

Macro-economic factors causing variation in the exchange rate of BRICS countries- a study

Sanjeeta Shirodkar, Karen Fernandes

Dnyanprassarak Mandal's College and Research Centre, Assagao, Goa, India
sanjita_shirodkar@rediffmail.com, karenfernandes6111@yahoo.com

Abstract

Objectives: This study aims to identify and analyze which macro-economic factors have an influence on the exchange rate of the currency of each country belonging to BRICS by analysing the long term and short term relationship between the exchange rate and factors such as interest rates, inflation index, and money supply, exports and imports variables.

Methods/Statistical Analysis: In order to achieve the objectives of this study OLS model and Johansens co-integration is applied, data is also tested for stationarity using ADF test. Johansens co-integration is employed to analyze the long term relationship between the variables and the short term relationship between the variables is analyzed using Vector error correction model.

Findings: OLS model indicated that the exchange rate of the Brazilian Real and Chinese Yuan is affected by interest rates. However in case of the Russian Ruble, inflation and money supply have an impact in addition to interest rates. The exchange rate of the Indian Rupee is affected by imports and the South African Rand is affected by imports as well as interest rates. Johansens co-integration test indicated that all the variables are co-integrated in the long run. The results of VECM indicated that Russian Ruble is the only currency that is affected by the select macro-economic variables in the long run. However in the short run the Russian Ruble is found to be affected by inflation rates, export rates and interest rates. Similarly interest rates have an impact on the Chinese Yuan and inflation rates have an impact on the Brazilian real in the short run.

Applications/Improvements: This study can help various stakeholders of BRICS economies to understand which factors have a significant impact on their exchange rate so as to control such factors thereby positively enhancing the economic growth and development of the country.

Keywords: Exchange rates, BRICS, OLS, and VECM.

1. Introduction

BRICS is a group of newly advanced and economically developing nations like Brazil, Russia, India, China and South Africa. They are considered to be leading emerging economies and political powers regionally and internationally. Each country is distinctive i.e. Russia is a commodity-driven economy, China is a country driven by exports, India is a domestic demand-driven economy, Brazil has a developed economic structure and South Africa is one of the fastest growing region of Africa. Growth is a significant factor that makes BRICS prominent in the global economy. Interestingly, China and Russia have already started using their own currencies to settle trade transactions mainly due to the following reasons.

Firstly, it would allow BRICS to diversify their foreign reserves by way of managing risk. Secondly, there is a possibility that if BRICS use their national currency to trade, their currencies could become global like the US dollar. Thirdly, it is believed that the use of BRICS currencies would decrease transaction costs compared to the USD. Fourthly, this would also allow BRICS to have greater political power in international negotiations. Finally, by using their national currency, BRICS could lay the foundation for a monetary union. This paper aims at finding out which factors have an influence on the exchange rate of the currency of each country in relation to the US dollar. For this purpose five factors are studied which includes Interest rates, Inflation rate (CPI), Money supply (M3), Export and Import.

2. Literature survey

Studies relating to Brazil, Russia, India, China and South Africa have indicated various findings where certain factors prove to be more effective and have a greater influence on the exchange rate of their respective currencies. In case of Brazil [1] the effect of capital inflows and domestic factors on the exchange rate of Brazil by using Generalised VAR model was examined. Domestic factors included interest rate differentials, government spending, money-base velocity and Temporary Component of the Real Exchange Rate (TCRER). Results indicated that interest rate shocks explain the fluctuations in capital flows and TCRER. However according to another study [2] the exchange rate of Brazil is influenced by global shocks that is international interest rates. In case of Russia, previous studies [3] indicate that the exchange rate of Russia is influenced by import price rigidity and import price rigidity is influenced by pricing of consumer goods, contract currency, and foreign trade operations etc. On the other hand another study [4] tried to identify the impact of oil prices and risk exposure of exchange rate volatility on economic growth in Russia and results indicated that imports, exports, inflation, interest rates, government consumption expenditure and FDI have a significant impact on the real effective exchange rate in the long run and short run.

