Chapter - 4

Analysis and Interpretation

This chapter presents the analysis of data and discusses the results for each objective set for the study. The data collected through secondary sources are tabulated and appropriate statistical tools and models mentioned in the previous chapter have been applied in the process.

4.1. Identification of the nature of data:

Descriptive statistics are used to identify the nature of data. It is used to describe the nature of the data in the study. It provides simple summaries about the sample and the measures.

4.1.1 Descriptive Statistics of BRICS Exchange Rates:

The exchange rate is one of the most important determinants of a country's economic health. Table 4.1 displays the descriptive statistics of the BRICS Exchange rate for the study period of fifteen years

Table 4.1

Descriptive Statistics of BRICS Exchange Rates

Particulars	Brazil (USD)	Russia (USD)	India (USD)	China (USD)	South Africa (USD)
Mean	0.43	0.03	0.01	0.14	0.11
Median	0.43	0.03	0.02	0.14	0.12
Std. Dev.	0.63	0.04	0.02	0.16	0.17
Skewness	0.2	0.0	0.0	0.12	0.06
Kurtosis	0.1	0.0	0.0	0.01	0.0

From the above table 4.1 it is found that Brazil records the highest mean (0.43) followed by China, which indicates greater reliability. Russia and South Africa indicates moderate reliability. whereas India indicates low reliability. As the data are symmetric, the mean and median are similar. Brazil records the highest Standard deviation (0.63) compared to other countries, which indicates the greater spread data from the mean. Whereas other countries will have moderate and low spread data from the mean. The results of Positive Skewness and Kurtosis reflects that all the selected series are less peaked than a normal

distribution. Brazil shows the highest value of the US dollar compared to other countries. Hence, it is identified that Brazil has a relative level of economic health compared to Russia, India, China, and South Africa.

4.1.2 Descriptive Statistics of Prices, Production, and Labour

Prices production and Labour plays a vital role in the development of an economy. The real economic growth only comes from increasing quality and quantity of price, production, and labor. Table 4.2 displays the descriptive statistics of Prices, Production, and Labour for the study period of fifteen years.

Table 4.2

Descriptive Statistics of Prices, Production, and Labour

Particulars	Brazil (USD)	Russia (USD)	India (USD)	China (USD)	South Africa (USD)
Mean	3536.20	907.03	48.15	398.97	100.4
Median	70.31	6.43	3.27	34.60	20.11
Std. Dev.	6561.93	1333.45	232.03	469.70	448.70
Skewness	1.0	0.0	0.1	0.1	0.9
Kurtosis	2.3	0.0	0.7	0.3	4.6

From the above table table 4.2 it is identified that. Brazil records the highest mean (3536.20) followed by Russia which indicates greater reliability. China and South Africa indicates moderate reliability. whereas India indicates low reliability. As the data are symmetric, the mean and median are similar. Brazil records the highest Standard deviation (6561.93) compared to other countries, which indicates the greater spread data from the mean. Whereas other countries will have moderate and low spread data from the mean. The results of Positive Skewness and Kurtosis reflects that all the selected series are less peaked than a normal distribution. Brazil is ranked higher because it has greater reliability and positive outcomes compared to Russia, India, China, and South Africa

4.1.3 Descriptive Statistics of Effective Exchange rate based on SDR and CPI

Effective Exchange rate based on SDR and CPI is the widely used economic indicator. Table 4.3 protrays the Descriptive statistics of Effective Exchange rate based on SDR and CPI for the study period of fifteen years.

Table 4.3

Descriptive Statistics of Effective Exchange rate based on SDR and CPI

Particulars	Brazil (USD)	Russia (USD)	India (USD)	China (USD)	South Africa (USD)
Mean	20.57	2.60	2.08	14.94	4.73
Median	2.62	2.57	1.99	14.34	2.61
Std. Dev.	24.50	1.02	0.49	13.52	4.43
Skewness	0.5	0.0	0.0	0.0	0.1
Kurtosis	1.3	0.1	0.1	0.2	0.3

From the table 4.3 it is found that Brazil records the highest mean (20.57) followed by China which indicates greater reliability. Russia and South Africa indicates moderate reliability. whereas India indicates low reliability. As the data are symmetric, the mean and median are similar. Brazil records the highest Standard deviation (24.50) compared to other countries, which indicates the greater spread data from the mean. Whereas other countries will have moderate and low spread data from the mean. The results of Positive Skewness and Kurtosis reflects that all the selected series are less peaked than a normal distribution. Brazil records the highest US dollar compared to other countries that indicate the better flow of prices and liquidity position of official reserves of the country.

4.1.4 Descriptive Statistics of Balance of payments

The balance of payments is the portion of a country's economy that interact with other country's economy. Table 4.4 displays the descriptive statistics of Balance of payments for the study period of fifteen years.

Table 4.4

Descriptive Statistics of Balance of payments

Particulars	Brazil (USD)	Russia (USD)	India (USD)	China (USD)	South Africa (USD)
Mean	135868.75	4228.96	3163.53	131934.85	4993.03
Median	5124.18	426.60	37.13	2296.55	108.63
Std. Dev.	284164.27	12471.31	7188.14	324113.75	17159.88
Skewness	1.5	0.1	0.1	0.5	0.5
Kurtosis	4.2	0.4	0.1	1.7	1.8

From the above table 4.4 it is found that Brazil records the highest mean (135868.75) followed by China which indicates greater reliability. Russia and South Africa indicates moderate reliability. whereas India indicates low reliability. As the data are symmetric, the mean and median are similar. China records the highest Standard deviation (324113.75) compared to other countries, which indicates the greater spread data from the mean. Whereas other countries will have moderate and low spread data from the mean. The results of Positive Skewness and Kurtosis reflects that all the selected series are less peaked than a normal distribution. Hence, Balance of payments of Brazil plays a vital role in the economic expansion of the country. Brazil has international transactions that all residents of the country conduct with the rest of the world.

4.1.5 Descriptive Statistics of GDP

GDP is one of the primary indicator used to gauge the health of the country's economy Table 4.5 frame up the descriptive statistics of GDP for the study period of fifteen years.

Table 4.5

Descriptive Statistics of GDP

Particulars	Brazil (USD)	Russia (USD)	India (USD)	China (USD)	South Africa (USD)
Mean	4089.03	8907.03	64.21	398.97	100.40
Median	72.18	6.43	4.36	34.60	20.11
Std. Dev.	6906.34	1333.45	309.36	469.70	448.70
Skewness	0.86	0.1	0.2	0.1	0.9
Kurtosis	1.8	0.1	1.0	0.3	4.6

Table 4.5 initiates that Russia records the highest mean (8907.03) followed by Brazil which indicates greater reliability. China and South Africa indicates moderate reliability. whereas India indicates low reliability. As the data are symmetric, the mean and median are similar. Brazil records the highest Standard deviation (6906.34) compared to other countries, which indicates the greater spread data from the mean. Whereas other countries will have moderate and low spread data from the mean. The result of Positive Skewness and Kurtosis casts that all the selected series are less peaked than a normal distribution, it may be concluded that Russia's GDP is better compared to other countries as measured by its growth rates and are often considered as the benchmark for the economy.

4.1.6 Descriptive Statistics of Government Finance

Government Finance plays an important role in the economy. Table 4.6 arrays the descriptive statistics of Government Finance for the study period of fifteen years.

Table 4.6

Descriptive Statistics of Government Finance

Particulars	Brazil (USD)	Russia (USD)	India (USD)	South Africa (USD)
Mean	84854.95	101596.28	38250.93	23750.20
Median	43824.92	54876	18490.53	11708
Std. Dev.	148552.27	155530.08	60391.14	35541.90
Skewness	3.2	0.2	0.1	0.5
Kurtosis	21.3	0.9	0.6	2.6

Note: Lack of data for China

From the table 4.6 it is found that Russia records the highest mean (101596.28) followed by Brazil which indicates greater reliability. India and South Africa indicates moderate reliability and low reliability. As the data are symmetric, the mean and median are similar. Russia records the highest Standard deviation (155530.08) compared to other countries, which indicates the greater spread data from the mean. Whereas other countries will have moderate and low spread data. The results of Positive Skewness and Kurtosis mirrors that all the selected series are less peaked than a normal distribution. The above table concludes that Russia takes initiatives to expand the economy by directing funds from savers to borrowers as banks, credit unions, and other financial institutions provide credit for the development of the economy.

4.1.7 Descriptive Statistics of Interest Rates

Interest rates provide insight into future economic and market activity. Table 4.7 synopsize the descriptive statistics of Interest Rates for the study period of fifteen years.

Table 4.7

Descriptive Statistics of Interest Rates

Particulars	Brazil (USD)	Russia (USD)	India (USD)	China (USD)	South Africa (USD)
Mean	12.77	0.36	0.28	0.45	1.15
Median	9.75	0.34	0.27	0.13	1.12
Std. Dev.	9.07	0.14	0.10	0.59	0.4
Skewness	1.3	0.0	0.0	0.2	0.0
Kurtosis	4.3	0.1	0.1	0.7	0.5

From the table 4.7 it is identified that Brazil records the highest mean (9.07) followed by China which indicates greater reliability. Russia, South Africa, and India indicates moderate reliability and low reliability. As the data are symmetric, the mean and median are similar. Brazil records the highest Standard deviation (12.6) compared to other countries, which indicates the greater spread data from the mean. Whereas other countries will have moderate and low spread data from the mean. The results of Positive Skewness and Kurtosis resonates that all the selected series are less peaked than a normal distribution. Finally, Brazil records the highest interest rates which indicate the cost of borrowing, return on savings are issued to raise capital. The higher interest rates indicate the strength of the economy.

4.1.8 Descriptive Statistics of International Liquidity

International liquidity is the aggregate stock of internally acceptable assets held by the central bank to settle a deficit in a country's balance of payments. Table 4.8 skims the descriptive statistics of International Liquidity for the study period of fifteen years.

Table 4.8

Descriptive Statistics of International Liquidity

Particulars	Brazil (USD)	Russia (USD)	India (USD)	China (USD)	South Africa (USD)
Mean	610.25	5121.23	3273.61	67649.71	2667.26
Median	320.47	1852.33	572.22	963.50	764.56
Std. Dev.	661.43	6104.61	4134.87	99994.66	3018.23
Skewness	0.6	0.0	0.0	0.4	0.1
Kurtosis	1.9	0.1	0.1	1.3	0.3

From the table 4.8 it is found that China records the highest mean (67649.71) followed by Russia which indicates greater reliability. India and Russia indicates moderate reliability. whereas Brazil indicates low reliability. As the data are symmetric, the mean and median are similar. China records the highest Standard deviation (99994.66) compared to other countries, which indicates the greater spread data from the mean. Whereas other countries will have moderate and low spread data from the mean. The results of Positive Skewness and Kurtosis flashes that all the selected series are less peaked than a normal distribution. The international liquidity of China provides the ability to finance its deficit in

the balance of payments. It clearly states the liquidity and possibility of obtaining credit from financial institutions operating in international financial markets of BRICS Countries.

4.1.9 Descriptive Statistics of Foreign trade

Foreign Trade is an important aspect supporting development and poverty reduction. Table 4.9 reviews the descriptive statistics of Foreign trade for the study period of fifteen years

Table 4.9

Descriptive Statistics of Foreign trade

Particulars	Brazil (USD)	Russia (USD)	India (USD)	China (USD)	South Africa (USD)
Mean	51998.99	693.78	44384.82	8872.79	16894.18
Median	33532.56	303.98	1982.08	21791.60	10859.57
Std. Dev.	76504.75	922.54	102840.21	173407.60	27929.66
Skewness	2.1	0.1	0.1	0.9	0.6
Kurtosis	9.9	0.2	0.8	4.1	3.0

From the table 4.9 it is found that Brazil records the highest mean (51998.99) followed by India which indicates greater reliability. China and South Africa indicates moderate reliability. whereas Russia indicates low reliability. As the data are symmetric, the mean and median are similar. China records the highest Standard deviation (173407.60) compared to other countries, which indicates the greater spread data from the mean. Whereas other countries will have moderate and low spread data from the mean. The results of Positive Skewness and Kurtosis reflects that all the selected series are less peaked than a normal distribution.It is concluded that Trade of Brazil is better compared to other countries which indicate the larger share of exports and imports. It clearly states that countries could not be benefitted without trade.

4.2. Relationship of Macroeconomic Indicators with Exchange Rates:

An econometric model is one of the tools used to forecast future developments in the economy. In the present study Macroeconomic Indicators and Exchange Rates are used to examine the relationship of Macroeconomic Indicators with Exchange Rates and to forecast the economy or to calculate the effects of changes in the economy.

4.2.1 Stationarity for Exchange Rates - Augmented Dickey-Fuller Unit root test for Exchange Rates

Augmented Dickey-Fuller unit root tests the stationarity for BRICS Exchange Rates are presented in Table 4.10. ADF test has been applied to test the following hypothesis.

Hypothesis 1*: Unit root exists (i.e. nonstationarity) for Exchange Rates.*

Table 4.10

Stationarity for Exchange Rates

Countries	t-statistic	Probability	Test critical values		
			1 percent	5 percent	10 percent
Brazil	-8.00	0.00**	-3.46	-2.87	-2.57
Russia	-10.33	0.00**	-3.46	-2.87	-2.57
India	-10.55	0.00**	-3.46	-2.87	-2.57
China	-7.87	0.00**	-3.46	-2.87	-2.57
South Africa	-6.26	0.00**	-3.46	-2.87	-2.57

**indicates the significance of the Augmented Dickey-Fuller Unit root test

Table 4.10 shows that ADF tests confirm that the series were stationary at levels and intercept. Exchange Rates was significant at one percent level of significance. The critical values are -3.46 at 1 percent level -2.87 at 5 percent level and -2.57 at 10 percent level. A** indicates the significance of Augmented Dickey-Fuller unit root test value at 1 percent level. The results for the tests on the Exchange are reported in Table 4.10. Therefore the Exchange Rates were found to be significant at 1 percent level of significance, hence ***hypothesis 1 is rejected*** which means that unit root does not exist for Exchange Rates.

4.2.2 Stationarity for Prices, Production, and Labour - Augmented Dickey-Fuller Unit root test for Prices, Production, and Labour.

Augmented Dickey-Fuller unit root test for stationarity of Prices, Production, and Labour are presented in Table 4.11. It has been applied to test the following hypothesis.

Hypothesis 2(a)*: Unit root exists (i.e. nonstationarity) for Prices, Production, and Labour.*

Table 4.11

Stationarity for Prices, Production, and Labour

Countries	t-statistic	Probability	Test critical values		
			1 percent	5 percent	10 percent
Brazil	-28.13	0.00**	-3.43	-2.86	-2.57
Russia	-8.71	0.00**	-3.44	-2.86	-2.57
India	-14.55	0.00**	-3.46	-2.87	-2.57
China	-15.95	0.00**	-3.44	-2.86	-2.57
South Africa	-10.73	0.00**	-3.46	-2.87	-2.57

**indicates the significance of the Augmented Dickey-Fuller Unit root test

Table 4.11 shows that ADF tests confirm that the series was not stationary at levels and were found to be stationary at first difference and intercept. Prices, Production, and Labour was significant at one percent level of significance. The critical values are -3.43 at 1 percent level for Brazil -3.44 at 1 percent level for Russia and China. -3.46 at 1 percent level for India and South Africa. The critical values are -2.86 at 5 percent level for Brazil, Russia, and China. -2.87 at 5 percent for India and South Africa and the critical values are -2.57 at 10 percent level for all countries. A** indicates the significance of Augmented Dickey-Fuller unit root test value at 1 percent level. The results for the tests on Prices, Production and Labour are reported in Table 4.11. Therefore Prices, Production, and Labour were found to be significant at 1 percent level of significance, hence ***hypothesis 2(a) is rejected*** which means that unit root does not exist for Prices, Production, and Labour.

4.2.14 Stationarity for Effective Exchange Rates based on SDR and CPI - Augmented Dickey-Fuller Unit root test for Effective Exchange Rates based on SDR and CPI

Augmented Dickey-Fuller unit root test for stationarity of Effective Exchange Rates based on SDR and CPI are presented in Table 4.12. It has been applied to test the following hypothesis.

Hypothesis 2(b)*: Unit root exists (i.e. nonstationarity) for Effective Exchange Rates based on SDR and CPI.*

Table 4.12

Stationarity for Effective Exchange Rates based on SDR and CPI

Countries	t-statistic	Probability	Test critical values		
			1 percent	5 percent	10 percent
Brazil	-16.43	0.00**	-3.44	-2.86	-2.57
Russia	-12.23	0.00**	-3.44	-2.86	-2.56
India	-21.95	0.00**	-3.44	-2.86	-2.57
China	-12.49	0.00**	-3.43	-2.86	-2.56
South Africa	-6.81	0.00**	-3.44	-2.86	-2.56

**indicates the significance of the Augmented Dickey-Fuller Unit root test

Table 4.12 shows that ADF tests confirm that the series was not stationary at levels and were found to be stationary at first difference and intercept. Effective Exchange Rates based on SDR and CPI was significant at one percent level of significance. The critical values are -3.43 at 1 percent level for China -3.44 at 1 percent level for Brazil, Russia, India, and South Africa. The critical values are -2.86 at 5 percent level for all countries and the critical values are -2.56 at 10 percent level for Russia, China, and South Africa and -2.57 at 10 percent level for Brazil and India. A** indicates the significance of Augmented Dickey-Fuller unit root test value at 1 percent level. The results for the tests on Effective Exchange Rates based on SDR and CPI are reported in Table 4.12. Therefore Effective Exchange Rates based on SDR and CPI were found to be significant at 1 percent level of significance, hence ***hypothesis 2(b) is rejected*** which means that unit root does not exist for Effective Exchange Rates based on SDR and CPI.

4.2.3 Stationarity for Balance of payments- Augmented Dickey-Fuller Unit root test for External Sector

Augmented Dickey-Fuller unit root test for stationarity of Balance of payments are presented in Table 4.13. It has been applied to test the following hypothesis.

Hypothesis 2(c) *Unit root exists (i.e. nonstationarity) for Balance of payments.*

Table 4.13

Stationarity for Balance of payments

Countries	t-statistic	Probability	Test critical values		
			1 percent	5 percent	10 percent
Brazil	-2.87	0.04**	-3.44	-2.86	-2.57
Russia	-7.48	0.00**	-3.44	-2.86	-2.56
India	-6.20	0.00**	-3.44	-2.86	-2.57
China	-8.57	0.00**	-3.98	-3.42	-3.13
South Africa	-12.96	0.00**	-3.44	-2.86	-2.57

**indicates the significance of the Augmented Dickey-Fuller Unit root test

Table 4.13 shows that ADF tests confirm that the series was not stationary at levels and were found to be stationary at first difference and intercept. The balance of payments was significant at one percent level of significance for all countries except Brazil. The critical values are -3.44 at 1 percent level for all countries except China hence it was found to be -3.98. The critical values are -2.86 at 5 per cent level for all countries except China which was -3.42 and the critical values are -2.56 at 10 percent level for Russia -2.57 at 10 percent level for Brazil, India, and South Africa and -3.13 for China An ** indicates significance of Augmented Dickey-Fuller unit root test value at 1 percent level and 5 percent level. Therefore Balance of payments was found to be significant at 1 percent level of significance for all countries except Brazil, it was found to be significant at 5 percent level of significance hence ***hypothesis 2(c) is rejected*** which means that unit root does not exist for Balance of payments.

4.2.4 Stationarity for GDP - Augmented Dickey-Fuller Unit root test for GDP

Augmented Dickey-Fuller unit root test for stationarity of GDP are presented in Table 4.14. It has been applied to test the following hypothesis.

Hypothesis 2(d)*: Unit root exists (i.e. nonstationarity) for GDP.*

Table 4.14

Stationarity for GDP

Countries	t-statistic	Probability	Test critical values		
			1 percent	5 percent	10 percent
Brazil	-1.65	0.04**	-3.43	-2.86	-2.56
Russia	-8.71	0.00**	-3.44	-2.86	-2.57
India	-14.55	0.00**	-3.46	-2.87	-2.57
China	-15.95	0.00**	-3.44	-2.86	-2.56
South Africa	-10.54	0.00**	-3.46	-2.87	-2.57

**indicates the significance of the Augmented Dickey-Fuller Unit root test

Table 4.14 shows that ADF tests confirm that the series were stationary at levels for Brazil and were found to be stationary at first difference and intercept for Russia, China, India, and South Africa. GDP was significant at one percent level of significance except for Brazil. The critical values are -3.43 at 1 percent level for Brazil -3.44 at 1 percent level for Russia and China -3.46 at 1 percent level for India and South Africa. The critical values are -2.86 at 5 percent level for Brazil, Russia, and China. -2.87 at 5 percent for India and South Africa and the critical values are -2.57 at 10 percent level for Russia, India, and South Africa and -2.56 for Brazil and China. A** indicates significance of Augmented Dickey-Fuller unit root test value at 1 percent level and 5 percent level. Therefore GDP was found to be significant at 1 percent level of significance for all countries except Brazil, it was found to be significant at 5 percent level of significance hence ***hypothesis 2(d) is rejected*** which means that unit root does not exist for GDP.

4.2.5 Stationarity for Government Finance - Augmented Dickey-Fuller Unit root test for Government Finance

Augmented Dickey-Fuller unit root test for stationarity of Government Finance are presented in Table 4.15. It has been applied to test the following hypothesis.

Hypothesis 2(e)*: Unit root exists (i.e. nonstationarity) for Government Finance.*

Table 4.15

Stationarity for Government Finance

Countries	t-statistic	Probability	Test critical values		
			1 percent	5 percent	10 percent
Brazil	-3.29	0.01**	-3.44	-2.86	-2.57
Russia	-22.47	0.00**	-3.44	-2.86	-2.57
India	-15.28	0.00**	-3.44	-2.86	-2.57
South Africa	-7.86	0.00**	-3.45	-2.87	-2.57

**indicates the significance of the Augmented Dickey-Fuller Unit root test
Note: Lack of data for China

Table 4.15 shows that ADF tests confirm that the series were stationary at levels for Brazil and were found to be stationary at first difference and intercept for Russia and India and the series were stationary at the second difference and intercept for South Africa. Government Finance was significant at one percent level of significance. The critical values are -3.44 at 1 percent level for Brazil, Russia, and India -3.45 at 1 percent level for South Africa. The critical values are -2.86 at 5 percent level for Brazil, Russia, and India. -2.87 at 5 percent for and South Africa and the critical values are -2.57 at 10 percent level for Brazil, Russia, India, and South Africa. A** indicates the significance of Augmented Dickey-Fuller unit root test value at 1 percent level. Therefore Government Finance was found to be significant at 1 percent level of significance for Brazil, Russia, India, and South Africa, hence ***hypothesis 2(e) is rejected*** which means that unit root does not exist for Government Finance.

4.2.6 Stationarity for Interests Rates - Augmented Dickey-Fuller Unit root test for Interests Rates

Augmented Dickey-Fuller unit root test for stationarity of the Interest Rates are presented in Table 4.16. It has been applied to test the following hypothesis.

Hypothesis 2(f)*: Unit root exists (i.e. nonstationarity) for Interest Rates.*

Table 4.16

Stationarity for Interest Rates

Countries	t-statistic	Probability	Test critical values		
			1 percent	5 percent	10 percent
Brazil	-4.36	0.04**	-3.44	-2.86	-2.56
Russia	-4.81	0.00**	-3.44	-2.86	-2.56
India	-4.84	0.00**	-3.44	-2.86	-2.57
China	-10.58	0.00**	-3.44	-2.86	-2.56
South Africa	-5.53	0.00**	-3.43	-2.86	-2.56

**indicates the significance of the Augmented Dickey-Fuller Unit root test

Table 4.16 shows that ADF tests confirm that the series were stationary at levels for India and South Africa. It was found to be stationary at first difference and intercept for Brazil and China. Interest Rates was significant at one percent level of significance except for Brazil which was significant at five percent level of significance. The critical values are -3.44 at 1 percent level for Brazil, India, and China -3.43 at 1 percent level for South Africa. The critical values are -2.86 at 5 percent level for Brazil, India, China, and South Africa and the critical values are -2.56 at 10 percent level for Brazil, China and South Africa and -2.57 for India. A** indicates significance of Augmented Dickey-Fuller unit root test value at 1 percent level and 5 percent level. Therefore Interest Rates were found to be significant at 1 percent level of significance for India, China and South Africa and 5 percent level of significance for Brazil hence ***hypothesis 2(f) is rejected*** which means that unit root does not exist for Interest Rates.

4.2.7 Stationarity for International Liquidity - Augmented Dickey-Fuller Unit root test for International Liquidity

Augmented Dickey-Fuller unit root test for stationarity of International Liquidity are presented in Table 4.17. It has been applied to test the following hypothesis.

Hypothesis 2(g)*: Unit root exists (i.e. non stationarity) for International Liquidity.*

Table 4.17

Stationarity for International Liquidity

Countries	t-statistic	Probability	Test critical values		
			1 percent	5 percent	10 percent
Brazil	-22.95	0.00**	-3.44	-2.86	-2.56
Russia	-16.61	0.00**	-3.43	-2.86	-2.56
India	-6.75	0.00**	-3.44	-2.86	-2.56
China	-10.65	0.00**	-3.44	-2.86	-2.56
South Africa	-30.77	0.00**	-3.43	-2.86	-2.56

**indicates the significance of the Augmented Dickey-Fuller Unit root test

Table 4.17 shows that ADF tests confirm that the series was not stationary at levels and were found to be stationary at first difference and intercept. International Liquidity was significant at one percent level of significance. The critical values are -3.44 at 1 percent level for Brazil, India, and China -3.43 at 1 percent level for Russia and South Africa. The critical values are -2.86 at 5 percent level for all countries and the critical values are -2.57 at 10 percent level for all countries. A** indicates the significance of Augmented Dickey-Fuller unit root test value at 1 percent level. Therefore International Liquidity was found to be significant at 1 percent level of significance, hence ***hypothesis 2(g) is rejected*** which means that unit root does not exist for International Liquidity.

4.2.8 Stationarity for Foreign trade - Augmented Dickey-Fuller Unit root test for Foreign trade

Augmented Dickey-Fuller unit root test for stationarity of Foreign trade are presented in Table 4.18. It has been applied to test the following hypothesis.

Hypothesis 2(h)*: Unit root exists (i.e. nonstationarity) for Foreign Trade.*

Table 4.18

Stationarity for Foreign trade

Countries	t-statistic	Probability	Test critical values		
			1 percent	5 percent	10 percent
Brazil	-11.86	0.00**	-3.44	-2.86	-2.56
Russia	-4.96	0.00**	-3.73	-2.99	-2.63
India	-8.85	0.00**	-3.44	-2.86	-2.56
China	-11.11	0.00**	-3.44	-2.86	-2.56
South Africa	-11.28	0.00**	-3.44	-2.86	-2.56

**indicates the significance of the Augmented Dickey-Fuller Unit root test

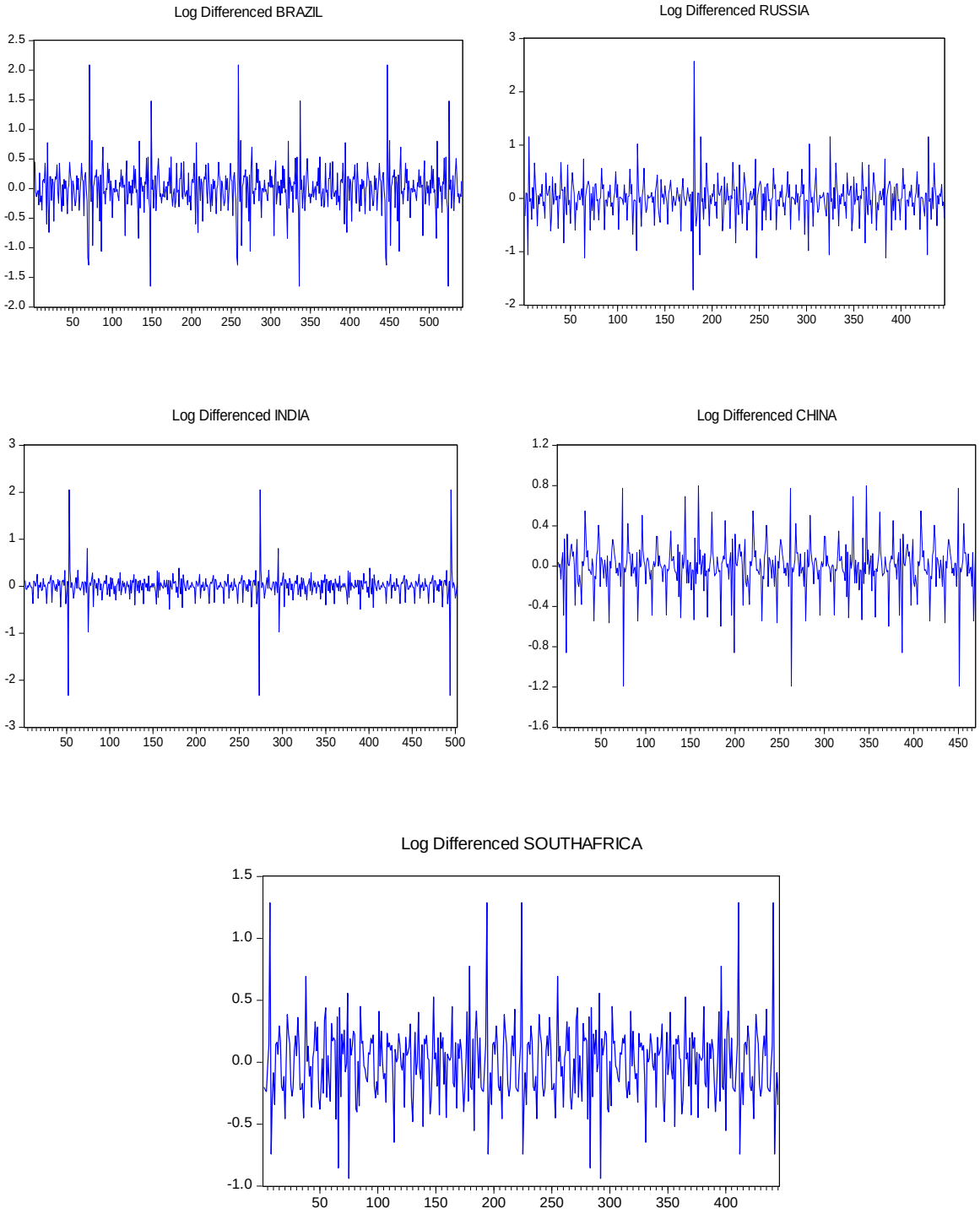
Table 4.18 shows that ADF tests confirm that the series were stationary at levels for Russia and were found to be stationary at first difference and intercept for Brazil, China, India, and South Africa. Foreign trade was significant at one percent level of significance. The critical values are -3.44 at 1 percent level for Brazil, India, China, and South Africa -3.73 at 1 percent level for Russia. The critical values are -2.86 at 5 percent level for all countries except Russia which was -2.99 and the critical values are -2.56 at 10 percent level for all countries except Russia which was -2.63. A** indicates the significance of Augmented Dickey-Fuller unit root test value at 1 percent level. Therefore Foreign trade was found to be significant at 1 percent level of significance, hence ***hypothesis 2(h) is rejected*** which means that unit root does not exist for Foreign Trade.

4.9 Stationarity – Graph

The following graph depicts the Stationarity of Macroeconomic Indicators and Exchange Rates of BRICS Countries.

