.4 Vector Autoregressive Model (VAR)
For South Africa as is evident in the results, the residual series are not stationary at level means they both are not I (0), so the conditions for co-integration among the series are not fulfilled.
Although all the variables are I (1) the residual series is not I (0), which is a necessary condition to prove the long-run relationship.
Henceforth, we have to go with VAR .VAR considers all the variables as dependent variables one by one and constructs different models. Among all the models, the following model given in Table 3.1, is the most appropriate with maximum significant variables.
BOVESPA_BRAZIL = C(1)*BOVESPA_BRAZIL(-1) + C(2)*BOVESPA_BRAZIL(-2) + C(3)*BRAZIL_FDI(-1) + C(4)*BRAZIL_FDI(-2)+C(5)*BRAZIL_PERSONAL_REMITTANCES(-1)+C(6)*BRAZIL_PERSONAL_REMITTANCES(2)+C(7)*BRAZIL_UNEMPLOYMENT(-1)+ C(8)*BRAZIL_UNEMPLOYMENT(-2)   +   C(9)*BRAZIL_BROADMONEY(-1)   + C(10)*BRAZIL_BROADMONEY(-2) + C(11)

Table 3.1_VAR_SouthAfrica

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	0.031778	0.217568	0.146061	0.8875
C(2)	0.530766	0.213724	2.483422	0.0379
C(3)	-2707.095	1449.831	-1.867179	0.0988
C(4)	-5949.194	1719.696	-3.459445	0.0086
C(5)	-105257.4	25911.05	-4.062257	0.0036
C(6)	-35911.53	28380.54	-1.265358	0.2414
C(7)	4100.614	1706.836	2.402465	0.0430
C(8)	4208.265	1985.589	2.119404	0.0669

C(9)	753.8378	543.4832	1.387049	0.2028
C(10)	-802.6153	556.8808	-1.441269	0.1875
C(11)	9270.690	18391.22	0.504082	0.6278

R-squared	0.994979	Mean dependent var	59340.87
Adjusted R-squared	0.988704	S.D. dependent var	26221.30
S.E. of regression	2786.887	Akaike info criterion	18.99613
Sum squared resid	62133892	Schwarz criterion	19.54292
Log likelihood	-169.4633	Hannan-Quinn criter.	19.08867
F-statistic	158.5465	Durbin-Watson stat	2.658518
Prob(F-statistic)	0.000000		

Wald coeff. test was conducted for the lags C9, C10 (which are insignificant). We will check if the coefficient of both the lags -Money Supply can jointly have an impact on the index of Brazil.

Table 3.2_Wald Test:

Test Statistic	Value	df	Probability
Chi-square	2.151575	2	0.3410

Null Hypothesis: C(9) = C(10)=0

As per the test results in table 3.2, the chi-square probability value is more than 0.05, we can say that C (9) and C(10) together cannot impact the Index of Brazil.

Furthermore, if we look at other parameters like R squared in table 3.1, it is quite high 99.49, and also the probability value of the F test is highly significant, which makes this model fit and appropriate. But while performing serial correlation LM test in residual diagnostics, we found that the variables are serially correlated to each other as depicted in table 3.3. And thus the variables are correlated.

Table 3.3_Breusch-Godfrey Serial Correlation LM Test:

F-statistic	2.904487	Prob. F(1,7)	0.1321
Obs*R-squared	5.571743	Prob. Chi-Square(1)	0.0183

To check heteroscedasticity, the results are as:

Table 3.4_Heteroscedasticity Test: Breusch-Pagan-Godfrey

F-statistic	2.160274	Prob. F(10,8)	0.1437
Obs*R-squared	13.86534	Prob. Chi-Square(10)	0.1792
Scaled explained SS	1.138923	Prob. Chi-Square(10)	0.9997

From the results given in table 3.4, we can say that the error term does not have heteroscedasticity. As per the results the data seems normally distributed as the probability value of Jarque bera is more than 0.05.

Jarque-Bera	1.261998
Probability	0.532060

6. CONCLUSION

In this study, a necessary analysis has been done to understand the relationship between the macroeconomic variable and share market indices of BRICS nations. The macroeconomic variables considered for the analysis are broad money, GDP, FDI, and Inflation. Data for a time of 21 years (2001- 2021) was used. VECM model is formed for Brazil, Russia, India, and China. The VAR model is prepared for South Africa. Co-integration test findings help understand the pricing mechanism of stock markets in BRICS nations. The findings show that all the economic variables are considerably leaving a spillover impact on the prices of BRICS nations.

As far as the growth of India is concerned the long-term growth rate of India is progressively becoming more steady. Various industrial and economic changes, particularly the Liberalization, Globalization, and privatization of 1991, have fueled growth. Large-scale FDI in several economic sectors, an increase in foreign exchange reserves, a boom in the IT industry, and a developing capital market are some of the outcomes of the LPG policy. Furthermore, the government's increased spending on public welfare has driven the expansion of the service sector. The economy's services sector is essential for raising production and fostering a global competitive environment among nations. Today's economy is dominated by the service sector, which makes a significant contribution to GDP growth. India's ability to expand is primarily dependent on how much it imports, how many people are employed, and how massively its middle class is growing. To accomplish shared objectives for the advancement of global economic and social development, BRICS offers innovative multilateralism. This BRIC-led collaboration with other countries will probably play a significant role in future global growth.

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