Studies on the foreign exchange rate with respect to the Indian Rupee [5] indicate that money supply, trade balance, inflation and interest rates have a significant influence. In addition, [6] GDP and FDI also lead to variations in the exchange rate of the Rupee. Another study [7] confirmed that the above mentioned variables have an impact on the exchange rate of the Rupee and included output as a factor that accounts for variance in the dollar-rupee. Besides the mentioned variables [8] the short and medium run exchange rate is influenced by micro-variables such as speculation and central bank intervention. However in the long run macro-economic variables determine exchange rates. In [9] Studies suggest that the Chinese Yuan is influenced by interest rates and inflation rates which are positively correlated and have an influence on the exchange rate of the Chinese Yuan.

In [10] appreciation in the Renminbi decreases Chinese exports by half percent and imports by 1/10th percent and according to another study [11] appreciation in the Renminbi has a negative effect on economic growth and employment. However [12] in general long run exchange rate variation has a positive impact on import and export. With reference to foreign currency reserves [13] after studying how exchange rate systems impact the level of reserves in India and China, it was concluded that since the Indian economy is an open economy, CAB is a significant variable as compared to China. Studies related to the currency of South Africa(ZAR) in relation to the USD [14] indicate that there a positive relation between the exchange rate and S. African government bond yield, US real GDP, US stock prices and S.

African inflation rate however the exchange rate is negatively influenced by US government bond yield, S. African GDP, South African stock prices and US inflation rate. In [15] there a significant positive relationship between exchange rate and South Africa exports however on the other hand [16] exchange rate volatility has a significant negative impact on South African exports. Other studies [17] [18] identify commodity price volatility, trade openness, output volatility, money supply, foreign exchange reserves and global market volatility and domestic political uncertainty to be the factors that lead to volatility in the South African rand while [19] global shocks is also a factor which influences the South African Rand. The Macroeconomic variables chosen for the study are Interest rates, Inflation Index, Money supply, Exports and Imports for Brazil, Russia, India, China and South Africa and we propose to conduct an extensive study to analyze the impact of the mentioned macroeconomic variables on the exchange rates of each individual country.

3. Objectives of the study

1. To identify the factors that influences the exchange rate of BRICS countries and to study the impact of select macro-economic variables on the exchange rate of BRICS countries.
2. To study the nature of relationship between Exchange rates and select economic variables of all BRICS countries in the short-run and long-run.

4. Research methodology

The Macroeconomic variables chosen for the study include the exchange rate of BRICS countries against the US dollar, Interest rates, Inflation Index, Money supply, Exports and Imports for Brazil, Russia, India, China and South Africa. We have used monthly data for a period ranging from 2011-2017.

The data has been extracted using Bloomberg data base and Federal Reserve Economic data base. Monthly data for last five year has been analyzed using various statistical and econometric tools with the help of views 8 software.

5. Statistical tools

In order to derive meaningful inferences using time series data, we must ascertain if the data is stationary. If data is found to be non-stationary, it could produce spurious results, which are not reliable.

Stationarity test helps to indicate the order of integration which is essential while applying OLS models or co-integration. So in order to ascertain the stationarity of the data, Augmented Dickey-Fuller test has been employed to examine the stationery property of Exchange rates of the BRICS countries against the US dollar, Interest rates, Inflation Index, Money supply, Exports and Imports for Brazil, Russia, India, China and South Africa. Further difference-stationery process has been used to transform non-stationery series into stationery series. Johansen's co-integration test has been used for investigating the long term relationship between the Exchange rates of the BRICS countries against the dollar, Interest rates, Inflation Index, Money supply, Exports and Imports for Brazil, Russia, India, China and South Africa.

The Johansen's test approaches the testing for co-integration by examining the number of independent linear combinations for time series variables that yields a stationarity process. As Johansen's co-integration test is sensitive to the choice of lag length an appropriate lag structure has been selected using Akaike Information Criterion (AIC), Schwarz Criterion (SC) and the Likelihood Ratio (LR) test. The presence of co-integration indicates interdependence of the endogenous variables, which may be the result of economic linkage between the markets or the arbitrage activities among investors.