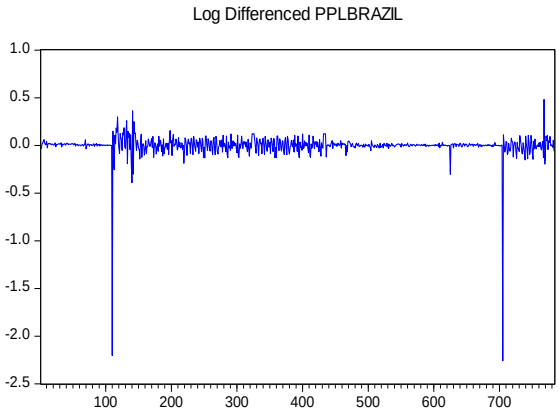
Graph 4.9.1

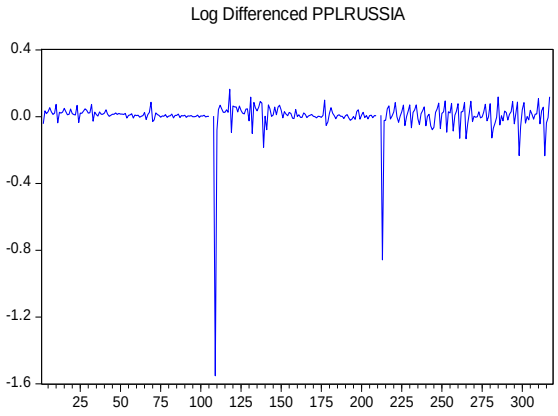
Stationarity for BRICS Exchange Rates

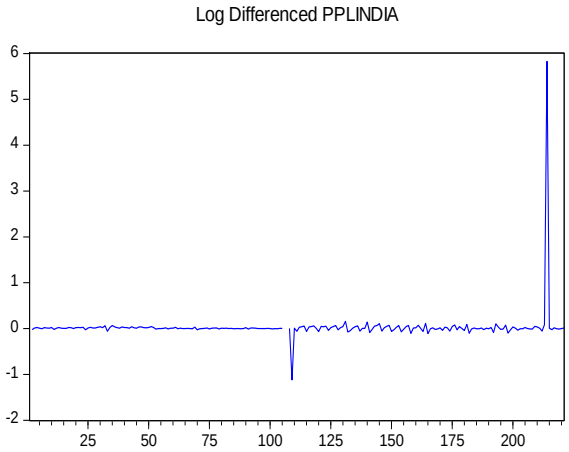


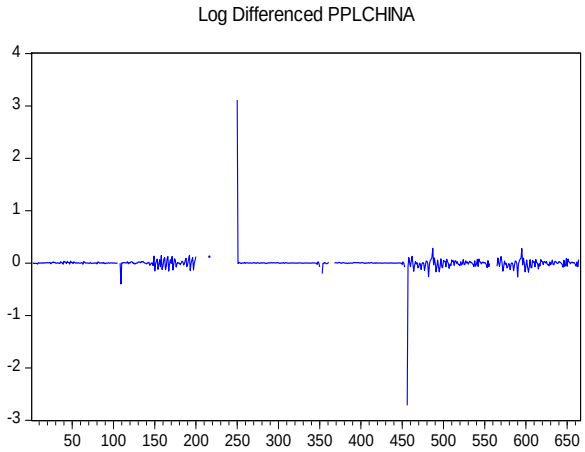
Graph 4.9.2

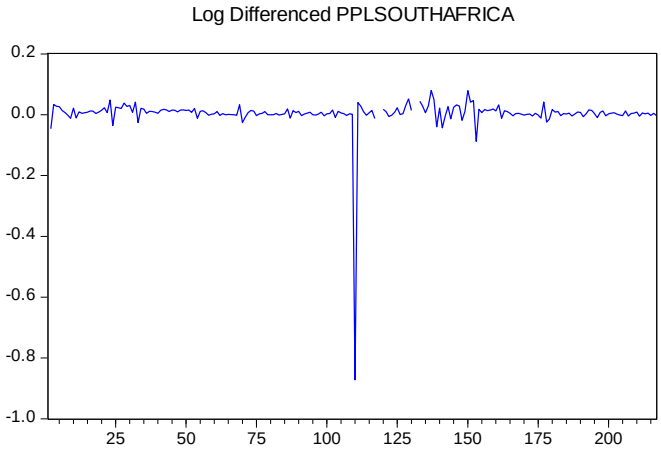
Stationarity for Prices, Production, and Labour





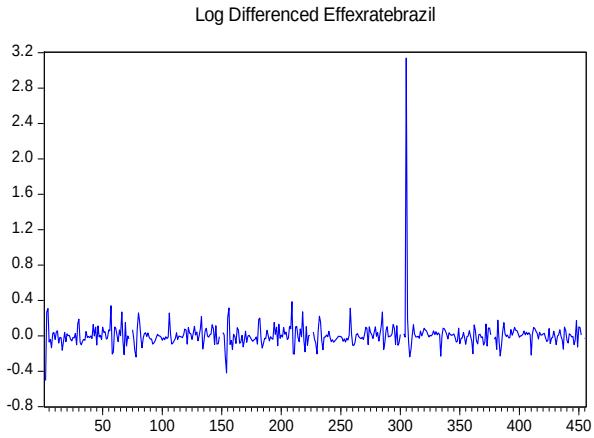


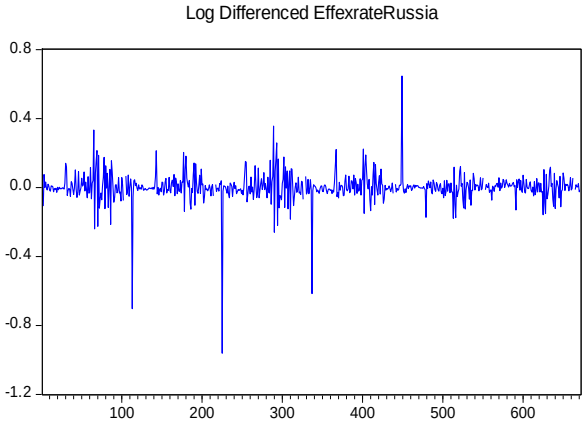


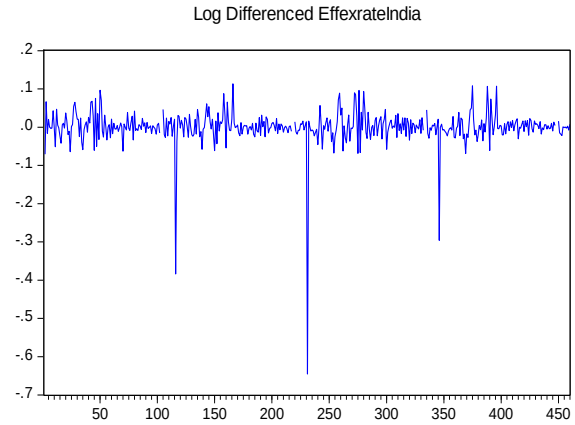


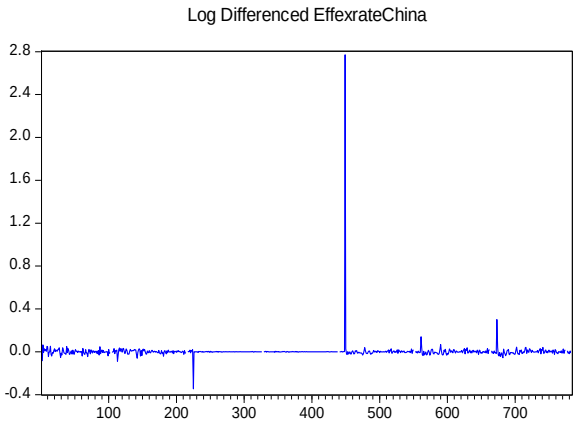
Graph 4.9.3

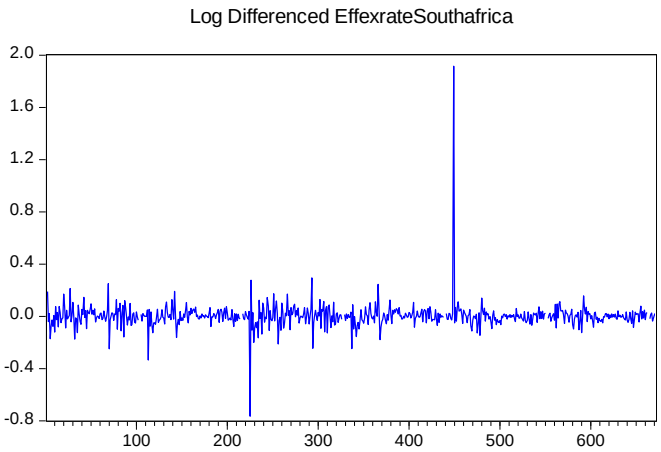
Stationarity for Effective Exchange Rates based on SDR and CPI





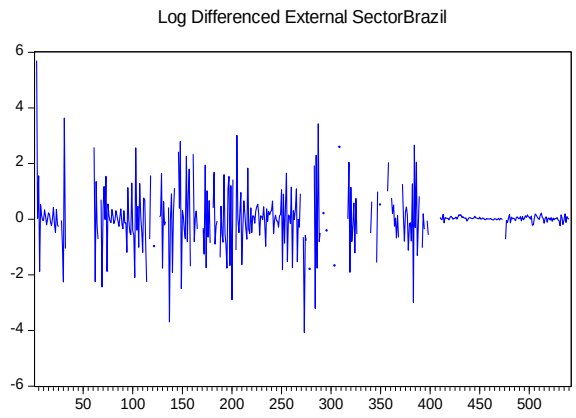


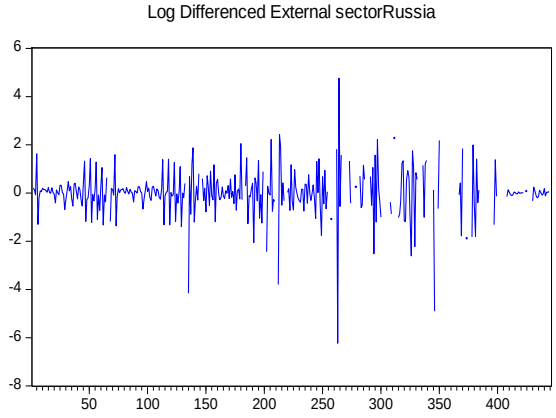


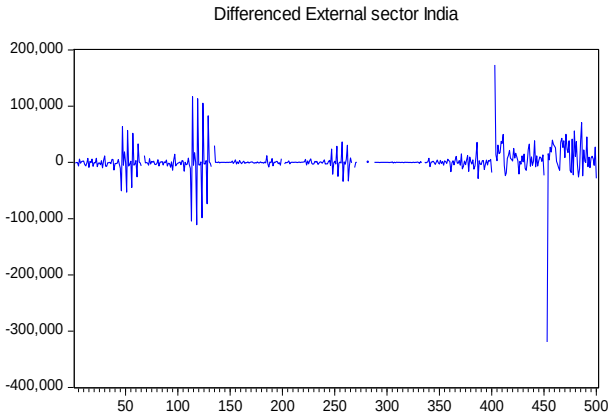


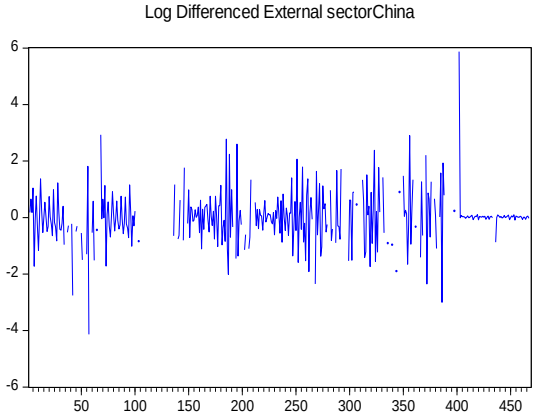
Graph 4.9.4

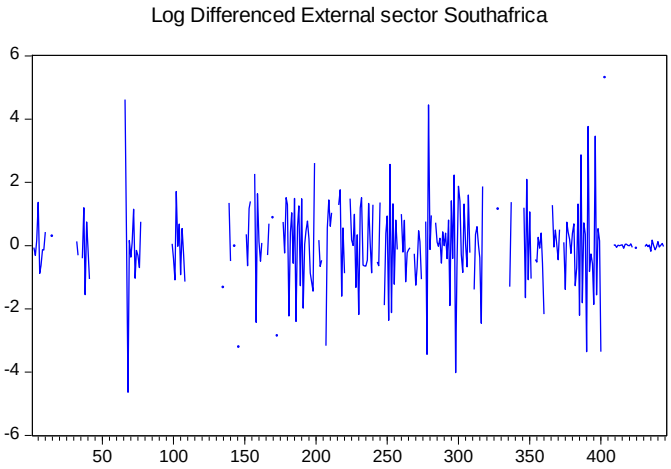
Stationarity for Balance of payments





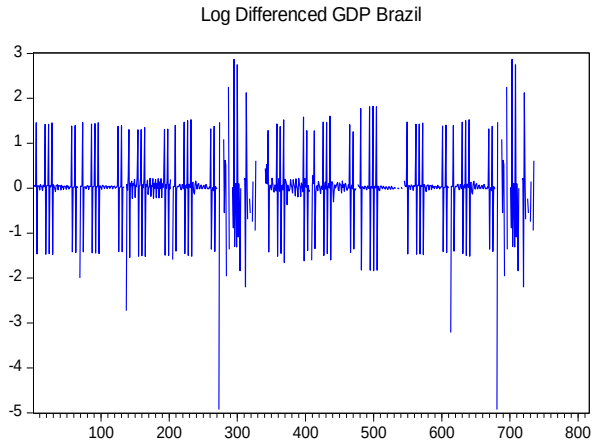


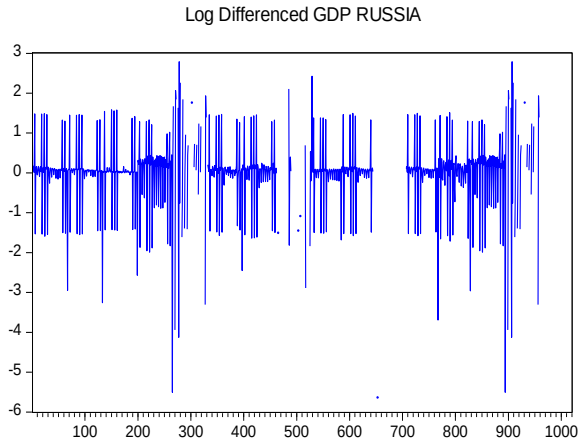


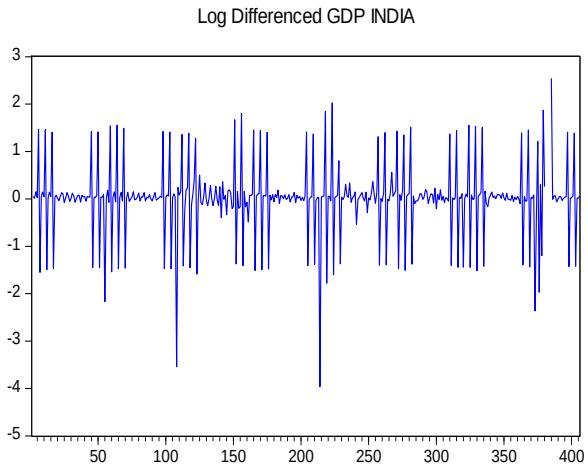


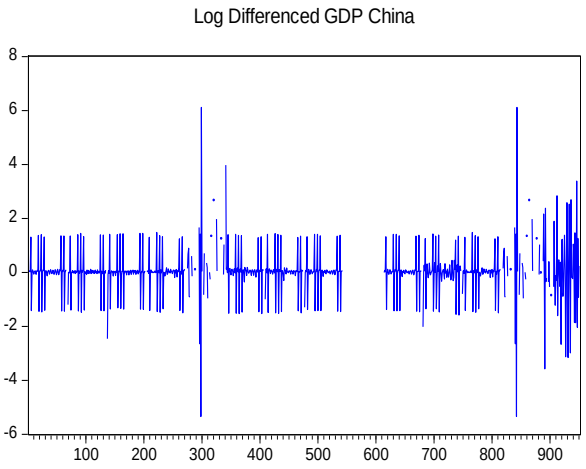
Graph 4.9.5

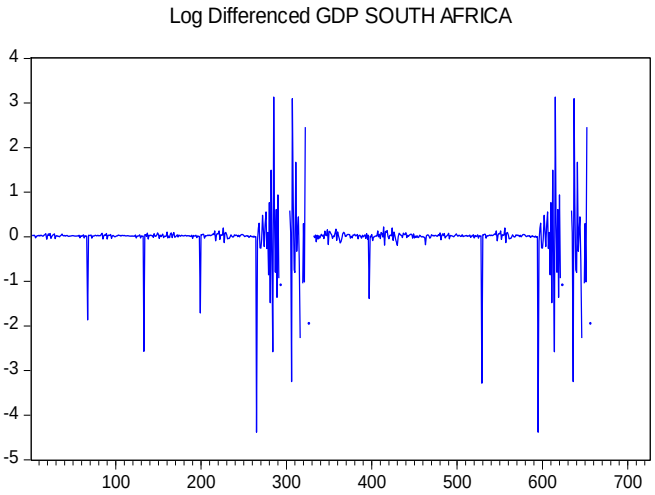
Stationarity for GDP





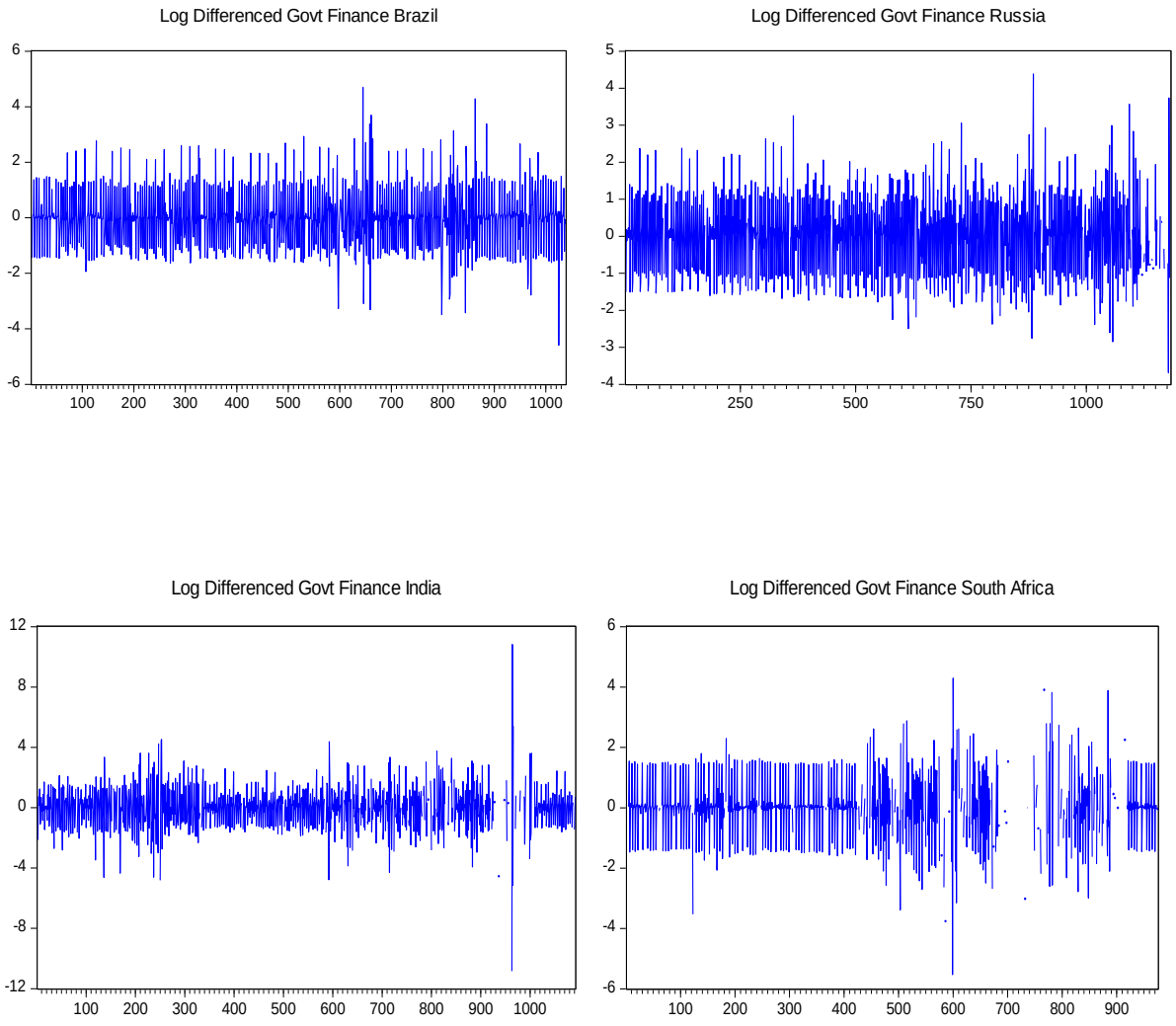






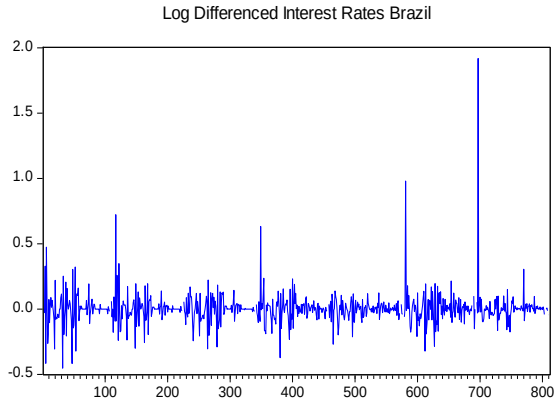
Graph 4.9.6

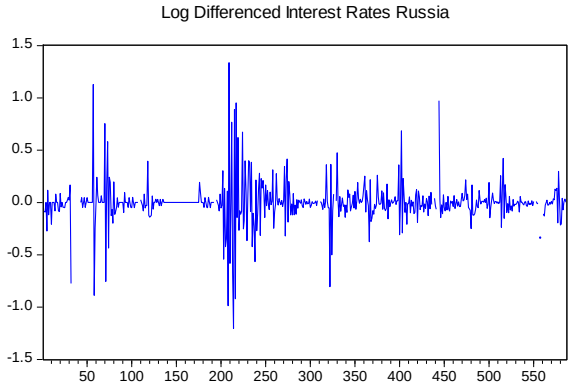
Stationarity for Government Finance

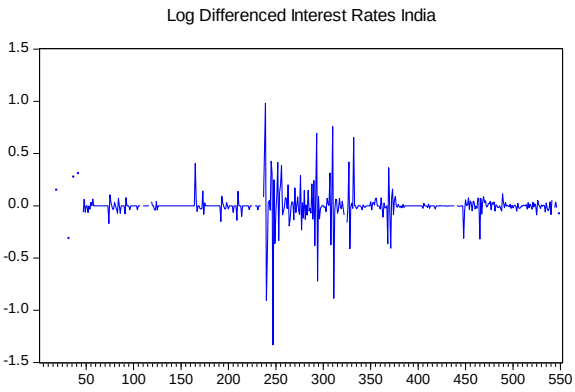


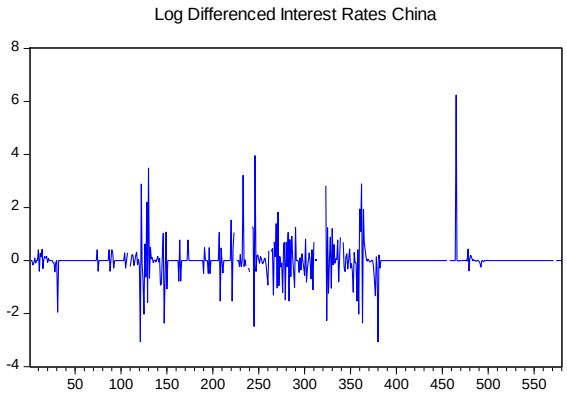
Graph 4.9.7

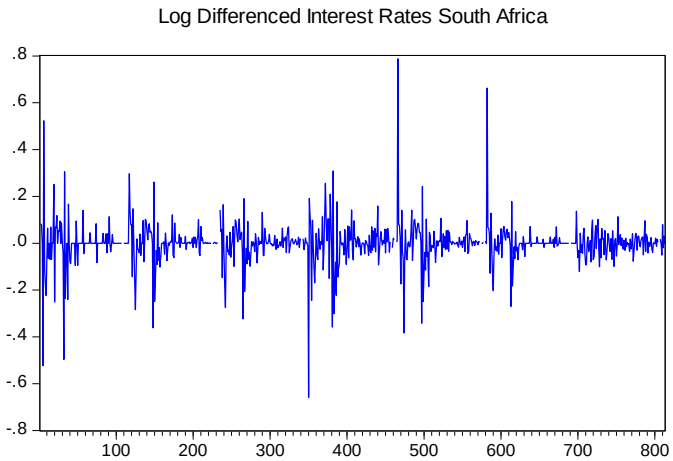
Stationarity for Interest Rates





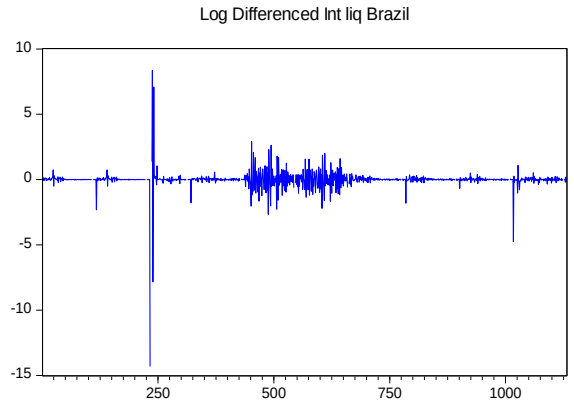


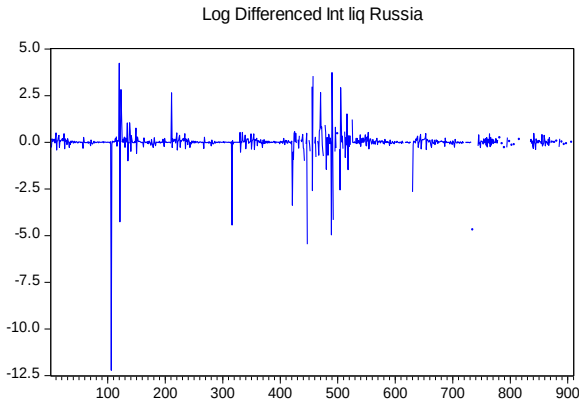


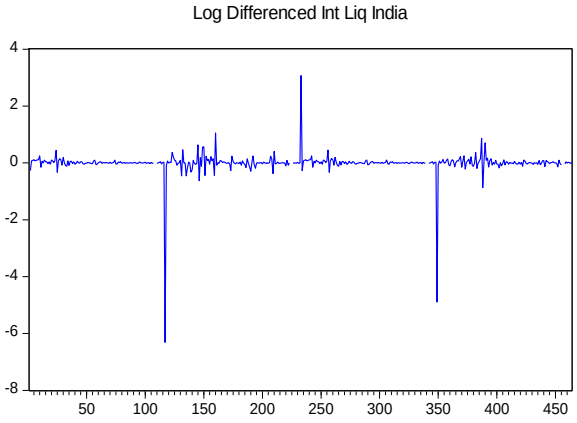


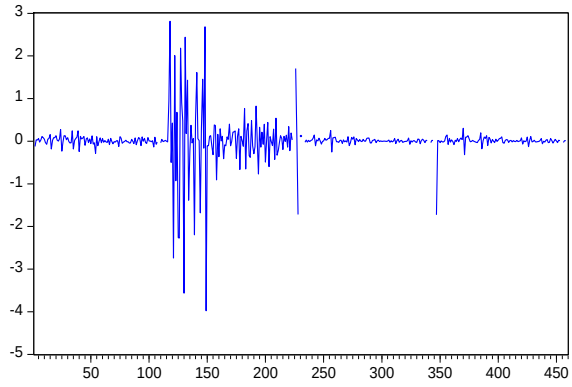
Graph 4.9.8

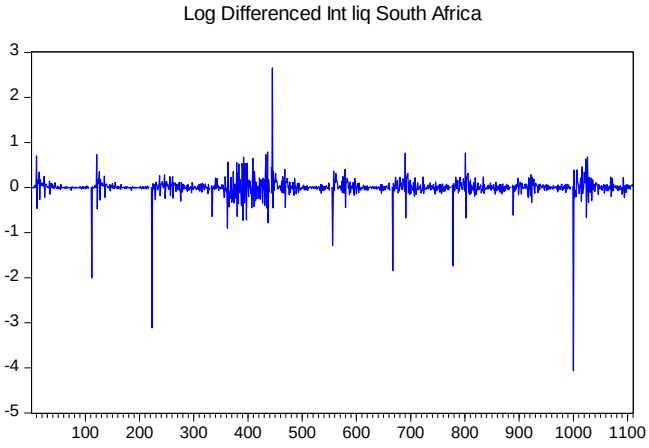
Stationarity for International Liquidity





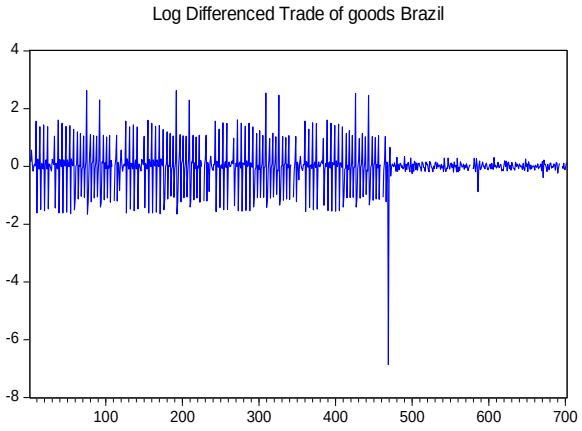


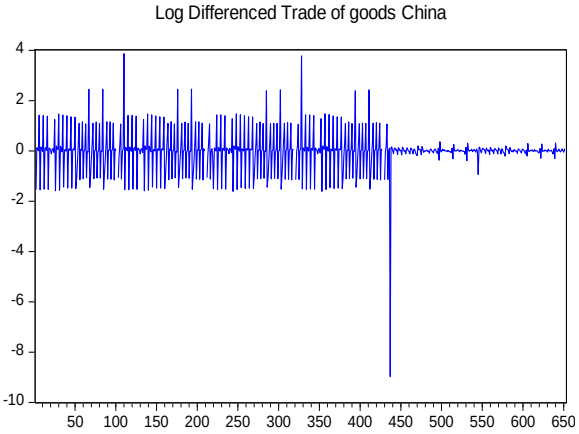


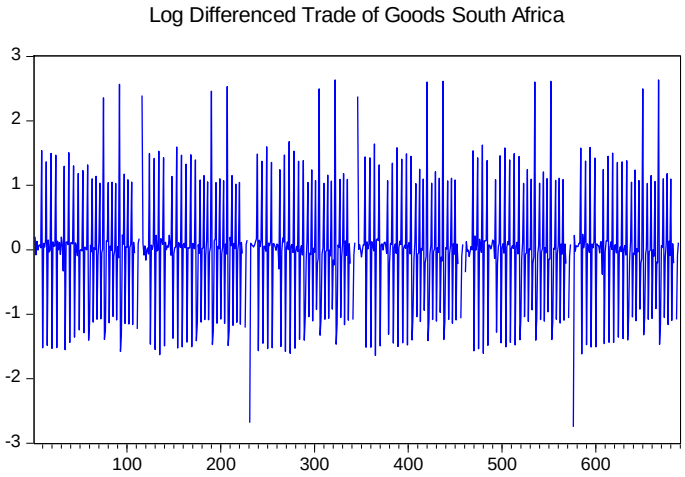


Graph 4.9.9

Stationarity for Foreign trade







4.2.9 Long-run Equilibrium relationship- Johansen's co-integration tests for Prices, Production, and Labour

It is used to check the long-run co-integrating equilibrium relationship between Prices, Production, and Labour with Exchange Rates. Johansen's co-integration tests been applied to test the following hypothesis.

Hypothesis 3(a): *There is no long-run relationship between Prices, Production, and Labour with Exchange Rates.*

Table 4.20

Johansen's long-run co-integrating equilibrium relationship between Prices, Production and Labour and Exchange Rates

Countries	Trace statistic		Max–eigenvalue		5 percent critical Value		P-value	
	None	Almost one	None	Almost one	None	Almost one	None	Almost one
Brazil	17.23	3.44	13.79	3.44	15.49	3.84	0.02*	0.06
Russia	12.05	1.87	10.17	1.87	15.49	3.84	0.15	0.17
India	4.21	0.33	3.67	0.33	15.49	3.84	0.90	0.56
China	5.77	0.55	5.21	0.55	15.49	3.84	0.72	0.45
South Africa	7.90	1.50	6.39	1.50	15.49	3.84	0.47	0.21

*indicates 5 percent significant

A country's economic growth results from Prices, Production, and Labour. The Johansen's cointegration test results are reported in Table 4.20. The tests confirm that there is one co-integrating equation among Prices, Production and Labour and Exchange Rates. The cointegration results indicates that the Prices, Production, and Labour with Brazil Exchange Rates have a tendency to move in the long-run. However, in the short-run, they may deviate from such long-run relationship. It identifies that p-value is significant at 5 percent level ($P > 0.05$) for Brazil. There is a long run co-integrating equilibrium relationship between Prices, Production, and Labour with Brazil Exchange Rates at 5 percent level of significance. Therefore ***hypothesis 3(a) is accepted*** in case of Russia, India, China, and South Africa which means that there is no long-run relationship between Prices, Production and Labour and Exchange Rates and ***hypothesis 3(a) are rejected*** in case of Brazil that indicates the long-run relationship. To further investigate the relationships

among the Prices, Production and Labour and Exchange Rates. VECM (Vector Error Correction Model) is examined for co-integrating variables and VAR (Vector Autoregression) is examined for variables which are not cointegrated.

Hence the above table concludes that Prices, Production, and Labour of Brazil shows one co-integrating equation indicating the Long-run co-integrating equilibrium relationship between the variables. It can further proceed to VECM (Vector Error Correction Model) for Brazil. VAR model can be carried out for the other countries.

4.2.10 Long-run Equilibrium relationship- Johansen's co-integration tests for Effective Exchange Rates as per SDR and CPI

It is used to check the long-run co-integrating equilibrium relationship between Effective Exchange Rates as per SDR and CPI and Exchange Rates. Johansen's co-integration tests been applied to test the following hypothesis.

Hypothesis 3(b): *There is no long-run relationship between Effective Exchange Rates as per SDR and CPI and Exchange Rates.*

Table 4.21

Johansen's long-run co-integrating equilibrium relationship between Effective Exchange Rates as per SDR and CPI and Exchange Rates

Countries	Trace statistic		Max–eigen value		5 percent critical Value		P-value	
	None	Atmost one	None	Atmost one	None	Atmost one	None	Atmost one
Brazil	8.74	0.02	8.72	0.02	15.49	3.84	0.38	0.88
Russia	29.17	9.09	20.08	9.09	15.49	3.84	0.00**	0.00**
India	9.89	3.39	6.49	3.39	15.49	3.84	0.28	0.68
China	6.50	1.03	5.47	1.03	15.49	3.84	0.63	0.30
South Africa	8.59	2.95	5.68	2.95	15.49	3.84	0.40	0.80

**indicates 1 percent significant

SDR and CPI play a vital role in the Exchange Rates system. The Johansen's cointegration test results are reported in Table 4.21. The tests confirm that there is one co-integrating equation among Effective Exchange Rates as per SDR and CPI with BRICS Exchange Rates. The cointegration results indicates that the Effective Exchange Rates as per SDR and CPI with Russia Exchange Rates have a tendency to move in the long-run.

However, in the short-run, they may deviate from such long-run relationship. It identifies that that p-value is significant at 1 percent level (P > 0.01) for Russia. There is a long run co-integrating equilibrium relationship between Effective Exchange Rates as per SDR and CPI with Russia Exchange Rates at 1 percent level of significance. Therefore ***hypothesis 3(b) is rejected*** in case of Russia that indicates the long-run relationship whereas ***hypothesis 3(b) is accepted*** in case of Brazil, India, China, and South Africa which means that there is no long-run relationship between Effective Exchange Rates as per SDR and CPI and Exchange Rates.

To further investigate the relationships among the Effective Exchange Rates as per SDR and CPI and Exchange Rates. VECM (Vector Error Correction Model)) is examined for Russia and VAR (Vector Autoregression) is examined for Brazil, India, China, and South Africa.

4.2.11 Long-run Equilibrium relationship- Johansen's co-integration tests between Balance of payments and Exchange Rates.

It is used to check the long-run co-integrating equilibrium relationship between Balance of payments and Exchange Rates. Johansen's co-integration tests been applied to test the following hypothesis.

Hypothesis 3(c): *There is no long-run relationship between Balance of payments and Exchange Rates.*

Table 4.22

Johansen's long-run co-integrating equilibrium relationship between Balance of payments and Exchange Rates

Countries	Trace statistic		Max–eigen value		5 percent critical Value		P-value	
	None	Atmost one	None	Atmost one	None	Atmost one	None	Atmost one
Brazil	15.34	3.74	11.60	3.74	15.49	3.84	0.05	0.05
Russia	9.64	1.26	8.37	1.26	15.49	3.84	0.30	0.26
India	21.93	3.96	17.97	3.96	15.49	3.84	0.00**	0.04*
China	85.64	3.86	81.78	3.86	15.49	3.84	0.00**	0.04*
South Africa	5.53	0.74	4.78	0.74	15.49	3.84	0.74	0.38

**indicates 1 percent significant *indicates 5 percent significant

Balance of payments makes international transactions which help in the development of an economy. The Johansen's cointegration test results are reported in Table 4.22. The tests confirm that there are two co-integrating equations among Balance of payments with BRICS Exchange Rates. The cointegration results indicates that Balance of payments with India and China Exchange Rates have a tendency to move in the long-run. However, in the short-run, they may deviate from such long-run relationship. It identifies that that p-value is significant at 1 percent level and 5 percent level (P > 0.01,0.05) for India and China. There is long run co-integrating equilibrium relationship between Balance of payments with India and China Exchange Rates at 1 percent and 5 percent significance levels. Therefore ***hypothesis 3(c) is rejected*** in case of India and China that indicates the long-run relationship whereas ***hypothesis 3(c) is accepted*** in case of Brazil, Russia, and South Africa which means that there is no long-run relationship between Balance of payments and Exchange Rates.

For further investigation the relationships among the Balance of payments and Exchange Rates VECM (Vector Error Correction Model)) is examined for India and Russia and VAR (Vector Autoregression) is examined for Brazil, China, and South Africa.

4.2.12 Long-run Equilibrium relationship- Johansen's co-integration tests between GDP and Exchange Rates.

It is used to check the long-run co-integrating equilibrium relationship between GDP and Exchange Rates. Johansen's co-integration tests been applied to test the following hypothesis.

Hypothesis 3(d): *There is no long-run relationship between GDP and Exchange Rates*

Table 4.23

Johansen's long-run co-integrating equilibrium relationship between GDP and Exchange Rates.

Countries	Trace statistic		Max–eigen value		5 percent critical Value		P-value	
	None	Atmost one	None	Atmost one	None	Atmost one	None	Atmost one
Brazil	22.16	10.52	11.63	10.52	15.49	3.84	0.00**	0.00**
Russia	50.99	20.08	30.90	20.08	15.49	3.84	0.00**	0.00**
India	12.01	3.86	8.14	3.86	15.49	3.84	0.15	0.04
China	8.26	0.59	7.66	0.59	15.49	3.84	0.43	0.43
South Africa	18.55	5.96	12.58	5.96	15.49	3.84	0.01*	0.01*

***indicates 1 percent significant *indicates 5 percent significant

The Johansen's cointegration test results are reported in Table 4.23. The tests confirm that there are three co-integrating equations among GDP and BRICS Exchange Rate. The cointegration results indicates that GDP and Exchange Rates of Brazil, Russia, and South Africa have a tendency to move in the long-run. However, in the short-run, they may deviate from such long-run relationship. It identifies that that p-value is significant at 1 percent and 5 percent levels (P > 0.01,0.05) for Brazil, Russia, and South Africa. There is a long run co-integrating equilibrium relationship between GDP and Exchange Rates of Brazil, Russia, and South Africa at 1 percent and 5 percent significance levels. Therefore the ***hypothesis 3(d) is rejected*** in the case of Brazil, Russia, and South Africa meaning that there is a long-run relationship. Whereas ***hypothesis 3(d) is accepted*** for China and India which means that there is no long-run relationship between GDP and Exchange Rates.

To further investigate the relationships among GDP and Exchange Rates of BRICS Countries VECM (Vector Error Correction Model)) is examined for Brazil, Russia, and South Africa and VAR (Vector Autoregression) is examined for India and China.

4.2.13 Long-run Equilibrium relationship- Johansen's co-integration tests between Government Finance and Exchange Rates

It is used to check the long-run co-integrating equilibrium relationship between Government Finance and Exchange Rates. Johansen's co-integration tests been applied to test the following hypothesis.

Hypothesis 3(e): *There is no long-run relationship between Government Finance and Exchange Rates.*

Table 4.24

Johansen's long-run co-integrating equilibrium relationship between Government Finance and Exchange Rates

Countries	Trace statistic		Max–eigen value		5 percent critical value		P-value	
	None	Atmost one	None	Atmost one	None	Atmost one	None	Atmost one
Brazil	44.25	18.37	26.67	18.37	15.49	3.84	0.00**	0.00**
Russia	43.67	15.72	27.94	15.72	15.49	3.84	0.00**	0.00**
India	35.62	11.75	23.86	11.75	15.49	3.84	0.00**	0.00**
South Africa	35.93	2.44	33.49	2.44	15.49	3.84	0.00**	0.01*

**indicates 1 percent significant *indicates 5 percent significant Note: Lack of data for China

The Johansen's cointegration test results are reported in Table 4.24. The tests confirm that there are four co-integrating equations among Government Finance and Exchange Rates. The cointegration results indicates that Government Finance with Brazil, Russia, India, and South Africa Exchange Rates have a tendency to move in the long-run. However, in the short-run, they may deviate from such long-run relationship. It identifies that that p-value is significant at 1 percent level (P > 0.01) and denotes there is long run co-integrating equilibrium relationship between Government Finance with all the four countries Exchange Rates at 1 percent significance level. Therefore ***hypothesis 3(e) is rejected*** that indicates there is a long-run relationship which means that there is long-run relationship between Government Finance and Exchange Rates.

For further investigating the relationships among the Government Finance and Exchange Rates of BRICS Countries VECM (Vector Error Correction Model)) is examined for Brazil, Russia, India, and South Africa.

4.2.14 Long-run Equilibrium relationship- Johansen's co-integration tests between Interest Rates and Exchange Rates.

It is used to check the long-run co-integrating equilibrium relationship between Interest Rates and Exchange Rates. Johansen's co-integration tests been applied to test the following hypothesis.

Hypothesis 3(f): *There is no long-run relationship between Interest Rates and Exchange Rates.*

Table 4.25

Johansen's long-run co-integrating equilibrium relationship between Interest Rates and Exchange Rates.

Countries	Trace statistic		Max–eigen value		5 percent critical Value		P-value	
	None	Atmost one	None	Atmost one	None	Atmost one	None	Atmost one
Brazil	11.87	2.69	9.17	2.69	15.49	3.84	0.16	0.10
Russia	30.86	10.05	20.81	10.05	15.49	3.84	0.00**	0.00**
India	19.95	6.55	13.40	6.55	15.49	3.84	0.01*	0.01*
China	9.18	3.68	5.49	3.68	15.49	3.84	0.34	0.05
South Africa	22.86	6.03	16.83	6.03	15.49	3.84	0.00**	0.01*

**indicates 1 percent significant *indicates 5 percent significant

The Johansen's cointegration test results are reported in Table 4.25. The tests confirm that there are three co-integrating equations among Interest Rates and Exchange Rates. The cointegration results indicates that Interest Rates with Russia, India and South Africa Exchange Rates have a tendency to move in the long-run. However, in the short-run, they may deviate from such long-run relationship. It identifies that that p-value is significant at 1 percent level and 5 percent level (P > 0.01,0.05) for Russia, India and South Africa. There is a long run co-integrating equilibrium relationship between Interest Rates with Russia, India, and South Africa Exchange Rates at 1 percent and 5 percent significance levels. Therefore ***hypothesis 3(f) is rejected*** in case of Russia, India and South Africa that indicates the long-run relationship whereas ***hypothesis 3(f) is accepted*** in case of Brazil and China which means that there is no long-run relationship between Interest Rates and Exchange Rates.

For further analyzing the relationships among the Interest Rates and Exchange Rates of BRICS Countries VECM (Vector Error Correction Model)) is examined for Russia, India, and South Africa and VAR (Vector Autoregression) is examined for Brazil and China.

4.2.15 Long-run Equilibrium relationship- Johansen's co-integration tests between International Liquidity and Exchange Rates.

It is used to check the long-run co-integrating equilibrium relationship between International Liquidity and Exchange Rates. Johansen's co-integration tests been applied to test the following hypothesis.

Hypothesis 3(g): *There is no long-run relationship between International Liquidity and Exchange Rates.*

Table 4.26

Johansen's long-run co-integrating equilibrium relationship between International Liquidity and Exchange Rates

Countries	Trace statistic		Max–eigen value		5 percent critical Value		P-value	
	None	Atmost one	None	Atmost one	None	Atmost one	None	Atmost one
Brazil	28.02	5.84	22.18	5.84	15.49	3.84	0.00**	0.01*
Russia	29.93	7.99	21.93	7.99	15.49	3.84	0.00**	0.00**
India	25.54	11.64	13.89	11.64	15.49	3.84	0.00**	0.00**
China	10.23	2.02	8.21	2.02	15.49	3.84	0.26	0.15
South Africa	13.47	3.48	10.26	3.48	15.49	3.84	0.09	0.06

**indicates 1 percent significant *indicates 5 percent significant

The Johansen's cointegration test results are reported in Table 4.26. The tests confirm that long-run relationship exists among between International Liquidity and Exchange Rates. The cointegration results indicates that International Liquidity and Exchange Rates have a tendency to move in the long-run. However, in the short-run, they may deviate from such long-run relationship. It identifies that that p-value is significant at 1 percent level and 5 percent level (P > 0.01,0.05) for Brazil, Russia, and India. Therefore the ***hypothesis 3(g) is rejected*** which means that there is long-run relationship between International Liquidity and Exchange Rates for Brazil, Russia and India and ***hypothesis 3(g) is accepted*** for China and South Africa which means that there is no long-run relationship between International Liquidity and Exchange Rates of China and South Africa.

To proceed further to investigate the relationships among International Liquidity and Exchange Rates VECM (Vector Error Correction Model)) is examined for Brazil, Russia and India and VAR (Vector Autoregression) is examined for China and South Africa.

4.2.16 Long-run Equilibrium relationship- Johansen's co-integration tests between Foreign Trade and Exchange Rates.

It is used to check the long-run co-integrating equilibrium relationship between Foreign Trade and Exchange Rates. Johansen's co-integration tests been applied to test the following hypothesis.

Hypothesis 3(h): *There is no long-run relationship between Foreign Trade and Exchange Rates.*

Table 4.27

Johansen's long-run co-integrating equilibrium relationship between Foreign Trade and Exchange Rates

Countries	Trace statistic		Max–eigen value		5 percent critical value		P-value	
	None	Atmost one	None	Atmost one	None	Atmost one	None	Atmost one
Brazil	19.83	5.83	14.20	5.83	15.49	3.84	0.01*	0.01*
Russia	6.59	0.98	5.60	0.98	15.49	3.84	0.62	0.32
India	23.79	7.20	16.59	7.20	15.49	3.84	0.00**	0.00**
China	12.05	4.43	7.62	4.43	15.49	3.84	0.15	0.03
South Africa	20.00	6.63	13.37	6.63	15.49	3.84	0.00**	0.01*

**indicates 1 percent significant *indicates 5 percent significant

The Johansen's cointegration test results are reported in Table 4.27. The tests confirm that long-run relationship exists among between Foreign Trade and Exchange Rates. The cointegration results indicates that Foreign Trade and Exchange Rates have a tendency to move in the long-run. However, in the short-run, they may deviate from such long-run relationship. It identifies that that p-value is significant at 1 percent and 5 percent levels (P > 0.01.0.05) for Brazil, India, and South Africa. Therefore the ***hypothesis 3(h) is rejected*** which means that there is a long-run relationship between Foreign Trade and Exchange Rates for Brazil, India, and South Africa and ***hypothesis 3(h) is accepted*** which means that there is no long-run relationship between Foreign Trade and Exchange Rates for Russia and China.

To investigate the relationships among Foreign trade and Exchange Rates VECM (Vector Error Correction Model)) is examined for Brazil, India, and South Africa and VAR (Vector Autoregression) is examined for Russia and China.

4.2.17 Causal relationships - Granger Causality test for Prices, Production, and Labour

Granger causality tests was used to find out the causal relationships between Prices, Production and Labour and Exchange Rates.

Hypothesis 4(a): *There is no causal relationship between Prices, Production and Labour and Exchange Rates.*

The results of the pair-wise Granger causality tests are reported in Table 4.28. The results from the Granger causality tests help in analyzing if Prices, Production and Labour Granger cause Exchange Rates and vice-versa.

The results interpret that there is no bidirectional Granger cause between Prices, Production and Labour and Exchange Rates. Therefore the hypothesis is accepted, the p-value for the hypothesis is found to be insignificant at 5 percent level in the case of Brazil, Russia, India, China, and South Africa. Thus it is identified that Prices, Production, and Labour does not lead to changes in the Exchange Rates in the short run. Therefore, ***hypothesis 4(a) is accepted*** which means that there is no causal relationship with Prices, Production and Labour and Exchange Rates

Table 4.28

Granger Causal relationship for Prices, Production, and Labour and Exchange Rates

Null hypothesis	Df	Chi-square	Probability	Result
Brazil Exchange Rates does not Granger Cause Prices, Production and Labour of Brazil	2	2.64	0.26	No Causality
Prices, Production, and Labour of does not Granger Cause Brazil Exchange Rates	2	0.06	0.96	No Causality
Russia Exchange Rates does not Granger Cause Prices, Production and Labour of Russia	4	0.88	0.92	No Causality
Prices, Production, and Labour of Russia does not Granger Cause Russia Exchange Rates	4	4.82	0.30	No Causality
India Exchange Rates does not Granger Cause Prices, Production and Labour of India	1	1.87	0.17	No Causality
Prices, Production, and Labour of India does not Granger Cause India Exchange Rates	1	0.01	0.92	No Causality
China Exchange Rates does not Granger Cause Prices, Production and Labour of China	4	0.98	0.91	No Causality
Prices, Production, and Labour of China does not Granger Cause China Exchange Rates	4	0.02	1.00	No Causality
South Africa Exchange Rates does not Granger Cause Prices, Production and Labour of South Africa	3	1.34	0.71	No Causality
Prices, Production, and Labour of South Africa does not Granger Cause South Africa Exchange Rates	3	1.34	0.71	No Causality

Hence from the above table, it may be concluded that Prices, Production, and Labour do not show any such short-run relationship among the variables as the computed p-value seems to be insignificant and cannot be taken for consideration.

4.2.18 Causal relationships - Granger Causality test for Effective Exchange Rates based on SDR and CPI

Granger causality tests was used to find out the causal relationships between Effective Exchange Rates based on SDR and CPI and Exchange Rates

Hypothesis 4(b): *There is no causal relationship between Effective Exchange Rates based on SDR and CPI and Exchange Rates.*

Table 4.29

Granger Causal relationship for Effective Exchange Rates based on SDR, CPI and Exchange Rates

Null hypothesis	df	Chi-square	Probability	Result
Brazil Exchange Rates does not Granger Cause Effective Exchange Rates based on SDR and CPI of Brazil	3	19.26	0.00**	Unidirectional Causality
Effective Exchange Rates based on SDR and CPI of Brazil does not Granger Cause Brazil Exchange Rates	3	1.18	0.75	No Causality
Russia Exchange Rates does not Granger Cause Effective Exchange Rates based on SDR and CPI of Russia	2	3.65	0.16	No Causality
Effective Exchange Rates based on SDR and CPI of Russia does not Granger Cause Russia Exchange Rates	2	6.05	0.04*	Unidirectional Causality
India Exchange Rates does not Granger Cause Effective Exchange Rates based on SDR and CPI of India	2	1.68	0.43	No Causality
Effective Exchange Rates based on SDR and CPI of India does not Granger Cause India Exchange Rates	2	0.90	0.63	No Causality
China Exchange Rates does not Granger Cause Effective Exchange Rates based on SDR and CPI of China	1	0.65	0.41	No Causality
Effective Exchange Rates based on SDR and CPI of China does not Granger Cause China Exchange Rates	1	0.13	0.71	No Causality
South Africa Exchange Rates does not Granger Cause Effective Exchange Rates based on SDR and CPI of South Africa	8	1.94	0.98	No Causality
Effective Exchange Rates based on SDR and CPI of South Africa does not Granger Cause South Africa Exchange Rates	8	1.13	0.99	No Causality

**indicates 1 percent significant *indicates 5 percent significant

The results of the pair-wise Granger causality tests are reported in Table 4.29. The results from the Granger causality tests help in analyzing if Effective Exchange Rates based on SDR and CPI Granger cause Exchange Rates. The results interpret that there is unidirectional Granger cause between Effective Exchange Rates based on SDR and CPI and Exchange Rates of Brazil and Russia. The results interpret that there is no bidirectional Granger cause between Effective Exchange Rates based on SDR and CPI and Exchange Rates. Therefore the hypothesis is accepted, the p-value for the hypothesis is found to be insignificant at 5 percent level in the case of Brazil, Russia, India, China, and South Africa. Thus it is identified that Effective Exchange Rates based on SDR and CPI does not lead to changes in the Exchange Rates in the short run. Therefore, ***hypothesis 4(b) is accepted*** which means that there is no causal relationship with Effective Exchange Rates based on SDR and CPI and Exchange Rates.

4.2.19 Causal relationships - Granger Causality test for Balance of payments

Granger causality tests was used to find out the causal relationships between Balance of payments and Exchange Rates.

Hypothesis 4(c): *There is no causal relationship between the Balance of payments and Exchange Rates*

Table 4.30
Granger Causal relationship for Balance of payments and Exchange Rates

Null hypothesis	df	Chi-square	probability	Result
Brazil Exchange Rates does not Granger Cause Balance of payments of Brazil	3	4.77	0.12	No Causality
The balance of payments of Brazil does not Granger Cause Brazil Exchange Rates	3	0.07	0.99	No Causality
Russia Exchange Rates does not Granger Cause Balance of payments of Russia	7	2.71	0.91	No Causality
The balance of payments of Russia does not Granger Cause Russia Exchange Rates	7	0.92	0.99	No Causality
India Exchange Rates does not Granger Cause Balance of payments of India	6	3.92	0.68	No Causality
The balance of payments of India does not Granger Cause India Exchange Rates	6	8.12	0.22	No Causality
China Exchange Rates does not Granger Cause Balance of payments of China	3	0.74	0.86	No Causality
The balance of payments of China does not Granger Cause China Exchange Rates	3	1.48	0.68	No Causality
South Africa Exchange Rates does not Granger Cause Balance of payments of South Africa	6	3.46	0.74	No Causality
The balance of payments of South Africa does not Granger Cause South Africa Exchange Rates	6	4.22	0.52	No Causality

The results of the pair-wise Granger causality tests are reported in Table 4.30. The results from the Granger causality tests help in analyzing if Balance of payments granger causes Exchange Rates.

The results interpret that there is no bidirectional Granger cause between Balance of payments and Exchange Rates. Therefore the hypothesis is accepted, the p-value for the hypothesis is found to be insignificant at 5 percent level in the case of Brazil, Russia, India, China, and South Africa. Thus it is identified that the Balance of payments does not lead to changes in the Exchange Rates in the short run.Therefore, ***hypothesis 4(c) is accepted*** which means that there is no causal relationship with the Balance of payments and Exchange Rates.

4.2.20 Causal relationships - Granger Causality test for GDP

Granger causality tests was used to find out the causal relationships between GDP and Exchange Rates.

Hypothesis 4(d): *There is no causal relationship between GDP and Exchange Rates.*

Table 4.31

Granger Causal relationship for GDP and Exchange Rates

Null hypothesis	Df	Chi-square	probability	Result
Brazil Exchange Rates does not Granger Cause GDP of Brazil	5	2.83	0.72	No Causality
GDP of Brazil does not Granger Cause Brazil Exchange Rates	5	1.62	0.89	No Causality
Russia Exchange Rates does not Granger Cause GDP of Russia	6	7.31	0.29	No Causality
GDP of Russia does not Granger Cause Russia Exchange Rates	6	24.57	0.00**	Unidirectional Causality
India Exchange Rates does not Granger Cause GDP of India	6	3.99	0.67	No Causality
GDP of India does not Granger Cause India Exchange Rates	6	11.53	0.07	No Causality
China Exchange Rates does not Granger Cause GDP of China	5	0.24	0.99	No Causality
GDP of China does not Granger Cause China Exchange Rates	5	3.57	0.61	No Causality
South Africa Exchange Rates does not Granger Cause GDP of South Africa	3	1.30	0.72	No Causality
GDP of South Africa does not Granger Cause South Africa Exchange Rates	3	4.65	0.19	No Causality

**indicates 1 percent significant

The results of the pair-wise Granger causality tests are reported in Table 4.31. The results from the Granger causality tests help in analyzing if GDP Granger causes BRICS Exchange Rates.

The results interpret that there is unidirectional Granger cause between GDP and Russia Exchange Rates and there is no bidirectional Granger cause between GDP and Exchange Rates. Therefore the hypothesis is accepted, the p-value for the hypothesis is found to be insignificant at 5 percent level in the case of Brazil, Russia, India, China, and South Africa. Thus it is identified that GDP does not lead to changes in the Exchange Rates in the short run. Therefore, ***hypothesis 4(d) is accepted*** which means that there is no causal relationship with GDP and Exchange Rates.

4.2.21 Causal relationships - Granger Causality test for Government Finance

Granger causality tests was used to find out the causal relationships between Government Finance and Exchange Rates.

Hypothesis 4(e): *There is no causal relationship between Government Finance and Exchange Rates*

Table 4.32
Granger Causal relationship for Government Finance and Exchange Rates

Null hypothesis	Df	Chi-square	Probability	Result
Brazil Exchange Rates does not Granger Cause Government Finance of Brazil	8	7.17	0.51	No Causality
Government Finance of Brazil does not Granger Cause Brazil Exchange Rates	8	4.29	0.73	No Causality
Russia Exchange Rates does not Granger Cause Government Finance of Russia	8	2.31	0.96	No Causality
Government Finance of Russia does not Granger Cause Russia Exchange Rates	8	2.53	0.95	No Causality
India Exchange Rates does not Granger Cause Government Finance of India	8	2.97	0.93	No Causality
Government Finance of India does not Granger Cause India Exchange Rates	8	4.90	0.65	No Causality
South Africa Exchange Rates does not Granger Cause Government Finance of South Africa	8	9.06	0.33	No Causality
Government Finance of South Africa does not Granger Cause South Africa Exchange Rates	8	10.82	0.21	No Causality

Note: Lack of data for China

The results of the pair-wise Granger causality tests are reported in Table 4.32. The results from the Granger causality tests help in analyzing if Government Finance granger cause Exchange Rates.

The results interpret that there is no bidirectional Granger cause between Government Finance and BRICS countries Exchange Rates. Therefore the hypothesis is accepted, the p-value for the hypothesis is found to be insignificant at 5 percent level in the case of Brazil, Russia, India, and South Africa. Thus it is identified that Government Finance does not lead to changes in the Exchange Rates in the short run.Therefore, ***hypothesis 4(e) is accepted*** except China which means that there is no causal relationship with Government Finance and Exchange Rates.

4.2.22 Causal relationships - Granger Causality test for Interest Rates

Granger causality tests was used to find out the causal relationships between Interest Rates and Exchange Rates.

Hypothesis 4(f): *There is no causal relationship between Interest Rates and Exchange Rates*

Table 4.33

Granger Causal relationship for Interest Rates and Exchange Rates

Null hypothesis	df	Chi-square	probability	Result
Brazil Exchange Rates does not Granger Cause Interest Rates of Brazil	8	4.95	0.76	No Causality
Interest Rates of Brazil does not Granger Cause Brazil Exchange Rates	8	4.23	0.83	No Causality
Russia Exchange Rates does not Granger Cause Interest Rates of Russia	4	2.02	0.00**	Unidirectional Causality
Interest Rates of Russia does not Granger Cause Russia Exchange Rates	4	4.25	0.37	No Causality
India Exchange Rates does not Granger Cause Interest Rates of India	8	6.54	0.58	No Causality
Interest Rates of India does not Granger Cause India Exchange Rates	8	2.80	0.94	No Causality
China Exchange Rates does not Granger Cause Interest Rates of China	2	0.65	0.72	No Causality
Interest Rates of China does not Granger Cause China Exchange Rates	2	0.42	0.80	No Causality
South Africa Exchange Rates does not Granger Cause Interest Rates of South Africa	8	3.88	0.86	No Causality
Interest Rates of South Africa does not Granger Cause South Africa Exchange Rates	8	1.84	0.98	No Causality

**indicates 1 percent significant

The results of the pair-wise Granger causality tests are reported in Table 4.33. The results from the Granger causality tests help in analyzing if Interest Rates Granger cause Exchange Rates.

The results interpret that there is unidirectional Granger cause between Interest Rates and Exchange Rates of Russia and there is no bidirectional Granger cause between Interest Rates and Exchange Rates. Therefore the hypothesis is accepted, the p-value for the hypothesis is found to be insignificant at 5 percent level in the case of Brazil, Russia, India, China, and South Africa. Thus it is identified that Interest Rates does not lead to changes in the Exchange Rates in the short run. Therefore, ***hypothesis 4(f) is accepted*** which means that there is no causal relationship with Interest Rates and Exchange Rates.

4.2.23 Causal relationships - Granger Causality test for International liquidity

Granger causality tests was used to find out the causal relationships between International liquidity and Exchange Rates.

Hypothesis 4(g): *There is no causal relationship between International liquidity and Exchange Rates*

Table 4.34
Granger Causal relationship for International liquidity and Exchange Rates

Null hypothesis	df	Chi-square	probability	Result
Brazil Exchange Rates does not Granger Cause International liquidity of Brazil	6	4.75	0.57	No Causality
International liquidity of Brazil and does not Granger Cause Brazil Exchange Rates	6	4.75	0.57	No Causality
Russia Exchange Rates does not Granger Cause International liquidity of Russia	5	11.55	0.04*	Bidirectional Causality
International liquidity of Russia does not Granger Cause Russia Exchange Rates	5	23.27	0.00**	Bidirectional Causality
India Exchange Rates does not Granger Cause International liquidity of India	2	7.67	0.02*	Bidirectional Causality
International liquidity of India does not Granger Cause India Exchange Rates	2	14.42	0.00**	Bidirectional Causality
China Exchange Rates does not Granger Cause International liquidity of China	6	9.59	0.14	No Causality
International liquidity of China does not Granger Cause China Exchange Rates	6	1.06	0.98	No Causality
South Africa Exchange Rates does not Granger Cause International liquidity of South Africa	7	4.65	0.70	No Causality
International liquidity of South Africa does not Granger Cause South Africa Exchange Rates	7	28.28	0.00**	Unidirectional Causality

**indicates 1 percent significant *indicates 5 percent significant

The results of the pair-wise Granger causality tests are reported in Table 4.34. The results from the Granger causality tests help in analyzing if International Liquidity Granger causes Exchange Rates.

The results interpret that there is bidirectional Granger cause between International Liquidity and Exchange Rates of Russia and India and unidirectional Granger cause between International Liquidity and Exchange Rates of South Africa. Therefore the ***hypothesis 4(g) is rejected***, the p-value for the hypothesis is found to be significant at 1 percent and 5 percent level in the case of Russia and India indicating the presence of a causal relationship. Thus it is identified that International Liquidity leads to changes in the Exchange Rates of Russia and India in the short run. Thus ***Hypothesis 4(g) is accepted*** which means that there is no causal relationship with International Liquidity and Exchange Rates of Brazil, China, and South Africa.

4.2.24 Causal relationships - Granger Causality test for Foreign trade

Granger causality tests was used to find out the causal relationships between Foreign Trade and Exchange Rates.

Hypothesis 4(h): *There is no causal relationship between Foreign Trade and Exchange Rates*

Table 4.35
Granger Causal relationship for Foreign Trade and Exchange Rates

Null hypothesis	Df	Chi-square	probability	Result
Brazil Exchange Rates does not Granger Cause Foreign trade of Brazil	8	12.62	0.12	No Causality
Foreign trade of Brazil and does not Granger Cause Brazil Exchange Rates	8	12.46	0.13	No Causality
Russia Exchange Rates does not Granger Cause Foreign trade and of Russia	2	0.26	0.87	No Causality
Foreign trade of Russia does not Granger Cause Russia Exchange Rates	2	0.44	0.80	No Causality
India Exchange Rates does not Granger Cause Foreign trade of India	8	8.05	0.42	No Causality
Foreign trade of India does not Granger Cause India Exchange Rates	8	27.32	0.00**	Unidirectional Causality
China Exchange Rates does not Granger Cause Foreign trade of China	8	6.74	0.56	No Causality
Foreign trade of China does not Granger Cause China Exchange Rates	8	19.92	0.01*	Unidirectional Causality
South Africa Exchange Rates does not Granger Cause Foreign trade of South Africa	8	4.56	0.69	No Causality
Foreign trade of South Africa does not Granger Cause South Africa Exchange Rates	8	8.41	0.39	No Causality

**indicates 1 percent significant *indicates 5 percent significant

The results of the pair-wise Granger causality tests are reported in Table 4.35. The results from the Granger causality tests help in analyzing if Foreign trade Granger causes Exchange Rates.

The results interpret that there is unidirectional Granger cause between Foreign Trade and Exchange Rates of India, China, and South Africa and there is no bidirectional Granger cause between Foreign Trade and Exchange Rates. Therefore the hypothesis is accepted, the p-value for the hypothesis is found to be insignificant at 5 percent level in the case of Brazil, Russia, India, China, and South Africa. Thus it is identified that Foreign trade does not lead to changes in the Exchange Rates in the short run. Thus, ***Hypothesis 4(h) is accepted*** which means that there is no causal relationship with Foreign Trade and Exchange Rates.

4.2.24 Stability condition -Diagnostic Tests

Diagnostic tests focus on specific dependence structure of Macroeconomic indicators and Exchange Rates. Diagnostic tests includes Breusch-Godfrey Serial Correlation Lagrange Multiplier (LM) Test, Histogram normal distribution and ARCH Test. These tests are applied to diagnose the residuals are not serially correlated, free from heteroskedasticity and normally distributed.

4.2.25 Serial correlation test – Breusch-Godfrey Serial Correlation Lagrange Multiplier (LM) Test:

Hypothesis 5: *There is no serial correlation between Macroeconomic Indicators and Exchange rates of BRICS Countries*

(LM) Test is applied to check serial correlation between Macroeconomic Indicators with Exchange rates of BRICS Countries.