There may be an existence of a long-run equilibrium relationship between two or more variables but in the short run there could be disequilibrium. The nature of the relationship between exchange rate, exports, imports, inflation index, interest rates and money supply of all the BRICS countries in the short-run can be investigated by implementing the vector error correction mechanism. A vector error correction model is a restricted VAR that has co-integration restrictions built into the specification. Since the data series are non-stationery at level and found to be co-integrated, our data qualifies to be tested under the VECM model. The error correction term of VECM specification signifies the rate at which it corrects its previous period disequilibrium or speed of adjustment to restore the long-run equilibrium relationship.

The result of the Stationery test is given in the Table 1. All the variables are found to be non-stationery at its level and they are not significant at 5% level, since the P-value is more than 0.05%. Therefore, unit root test is conducted in first differences. All the series are now found to be stationery at first difference. So this data can be used to find the Johansen (1998) and Johansen and Juselius (1990) co-integration for long term relationship.

The result of OLS Model provides for Exchange rates, Exports, Imports, Inflation index, Interest rates, and Money supply for Brazil, Russia, India, China and South Africa; wherein Exchange rate of the respective country is a dependent factor and Exports, Imports, Inflation index, Interest rates, and Money supply are the independent factor. R Square of 0.145 signifies that 14% of variation in the Exchange rates is being explained by the Exports, Imports, Inflation index, Interest rates, and Money supply. The coefficient of interest rate has been found to be significant at 5% level of significance, which implies that changes in interest rates, has a significant impact on the Brazilian Exchange rates. As far as Russia is concern, R Square of 0.521 signifies that 52% of variation in the Exchange rates is being explained by the Exports, Imports, inflation index, interest rates, and Money supply. The Coefficient of interest rates, inflation rates and money supply for Russia has been found to be significant at 5% level of significance, which implies that changes in interest rates, inflation rates and money supply has a significant impact on the Russian Exchange rates. OLS Model for India exhibits an R Square of 0.103 signifies that 10% of variation in the Exchange rates is being explained by the Exports, Imports, inflation index, interest rates, and Money supply.