Table 4.36
Serial Correlation Lagrange Multiplier (LM)Test

Macro-economic variables	coefficient	Std. error	t-statistic	f-statistic	Obs*R-sq	Prob (chi-square)
Prices, production and Labour	0.00	0.02	0.09	0.20	0.43	0.80*
Effective exchange rate on SDR & CPI	-0.17	0.14	-1.26	1.39	22.43	0.12*
Balance of payments	-0.06	0.35	-0.17	1.28	0.13	0.13*
GDP	0.00	0.02	0.09	0.20	0.43	0.80*
Government Finance	0.10	0.27	0.38	0.21	0.44	0.79*
Interest rates	-0.20	0.20	-1.03	1.19	43.14	0.19*
International Liquidity	0.03	0.05	0.68	1.30	100.14	0.12*
Foreign trade	-0.19	0.44	-0.43	1.01	2.11	0.34*

*indicates insignificant p-value

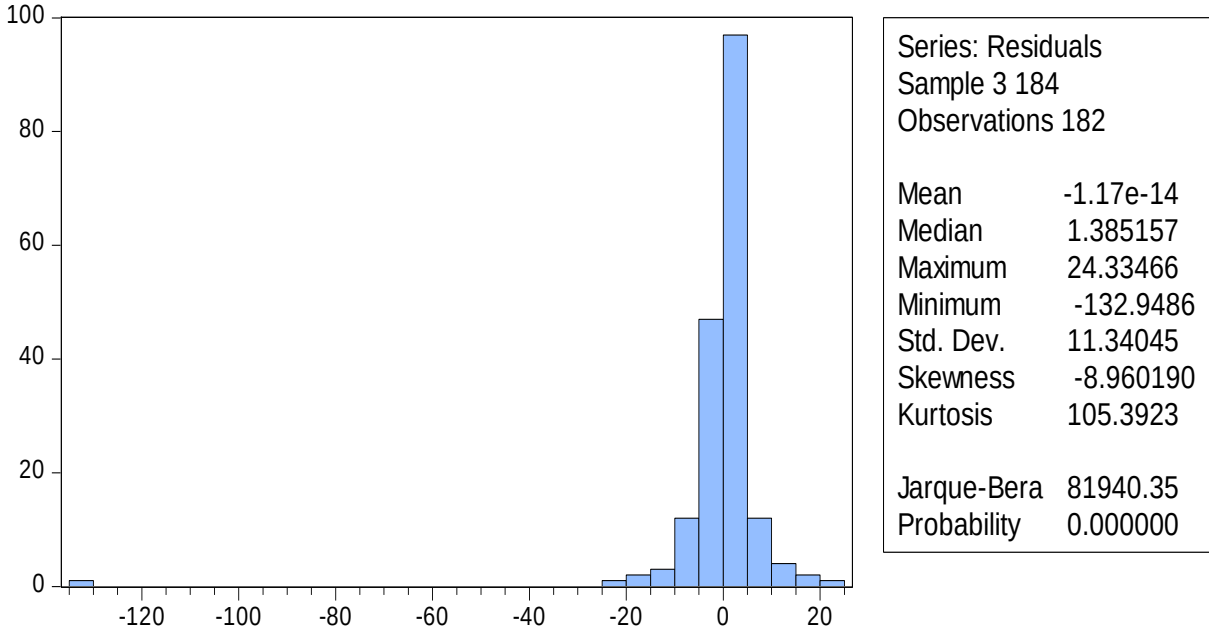
The Serial correlation test results are reported in Table 4.36. Breusch-Godfrey Serial Correlation Lagrange Multiplier (LM) Test is used to detect serial correlation or autocorrelation. This test is done after the computation of ordinary least squares (OLS). From the above table, it was noted that the p-value is more than 0.05 which indicates p-value is not significant as it is more than 5 percent and there is no serial correlation. Finally, it is concluded that above ***hypothesis is accepted*** as the p-value is more the 5 percent which is desirable.

4.2.26 Histogram normal distribution between Macroeconomic Indicators with BRICS Exchange rate:

The computed graph shows that the residuals are normally distributed, P-value (0.00) indicates that it is significant at 1 percent level of significance

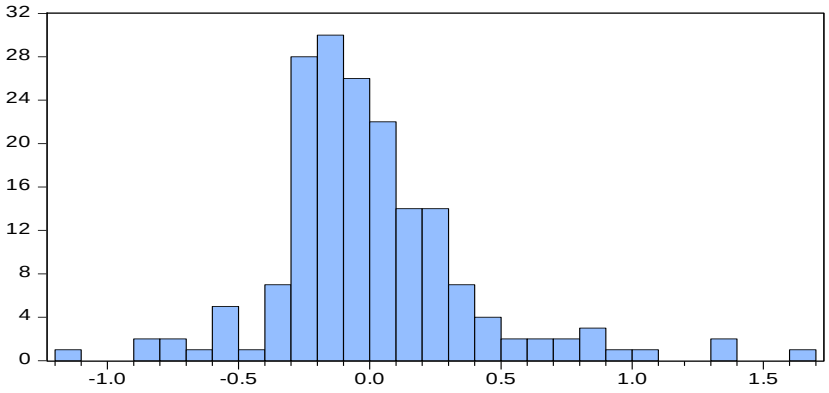
Graph-4.37.1

Histogram normal distribution of Prices, Production and Labour with Exchange rate



Graph-4.37.2

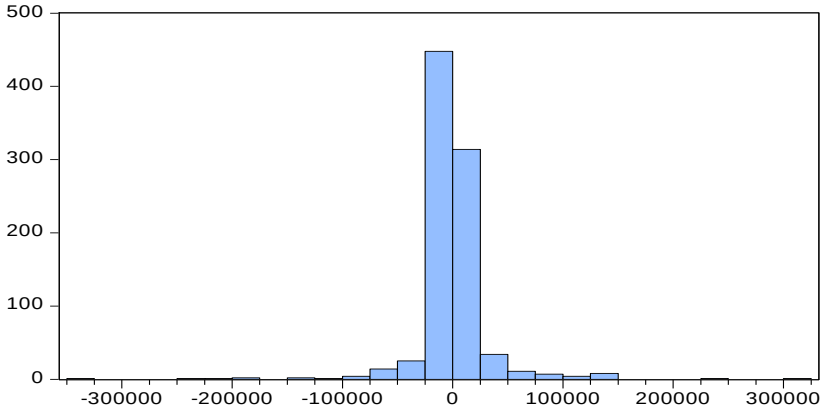
Histogram normal distribution of Effective Exchange rate based on SDR and CPI and Exchange rates



Series: Residuals	
Sample 3 184	
Observations 178	
Mean	1.37e-15
Median	-0.071633
Maximum	1.600855
Minimum	-1.145480
Std. Dev.	0.378585
Skewness	1.083658
Kurtosis	6.441660
Jarque-Bera	122.6886
Probability	0.000000

Graph-4.37.3

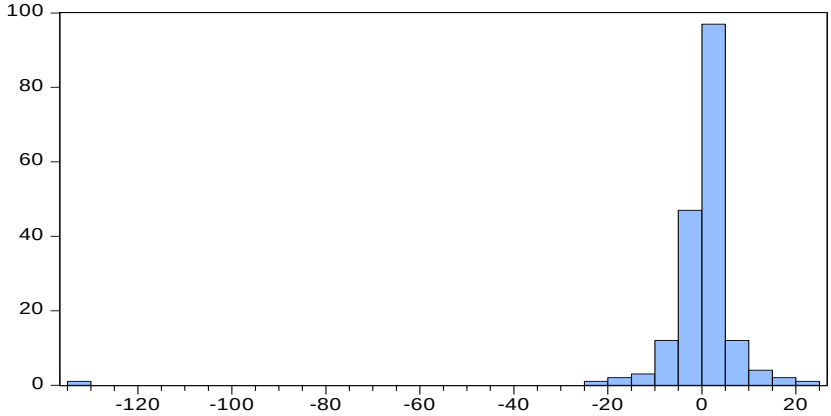
Histogram normal distribution of Balance of payments and Exchange rates



Series: Residuals	
Sample 4 934	
Observations 879	
Mean	1.13e-12
Median	-1212.532
Maximum	316256.4
Minimum	-345679.3
Std. Dev.	33883.91
Skewness	-0.254013
Kurtosis	35.28006
Jarque-Bera	38172.79
Probability	0.000000

Graph-4.37.4

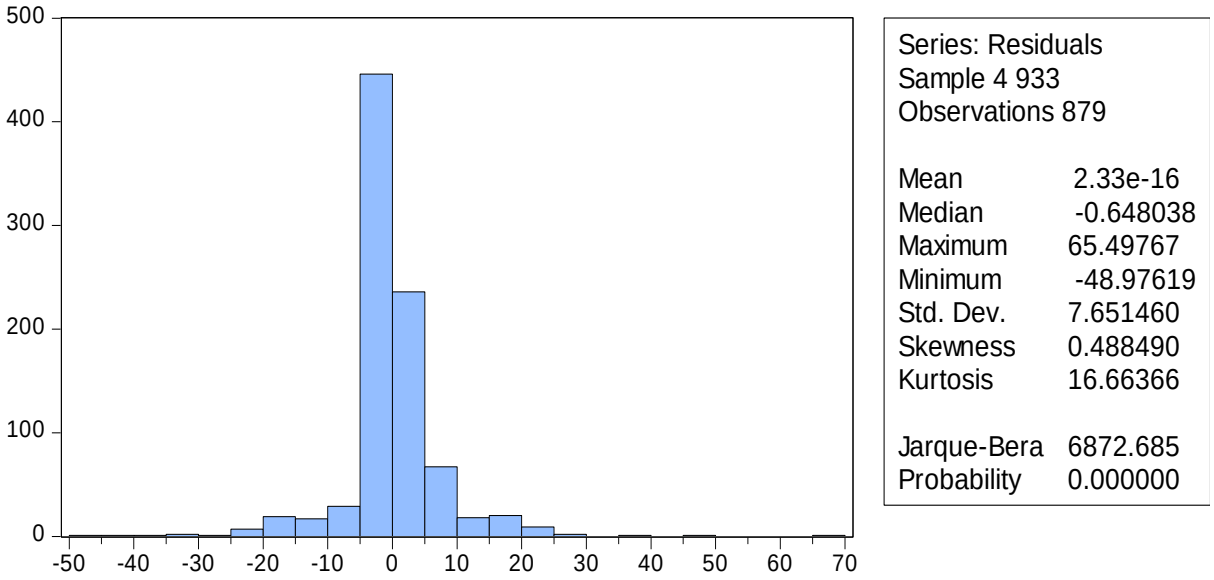
Histogram normal distribution of GDP and Exchange rates



Series: Residuals	
Sample 3 184	
Observations 182	
Mean	-1.17e-14
Median	1.385157
Maximum	24.33466
Minimum	-132.9486
Std. Dev.	11.34045
Skewness	-8.960190
Kurtosis	105.3923
Jarque-Bera	81940.35
Probability	0.000000

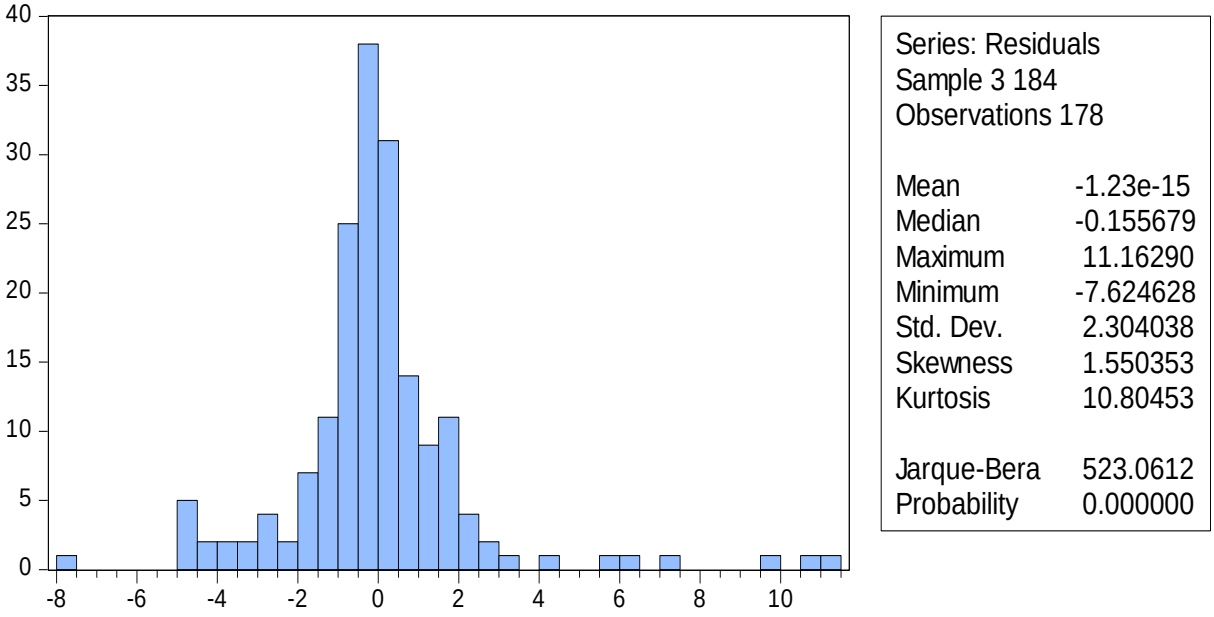
Graph-4.37.5

Histogram normal distribution of Government Finance and Exchange rates



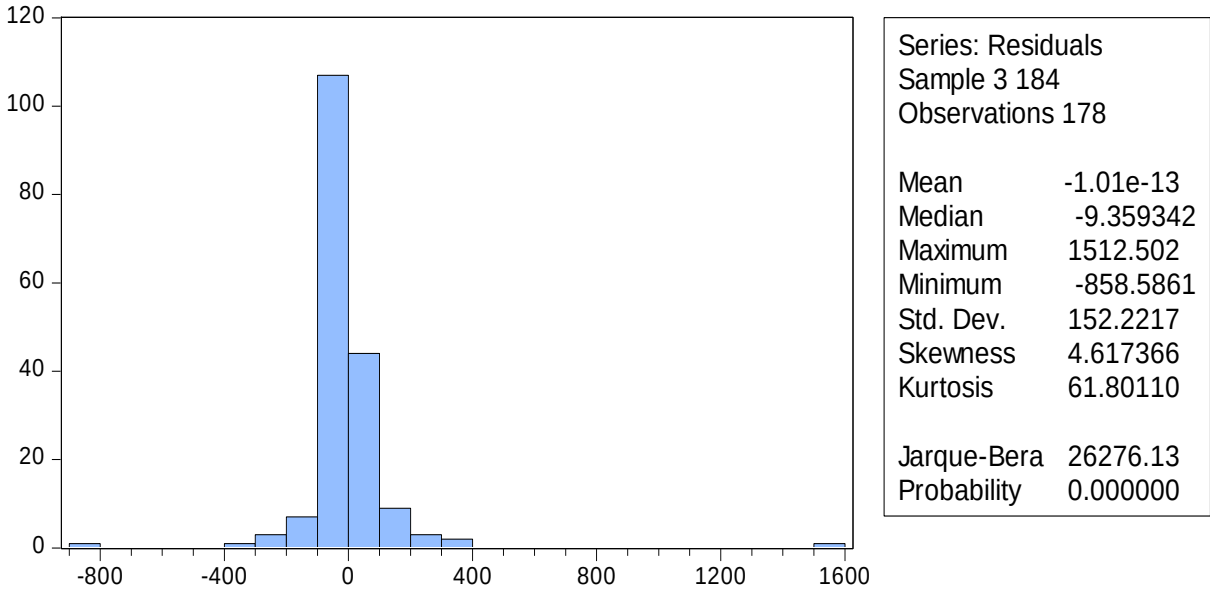
Graph-4.37.6

Histogram normal distribution of Interest Rates and Exchange rates



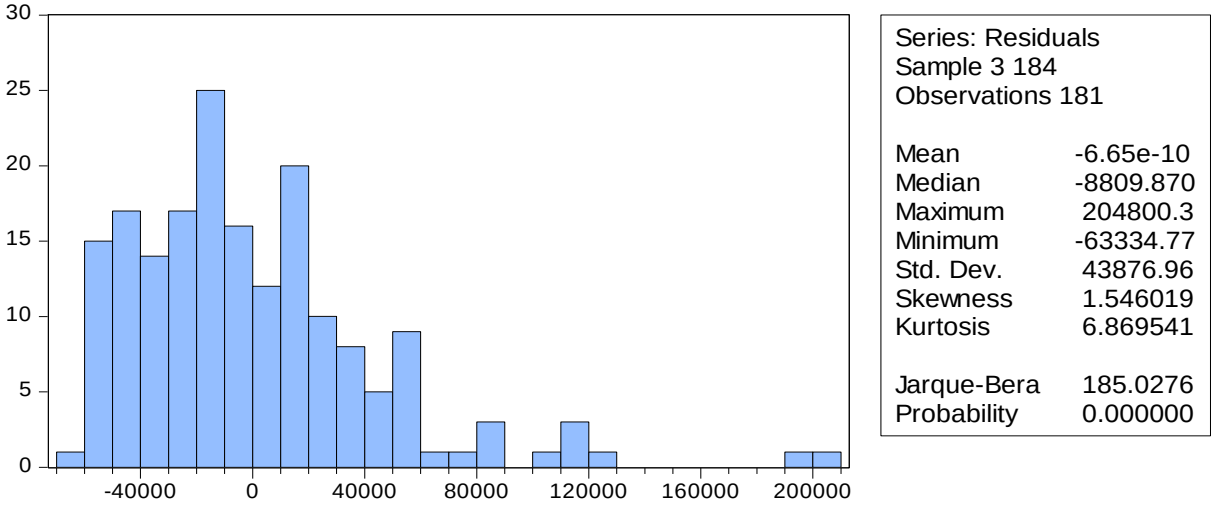
Graph-4.37.7

Histogram normal distribution of International liquidity and Exchange rates



Graph-4.37.8

Histogram normal distribution of Foreign trade and Exchange rates



4.2.27 Heteroskedasticity Test: ARCH Test

Hypothesis 6: *There is no Heteroskedasticity between Macroeconomic Indicators and Exchange rates of BRICS Countries.*

ARCH test is used to check Heteroskedasticity between Macroeconomic Indicators with Exchange rate of BRICS Countries.

Table 4.38

Heteroskedasticity Test

Macro-economic variables	coefficient	Std.error	t-statistic	f-statistic	Obs*R-sq	Prob (chi-square)
Prices, production and Labour	-0.05	0.07	-0.06	0.20	0.00	0.94*
Effective exchange rate on SDR & CPI	-0.17	0.14	-1.26	1.39	22.43	0.12*
Balance of payments	0.03	0.07	0.52	0.27	0.27	0.59*
GDP	-0.00	0.07	-0.06	0.00	0.00	0.94*
Government Finance	-0.04	0.08	-0.54	0.29	0.29	0.58*
Interest rates	0.58	0.25	2.31	1.24	7.47	0.27*
International Liquidity	0.03	0.07	0.47	0.22	0.22	0.63*
Foreign trade	-0.09	0.07	-1.32	1.76	1.76	0.18*

*indicates insignificant p-value.

The Heteroskedasticity test results are reported in Table 4.38. ARCH Test is used to detect Heteroskedasticity. This test is done after detecting Serial correlation and normal distribution of residuals. From the above table, it is notified that p-value is more than 0.05 which indicates p-value is not significant as it is more than 5 percent and there is no heteroskedasticity thus above ***hypothesis is accepted*** which is desirable, as it indicates the presence of homoscedasticity which denotes that errors have constant variance. Finally, it is concluded that the null hypothesis is accepted which means that there is no Heteroskedasticity between Macroeconomic Indicators and Exchange Rate of BRICS Countries.

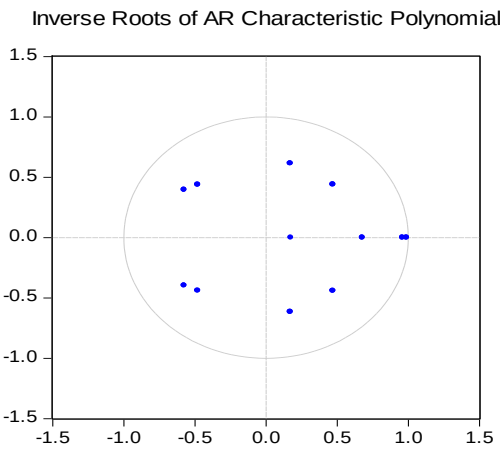
4.2.28 AR Roots Graph

The Graph shows that the values are within one and lies inside the unit circle between Macroeconomic Indicators and Exchange rate of BRICS Countries. Hence it concludes that VAR Satisfies the stability condition.

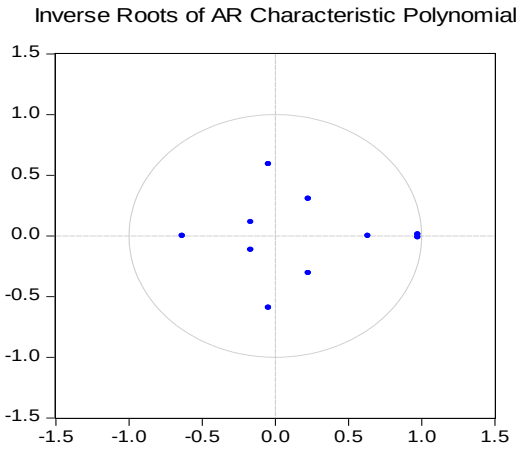
Graph-4.39.1

AR Roots graph of Prices, Production, and Labour with Exchange rate of BRICS Countries

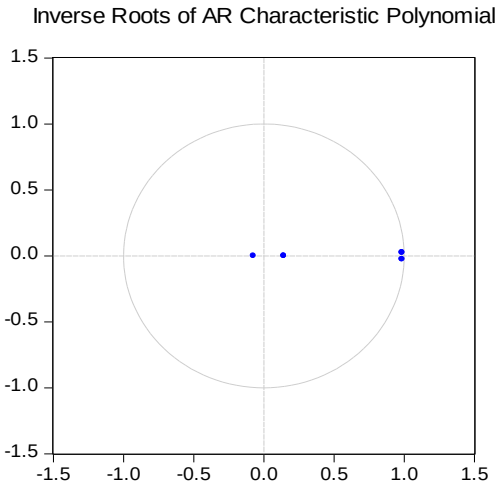
Brazil



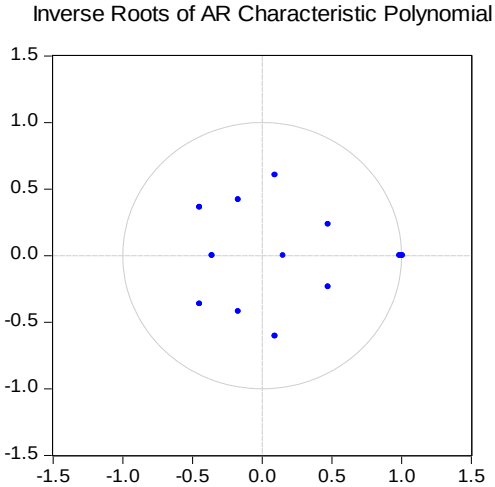
Russia



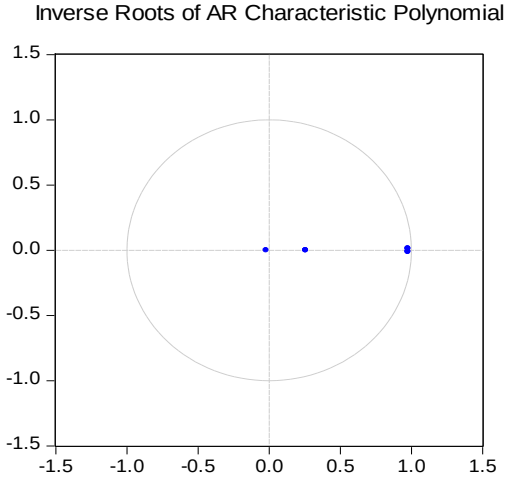
India



China



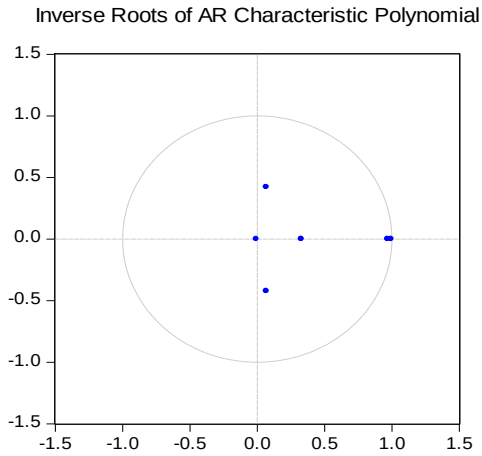
South Africa



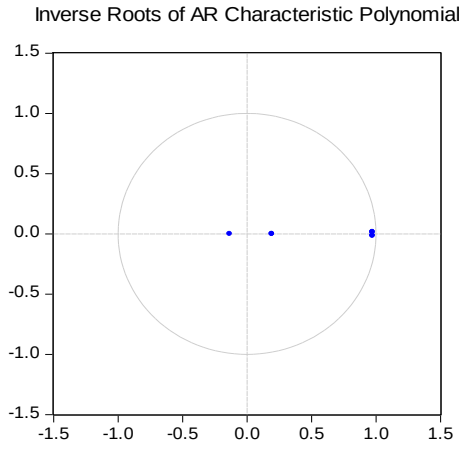
Graph-4.39.2

AR Roots graph of the Effective exchange rate as per SDR and CPI with Exchange rate of BRICS Countries