Table 1. Augmented dickey-fuller test for the variables

Instrument/Indices	At level			At first difference
	None	Trend	Trend and Intercept	
Brazil exports	3.1176	0.8627	-2.0073	-3.5130
	0.9994	0.9944	0.5871	0.0104
Brazil imports	-0.8832	-0.3663	-2.6546	-10.8174
	0.3300	0.9084	0.2584	0.0001
Brazil inflation index	3.1176	0.8627	-2.0073	-3.5130
	0.9994	0.9944	0.5871	0.0104
Brazil interest rates	0.1160	-0.9046	-1.9460	-7.3764
	0.9649	0.7814	0.6200	0.0000
Brazil money supply	16.0538	0.1160	-1.2398	-7.0305
	1.0000	0.9649	0.8941	0.0000
Russia exports	-1.1373	-0.2640	-2.1402	-12.3220
	0.2303	0.9241	0.5146	0.0001
Russia imports	-0.8302	-0.3780	-2.3191	-9.9140
	0.3528	0.9066	0.4182	0.0001
Russia inflation index	2.9959	0.6514	-2.5489	-3.9260
	0.9992	0.9902	0.3046	0.0031
Russia interest rates	0.2655	-1.3438	-2.0690	-7.3570
	0.7603	0.6048	0.5537	0.0000
Russia money supply	4.4525	-1.0263	-1.2369	-7.5687
	1.0000	0.7397	0.8948	0.0000
India exports	-0.2180	-1.3398	-2.0034	-10.0306
	0.6043	0.6067	0.5894	0.0001
India imports	-0.2744	-1.7099	-4.1312	-11.6571
	0.5837	0.4219	0.0090	0.0001
India inflation index	3.1491	-2.3571	-1.9616	-5.8138
	0.9995	0.1579	0.6116	0.0000
India interest rates	-0.8982	-0.4928	-1.6760	-7.3312
	0.3237	0.8858	0.7517	0.0000
India money supply	8.8796	-0.6878	-3.0639	-7.6392
	1.0000	0.8426	0.1230	0.0000
China exports	0.3980	-2.5446	-3.4794	-10.5511
	0.7958	0.1096	0.0495	0.0001
China imports	-1.0195	-0.4708	-1.6272	-8.3666
	0.2743	0.8900	0.7723	0.0000
China inflation index	2.9853	-1.3699	-4.0115	-7.1027
	0.9992	0.5923	0.0126	0.0000
China interest rates	-1.0195	-0.4708	-1.6272	8.3666
	0.2743	0.8900	0.7723	0.0000
China money supply	13.9542	1.2879	-2.3902	-9.5221
	1.0000	0.9984	0.3814	0.0000
South Africa exports	-0.9280	-1.1640	-4.5855	-11.8230
	0.3112	0.6855	0.0023	0.0001
South Africa imports	-0.8023	-0.4494	-3.7294	-8.1724
	0.3649	0.8939	0.0267	0.0000
South Africa inflation index	5.2593	0.741989	-3.2649	-6.3709
	1.0000	0.9923	0.0807	0.0000
South Africa interest rates	0.0772	-1.7806	-2.1296	-7.7688
	0.7041	0.3871	0.5205	0.0000
South Africa M3	6.0734	0.8131	-3.0000	-9.9089
	1.0000	0.9936	0.1396	0.0001

Compiled by the researcher

The coefficient of imports for India has been found to be significant at 5% level of significance, which implies that changes in imports, has a significant impact on the Indian exchange rates. R Square of China is 0.062 signifies that 06% of variation in the exchange rates is being explained by the exports, imports, inflation index, interest rates, and money supply as shown in Table 2.

Table 2. OLS Model for Brazil, Russia, India, China and South Africa

	Coefficient	Std. Error	Z-Statistic	Prob.
Brazil				
Constant	0.0867	0.0363	2.3879	0.0199
Brazil exports	0.000	0.000	-0.693	0.4908
Brazil imports	0.0035	0.0303	0.1166	0.9075
Brazil inflation index	0.0276	0.0257	1.0746	0.2865
Brazil interest rates	0.000	0.000	-2.5298	0.0138
Brazil M3	-7.03E-13	5.21E-12	-0.13489	0.8931
R-Squared	0.1452			
Russia				
Constant	-0.67574	1.165768	-0.57966	0.5642
Russia exports	-7.27E-12	2.84E-11	-0.25616	0.7986
Russia imports	1.19E-10	2.80E-10	0.423285	0.6735
Russia inflation index	8.25E-01	3.47E-01	2.374772	0.0205
Russia interest rates	2.11E+00	5.36E-01	3.93545	0.0002
RussiaM3	1.85E-12	4.69E-13	3.942255	0.0002
R-Squared	0.5210			
India				
Constant	0.142171	0.208289	0.682566	0.4973
India exports	2.78E-11	2.27E-10	0.122298	0.903
India imports	-1.04E-10	5.19E-11	-2.00498	0.0491
India inflation index	1.33E-02	1.25E-01	0.106435	0.9156
India interest rates	8.53E-02	2.62E-01	0.325399	0.7459
India M3	2.01E-13	1.80E-13	1.120323	0.2667
R-Squared	0.1034			
China				
Constant	-0.0049	0.0104	-0.4726	0.6381
China exports	0.000	0.000	0.9097	0.3663
China imports	-0.0267	0.1226	-0.2179	0.8282
China inflation index	0.000	0.000	1.1547	0.2525
China interest rates	0.000	0.000	-1.7602	0.0431
China M3	-0.0058	0.0101	-0.5731	0.5686
R-Squared	0.06219			
South Africa				
Constant	0.177	0.0511	3.4622	0.001
South Africa exports	0.000	0.000	-1.9665	0.0535
South Africa imports	0.000	0.000	-3.1338	0.0026
South Africa inflation index	-0.1292	0.068	-1.8984	0.0621
South Africa interest rates	0.672	0.1243	5.4073	0.000
South Africa M3	0.000	0.000	-0.8283	0.4105
R-Squared	0.53136			

Compiled by the researcher

The coefficient of interest rate has been found to be significant at 5% level of significance, which implies that changes in interest rates, has a significant impact on the Chinese exchange rates. OLS model for South Africa exhibits an R Square of 0.53 signifies that 53% of variation in the exchange rates is being explained by the exports, imports, inflation index, interest rates, and money supply. The coefficient of imports and interest rate has been found to be significant at 5% level of significance. Table 3 displays the result of Johansen's Co integration test.

The following test has been performed by taking lag interval as 1 to 2, which has been selected as per the optimum lag length suggested by different tests like Akaike Information Criterion (AIC), Schwarz Criterion (SC) and the Likelihood Ratio (LR) test. The result of Johansen's co-integration test indicates the existence of at least one Co-integrating vector at the 1% level of significance for all the BRICS countries. This result has been supported by trace test as well as max Eigen values. Therefore null hypothesis of co-integration among the variables in long run has been rejected at 5% level of significance. As the variables are co-integrated, Vector error correction mechanism is used to identify the long and short term causal relationship among the variables. The result of the long-run and the short-run causality test under VECM framework are reported below.

Table 3. Results for Johansen's co-integration test for the BRICS countries

Null Hypothesis	Alternative Hypothesis	Eigen Value	Trace statistics	Critical value at 5% (p-value)	Maximum Eigen statistics	Critical value at 5% (p-value)
Brazil						
H0: r = 0	H1: r = 1	0.5909	123.5537	95.7536 (0.0002)	61.6862	40.0775 (0.0001***)
H0: r ≤ 1	H1: r = 2	0.3405	61.8674	69.8188 (0.1825)	28.7299	33.8768 (0.1818)
Russia						
H0: r = 0	H1: r = 1	0.5767	135.7335	95.7536 (0.0000)	59.3307	40.0775 (0.0001***)
H0: r ≤ 1	H1: r = 2	0.3268	76.4027	69.8188 (0.0136)	27.3068	33.8768 (0.2473)
India						
H0: r = 0	H1: r = 1	0.5608	114.1614	95.7536 (0.0015)	56.7764	40.0775 (0.0003***)
H0: r ≤ 1	H1: r = 2	0.2727	57.3848	69.8188 (0.3243)	21.9722	33.8768 (0.6098)
China						
H0: r = 0	H1: r = 1	0.5228	113.9518	95.7536 (0.0016)	51.0505	40.0775 (0.0020***)
H0: r ≤ 1	H1: r = 2	0.3209	62.9012	69.8188 (0.1573)	26.7106	33.8768 (0.2791)
South Africa						
H0: r = 0	H1: r = 1	0.5525	116.2979	95.7536 (0.0009)	54.6837	40.0775 (0.0006***)
H0: r ≤ 1	H1: r = 2	0.3364	61.6141	69.8188 (0.1891)	27.8851	33.8768 (0.2188)

Compiled by the researcher

6. Vector error correction model

1. Long run causality

Exhibits of Table 4 display the result of VECM model for all the BRICS countries, wherein exchange rate is a dependent factor and all the other economic variables are the independent factors. The coefficients of the error correction term for Russia is negative and also statistically significant at 1 percent level which indicates that any changes in exports, imports, inflation index, interest rates and money supply will cause changes in the Russian Ruble/USD exchange rates in the long run.

But for all the other BRICS countries except Russia, the coefficient of error correction term is neither negative nor significant. Hence it could be concluded that for all these countries any changes in exports, imports, inflation index, interest rates and money supply will not have any impact on their respective exchange rates in the long run.