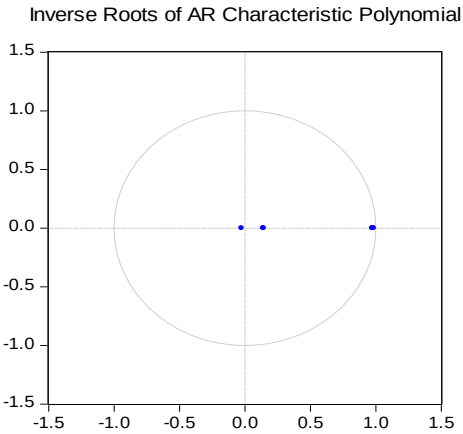
Brazil



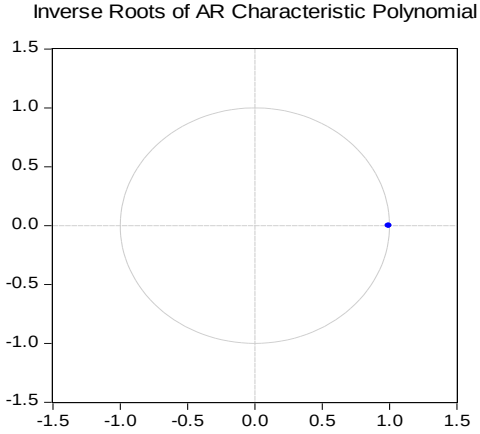
Russia



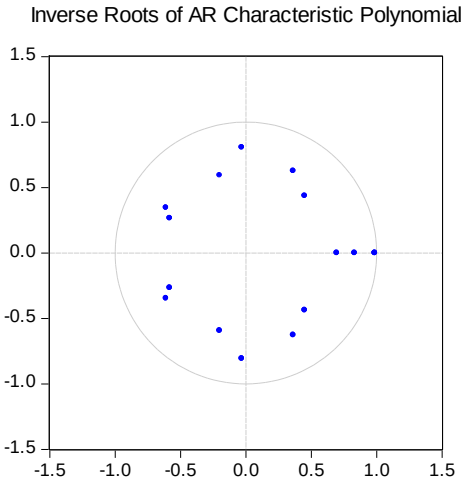
India



China



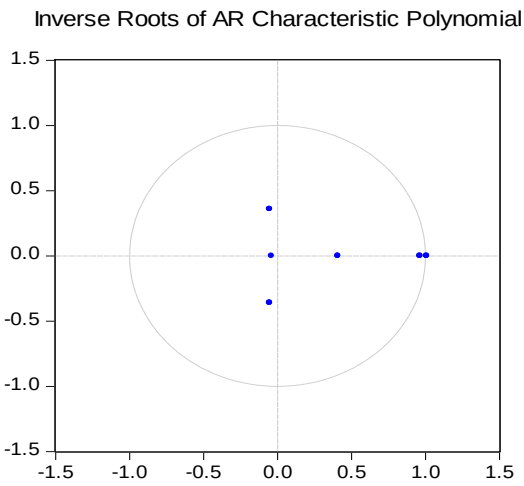
South Africa



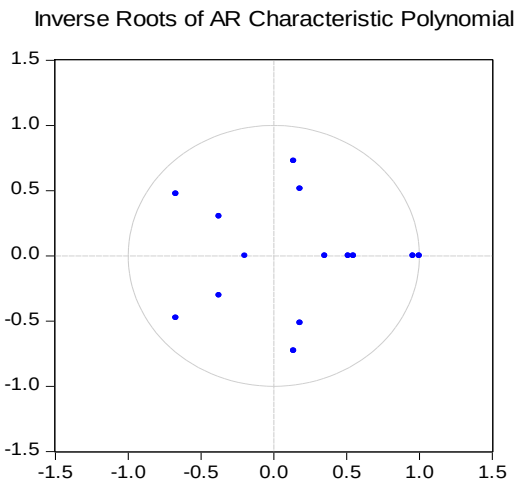
Graph-4.39.3

AR Roots graph of Balance of payments with Exchange rate of BRICS Countries

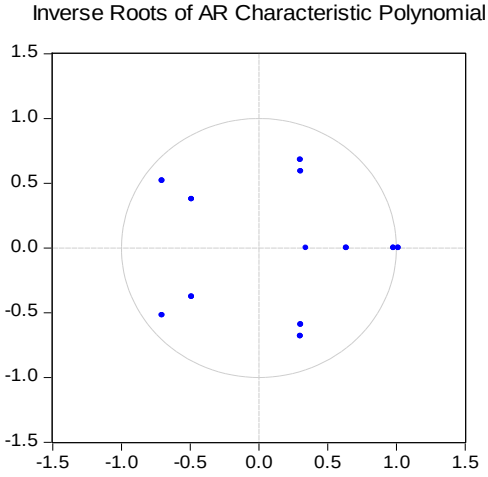
Brazil



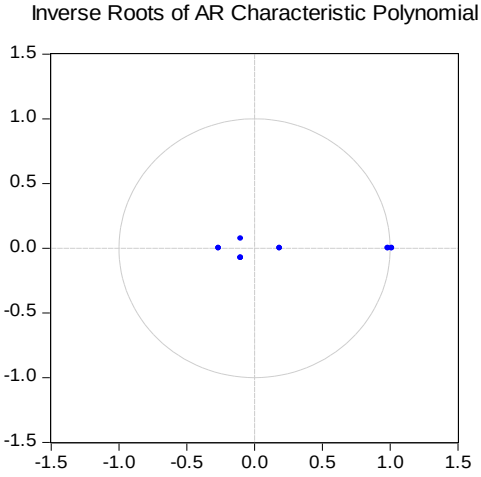
Russia



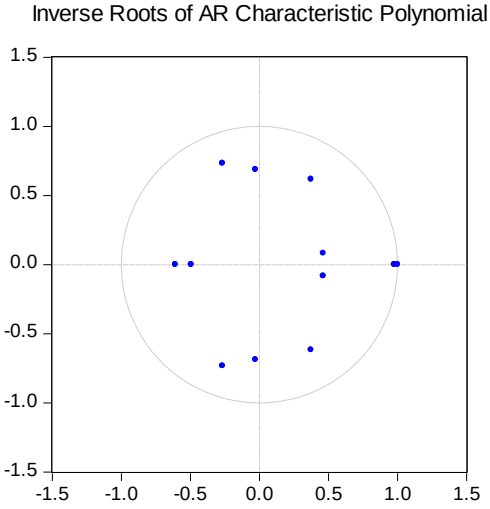
India



China



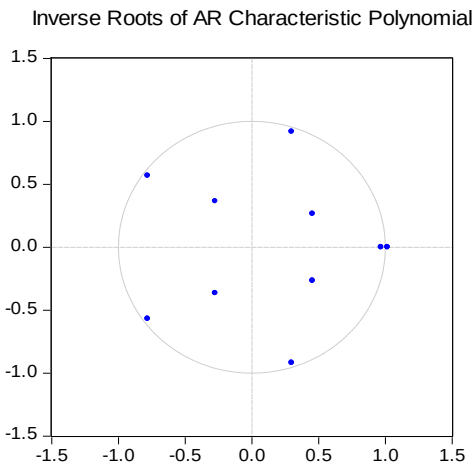
South Africa



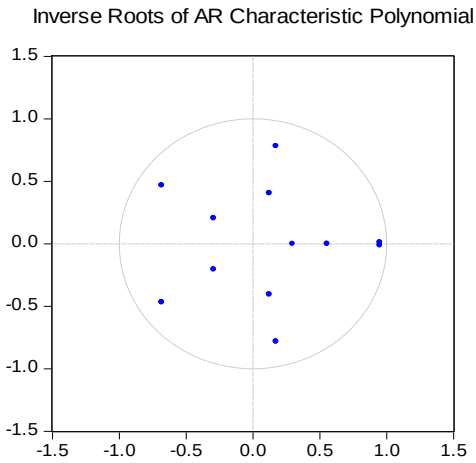
Graph-4.39.4

AR Roots graph of GDP with Exchange rate of BRICS Countries

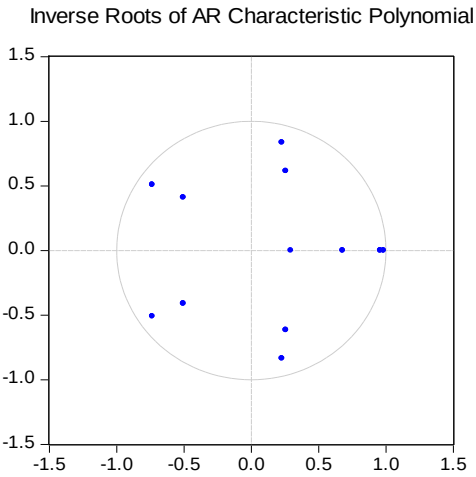
Brazil



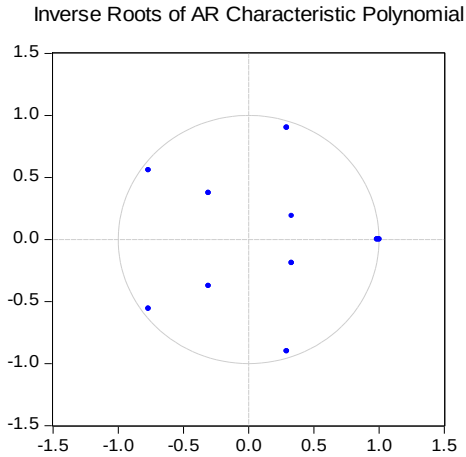
Russia



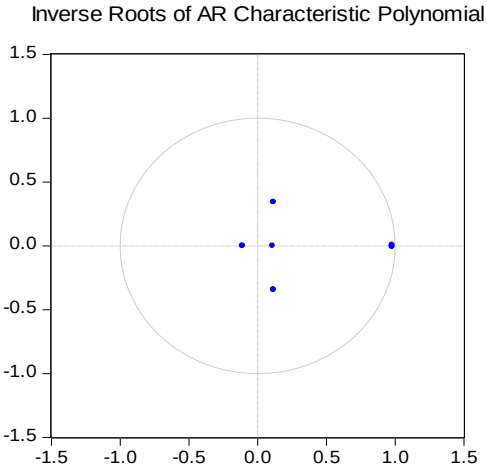
India



China



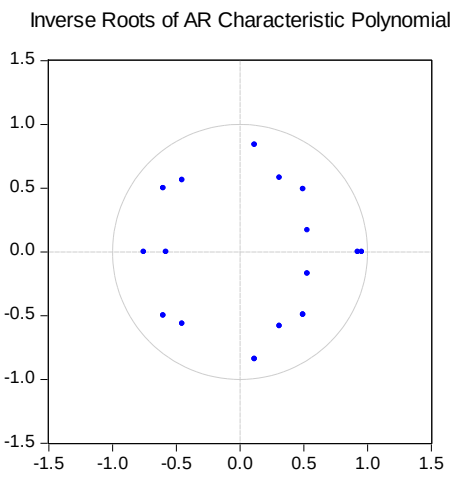
South Africa



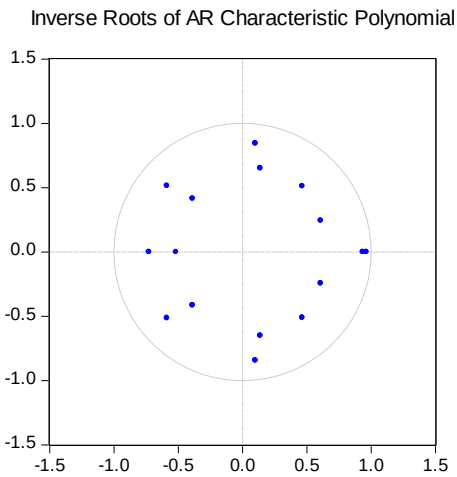
Graph-4.39.5

AR Roots graph of Government Finance with Exchange rate of BRICS Countries

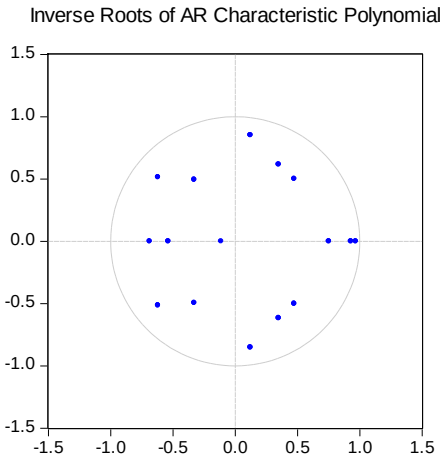
Brazil



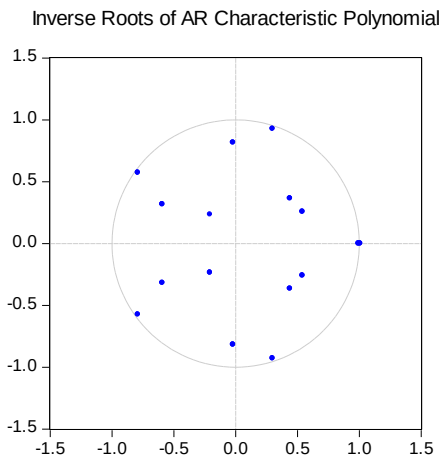
Russia



India



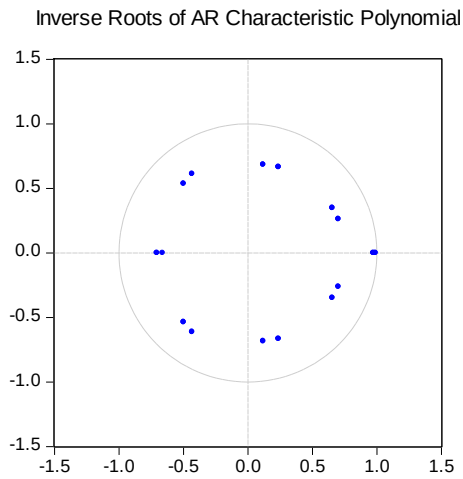
South Africa



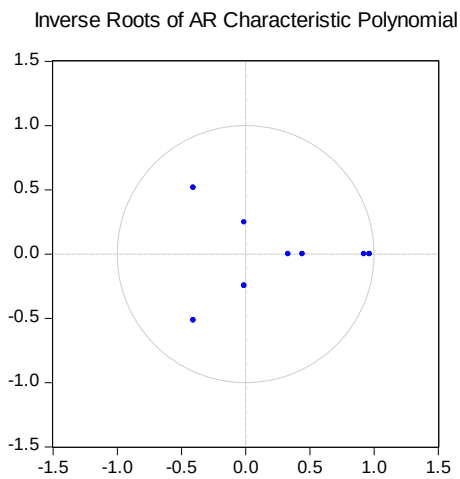
Graph-4.39.6

AR Roots graph of Interest Rates with Exchange rate of BRICS Countries

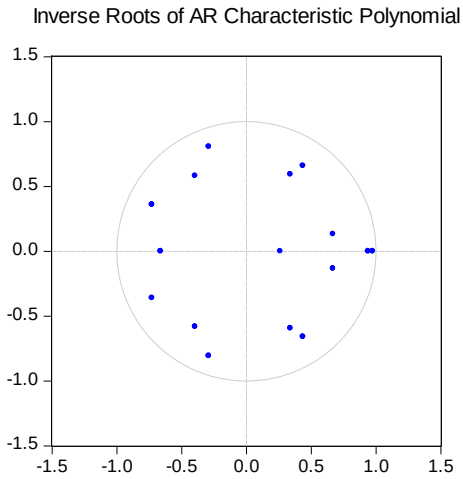
Brazil



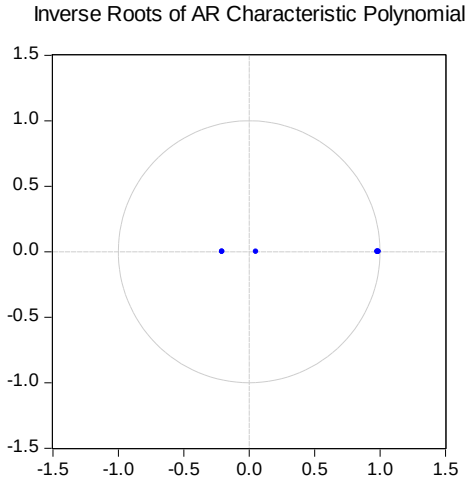
Russia



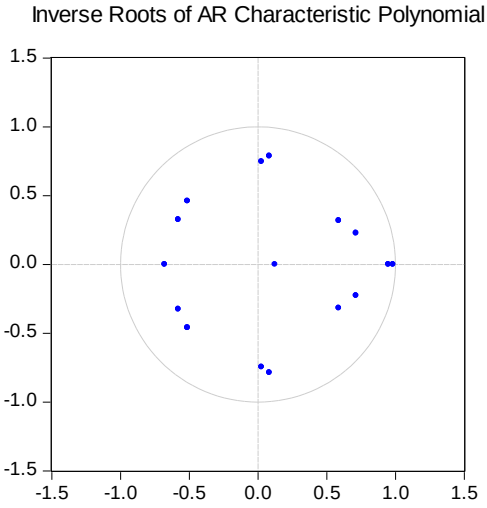
India



China



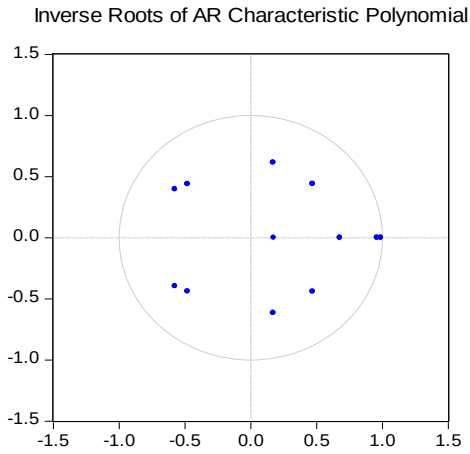
South Africa



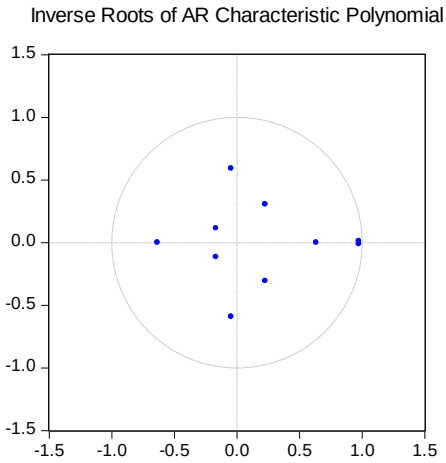
Graph-4.39.7

AR Roots graph of International Liquidity with Exchange rate of BRICS Countries

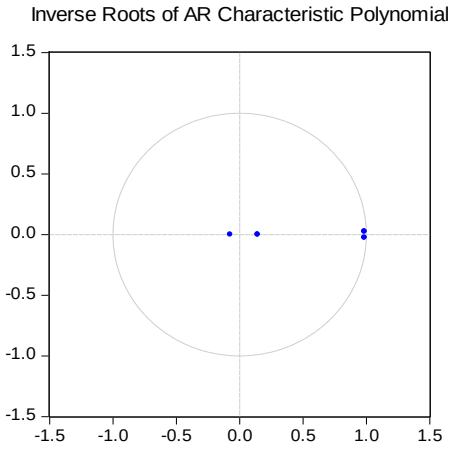
Brazil



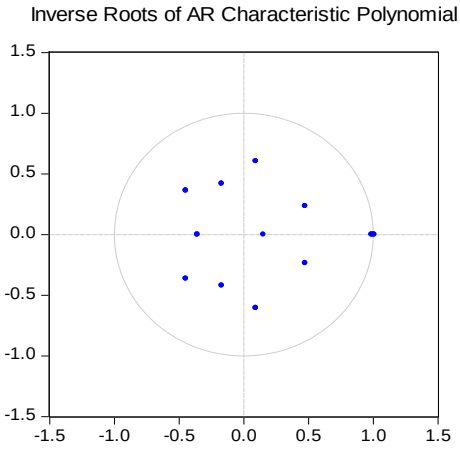
Russia



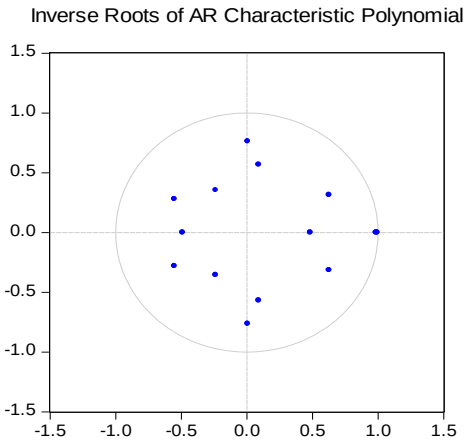
India



China



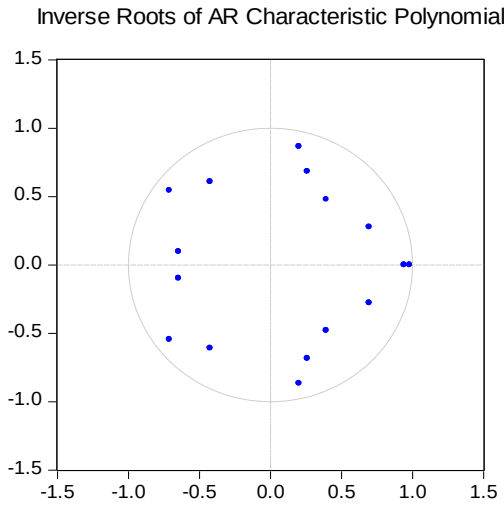
South Africa



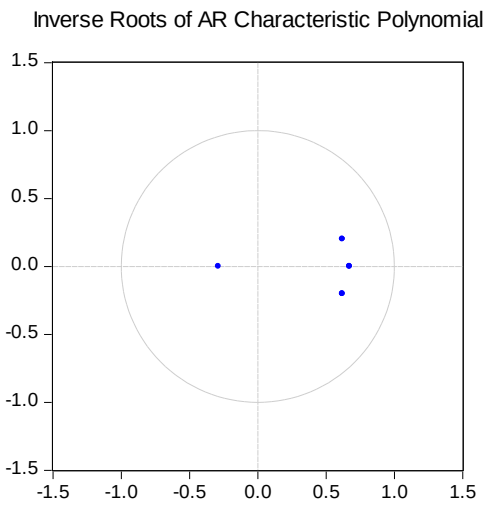
Graph-4.39.8

AR Roots graph of Foreign trade with Exchange rate of BRICS Countries

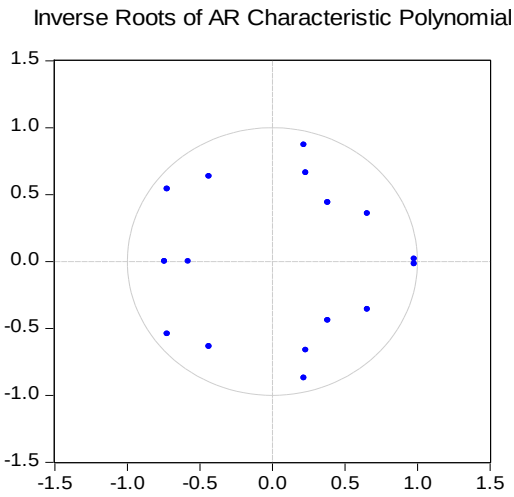
Brazil



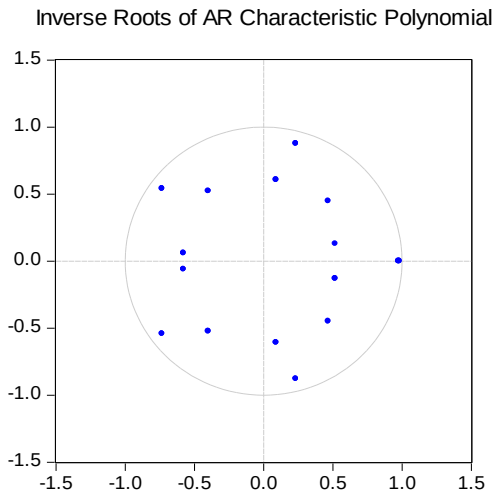
Russia



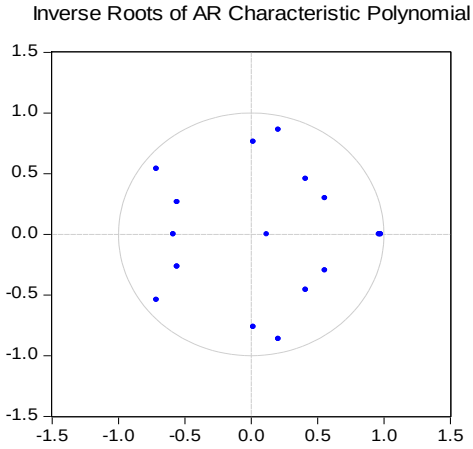
India



China



South Africa



4.2.29 Long-term effects - Vector Error Correction Model (Restricted VAR)

VECM model is applied for estimating Long-term effects of Macroeconomic Indicators with Exchange Rate of BRICS Countries. BRICS countries having a co-integrating relationship with the variables are further proceeded to VECM Analysis.

4.2.30 Long-term effects -VECM of Prices, Production, Labour and Brazil Exchange Rate

VECM Model has been inclined for estimating Long-term effects of Prices, Production, Labour and Brazil Exchange Rate.

Table 4.40
Long-term effects of Prices, Production, Labour and Brazil Exchange Rate

Lags	Coefficient	Std error	t-statistics	probability
C(1)	-0.019875	0.005940	-3.345917	0.0008***
C(2)	0.337140	0.036555	9.222938	0.0000
C(3)	0.020066	0.036815	0.545056	0.5858
C(4)	-1.47E-07	5.66E-07	-0.260420	0.7946
C(5)	8.56E-07	5.65E-07	1.515252	0.1299
C(6)	1.21E-05	0.000626	0.019261	0.9846
C(7)	377.7531	281.0733	1.343966	0.1792
C(8)	878.4098	1729.394	0.507929	0.6116
C(9)	107.1950	1742.808	0.061507	0.9510
C(10)	-0.000895	0.026756	-0.033455	0.9733
C(11)	3.88E-05	0.026724	0.001454	0.9988
C(12)	-27.83354	29.64118	-0.939016	0.3479

*** indicating 1 percent level of significance

Table 4.40 interprets that the Error Correction Term (ECT) of Prices, Production, Labour for Brazil shows negative coefficient indicating a correction of disequilibrium between fifteen years time period. It has significant p-value (0.00) at 1 percent level in the long run.

The intuition behind the VECM analysis is that it adjusts long-run changes in variables and deviations from equilibrium. Thus the VECM model is used to examine long-run relationships among Prices, Production, Labour and Exchange Rate for the entire period of fifteen years. Finally, it is concluded that there is the presence of Long-term Changes in

Prices, Production, Labour and Exchange Rate of Brazil, hence it reflects negative coefficients and changes in disequilibrium corrected between the selected time period of fifteen years.

4.2.31 Long-term effects -VECM of Effective Exchange Rate based on SDR, CPI and Russia Exchange Rate

VECM Model has been inured for estimating Long-term effects of Effective Exchange Rate based on SDR, CPI and Russia Exchange Rate

Table 4.41

Long-term effects of Effective Exchange Rate based on SDR, CPI and Russia Exchange Rate

Lags	Coefficient	Std error	t-statistics	probability
C(1)	-0.034865	0.008306	-4.297578	0.0000***
C(2)	0.187298	0.038871	4.818475	0.0000
C(3)	0.009586	0.038943	0.246149	0.8056
C(4)	1.47E-07	1.26E-05	0.011645	0.9907
C(5)	2.00E-05	1.26E-05	1.585812	0.1130
C(6)	1.49E-05	6.96E-05	0.213795	0.8307
C(7)	37.53143	26.32523	1.425683	0.1542
C(8)	-29.69160	122.6405	-0.242103	0.8087
C(9)	-132.0015	122.8198	-1.074757	0.2827
C(10)	-0.146562	0.039904	-3.672831	0.0002
C(11)	-0.037849	0.039796	-0.951068	0.3417
C(12)	0.111961	0.220353	0.508098	0.6115

*** indicating 1 percent level of significance

Table 4.41 interprets that the Error Correction Term (ECT) of Effective Exchange Rate based on SDR, CPI for Russia shows negative coefficient indicating a correction of disequilibrium between fifteen years time period. It has significant p-value (0.00) at 1 percent level in the long run.

The intuition behind the VECM analysis is that it adjusts long-run changes in variables and deviations from equilibrium. Thus the VECM model is used to examine long-

run relationships among Effective Exchange Rate based on SDR, CPI and Exchange Rate for the entire period of fifteen years. Finally, it is concluded that there is the presence of Long-term Changes in Effective Exchange Rate based on SDR, CPI and Exchange Rate of Russia ,hence it reflects negative coefficients and changes in the correction of disequilibrium between Effective Exchange Rate based on SDR, CPI and Exchange Rate of Russia.

4.2.32 Long-term effects -VECM of Balance of payments and India Exchange Rate

VECM Model has been inured for estimating Long-term effects of Balance of payments and India Exchange Rate

Table 4.42

Long-term effects of Balance of payments and India Exchange Rate

Lags	Coefficient	Std error	t-statistics	probability
C(1)	-0.006981	0.003024	-2.308151	0.0212**
C(2)	0.129385	0.048870	2.647549	0.0083
C(3)	0.005713	0.049333	0.115807	0.9078
C(4)	-0.003890	0.049309	-0.078884	0.9371
C(5)	-0.019688	0.049092	-0.401038	0.6885
C(6)	0.081243	0.048883	1.661983	0.0969
C(7)	0.085608	0.048793	1.754518	0.0797
C(8)	1.09E-10	1.45E-09	0.075534	0.9398
C(9)	1.73E-11	1.43E-09	0.012114	0.9903
C(10)	-3.42E-09	1.39E-09	-2.457523	0.0142
C(11)	-3.42E-09	1.41E-09	-2.426240	0.0155
C(12)	-2.91E-09	1.47E-09	-1.986072	0.0474

** indicating 5 percent level of significance

Table 4.42 interprets that the Error Correction Term (ECT) for Balance of payments with India Exchange Rate shows negative coefficient indicating a correction of disequilibrium between fifteen years time period. It has significant p-value (0.00) at 1 percent level in the long run.

The intuition behind the VECM analysis is that it adjusts long-run changes in variables and deviations from equilibrium. Thus the VECM model is used to examine long-

run relationships among the Balance of payments and Exchange Rate for the entire period of fifteen years. It is concluded that there is the presence of Long-term Changes in among Balance of payments and Exchange Rate of India, hence it reflects negative coefficients and changes in the correction of disequilibrium during the study periodand there is long-term effect between Balance of payments and Exchange Rate of India

4.2.33 Long-term effects -VECM of Balance of payments and China Exchange Rate

VECM Model has been inclined for estimating Long-term effects of Balance of payments and China Exchange Rate

Table 4.43

Long-term effects of Balance of payments and China Exchange Rate

Lags	Coefficient	Std error	t-statistics	probability
C(1)	0.000134	0.000280	0.479671	0.6316
C(2)	0.056238	0.048244	1.165695	0.2441
C(3)	0.018429	0.048335	0.381290	0.7031
C(4)	0.051255	0.048335	1.060395	0.2893
C(5)	-2.05E-09	1.89E-09	-1.083265	0.2790
C(6)	-1.60E-09	1.91E-09	-0.839180	0.4016
C(7)	1.88E-10	5.63E-10	0.333052	0.7392
C(8)	2.88E-05	0.000111	0.259055	0.7957
C(9)	66459.93	7071.025	9.398910	0.0000
C(10)	-318197.9	1201507.	-0.264832	0.7912
C(11)	1382598.	1204330.	1.148023	0.2513
C(12)	-16106.41	1205173.	-0.013364	0.9893

Table 4.43 interprets that the Error Correction Term (ECT) for Balance of payments shows a positive coefficient and it is not significant as the p-value is 0.63. It is concluded that there is the absence of long-term Changes in among Balance of payments and Exchange Rate of India is reflected by positive coefficients confirms that there is no long-term effect between Balance of payments and Exchange Rate of India.

4.2.34 Long-term effects -VECM of GDP and Brazil Exchange Rate

VECM Model has been inured for estimating Long-term effects of GDP and Brazil Exchange Rate

Table 4.44

Long-term effects of GDP and Brazil Exchange Rate

Lags	Coefficient	Std error	t-statistics	probability
C(1)	-0.013502	0.004538	-2.975632	0.0030***
C(2)	0.350898	0.037062	9.467822	0.0000
C(3)	0.006194	0.039036	0.158685	0.8739
C(4)	0.037655	0.039165	0.961437	0.3365
C(5)	-0.072265	0.039153	-1.845718	0.0651
C(6)	0.024127	0.036972	0.652575	0.5141
C(7)	-1.78E-09	2.14E-09	-0.830030	0.4067
C(8)	-1.41E-09	2.37E-09	-0.593138	0.5532
C(9)	-2.05E-09	2.45E-09	-0.836422	0.4031
C(10)	-1.99E-09	2.40E-09	-0.828488	0.4075
C(11)	-7.60E-10	2.20E-09	-0.344908	0.7302
C(12)	0.000410	0.000642	0.638712	0.5231

** indicating 1 percent level of significance

Table 4.44 interprets that the Error Correction Term (ECT) for GDP with Brazil Exchange Rate shows negative coefficient indicating a correction of disequilibrium between fifteen year's time period. It has significant p-value (0.00) at 1 percent level in the long run.

The intuition behind the VECM analysis is that it adjusts long-run changes in variables and deviations from equilibrium. Thus the VECM model is used to examine long-run relationships among GDP and Brazil Exchange Rate for the entire period of fifteen years. It is concluded that there is the presence of Long-term Changes in GDP and Exchange Rate of Brazil is reflected by negative coefficients and changes in the correction of disequilibrium during the study period and there is long-term effect between GDP and Exchange Rate of Brazil

4.2.35 Long-term effects -VECM of GDP and Russia Exchange Rate

VECM Model has been inured for estimating Long-term effects of GDP and Russia Exchange Rate

Table 4.45

Long-term effects of GDP and Russia Exchange Rate

Lags	Coefficient	Std error	t-statistics	probability
C(1)	-0.000260	0.000155	-1.682422	0.0926*
C(2)	0.188509	0.031615	5.962725	0.0000
C(3)	-0.011931	0.032185	-0.370712	0.7109
C(4)	-0.001341	0.032200	-0.041661	0.9668
C(5)	0.005203	0.031945	0.162865	0.8706
C(6)	0.000553	0.031934	0.017313	0.9862
C(7)	-0.032057	0.031417	-1.020391	0.3077
C(8)	1.61E-11	1.18E-11	1.368631	0.1713
C(9)	2.34E-11	1.31E-11	1.786813	0.0741
C(10)	3.17E-11	1.34E-11	2.375450	0.0176
C(11)	-1.40E-11	1.30E-11	-1.078102	0.2811
C(12)	-7.07E-12	1.17E-11	-0.602451	0.5469

*indicating 10 percent level of significance

Table 4.45 interprets that the Error Correction Term (ECT) for GDP with Russia Exchange Rate shows negative coefficient indicating a correction of disequilibrium between fifteen years time period. It has significant p-value as 0.09 at 10 percent level in the long run.

The intuition behind the VECM analysis is that it adjusts long-run changes in variables and deviations from equilibrium. Thus the VECM model is used to examine long-run relationships among GDP and Russia Exchange Rate for the entire period of fifteen years. It is concluded that there is the presence of Long-term Changes in GDP and Exchange Rate of Russia is reflected by negative coefficients and changes in the correction of disequilibrium during the study periodand there is long-term effect between GDP and Exchange Rate of Russia

4.2.36 Long-term effects -VECM of GDP and South Africa Exchange Rate

VECM Model has been inured for estimating Long-term effects of GDP and South Africa Exchange Rate

Table 4.46

Long-term effects of GDP and South Africa Exchange Rate

Lags	Coefficient	Std error	t-statistics	probability
C(1)	-0.002837	0.001393	-2.035685	0.0420**
C(2)	0.232405	0.037388	6.216105	0.0000
C(3)	-0.141585	0.038026	-3.723421	0.0002
C(4)	0.021526	0.037337	0.576533	0.5643
C(5)	-8.78E-10	7.47E-10	-1.175735	0.2399
C(6)	4.71E-10	7.47E-10	0.630445	0.5285
C(7)	-5.36E-10	7.47E-10	-0.716951	0.4735
C(8)	-1.19E-05	0.000179	-0.066889	0.9467
C(9)	197246.8	70035.41	2.816387	0.0049
C(10)	1717976.	1879095.	0.914257	0.3607
C(11)	-450601.4	1911160.	-0.235774	0.8136
C(12)	1030941.	1876568.	0.549376	0.5828

** indicating 5 percent level of significance

Table 4.45 interprets that the Error Correction Term (ECT) for GDP with South Africa Exchange Rate shows negative coefficient indicating a correction of disequilibrium between fifteen years time period. It has significant p-value as 0.04 at 5 percent level in the long run.

The intuition behind the VECM analysis is that it adjusts long-run changes in variables and deviations from equilibrium. Thus the VECM model is used to examine long-run relationships among GDP and South Africa Exchange Rate for the entire period of fifteen years. It is concluded that there is the presence of Long-term Changes in GDP and Exchange Rate of South Africa is reflected by negative coefficients and changes in the correction of disequilibrium during the study periodand there is long-term effect between GDP and Exchange Rate of South Africa

4.2.37 Long-term effects -VECM of Government Finance and Brazil Exchange Rate

VECM Model has been inured for estimating the Long-term effects of Government Finance and Brazil Exchange Rate

Table 4.47
Long-term effects of Government Finance and Brazil Exchange Rate

Lags	Coefficient	Std error	t-statistics	probability
C(1)	-0.011648	0.004472	-2.604691	0.0093***
C(2)	0.166766	0.031533	5.288524	0.0000
C(3)	0.069225	0.031912	2.169271	0.0302
C(4)	-0.019371	0.031911	-0.607025	0.5439
C(5)	-0.120412	0.031904	-3.774206	0.0002
C(6)	0.033032	0.031876	1.036247	0.3002
C(7)	0.049467	0.032285	1.532203	0.1256
C(8)	-0.055849	0.032320	-1.728004	0.0841
C(9)	0.003189	0.031929	0.099893	0.9204
C(10)	1.04E-08	7.44E-09	1.403602	0.1606
C(11)	8.38E-09	7.68E-09	1.091418	0.2752
C(12)	2.65E-09	7.83E-09	0.338234	0.7352

*** indicating 1 percent level of significance

Table 4.47 interprets that the Error Correction Term (ECT) for Government Finance with Brazil Exchange Rate shows negative coefficient indicating a correction of disequilibrium between fifteen years time period. It has significant p-value as 0.01 at 5 percent level in the long run.

The intuition behind the VECM analysis is that it adjusts long-run changes in variables and deviations from equilibrium. Thus the VECM model is used to examine long-run relationships among Government Finance and Brazil Exchange Rate for the entire period of fifteen years. It is concluded that there is the presence of Long-term Changes in among Government Finance and Exchange Rate of Brazil is reflected by negative coefficients and changes in the correction of disequilibrium during the study periodand there is long-term effect between Government Finance and Exchange Rate of Brazil

4.2.51 Long-term effects -VECM of Government Finance and Russia Exchange Rate

VECM Model has been inured for estimating the Long-term effects of Government Finance and Russia Exchange Rate

Table 4.48

Long-term effects of Government Finance and Russia Exchange Rate

Lags	Coefficient	Std error	t-statistics	probability
C(1)	-0.004667	0.002700	-1.728849	0.0840*
C(2)	0.191689	0.033291	5.758066	0.0000
C(3)	-0.010016	0.033839	-0.295983	0.7673
C(4)	-0.000553	0.033815	-0.016352	0.9870
C(5)	0.023101	0.033806	0.683322	0.4945
C(6)	0.019083	0.033808	0.564447	0.5725
C(7)	-0.042143	0.033844	-1.245195	0.2132
C(8)	-0.038597	0.033883	-1.139127	0.2548
C(9)	-0.014051	0.033375	-0.421015	0.6738
C(10)	-5.59E-11	3.33E-11	-1.676361	0.0938
C(11)	-3.98E-11	3.49E-11	-1.141503	0.2538
C(12)	-1.99E-11	3.62E-11	-0.549383	0.5828

* indicating 10 percent level of significance

Table 4.48 interprets that the Error Correction Term (ECT) for Government Finance with Russia Exchange Rate shows negative coefficient indicating a correction of disequilibrium between fifteen years time period. It significant p-value as 0.08 at 10 percent level in the long run.