Table 4. Result of vector error correction model

	Coefficient	Std. Error	t-Statistic	Prob.
Brazil C(1)	0.0383	0.0364	1.0508	0.2980
Russia C(1)	-0.9126	0.1385	-6.5879	0.0000***
India C(1)	0.0181	0.0280	0.6453	0.5214
China C(1)	0.0980	0.0520	1.8843	0.0648
Africa C(1)	0.0128	0.0070	1.8236	0.0736

Compiled by the researcher

2. Short run causality

The results of short-run causality test/Block exogeneitywald test among the variables based on VEC Granger causality test for all the BRICS countries are presented in Table 5. It could be noted that there is an existence of unidirectional causality running from Inflation rates, exports and interest rates in Russia to Russian Ruble/USD exchange rates. As far as china is concern, it could be observed that there is a causal link flowing from interest rates in China to Chinese Yuan/USD Exchange rates. Result further indicates the presence of causal link flowing form Brazilian Inflation rates to Brazilian Reals/USD Exchange rates.

Table 5. Result of VEC granger causality/Block exogeneitywald test

Dependent variable	Independent variable	Chi-square (p-values)				
		Brazil	Russia	India	China	South Africa
Exchange rate	Exchange rate	13.04 (0.0015***)	1.8740 (0.3918)	3.6028 (0.1651)	13.043(0.0015***)	0.0108 (0.9946)
	Imports	0.378 (0.8276)	0.4912 (0.7822)	1.0491 (0.5918)	4.204 (0.1222)	0.05330 (0.9737)
	Exports	4.204 (0.1222)	14.01 (0.0009***)	0.6656 (0.7169)	0.7742 (0.6790)	0.5646 (0.7540)
	Inflation	10.123 (0.0063***)	6.5716 (0.0374**)	2.490 (0.2878)	2.2114 (0.3310)	4.18119(0.1236)
	Interest rates	0.7742 (0.6790)	18.72 (0.0001***)	0.7949 (0.6720)	10.123(0.0063***)	0.5964 (0.7421)
	M3	2.211(0.3310)	4.954 (0.0440**)	0.66019 (0.7189)	0.378 (0.8276)	0.2246 (0.8937)

Compiled by the researcher

7. Conclusion

This study focused on identifying which factors have an influence on the exchange rate of the currencies of each country belonging to BRICS. The data were found to be stationery at first difference using the ADF stationarity test. In order to determine which select factors have a significant impact on the currencies of each country, OLS model was applied. In case of Brazil and China, interest rates were found to have a significant impact on the exchange rate of the Brazilian real (Adebayo & Ngalawa) and Chinese Yuan (Baasankhuu, 2013). Interest rates determine whether borrowers can afford to borrow in order to conduct economic activities otherwise output will be adversely affected thus reducing exports and inflow of foreign exchange into the country. Moreover China is an export driven economy which depends upon forex inflow to stabilise the value of its currency. In addition to interest rates having an impact on the exchange rate of the S. African rand, inflation rates also have an impact as S. Africa is the fastest growing economy Engined by growing demand. However the Russian Ruble is affected by inflation rates, interest rates and money supply which are in line with the conclusion of (Shafi & Liu). Imports have proved to be the most significant variable that has an impact on the exchange rate of the Indian rupee. This is because in recent years India has been experiencing a trade imbalance where imports have exceeded exports. This results in depreciation of the Indian Rupee. Johansens co-integration test indicated that all the variables are co-integrated in the long run. The results of VECM which was used to test relationship between the variables with exchange rates as a dependant factor indicated that Russia Ruble is the only currency that is affected by the select variables in the long run. However in the short run the Russian Ruble is affected by inflation rates, export rates and interest rates. Similarly interest rates have an impact on the Chinese Yuan and inflation rates have an impact on the Brazilian real in the short run.

This study could be applied to other similar international trade cartels such as OPEC (Organisation of the Petroleum Exporting Countries), ASEAN (Association of South East Asian Nations) and SAARC (South Asian Association for Regional Co-operation) to find out and analyse the various factors that affect the foreign exchange value of each country. This will help each country to favourably position itself globally in terms of international trade relations as well as control its domestic economic fundamentals such as inflation, GDP and interest rates.

8. References

1. R.P. Agenor, A.W. Hoffmaister, C.I. Medeiros. Cyclical fluctuations in brazil's real exchange rate: the role of domestic and external factors. *IMF working paper*. 1997; 1-32.
2. N. Harold, A.K. Adebayo. Modelling exchangerate variations and global shocks in Brazil. *Journal of Economics and Business*. 2017; 73-95.
3. P. Yuriy, A.P. Yury. Exchange rate and Import price rigidity in Russia. *Monitoring of Russia's Economic Outlook*. 2017; 9-11.
4. K. Shafi, H. Liu. Oil prices fluctuations and its impact on Russian economy: An exchange rate exposure. *Asian Journal of Economic Modelling*. 2014; 2(4), 1-9.
5. K. Murari, R. Sharma. OLS Modelling for Indian Rupee fluctuations against US dollar. *Global Advanced Research Journal of Management and Business Research*. 2013; 4(7), 559-566.
6. A. Mirchandani. Analysis of Macroeconomic determinants of exchange rate volatility in India. *International Journal of Economics and Financial Issues*. 2013; 172-179.
7. What determines USD-INR rate movements an empirical analysis of the falling Rupee. <http://home.iitk.ac.in/~srajal/ECONOMETRICS%20-%20I%20Term%20Paper.pdf>. Date accessed: 2016.
8. N. Bhanumurthy. Macro-economic fundamentals and exchange rate dynamics in India. *Economic and Political Weekly*. 2006; 41(11), 1101-1107.
9. B. Baasankhuu. Anaysis on influencing factors of the exchange rate between Chinese Yuan (CNY) and Mongolian Togrog (MNT). *International Journal of Development and Sustainability*. 2013; 1636-1644.
10. J. Marquez, J.W. Schindler. Exchange rate effects on China's trade an interim report. *Working paper series Federal Reserve Bank of San Francisco*. 2006; 1-55.
11. H. Ping. The economic and social effects of real exchange rate- evidence from the Chinese provinces. *Fundación Internacional y para Iberoamérica de Administración y Políticas Públicas*. 2011; 1-51.
12. J. Wanhui. The effect of RMB exchange rate volatility on import and export trade in China. *International Journal of Academic Research in Business and Social Science*. 2014; 4(1), 615-625.
13. A.M. Romero. Comparative study: factors that affect foreign currency reserves in India and China. *The Park Place Economist*. 2005; 1-5.
14. Y. Hsing. Determinants of the ZAR/USD exchange rate and policy implications: A simultaneous equation model. *Cogent Economics and Finance*. 2016; 1-7.
15. K.R. Todani, T.V. Munyama. Exchange rate volatilityand Exports in South Africa. 2005; 1-26.
16. L. Sekantsi. The impact of real exchange rate volatility on South African exportsto the United States (US): A bound test approach. *Review of Economic and Business Studies*. 2011; 119-139.
17. N. Mavee, R. Perrelli, A. Schimmelpfennig. Surprise, Surprise: What drives the Rand/US dollar exchange rate volatility? *IMF working paper*. 2016; 1-38.
18. T. Mpofo. The determinants of echange rate volatility in South Africa. *Economic Research Southern Africa*. 2016; 1-40.
19. A.K. Adebayo, H. Ngalawa. Modelling exchange rate volatility and global shocks in South Africa. 2017; 13(3), 1-16.

The Publication fee is defrayed by Indian Society for Education and Environment (www.iseeadyar.org)

Cite this article as:

SanjeetaShirodkar, Karen Fernandes. Macro economic factors causing variation in the exchange rate of BRICS countries- a study. *Indian Journal of Economics and Development*. Vol 6 (7), July 2018.