The intuition behind the VECM analysis is that it adjusts long-run changes in variables and deviations from equilibrium. Thus the VECM model is used to examine long-run relationships among Government Finance and Russia Exchange Rate for the entire period of fifteen years. It is concluded that there is the presence of Long-term Changes in among Government Finance and Exchange Rate of Russia is reflected by negative coefficients and changes in the correction of disequilibrium during the study periodand there is long-term effect between Government Finance and Exchange Rate of Russia

4.2.38 Long-term effects -VECM of Government Finance and India Exchange Rate

VECM Model has been inured for estimating Long-term effects of Government Finance and India Exchange Rate

Table 4.49

Long-term effects of Government Finance and India Exchange Rate

Lags	Coefficient	Std error	t-statistics	probability
C(1)	-0.014204	0.003801	-3.736491	0.0002***
C(2)	0.134322	0.032186	4.273279	0.0000
C(3)	0.006918	0.032584	0.212323	0.8319
C(4)	-0.015981	0.033914	-0.471228	0.6375
C(5)	-0.015560	0.033747	-0.461085	0.6448
C(6)	0.060294	0.033801	1.783758	0.0746
C(7)	0.069125	0.033999	2.033159	0.0422
C(8)	-0.004326	0.033836	-0.127850	0.8983
C(9)	0.003538	0.033477	0.105682	0.9158
C(10)	-4.26E-11	1.72E-11	-2.417853	0.0157
C(11)	-4.25E-11	1.80E-11	-2.243651	0.0250
C(12)	-2.63E-11	1.86E-11	-1.408897	0.1590

*** indicating 1 percent level of significance

Table 4.49 interprets that the Error Correction Term (ECT) for Government Finance with India Exchange Rate shows negative coefficient indicating a correction of disequilibrium between fifteen years time period. It has significant p-value (0.00) at 1 percent level in the long run.

The intuition behind the VECM analysis is that it adjusts long-run changes in variables and deviations from equilibrium. Thus the VECM model is used to examine long-run relationships among Government Finance and India Exchange Rate for the entire period of fifteen years. It is concluded that there is the presence of Long-term Changes in among Government Finance and Exchange Rate of India is reflected by negative coefficients and changes in the correction of disequilibrium during the study period and there is long-term effect between Government Finance and Exchange Rate of India

4.2.39 Long-term effects -VECM of Government Finance and South Africa Exchange Rate

VECM Model has been inured for estimating Long-term effects of Government Finance and South Africa Exchange Rate

Table 4.50

Long-term effects of Government Finance and South Africa Exchange Rate

Lags	Coefficient	Std error	t-statistics	probability
C(1)	-0.002224	0.000957	-2.324212	0.0202**
C(2)	0.304633	0.036478	8.351252	0.0000
C(3)	-0.190763	0.038430	-4.963943	0.0000
C(4)	0.066010	0.038577	1.711112	0.0873
C(5)	0.109972	0.038797	2.834527	0.0047
C(6)	-0.064460	0.038914	-1.656452	0.0978
C(7)	-0.118592	0.039197	-3.025586	0.0025
C(8)	0.049759	0.038903	1.279049	0.2011
C(9)	0.018980	0.037230	0.509803	0.6103
C(10)	-2.48E-09	1.71E-09	-1.449496	0.1474
C(11)	-1.28E-09	2.18E-09	-0.585323	0.5584
C(12)	-3.36E-09	2.55E-09	-1.317006	0.1880

** indicating 5 percent level of significance

Table 4.50 interprets that the Error Correction Term (ECT) for Government Finance with South Africa Exchange Rate shows negative coefficient indicating a correction of disequilibrium between fifteen years time period. It has significant p-value as 0.02 at 5 percent level in the long run.

The intuition behind the VECM analysis is that it adjusts long-run changes in variables and deviations from equilibrium. Thus the VECM model is used to examine long-run relationships among Government Finance and South Africa Exchange Rate for the entire period of fifteen years. It is concluded that there is the presence of Long-term Changes in among Government Finance and Exchange Rate of South Africa is reflected by negative coefficients and changes in the correction of disequilibrium during the study periodand there is long-term effect between Government Finance and Exchange Rate of South Africa

4.2.40 Long-term effects -VECM of Interest Rates and Russia Exchange Rate

VECM Model has been inured for estimating Long-term effects of Interest Rates and Russia Exchange Rate

Table 4.51

Long-term effects of Interest Rates and Russia Exchange Rate

Lags	Coefficient	Std error	t-statistics	probability
C(1)	-0.003815	0.005604	-0.680754	0.4962
C(2)	0.302311	0.049791	6.071564	0.0000
C(3)	-0.042918	0.052190	-0.822357	0.4111
C(4)	0.000210	0.052522	0.003998	0.9968
C(5)	0.028035	0.050594	0.554110	0.5796
C(6)	-1.42E-05	4.77E-05	-0.296793	0.7667
C(7)	-8.18E-05	5.12E-05	-1.597167	0.1105
C(8)	1.06E-05	4.21E-05	0.212415	0.8318
C(9)	4.20E-05	4.50E-05	0.911041	0.3625
C(10)	1.92E-05	6.61E-05	0.290980	0.7711
C(11)	22.93276	5.122544	4.476830	0.0000
C(12)	-27.15177	45.40386	-0.598006	0.5500

Table 4.51 interprets that the Error Correction Term (ECT) for Interest Rates with Russia Exchange Rate shows negative coefficient indicating a correction of disequilibrium between fifteen years time period. It has insignificant p-value as 0.49 not significant in the long run.

It is concluded that there is the absence of long-term Changes in among Interest Rates and Exchange Rate of Russia is reflected by negative coefficients and insignificant p-values changes in disequilibrium is not corrected during the study periodand there is no long-term effect between Interest Rates and Exchange Rate of Russia

4.2.41 Long-term effects -VECM of Interest Rates and India Exchange Rate

VECM Model has been inured for estimating Long-term effects of Interest Rates and India Exchange Rate

Table 4.52

Long-term effects of Interest Rates and India Exchange Rate

Lags	Coefficient	Std error	t-statistics	probability
C(1)	-0.001068	0.003067	-0.348408	0.7276
C(2)	0.130811	0.049138	2.662112	0.0079
C(3)	0.017598	0.049558	0.355104	0.7226
C(4)	-0.008282	0.049542	-0.167179	0.8673
C(5)	-0.087788	0.049607	-1.769666	0.0772
C(6)	0.002733	0.049619	0.055089	0.9561
C(7)	0.046233	0.049822	0.927976	0.3537
C(8)	-0.041413	0.051122	-0.810086	0.4181
C(9)	0.021251	0.050832	0.418069	0.6760
C(10)	2.00E-06	2.69E-05	0.074313	0.9408
C(11)	2.25E-05	2.83E-05	0.794978	0.4269
C(12)	-6.08E-07	2.85E-05	-0.021314	0.9830

Table 4.52 interprets that the Error Correction Term (ECT) for Interest Rates with India Exchange Rate shows negative coefficient indicating a correction of disequilibrium between fifteen years time period. It has insignificant p-value as 0.72 which is not significant in the long run.

It is concluded that there is the absence of long-term Changes in among Interest Rates and Exchange Rate of India is reflected by negative coefficients and insignificant p-values changes in disequilibrium is not corrected during the study periodand there is no long-term effect between Interest Rates and Exchange Rate of India

4.2.42 Long-term effects -VECM of Interest Rates and South Africa Exchange Rate

VECM Model has been inured for estimating Long-term effects of Interest Rates and South Africa Exchange Rate

Table 4.53

Long-term effects of Interest Rates and South Africa Exchange Rate

Lags	Coefficient	Std error	t-statistics	probability
C(1)	-0.000918	0.002171	-0.423117	0.6723
C(2)	0.211228	0.037625	5.614033	0.0000
C(3)	-0.099328	0.038413	-2.585771	0.0098
C(4)	0.007121	0.038573	0.184610	0.8536
C(5)	0.063868	0.038532	1.657530	0.0976
C(6)	-0.010717	0.038691	-0.276982	0.7818
C(7)	-0.099331	0.038383	-2.587921	0.0098
C(8)	-0.006436	0.038493	-0.167196	0.8672
C(9)	0.042632	0.037610	1.133545	0.2572
C(10)	0.000250	0.000306	0.816451	0.4144
C(11)	0.000343	0.000293	1.173491	0.2408
C(12)	0.000151	0.000291	0.519501	0.6035

Table 4.53 interprets that the Error Correction Term (ECT) for Interest Rates with South Africa Exchange Rate shows negative coefficient indicating a correction of disequilibrium between fifteen years time period. It has insignificant p-value as 0.67 which is not significant in the long run. It is concluded that there is the absence of long-term Changes in among Interest Rates and Exchange Rate of South Africa is reflected by negative coefficients and insignificant p-values changes in disequilibrium is not corrected during the study periodand there is no long-term effect between Interest Rates and Exchange Rate of South Africa

4.2.43 Long-term effects -VECM of International Liquidity and Brazil Exchange Rate

VECM Model has been inured for estimating Long-term effects of International Liquidity and Brazil Exchange Rate

Table 4.54

Long-term effects of International Liquidity and Brazil Exchange Rate

Lags	Coefficient	Std error	t-statistics	probability
C(1)	-0.034416	0.007857	-4.279994	0.0000***
C(2)	0.159122	0.031145	5.109061	0.0000
C(3)	0.096019	0.031521	3.046237	0.0023
C(4)	-0.018084	0.031023	-0.582934	0.5600
C(5)	-0.167736	0.031202	-5.375741	0.0000
C(6)	0.044587	0.031498	1.415570	0.1571
C(7)	0.055841	0.031482	1.773742	0.0763
C(8)	5.84E-08	4.29E-08	1.331337	0.1832
C(9)	4.21E-09	5.58E-08	0.073641	0.9413
C(10)	9.78E-09	5.59E-08	0.175078	0.8610
C(11)	-5.91E-08	5.58E-08	-1.057584	0.2904
C(12)	-2.16E-08	5.59E-08	-0.387206	0.6986

*** indicating 1 percent level of significance

Table 4.54 interprets that the Error Correction Term (ECT) for International Liquidity with Brazil Exchange Rate shows negative coefficient indicating a correction of disequilibrium between fifteen years time period. It has significant p-value (0.00) at 1 percent level in the long run. The intuition behind the VECM analysis is that it adjusts long-run changes in variables and deviations from equilibrium. Thus the VECM model is used to examine long-run relationships among International Liquidity and Brazil Exchange Rate for the entire period of fifteen years. It is concluded that there is the presence of Long-term Changes in among International Liquidity and Exchange Rate of Brazil is reflected by negative coefficients and changes in the correction of disequilibrium during the study period and there is long-term effect between International Liquidity and Exchange Rate of Brazil

4.2.44 Long-term effects -VECM of International Liquidity and Russia Exchange Rate

It is used for estimating Long-term effects of International Liquidity and Russia Exchange Rate

Table 4.55

Long-term effects of International Liquidity and Russia Exchange Rate

Lags	Coefficient	Std error	t-statistics	probability
C(1)	-0.001085	0.000341	-3.181316	0.0015***
C(2)	-0.192979	0.038114	-4.263192	0.0000
C(3)	-0.020949	0.038602	-0.542690	0.5874
C(4)	-0.013834	0.038605	-0.358344	0.7201
C(5)	0.110946	0.038528	2.879629	0.0040
C(6)	-0.017318	0.037241	-0.465018	0.6420
C(7)	943475.6	626145.9	1.506798	0.1321
C(8)	678786.1	629803.0	1.077775	0.2813
C(9)	449716.9	626721.8	0.717570	0.4731
C(10)	136431.4	626387.9	0.217807	0.8276
C(11)	325079.1	619435.4	0.524799	0.5998
C(12)	352.2087	1039.748	0.338744	0.7349

*** indicating 1 percent level of significance

Table 4.55 interprets that the Error Correction Term (ECT) for International Liquidity with Russia Exchange Rate shows negative coefficient indicating a correction of disequilibrium between fifteen years time period. It has significant p-value (0.00) at 1 percent level in the long run. The intuition behind the VECM analysis is that it adjusts long-run changes in variables and deviations from equilibrium. Thus the VECM model is used to examine long-run relationships among International Liquidity and Russia Exchange Rate for the entire period of fifteen years. It is concluded that there is the presence of Long-term Changes in among International Liquidity and Exchange Rate of Russia is reflected by negative coefficients and changes in the correction of disequilibrium during the study periodand there is long-term effect between International Liquidity and Exchange Rate of Russia

4.2.45 Long-term effects -VECM of International Liquidity and India xchange Rate

VECM Model has been inured for estimating Long-term effects of International Liquidity and India Exchange Rate

Table 4.56

Long-term effects of International Liquidity and India Exchange Rate

Lags	Coefficient	Std error	t-statistics	probability
C(1)	-0.015270	0.004112	-3.713188	0.0002***
C(2)	0.144148	0.047102	3.060366	0.0023
C(3)	-0.018596	0.047065	-0.395109	0.6929
C(4)	1.17E-09	8.40E-10	1.393727	0.1638
C(5)	1.77E-10	8.39E-10	0.210748	0.8331
C(6)	-1.77E-06	2.23E-05	-0.079418	0.9367
C(7)	-72042.71	238456.1	-0.302122	0.7626
C(8)	-718576.2	2738739.	-0.262375	0.7931
C(9)	-1458698.	2755755.	-0.529328	0.5967
C(10)	-0.070097	0.048634	-1.441310	0.1499
C(11)	-0.044885	0.048625	-0.923083	0.3562
C(12)	-124.8363	1295.478	-0.096363	0.9233

*** indicating 1 percent level of significance

Table 4.56 interprets that the Error Correction Term (ECT) for International Liquidity with India Exchange Rate shows negative coefficient indicating a correction of disequilibrium between fifteen years time period. It has significant p-value (0.00) at 1 percent level in the long run. The intuition behind the VECM analysis is that it adjusts long-run changes in variables and deviations from equilibrium. Thus the VECM model is used to examine long-run relationships among International Liquidity and India Exchange Rate for the entire period of fifteen years. It is concluded that there is the presence of Long-term Changes in among International Liquidity and Exchange Rate of India is reflected by negative coefficients and changes in the correction of disequilibrium during the study periodand there is long-term effect between International Liquidity and Exchange Rate of India

4.2.46 Long-term effects -VECM of Foreign trade and Brazil Exchange Rate

VECM Model has been inured for estimating Long-term effects of Foreign trade and Brazil Exchange Rate

Table 4.57

Long-term effects of Foreign trade and Brazil Exchange Rate

Lags	Coefficient	Std error	t-statistics	probability
C(1)	-0.004191	0.002923	-1.433836	0.1519
C(2)	0.345928	0.040118	8.622821	0.0000
C(3)	-0.020585	0.042290	-0.486761	0.6265
C(4)	0.031503	0.042183	0.746833	0.4553
C(5)	-0.073375	0.041916	-1.750548	0.0803
C(6)	0.047923	0.041966	1.141943	0.2537
C(7)	0.040944	0.042147	0.971470	0.3315
C(8)	-0.092246	0.041500	-2.222792	0.0264
C(9)	-0.092663	0.039546	-2.343154	0.0193
C(10)	-6.58E-09	1.19E-08	-0.551787	0.5812
C(11)	6.22E-09	1.28E-08	0.485046	0.6277
C(12)	7.18E-09	1.35E-08	0.530634	0.5958

Table 4.57 interprets that the Error Correction Term (ECT) for Foreign trade with Brazil Exchange Rate shows positive coefficient indicating there is no disequilibrium corrected between fifteen years time period. It has statistically insignificant p-value as 0.15. It is concluded that there is the absence of long-term Changes in among Foreign trade and Exchange Rate of Brazil is reflected by positive coefficients and changes in disequilibrium is not corrected during the study periodand there is no long-term effect between Foreign Trade and Exchange Rate of Brazil

4.2.47 Long-term effects -VECM of Foreign trade and India Exchange Rate

VECM Model has been inured for estimating Long-term effects of Foreign trade and India Exchange Rate

Table 4.58

Long-term effects of Foreign trade and India Exchange Rate

Lags	Coefficient	Std error	t-statistics	probability
C(1)	0.005314	0.002045	2.598313	0.0095***
C(2)	0.148298	0.043386	3.418106	0.0007
C(3)	-0.025647	0.044996	-0.569990	0.5688
C(4)	-0.015135	0.045013	-0.336241	0.7368
C(5)	-0.100518	0.044879	-2.239776	0.0253
C(6)	-0.061161	0.043979	-1.390693	0.1646
C(7)	0.060776	0.044108	1.377888	0.1685
C(8)	-0.113385	0.044060	-2.573406	0.0102
C(9)	-0.015321	0.048078	-0.318668	0.7500
C(10)	4.28E-12	1.24E-11	0.408304	0.6831
C(11)	1.40E-11	1.38E-11	1.012637	0.3115
C(12)	1.76E-11	1.48E-11	1.188158	0.2350

*** indicating 1 percent level of significance

Table 4.58 interprets that the Error Correction Term (ECT) for Foreign trade with India Exchange Rate shows negative coefficient indicating a correction of disequilibrium between fifteen years time period. It has significant p-value (0.00) at 1 percent level in the long run. The intuition behind the VECM analysis is that it adjusts long-run changes in variables and deviations from equilibrium. Thus the VECM model is used to examine long-run relationships among Foreign trade and India Exchange Rate for the entire period of fifteen years. It is concluded that there is the presence of Long-term Changes in among Foreign trade and Exchange Rate of India is reflected by negative coefficients and changes in the correction of disequilibrium during the study periodand there is long-term effect between Foreign Trade and Exchange Rate of India

4.2.48 Long-term effects -VECM of Foreign trade and South Africa Exchange Rate

Model has been inured for estimating Long-term effects of Foreign trade and South Africa Exchange Rate

Table 4.59

Long-term effects of Foreign trade and South Africa Exchange Rate

Lags	Coefficient	Std error	t-statistics	probability
C(1)	-0.001521	0.000663	-2.293359	0.0220*
C(2)	0.218629	0.041211	5.305170	0.0000
C(3)	-0.098723	0.042057	-2.347365	0.0191
C(4)	-0.016845	0.042132	-0.399813	0.6894
C(5)	0.091534	0.042128	2.172756	0.0300
C(6)	-0.037154	0.042167	-0.881126	0.3784
C(7)	-0.092966	0.042288	-2.198408	0.0281
C(8)	-0.007211	0.042346	-0.170292	0.8648
C(9)	0.039209	0.041420	0.946618	0.3440
C(10)	5.55E-09	2.12E-09	2.618686	0.0089
C(11)	6.99E-09	2.32E-09	3.010229	0.0027
C(12)	5.31E-09	2.48E-09	2.140991	0.0325

**indicating 5 percent level of significance

Table 4.59 interprets that the Error Correction Term (ECT) for Foreign trade with South Africa Exchange Rate shows negative coefficient indicating a correction of disequilibrium between fifteen years time period. It has significant p-value as 0.02 at 5 percent level in the long run.

The intuition behind the VECM analysis is that it adjusts long-run changes in variables and deviations from equilibrium. Thus the VECM model is used to examine long-run relationships among Foreign trade and South Africa Exchange Rate for the entire period of fifteen years. It is concluded that there is the presence of Long-term Changes in among Foreign trade and Exchange Rate of South Africa is reflected by negative coefficients and changes in the correction of disequilibrium during the study periodand there is long-term effect between Foreign Trade and Exchange Rate of South Africa

4.2.49 Dynamic effects -Vector Autoregressive Model (Unrestricted VAR)

VAR Model is used to identify the structural shocks and their dynamic effects of Macroeconomic Indicators and Exchange Rates.

4.2. 50 Dynamic effects – VAR of Price, Production and Labour and Exchange rate of BRICS Countries.

VAR Model is applied to examine the dynamic effects of Price, Production and Labour with Exchange rate of BRICS Countries.

Table – 4.60

Vector Autoregression Estimates of Price, Production and Labour and Exchange rate of BRICS Countries

Structural Shocks/OLS	Brazil(-1)	Russia(-1)	India(-1)	China(-1)	South Africa(-1)
Own Shock	1.320939 (0.03454) [38.2417]	1.258086 (0.05831) [21.5769]	0.989589 (0.01032) [94.9167]	1.036031 (0.04203) [24.6471]	1.274553 (0.06729) [18.9409]
Shock to Prices, Production and Labour	2963.604 (2232.02) [1.32777]	190.5937 (223.048) [0.85450]	-80822.60 (59058.3) [-1.36852]	-230.4885 (359.985) [-0.64027]	-53.33381 (106.445) [-0.50105]
R-squared	0.985741	0.980481	0.871116	0.999859	0.945740
Adj. R-squared	0.985664	0.979950	0.869917	0.999857	0.944104
F-statistic	12858.47	1846.017	726.5802	500843.7	578.0927

Standard errors in ( ) & t-statistics in [ ]

BRICS Countries own shock and shock to Prices, Production and Labour are portrayed in Table 4.60. In VAR model all the variables are associated. The estimated coefficients are asymptotically normally distributed. T-statistic is computed as the ratio of an estimated coefficient to its standard error. Lags are selected with VAR Lag length criterion. The significance of R-squared is tested using f-statistics value. The results of adjusted R-squared indicates that the VAR model is fitted.

4.2.51 Dynamic effects – VAR of the Effective exchange rate as per SDR and CPI with Exchange rate of BRICS Countries.

VAR Model is applied to examine the dynamic effects of the Effective exchange rate as per SDR and CPI with Exchange rate of BRICS Countries.

Table-4.61

Vector Autoregression Estimates of the Effective exchange rate as per SDR and CPI with Exchange rate of BRICS Countries

Structural Shocks/OLS	Brazil(-1)	Russia(-1)	India(-1)	China(-1)	South Africa(-1)
Own Shock	1.283959 (0.04739) [27.0919]	1.152559 (0.03858) [29.8771]	0.951861 (0.04736) [20.0978]	0.989604 (0.00529) [186.941]	1.310533 (0.04107) [31.9130]
Shock to Effective exchange rate as per SDR, US Dollar, and CPI	57.43551 (13.1541) [4.26634]	-30.77056 (120.440) [-0.25548]	-7.34E-06 (7.9E-06) [-0.93426]	8.974752 (11.0633) [0.81122]	-16.57036 (39.4954) [-0.41955]
R-squared	0.985350	0.954637	0.971006	0.991500	0.987772
Adj. R-squared	0.985142	0.954357	0.970743	0.991478	0.987442
F-statistic	4730.688	3403.969	3692.210	44674.29	2993.923

Standard errors in ( ) & t-statistics in [ ]

BRICS Countries own shock and shock to the Effective exchange rate as per SD and CPI are portrayed in Table 4.61. In VAR model all the variables are associated. The estimated coefficients are asymptotically normally distributed. T-statistic is computed as the ratio of an estimated coefficient to its standard error. Lags are selected with VAR Lag length criterion. The significance of R-squared is tested using f-statistics value. The results of adjusted R-squared indicates that the VAR model is fitted.

4.2.52 Dynamic effects – VAR of Balance of payments with Exchange rate of BRICS Countries.

VAR Model is applied to examine the dynamic effects of Balance of payments with Exchange rate of BRICS Countries.

Table – 4.62

Vector Autoregression Estimates of Balance of payments with Exchange rate of BRICS Countries.

Structural Shocks/OLS	Brazil(-1)	Russia(-1)	India(-1)	China(-1)	South Africa(-1)
Own Shock	1.321656 (0.04477) [29.5241]	1.182424 (0.05298) [22.3199]	1.113440 (0.04922) [22.6198]	1.049620 (0.04831) [21.7251]	1.314528 (0.05160) [24.4753]
Shock to Balance of payments	-103988.6 (103267.) [-1.00699]	522524.7 (664944.) [0.78582]	-1507329. (1708168) [-0.88242]	141468.6 (1264848) [0.11185]	-24226.42 (111794.) [-0.21671]
R-squared	0.990022	0.991963	0.995734	0.997575	0.989405
Adj. R-squared	0.989902	0.991647	0.995610	0.997541	0.989063
F-statistic	8301.043	3138.470	8033.135	29412.56	2887.201

Standard errors in ( ) & t-statistics in [ ]

BRICS Countries own shock and shock to Balance of payments are portrayed in Table 4.62. In VAR model all the variables are associated. The estimated coefficients are asymptotically normally distributed. T-statistic is computed as the ratio of an estimated coefficient to its standard error. Lags are selected using VAR Lag length criterion. The significance of R-squared is tested using f-statistics value. The results of adjusted R-squared indicates that the VAR model is fitted.

4.2.53 Dynamic effects – VAR of GDP with Exchange rate of BRICS Countries.

VAR Model is applied to examine the dynamic effects of GDP with Exchange rate of BRICS Countries**.**

Table – 4.63

Vector Autoregression Estimates of GDP with Exchange rate of BRICS Countries.

Structural Shocks/OLS	Brazil(-1)	Russia(-1)	India(-1)	China(-1)	South Africa(-1)
Own Shock	1.330726 (0.03696) [36.0089]	1.169826 (0.03160) [37.0158]	1.197532 (0.05035) [23.7828]	1.033833 (0.03412) [30.2981]	1.220583 (0.03711) [32.8915]
Shock to GDP	383982.2 (742510.) [0.51714]	-77845443 (1.1E+08) [-0.71570]	-1.84E+09 (1.4E+09) [-1.31798]	-325464.2 (3951091) [-0.08237]	1557009. (1866666) [0.83411]
R-squared	0.719898	0.479507	0.506531	0.688470	0.946091
Adj. R-squared	0.716018	0.473268	0.491230	0.684831	0.945639
F-statistic	184.5628	76.84818	33.10364	189.1730	2094.275

Standard errors in ( ) & t-statistics in [ ]

BRICS Countries own shock and shock to GDP are portrayed in Table 4.63. In VAR model all the variables are associated. The estimated coefficients are asymptotically normally distributed. T-statistic is computed as the ratio of an estimated coefficient to its standard error. Lags are selected using VAR Lag length criterion. The significance of R-squared is tested using f-statistics value. The results of adjusted R-squared indicates that the VAR model is fitted. .

4.2.54 Dynamic effects – VAR of Government Finance with Exchange rate of BRICS Countries.

VAR Model is applied to examine the dynamic effects of Government Finance with Exchange rate of BRICS Countries**.**

Table -4.64

Vector Autoregression Estimates of Government Finance with Exchange rate of BRICS Countries.

Structural Shocks/OLS	Brazil(-1)	Russia(-1)	India(-1)	South Africa(-1)
Own Shock	1.141121 (0.03152) [36.1986]	1.169492 (0.03098) [37.7549]	1.117227 (0.03246) [34.4192]	1.298288 (0.03676) [34.2134]
Shock to Government Finance	-233420.9 (224594.) [-1.03929]	25695124 (4.9E+07) [0.52653]	-1.04E+08 (9.3E+07) [-1.11133]	1400096. (1001155) [1.39848]
R-squared	0.224899	0.258259	0.268776	0.759947
Adj. R-squared	0.212559	0.246859	0.256513	0.754833
F-statistic	18.22530	22.65347	21.91639	148.5922

Standard errors in ( ) & t-statistics in [ ]

BRICS Countries own shock and shock to Government Finance are portrayed in Table 4.64. In VAR model all the variables are associated. The estimated coefficients are asymptotically normally distributed. T-statistic is computed as the ratio of an estimated coefficient to its standard error. Lags are selected using VAR Lag length criterion. The significance of R-squared is tested using f-statistics value. The results of adjusted R-squared indicates that the VAR model is fitted. .

4.2.55 Dynamic effects – VAR of Interest Rates with Exchange rate of BRICS Countries.

VAR Model is applied to examine the dynamic effects of Interest Rates with Exchange rate of BRICS Countries

Table -4.65

Vector Autoregression Estimates of Interest Rates with Exchange rate of BRICS Countries.

Structural Shocks/OLS	Brazil(-1)	Russia(-1)	India(-1)	China(-1)	South Africa(-1)
Own Shock	1.303489 (0.03727) [34.9783]	1.294470 (0.04389) [29.4944]	1.112524 (0.04905) [22.6834]	1.039253 (0.04256) [24.4201]	1.200736 (0.03759) [31.9391]
Shock to Interest Rates	0.308339 (3.63942) [0.08472]	-4.226962 (44.6043) [-0.11681]	32.72539 (97.6558) [0.33511]	-7.349241 (9.15835) [-0.80246]	1.741677 (4.59230) [0.37926]
R-squared	0.982647	0.835104	0.697071	0.945997	0.940360
Adj. R-squared	0.982258	0.832558	0.685448	0.945604	0.939009
F-statistic	2526.913	327.9227	59.97244	2404.285	694.7357

Standard errors in ( ) & t-statistics in [ ]

BRICS Countries own shock and shock to Interest Rates are portrayed in Table 4.65. In VAR modeling all the variables are dependent and independent variables. The estimated coefficients are asymptotically normally distributed. T-statistic is computed as the ratio of an estimated coefficient to its standard error. Lags are selected using VAR Lag length criterion. The significance of R-squared is tested using f-statistics value. The results of adjusted R-squared indicates that the VAR model is fitted. .

4.2.56 Dynamic effects – VAR of International Liquidity with Exchange rate of BRICS Countries.

VAR Model is applied to examine the dynamic effects of International Liquidity with Exchange rate of BRICS Countries**.**

Table-4.66

Vector Autoregression Estimates of International Liquidity with Exchange rate of BRICS Countries.

Structural Shocks/OLS	Brazil(-1)	Russia(-1)	India(-1)	China(-1)	South Africa(-1)
Own Shock	1.125828 (0.03109) [36.2109]	1.170102 (0.03735) [31.3290]	1.126534 (0.04707) [23.9309]	1.044451 (0.05033) [20.7511]	1.249633 (0.03136) [39.8541]
Shock to International Liquidity	-33032.53 (21933.8) [-1.50601]	572442.5 (612194.) [0.93507]	-935571.5 (2685263) [-0.34841]	-1136811. (622370.) [-1.82658]	20088.93 (18913.2) [1.06216]
R-squared	0.976312	0.970335	0.963921	0.996571	0.980290
Adj. R-squared	0.976038	0.969911	0.963596	0.996468	0.980017
F-statistic	3554.892	2286.447	2972.231	9686.695	3591.590

Standard errors in ( ) & t-statistics in [ ]

BRICS Countries own shock and shock to International Liquidity are portrayed in Table 4.66. In VAR model all the variables are associated. The estimated coefficients are asymptotically normally distributed. T-statistic is computed as the ratio of an estimated coefficient to its standard error. Lags are selected using VAR Lag length criterion. The significance of R-squared is tested using f-statistics value. The results of adjusted R-squared indicates that the VAR model is fitted. .

4.2.57 Dynamic effects – VAR of Foreign trade with Exchange rate of BRICS Countries.

VAR Model is applied to examine the dynamic effects of Foreign trade with Exchange rate of BRICS Countries**.**

Table -4.67

Vector Autoregression Estimates of Foreign trade with Exchange rate of BRICS Countries.

Structural Shocks/OLS	Brazil(-1)	Russia(-1)	India(-1)	China(-1)	South Africa(-1)
Own Shock	1.346051 (0.03981) [33.8085]	1.401903 (0.19041) [7.36241]	1.146681 (0.04440) [24.8268]	1.039510 (0.04088) [24.4263]	1.205251 (0.04114) [29.2935]
Shock to Foreign trade	-22800.20 (207737.) [-0.10976]	-1014880. (6536540) [-0.15526]	51094918 (2.1E+08) [0.24319]	2197819. (7571849) [0.29026]	-338796.1 (1202242) [-0.28180]
R-squared	0.419079	0.100713	0.543216	0.559745	0.429139
Adj. R-squared	0.404159	-0.043173	0.529757	0.547826	0.413605
F-statistic	28.08963	0.699949	40.35916	46.96276	27.62639

Standard errors in ( ) & t-statistics in [ ]

BRICS Countries own shock and shock to Foreign trade are portrayed in Table 4.67. In VAR modeling all the variables are associated. The estimated coefficients are asymptotically normally distributed. T-statistic is computed as the ratio of an estimated coefficient to its standard error. Lags are selected using VAR Lag length criterion. The significance of R-squared is tested using f-statistics value. The results of adjusted R-squared indicates that the VAR model is fitted. .

Further, VAR forecasting is made using Variance Decomposition Models(VDM) and Impulse Response Function (IRF) to determine the structural shocks and their dynamic effects.

4.3. Forecasting the Future Movements of Macroeconomic indicators with Exchange Rates.

To forecast the future movements of the variables forecasting models were used, to examine the structural shock and their dynamic effects. The following forecasting models was included for the study

i. Variance Decomposition Model

ii. Impulse Response Function

Variance Decomposition Model determines the proportion of variation explained by each variable and its contribution to the other variables in the Autoregression estimates.

Impulse Response Function traces the effect of a one-time shock to one of the innovations on current and future values of the endogenous variables.

4.3.1 Exogenous Shock – Variance Decomposition of Prices, Production, and Labour

Variance Decomposition Model is used to predict the exogenous shock of Prices, Production, and Labour with Exchange Rates of BRICS Countries. The below table gives the forecasted figures for one year from January 2018 to December 2018.

Table – 4.68

Variance Decomposition of Exchange Rates with Prices, Production, and Labour

Period	Brazil	Russia	India	China	South Africa
1	0.00	0.00	0.00	0.01	0.00
2	0.00	0.04	0.00	0.07	0.34
3	0.00	0.02	0.00	0.16	4.57
4	0.00	0.04	0.00	0.15	8.11
5	0.00	0.07	0.00	0.12	9.87
6	0.01	0.10	0.01	0.12	10.95
7	0.01	0.14	0.01	0.12	11.93
8	0.01	0.18	0.01	0.11	12.83
9	0.01	0.22	0.01	0.10	13.64
10	0.01	0.27	0.01	0.10	14.36
11	0.01	0.33	0.02	0.09	14.33
12	0.01	0.39	0.02	0.08	14.67

VDC measures the relative importance of fluctuation of nominal or real shocks. Own series shocks explain most of the error variance, although the shock will also affect other variables in the system. To analyse the relative strength of the variables in the system variance decomposition is carried out. The results of the forecast error variance decomposition is presented for the period from January 2018 to December 2018. In particular, the table provides decomposition for 12 months, explained at month intervals.

Analysing the results from the variance decomposition, in the first month there is no contribution of other variables in the system. In the second month, Exchange rates of South Africa displays a certain amount of exogenity over 0.34 per cent of their own variance explained by innovations in the Prices, Production and Labour. It is followed by Exchange Rates of China at 0.07 percent and Russia at 0.04 percent. In the sixth month Exchange rates of South Africa displays a greater amount of exogenity over 10.9 percent followed by Exchange rates of China at 0.12 percent and Russia at 0.10 percent. By the end of twelfth month Exchange rates of South Africa displays a greater amount of exogenity over 14.6 percent followed by Exchange rates of Russia at 0.39 percent and China at 0.08 percent.

The results from the variance Decomposition are consistent with the results from the VAR Model. Exchange Rate of South Africa is the most influential in terms of their explanation of the variance innovations compared to other countries. This is due to low production costs of South Africa. Exchange Rate of India seems to be an exogenous, as it explains most of its own variance and also have minimal effect on the variances. This may be due to low value of Indian Currency against US Dollars. India's exposure to changes in global financial conditions is relatively low. Robust growth has been accompanied by a rapid decline in inflation and the current account deficit (OECD economic surveys 2017)

4.3.2 Exogenous Shock – Variance Decomposition of Effective Exchange rate based on SDR and CPI

Variance Decomposition Model is used to predict the exogenous shock of Effective Exchange rate based on SDR and CPI with Exchange Rates of BRICS Countries. The below table gives the forecasted figures for one year from January 2018 to December 2018.

Table -4.69

Variance Decomposition of Exchange Rate with Effective Exchange rate based on SDR and CPI

Period	Brazil	Russia	India	China	South Africa
1	0.00	0.00	0.00	0.00	0.00
2	0.01	0.03	0.08	0.00	0.00
3	0.02	0.09	0.11	0.00	0.00
4	0.01	0.16	0.12	0.00	0.00
5	0.01	0.26	0.13	0.00	0.01
6	0.01	0.38	0.13	0.00	0.03
7	0.01	0.52	0.13	0.00	0.06
8	0.01	0.68	0.13	0.00	0.07
9	0.01	0.86	0.12	0.00	0.07
10	0.02	1.06	0.12	0.00	0.08
11	0.03	1.27	0.12	0.00	0.09
12	0.04	1.51	0.11	0.01	0.09

VDC measures the relative importance of fluctuation of nominal or real shocks. Own series shocks explain most of the error variance, although the shock will also affect other variables in the system. To analyse the relative strength of the variables in the system variance decomposition is carried out. The results of the forecast error variance decomposition is presented for the period from January 2018 to December 2018. In particular, the table provides decomposition for 12 months, explained at month intervals.

Analysing the results from the variance decomposition, in the first month there is no contribution of other variables in the system. In the second month, Exchange rates of India displays a certain amount of exogeneity over 0.08 per cent of their own variance explained by innovations in the Effective Exchange rate based on SDR and CPI. It is followed by Exchange Rates of Russia at 0.03 percent and Brazil at 0.01 percent. In the sixth month, Exchange rates of Russia displays a greater amount of exogeneity over 0.38 percent followed by Exchange rates of India at 0.13 percent and South Africa at 0.03 percent. By the end of twelfth month Exchange rates of Russia displays a greater amount of exogeneity over 1.51 percent followed by Exchange rates of India at 0.11 percent and China at 0.09 percent.

The results from the variance Decomposition are consistent with the results from the VAR Model. Exchange Rate of Russia is prominent in terms of their explanation of the variance innovations compared to other countries. Russia sell dollars to support their own currencies and also there was an increase in CPI. Russia will make use of "Market means" (Alexei Kudrin, Finance minister 2010). Exchange Rate of China seems to be an exogenous, as it explains most of its own variance and also have minimal effect on the variances. This may be due to lack of managing dollar denominated reserves. The role of SDR has not been flexible due to limitations on its allocations (Zhou).

4.3.3 Exogenous Shock – Variance Decomposition of Balance of payments

Variance Decomposition Model is used to predict the exogenous shock of Balance of payments with Exchange Rates of BRICS Countries. The below table gives the forecasted figures for one year from January 2018 to December 2018.

Table - 4.70

Variance Decomposition of Exchange Rate with Balance of payments

Period	Brazil	Russia	India	China	South Africa
1	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.04	0.07	0.01
3	0.00	0.00	0.11	0.06	0.12
4	0.00	0.00	0.12	0.06	0.51
5	0.00	0.00	0.31	0.05	0.90
6	0.01	0.00	0.53	0.05	1.08
7	0.00	0.00	0.60	0.05	1.10
8	0.00	0.00	0.57	0.04	1.09
9	0.00	0.00	0.56	0.04	1.11
10	0.00	0.00	0.58	0.04	1.13
11	0.00	0.00	0.62	0.04	1.14
12	0.01	0.01	0.66	0.03	1.15

VDC measures the relative importance of fluctuation of nominal or real shocks. Own series shocks explain most of the error variance, although the shock will also affect other variables in the system. To analyse the relative strength of the variables in the system variance decomposition is carried out. The results of the forecast error variance decomposition is presented for the period from January 2018 to December 2018. In particular, the table provides decomposition for 12 months, explained at month intervals.

Analysing the results from the variance decomposition, in the first month there is no contribution of other variables in the system. In the second month, Exchange rates of China displays a certain amount of exogeneity over 0.07 per cent of their own variance explained by innovations in the Balance of payments. It is followed by Exchange Rates of India at 0.04 percent and South Africa at 0.01 percent. In the sixth month, Exchange rates of South Africa displays a greater amount of exogeneity over 1.08 percent followed by Exchange rates of India at 0.53 percent and China at 0.05 percent. By the end of twelfth month Exchange rates of South Africa displays a greater amount of exogeneity over 1.15 percent followed by Exchange rates of India at 0.66 percent and China at 0.03 percent.

The results from the variance Decomposition are consistent with the results from the VAR Model. Exchange Rate of South Africa is leading in terms of their explanation of the variance innovations compared to other countries. South Africa shift in direct investments has improved its financial account of Balance of Payments. RBI bulletin showed the capital inflows were more than adequate to finance deficits on current accounts and Balance of payments. Exchange Rate of Russia shows minimal effect on the variances because Russia's Balance of payments was weakened due to oil price dynamics.

4.3.4 Exogenous Shock – Variance Decomposition of GDP

Variance Decomposition Model is used to predict the exogenous shock of GDP with Exchange Rates of BRICS Countries. The below table gives the forecasted figures for one year from January 2018 to December 2018.

Table – 4.71

Variance Decomposition of Exchange Rate with GDP

Period	Brazil	Russia	India	China	South Africa
1	0.00	0.00	0.00	0.00	0.00
2	0.01	0.00	0.21	0.00	0.03
3	0.03	0.06	1.21	0.01	0.02
4	0.03	0.24	2.17	0.02	0.03
5	0.03	0.20	2.48	0.02	0.06
6	0.03	0.19	2.55	0.03	0.10
7	0.04	0.18	2.40	0.03	0.15
8	0.07	0.17	2.44	0.03	0.22
9	0.08	0.16	2.54	0.03	0.30
10	0.09	0.21	2.53	0.04	0.39
11	0.10	0.25	2.51	0.08	0.49
12	0.12	0.28	2.42	0.10	0.60

. In order to analyse the relative strength of the variables in the system variance decomposition is carried out. The results of the forecast error variance decomposition is presented for the period from January 2018 to December 2018. In particular, the table provides decomposition for 12 months, explained at month intervals.

Analysing the results from the variance decomposition, in the first month there is no contribution of other variables in the system. In the second month, Exchange rates of India displays a certain amount of exogeneity over 0.21 per cent of their own variance explained by innovations in the GDP. It is followed by Exchange Rates of South Africa at 0.03 percent and Brazil at 0.01 percent. In the sixth month, Exchange rates of India displays a greater amount of exogeneity over 2.55 percent followed by Exchange rates of Russia at 0.19 percent and South Africa at 0.10 percent. By the end of twelfth month Exchange rates of India displays a greater amount of exogeneity over 2.42 percent followed by Exchange rates of South Africa at 0.60 percent and China at 0.10 percent.

The results from the variance Decomposition are consistent with the results from the VAR Model. Exchange Rate of India is dominant in terms of explanation of the variance innovations compared to other countries. India is the world's fast-growing economy. India is the world's sixth largest economy in contribution towards nominal GDP and stands third largest towards contribution in Purchase power parity (PPP). Exchange Rate of China shows minimal effect on the variances because China economy is four times a bigger than India and is expected to attain growth in future.

4.3.5 Exogenous Shock – Variance Decomposition of Government Finance

Variance Decomposition Model is used to predict the exogenous shock of Government Finance with Exchange Rates of BRICS Countries. The below table gives the forecasted figures for one year from January 2018 to December 2018.

In order to analyse the relative strength of the variables in the system variance decomposition is carried out. The results of the forecast error variance decomposition is presented for the period from January 2018 to December 2018. In particular, the table provides decomposition for 12 months, explained at month intervals.

Table –4.72

Variance Decomposition of Exchange Rate with Government Finance

Period	Brazil	Russia	India	South Africa
1	0.00	0.00	0.00	0.00
2	0.09	0.00	0.06	0.00
3	0.18	0.00	0.09	0.01
4	0.38	0.02	0.20	0.01
5	0.58	0.03	0.38	0.02
6	0.65	0.05	0.49	0.01
7	0.73	0.04	0.60	0.02
8	0.74	0.04	0.78	0.02
9	0.76	0.06	0.95	0.02
10	0.78	0.08	1.14	0.03
11	0.80	0.10	1.31	0.04
12	0.83	0.11	1.49	0.04

Note: Lack of data for China

Analysing the results from the variance decomposition, in the first month there is no contribution of other variables in the system. In the second month, Exchange rates of India displays a certain amount of exogeneity over 0.06 per cent of their own variance explained by innovations in the Government Finance. It is followed by Exchange Rates of Brazil at 0.09 percent and South Africa at 0.00 percent. In the sixth month, Exchange rates of Brazil displays a greater amount of exogeneity over 0.65 percent followed by Exchange rates of India at 0.49 percent and Russia at 0.05 percent. By the end of twelfth month Exchange rates of India displays a greater amount of exogeneity over 1.49 percent followed by Exchange rates of Brazil at 0.83 percent and South Africa at 0.04 percent.

The results from the variance Decomposition are consistent with the results from the VAR Model. Exchange Rate of India is persuasive in variance innovations compared to other countries. India reported fiscal deficit better than previous years. Exchange Rate of Russia shows minimal effect on the variances because there was devaluation of Russian rubble in the second half of the year 2014. Investors began to sell Russian assets and fall in prices of oil was also considered.

4.3.6 Exogenous Shock – Variance Decomposition of Interest Rates

Variance Decomposition Model is used to predict the exogenous shock of Interest Rates with Exchange Rates of BRICS Countries. The below table gives the forecasted figures for one year from January 2018 to December 2018.

Table –4.73

Variance Decomposition of Exchange Rate with Interest Rates

Period	Brazil	Russia	India	China	South Africa
1	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.01	0.00	0.00
3	0.01	0.21	0.15	0.00	0.06
4	0.02	0.34	0.17	0.01	0.18
5	0.08	0.40	0.26	0.01	0.27
6	0.13	0.48	0.32	0.02	0.31
7	0.13	0.52	0.37	0.03	0.36
8	0.12	0.55	0.42	0.05	0.39
9	0.11	0.57	0.43	0.06	0.41
10	0.10	0.59	0.43	0.08	0.42
11	0.10	0.60	0.42	0.09	0.42
12	0.09	0.61	0.41	0.11	0.42

In order to analyse the relative strength of the variables in the system variance decomposition is carried out. The results of the forecast error variance decomposition is presented for the period from January 2018 to December 2018. In particular, the table provides decomposition for 12 months, explained at month intervals.

Analysing the results from the variance decomposition, in the first month there is no contribution of other variables in the system. In the second month, Exchange rates of India displays a certain amount of exogeneity over 0.01 per cent of innovations in the Interest Rates. It is followed by Exchange Rates of Brazil at 0.00 percent and South Africa at 0.00 percent. In the sixth month, Exchange rates of Russia displays a greater amount of exogeneity over 0.48 percent followed by Exchange rates of India at 0.32 percent and South Africa at 0.31 percent. By the end of twelfth month Exchange rates of Russia displays a greater amount of exogeneity over 0.61 percent followed by Exchange rates of South Africa at 0.42 percent and India at 0.41 percent.

The results from the variance Decomposition are consistent with the results from the VAR Model. Exchange Rate of Russia is authoritative in variance innovations compared to other countries. High interest rate in Russia gains developed status in the economy. Exchange Rate of Brazil shows minimal effect on the variances because there was reduction in interest rates by the central banks to stimulate economy.

4.3.7 Exogenous Shock – Variance Decomposition of International Liquidity

Variance Decomposition Model is used to predict the exogenous shock of International Liquidity with Exchange Rates of BRICS Countries. The below table gives the forecasted figures for one year from January 2018 to December 2018.

Table –4.74

Variance Decomposition of Exchange Rate with International Liquidity

Period	Brazil	Russia	India	China	South Africa
1	0.00	0.00	0.00	0.00	0.00
2	0.16	0.01	0.43	0.01	0.01
3	0.19	0.01	0.79	0.01	0.03
4	0.21	0.02	1.16	0.01	0.03
5	0.18	0.30	1.57	0.01	0.02
6	0.17	0.53	2.01	0.01	0.02
7	0.16	0.72	2.50	0.01	0.08
8	0.16	0.87	3.03	0.01	0.12
9	0.16	1.08	3.60	0.01	0.15
10	0.16	1.27	4.21	0.02	0.17
11	0.17	1.45	4.85	0.02	0.20
12	0.17	1.62	4.53	0.02	0.23

The results of the forecast error variance decomposition is presented for the period from January 2018 to December 2018. In particular, the table provides decomposition for 12 months, explained at month intervals.

Analysing the results from the variance decomposition, in the first month there is no contribution of other variables in the system. In the second month, Exchange rates of India displays a certain amount of exogeneity over 0.43 per cent of innovations in the International Liquidity. It is followed by Exchange Rates of Brazil at 0.16 percent and Russia at 0.01 percent. In the sixth month, Exchange rates of India displays a greater

amount of exogeneity over 2.01 percent followed by Exchange rates of Russia at 0.53 percent and South Africa at 0.02 percent. By the end of twelfth month Exchange rates of India displays a greater amount of exogeneity over 4.53 percent followed by Exchange rates of Russia at 1.62 percent and South Africa at 0.23 percent.

The results from the variance Decomposition are consistent with the results from the VAR Model. Exchange Rate of India is strong in variance innovations compared to other countries. India has a better position of foreign exchange reserves. High stock prices indicated robust economic growth and reflects the ideal economy. Exchange Rate of China shows minimal effect on the variances because there was problem of Global financial crisis, Asymmetric recovery on growth and fiscal limits to supply of reserves.

4.3.8 Exogenous Shock – Variance Decomposition of Foreign trade

Variance Decomposition Model is used to predict the exogenous shock of Foreign trade with Exchange Rates of BRICS Countries. The below table gives the forecasted figures for one year from January 2018 to December 2018.

Table – 4.75

Variance Decomposition of Exchange Rate with Foreign trade

Period	Brazil	Russia	India	China	South Africa
1	0.00	0.00	0.00	0.00	0.00
2	0.40	0.18	0.37	0.01	0.08
3	0.36	0.91	0.37	0.03	0.36
4	0.31	1.81	0.32	0.40	0.43
5	0.27	2.68	0.27	0.73	0.39
6	0.25	3.40	0.58	1.10	0.34
7	0.23	3.92	0.86	1.54	0.32
8	0.25	4.25	1.19	1.99	0.29
9	0.29	4.44	1.42	1.95	0.30
10	0.34	4.54	1.62	1.90	0.32
11	0.41	4.59	2.12	1.87	0.33
12	0.46	4.61	2.61	1.88	0.35

The results of the forecast error variance decomposition is presented for the period from January 2018 to December 2018. In particular, the table provides decomposition for 12 months, explained at month intervals

Analysing the results from the variance decomposition, in the first month there is no contribution of other variables in the system. In the second month, Exchange rates of Brazil displays a certain amount of exogeneity over 0.40 per cent of innovations in Foreign trade. It is followed by Exchange Rates of India at 0.37 percent and Russia at 0.18 percent. In the sixth month, Exchange rates of Russia displays a greater amount of exogeneity over 3.40 percent followed by Exchange rates of China at 1.10 percent and India at 0.58 percent. By the end of twelfth month Exchange rates of Russia displays a greater amount of exogeneity over 4.61 percent followed by Exchange rates of India at 2.61 percent and China at 1.88 percent.

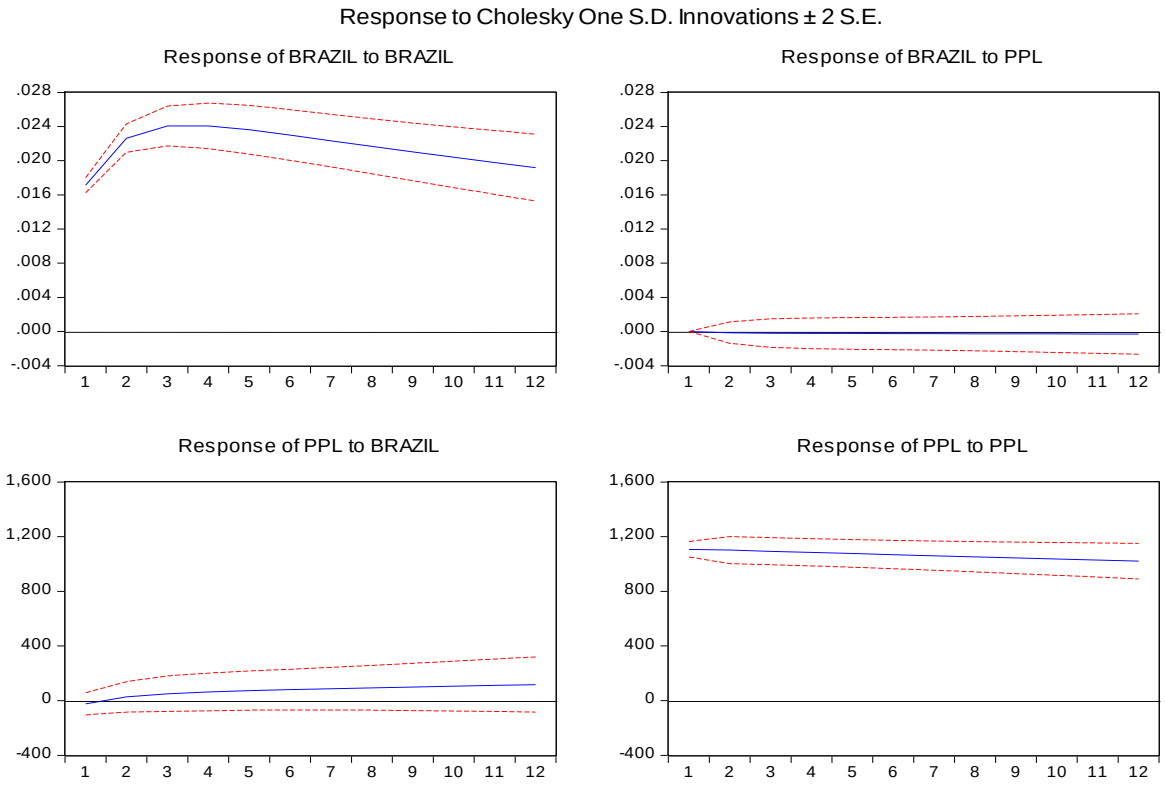
The results from the variance Decomposition are consistent with the results from the VAR Model. Exchange Rate of Russia is strong in variance innovations compared to other countries. Trade and investment in Russia is high compared to other countries and it depends on commodity exports. Russian government eliminated nontariff customs barriers on most imports and maintained high tariffs and other duties on imports of goods to raise revenue and protect domestic producers. Exchange Rate of South Africa shows minimal effect on the variances because South Africa's economy has depended heavily on foreign trade and it was under pressure from international sanctions and recession.

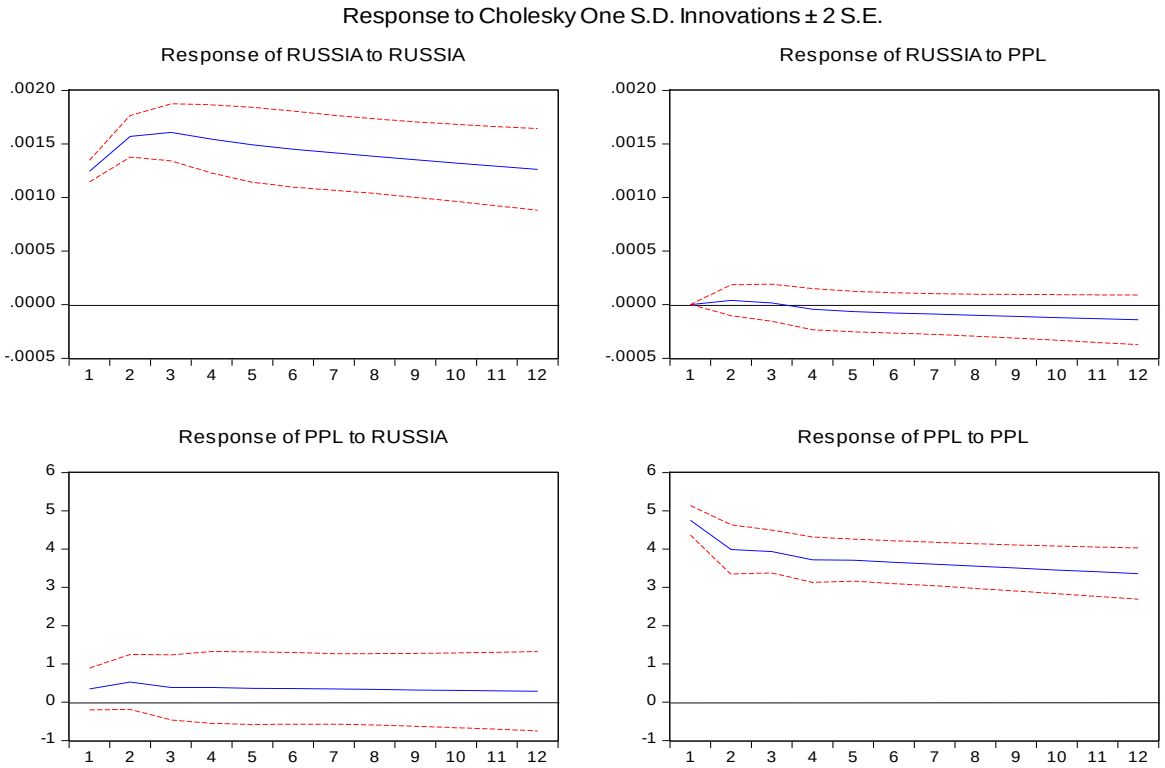
4.3.9 Effect of one time Shock - Impulse response Function of Prices, Production, and Labour with Exchange Rate of BRICS Countries

The below displayed graph produces the time path of one-time shock of Prices, Production and Labour with Exchange Rate of BRICS Countries

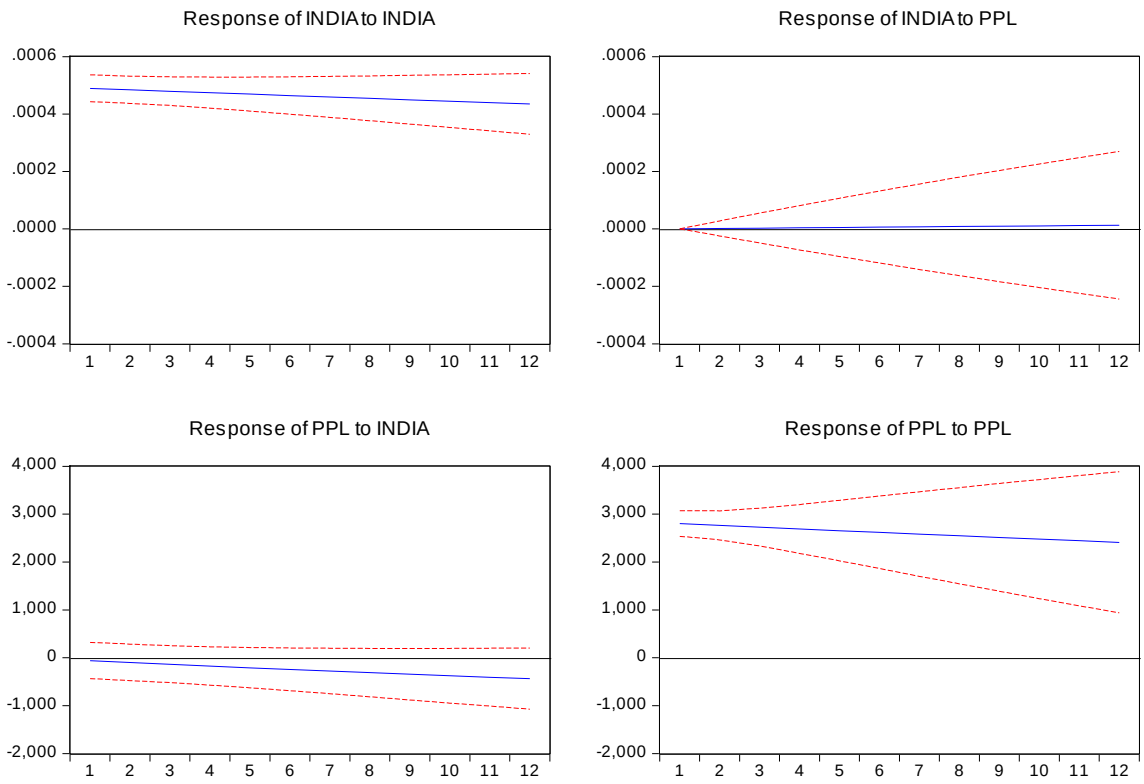
Graph – 4.76.1

Impulse Response Function of Prices, Production, and Labour with Exchange Rate of BRICS Countries

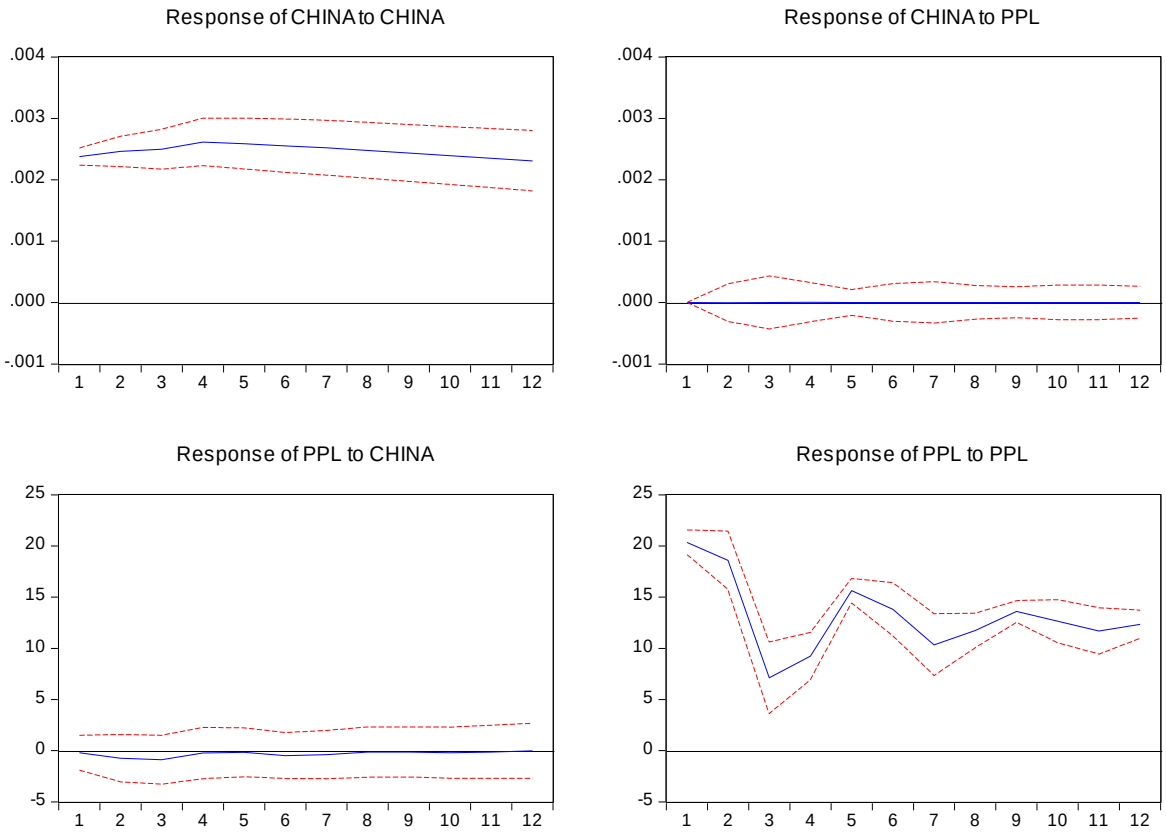


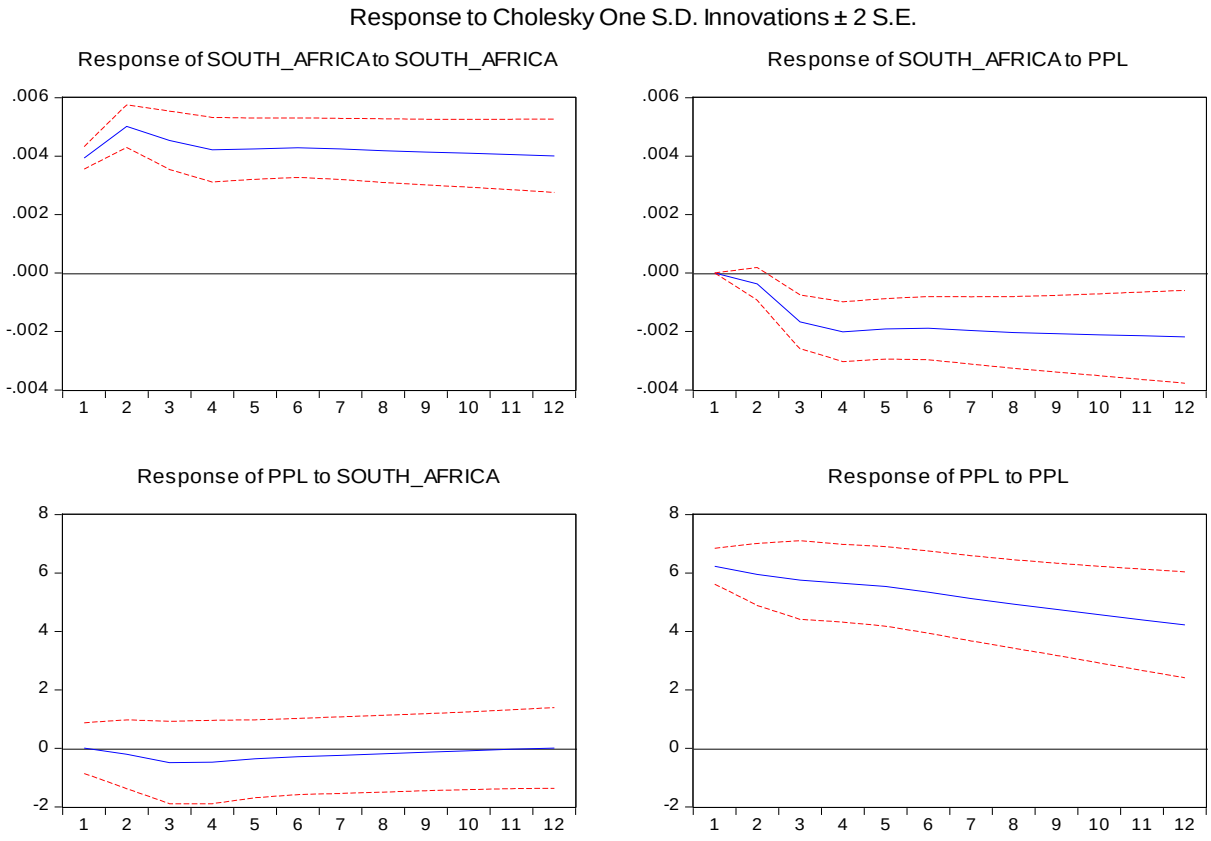


Response to Cholesky One S.D. Innovations ± 2 S.E.



Response to Cholesky One S.D. Innovations ± 2 S.E.





A generalised impulse response function analysis was conducted to further investigate the dynamic relationships among the Exchange Rates and Prices, Production and Labour. The above graph show the generalised impulse response functions of BRICS countries Exchange Rates for the period January 2018 to December 2018. The combined graphs are based on the output of the unrestricted VAR with analytic response standard error over 12 periods and Cholesky degrees of freedom adjusted, showing the response to Cholesky one standard deviation innovation.

This analysis provides the dynamic response of each Exchange Rate to innovations in Prices, Production, and Labour within the system. Analysis of an impulse response function shows the extent to which the shocks in Exchange Rate are persistent in terms of their effects on their own and on Prices, Production and Labour.

Each graph as shown in plots includes a point estimation of impulse response functions as well as lower and upper bounds for a 95 percent confidence interval. As usual, the solid lines depict the variable percent change in response to a standard deviation of one in the respective macroeconomic variables The dotted lines represent the 95 percent error bands.

The impulse response function for Exchange Rate of Brazil to Prices, Production and Labour is significant and positive. The impact remains positive up to twelfth month. Innovations in Exchange Rate of Russia to Prices, Production and Labour remains positively significant over the entire time period. The Exchange Rate of India to Prices, Production and Labour have a significant positive impact. Exchange Rate of China remains constant. Whereas Exchange Rate of South Africa declines to negative from second month till the end of the twelfth month.

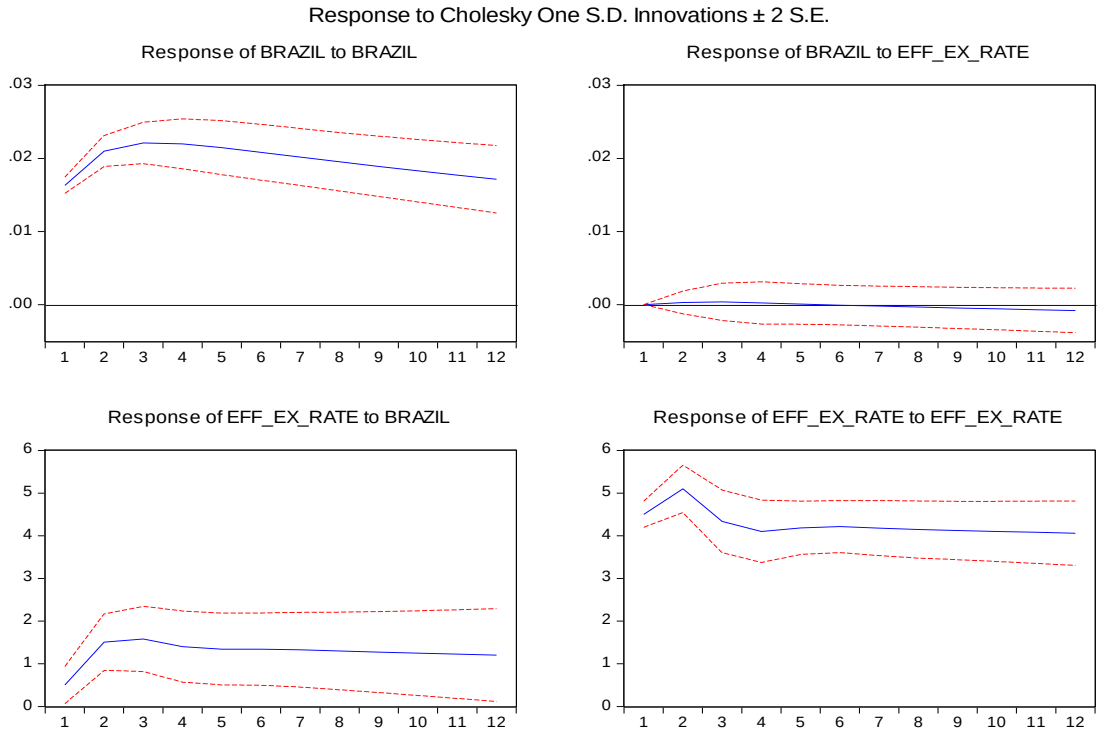
According to the impulse response functions of Exchange Rate with Prices, Production and Labour of BRICS countries except South Africa remains significant and had a positive effect over the entire time period of twelve months.

4.3.10 Effect of one time Shock - Impulse response Function of Effective Exchange rate based on SDR and CPI with Exchange Rate of BRICS Countries

The below displayed graph produces the time path of one-time shock of Effective Exchange rate based on SDR and CPI with Exchange Rate of BRICS Countries

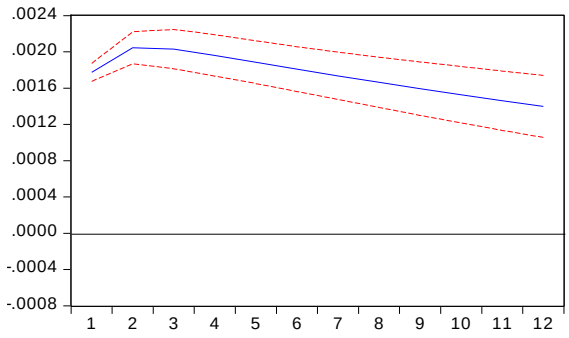
Graph – 4.76.2

Impulse Response Function of Effective Exchange rate based on SDR and CPI with Exchange rate of BRICS Countries

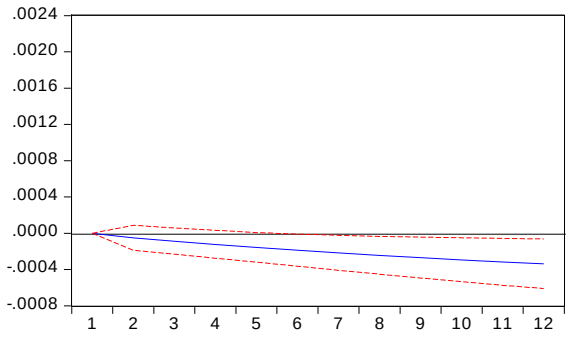


Response to Cholesky One S.D. Innovations ± 2 S.E.

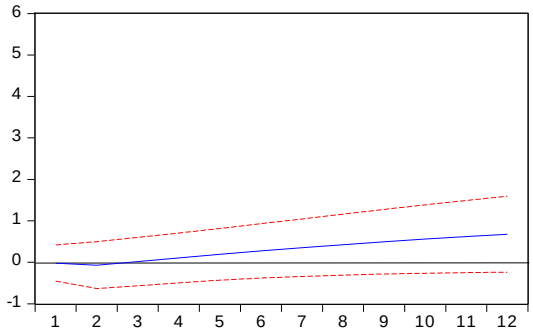
Response of RUSSIA to RUSSIA



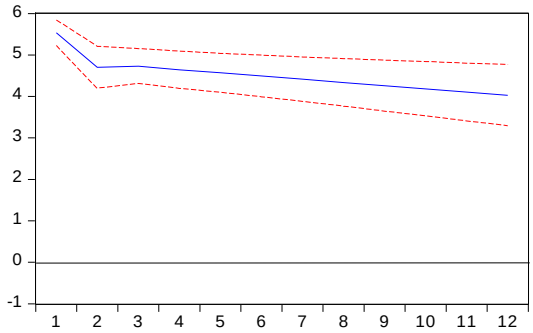
Response of RUSSIA to EFF_EX_RATE



Response of EFF_EX_RATE to RUSSIA

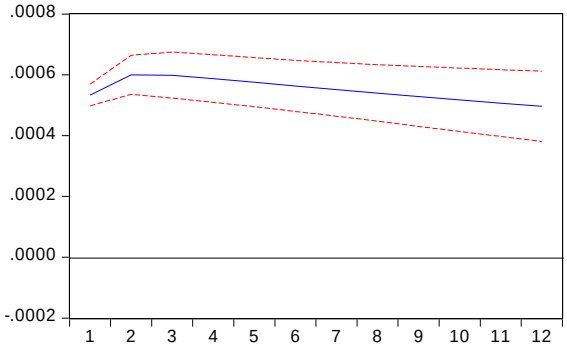


Response of EFF_EX_RATE to EFF_EX_RATE

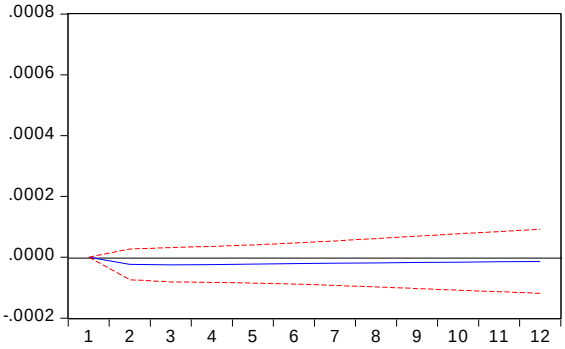


Response to Cholesky One S.D. Innovations ± 2 S.E.

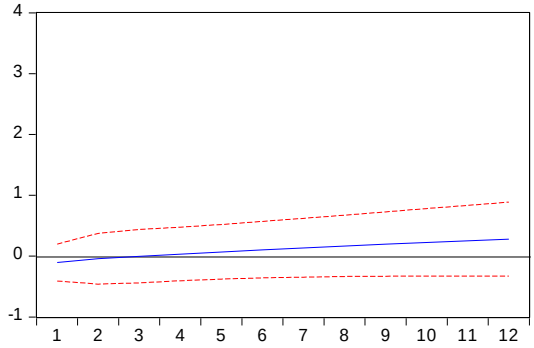
Response of INDIA to INDIA



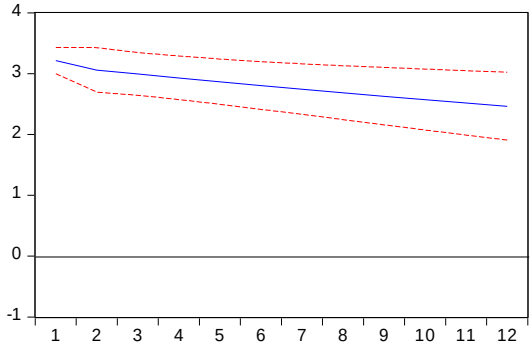
Response of INDIA to EFFE_EX_RATE



Response of EFFE_EX_RATE to INDIA

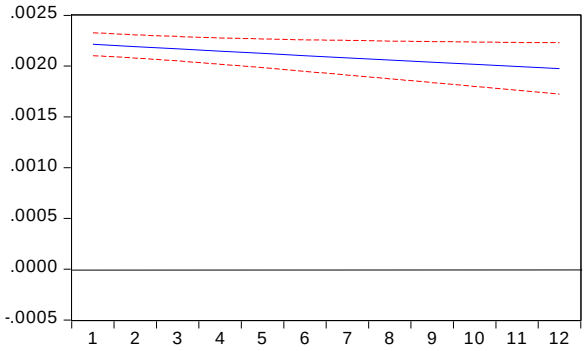


Response of EFFE_EX_RATE to EFFE_EX_RATE

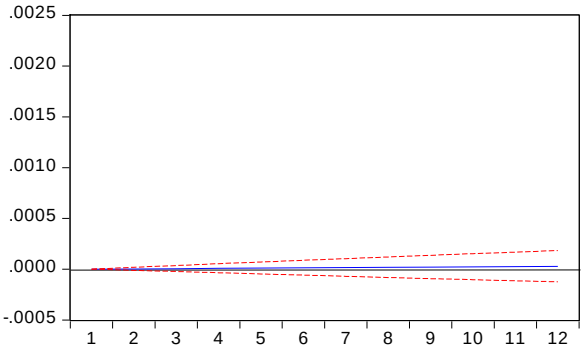


Response to Cholesky One S.D. Innovations ± 2 S.E.

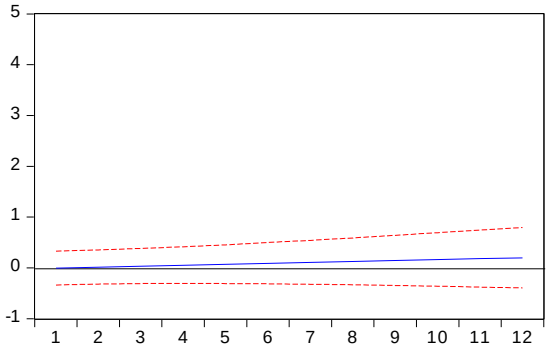
Response of CHINA to CHINA



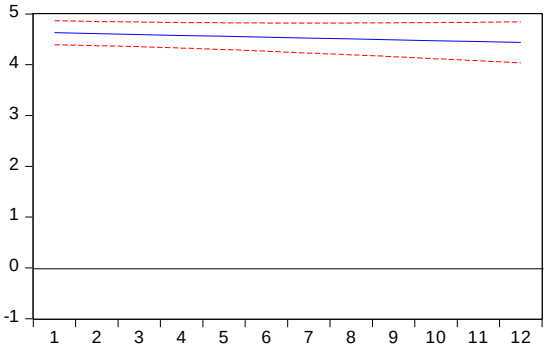
Response of CHINA to EFF_EX_RATE



Response of EFF_EX_RATE to CHINA

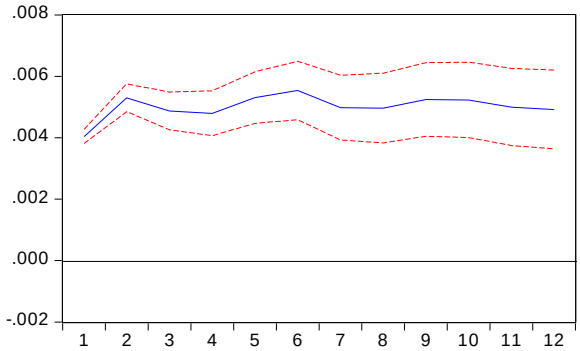


Response of EFF_EX_RATE to EFF_EX_RATE

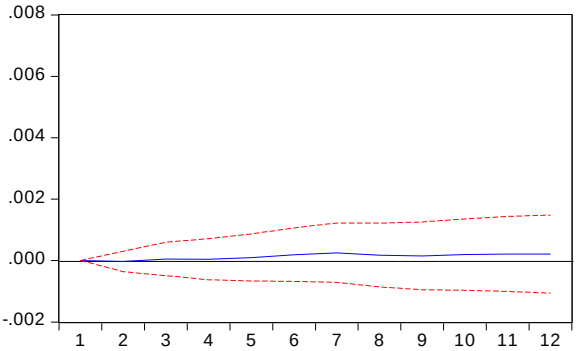


Response to Cholesky One S.D. Innovations ± 2 S.E.

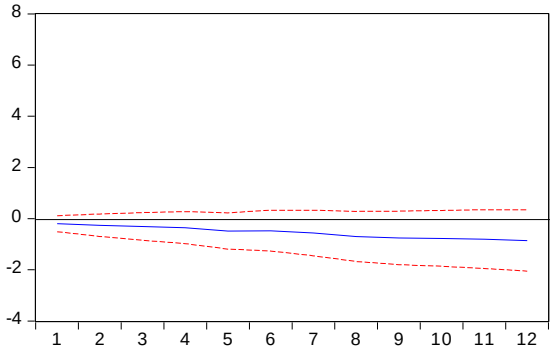
Response of SOUTH_AFRICA to SOUTH_AFRICA



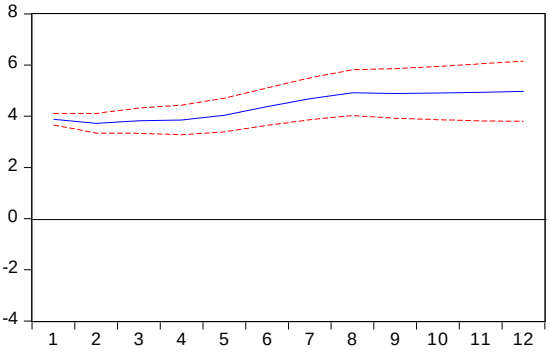
Response of SOUTH_AFRICA to EFF_EX_RATE



Response of EFF_EX_RATE to SOUTH_AFRICA



Response of EFF_EX_RATE to EFF_EX_RATE



A generalised impulse response function analysis was conducted to further investigate the dynamic relationships among the Exchange Rates and Effective Exchange rate based on SDR and CPI . The above graph show the generalised impulse response functions of BRICS countries Exchange Rates for the period January 2018 to December 2018. The combined graphs are based on the output of the unrestricted VAR with analytic response standard error over 12 periods and Cholesky degrees of freedom adjusted, showing the response to Cholesky one standard deviation innovation.

This analysis provides the dynamic response of each Exchange Rate to innovations in Effective Exchange rate based on SDR and CPI within the system. Analysis of an impulse response function shows the extent to which the shocks in Exchange Rate are persistent in terms of their effects on their own and on Effective Exchange rate based on SDR and CPI.

Each graph as shown in plots includes a point estimation of impulse response functions as well as lower and upper bounds for a 95 percent confidence interval. As usual, the solid lines depict the variable percent change in response to a standard deviation of one in the respective macroeconomic variables The dotted lines represent the 95 percent error bands.

The impulse response function for Exchange Rate of Brazil to Effective Exchange rate based on SDR and CPI is statistically significant. The impact remains positive up to twelfth month. Innovations in Exchange Rate of Russia to Effective Exchange rate based on SDR and CPI is not significant over the entire time period. Exchange Rate of India to Effective Exchange rate based on SDR and CPI had a negative effect because Exchange Rates declines after sixth month. Exchange Rate of China to Effective Exchange rate based on SDR and CPI is statistically significant and positive. Exchange Rate of South Africa remains significant and positive till the end of twelfth month.

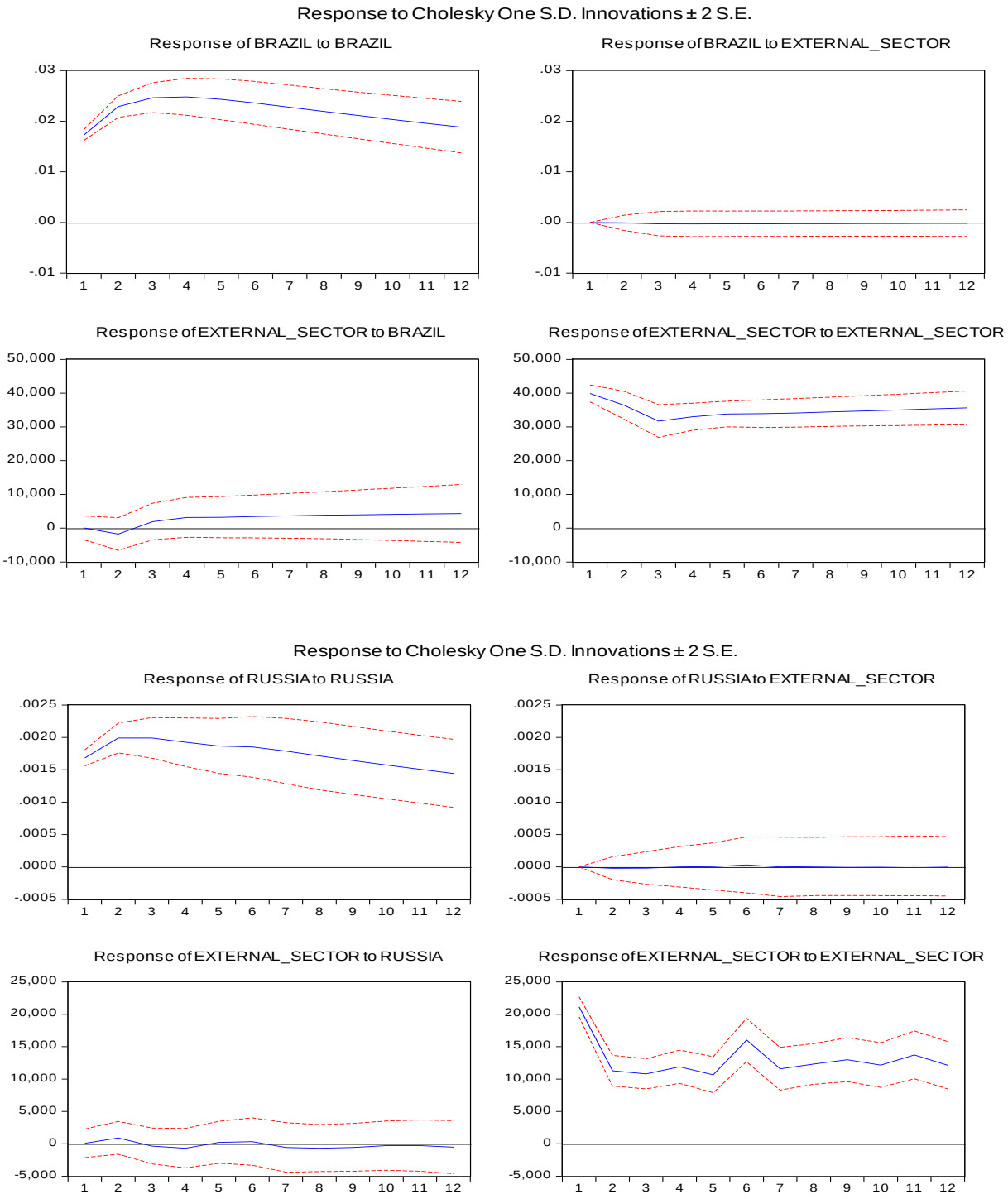
According to the impulse response functions of Exchange Rate of BRICS countries to Effective Exchange rate based on SDR and CPI remains statistically significant and positive except India.

4.3.11 Effect of one time Shock - Impulse response Function of Balance of payments with Exchange Rate of BRICS Countries

The below displayed graph produces the time path of one-time shock of Balance of payments with Exchange Rate of BRICS Countries

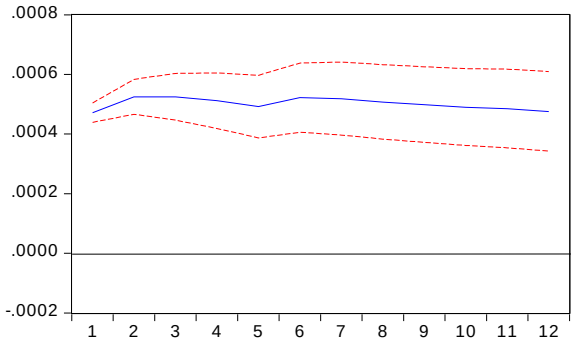
Graph – 4.76.3

Impulse Response Function of Balance of payments with Exchange rate of BRICS Countries

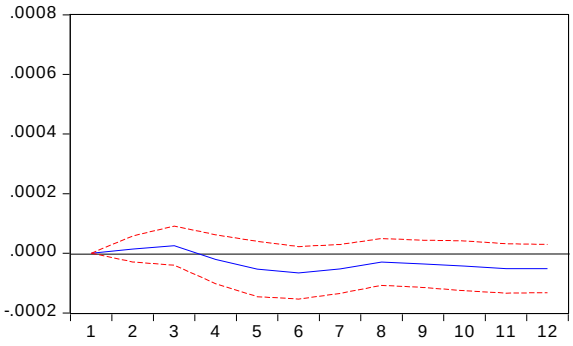


Response to Cholesky One S.D. Innovations ± 2 S.E.

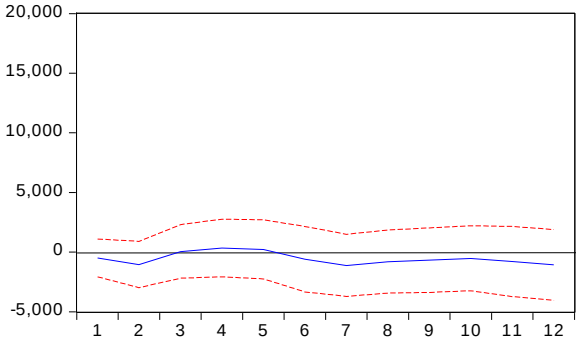
Response of INDIA to INDIA



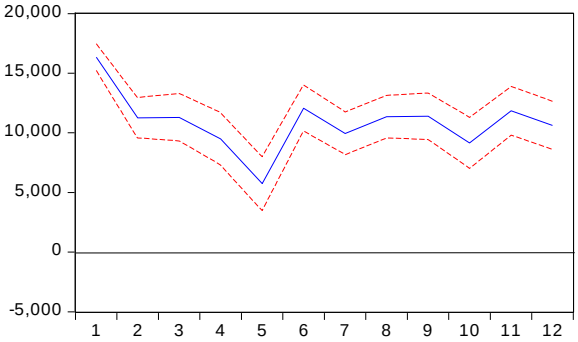
Response of INDIA to EXTERNAL_SECTOR



Response of EXTERNAL_SECTOR to INDIA

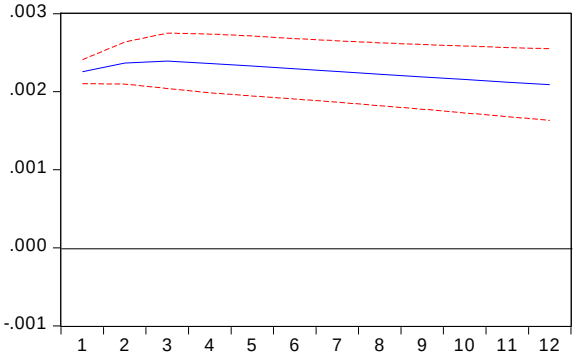


Response of EXTERNAL_SECTOR to EXTERNAL_SECTOR

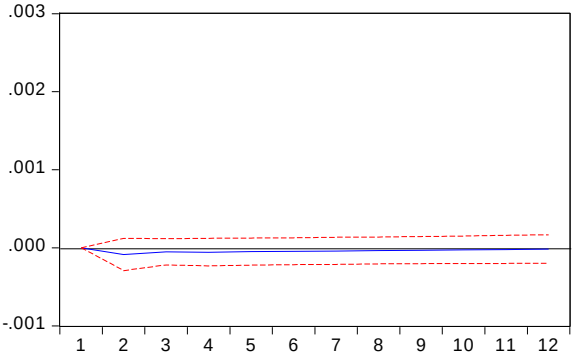


Response to Cholesky One S.D. Innovations ± 2 S.E.

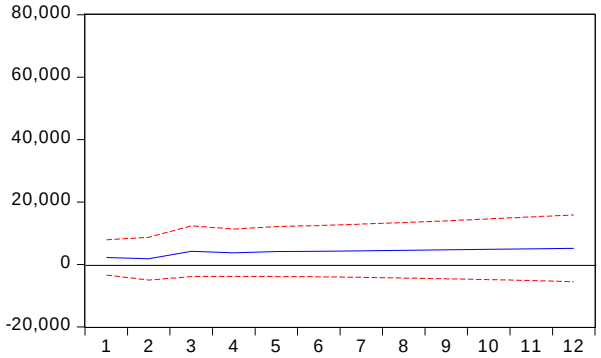
Response of CHINA to CHINA



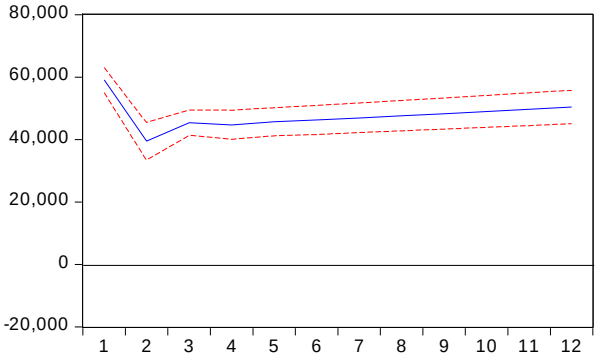
Response of CHINA to EXTERNAL_SECTOR

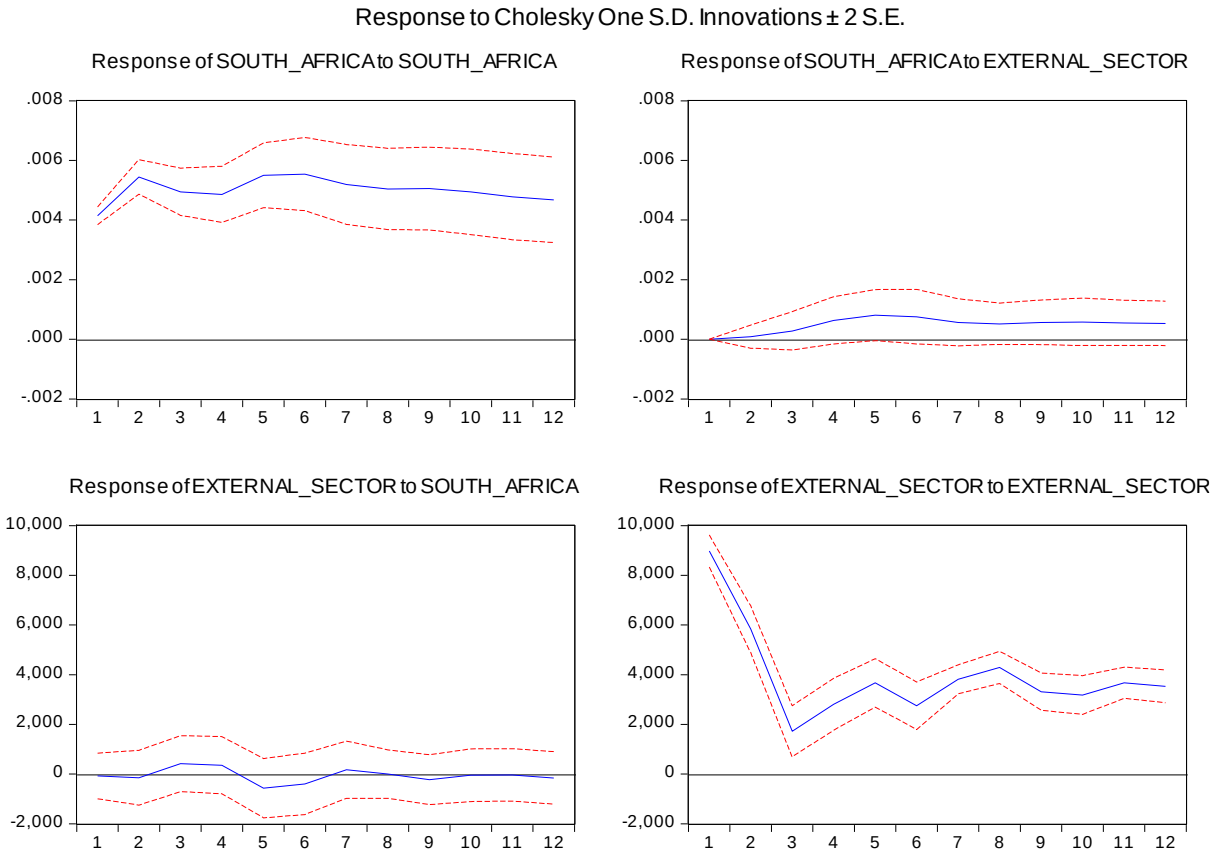


Response of EXTERNAL_SECTOR to CHINA



Response of EXTERNAL_SECTOR to EXTERNAL_SECTOR





A generalised impulse response function analysis was conducted to further investigate the dynamic relationships among the Exchange Rates and Balance of Payments. The above graph show the generalised impulse response functions of BRICS countries Exchange Rates for the period January 2018 to December 2018. The combined graphs are based on the output of the unrestricted VAR with analytic response standard error over 12 periods and Cholesky degrees of freedom adjusted, showing the response to Cholesky one standard deviation innovation.

This analysis provides the dynamic response of each Exchange Rate to innovations in Balance of Payments within the system. Analysis of an impulse response function shows the extent to which the shocks in Exchange Rate are persistent in terms of their effects on their own and on Balance of Payments.

Each graph as shown in plots includes a point estimation of impulse response functions as well as lower and upper bounds for a 95 percent confidence interval. As usual, the solid lines depict the variable percent change in response to a standard deviation of one in the respective macroeconomic variables. The dotted lines represent the 95 percent error bands.

The impulse response function for Exchange Rate of Brazil to Balance of Payments is statistically significant and positive. The impact remains positive up to twelfth month. Innovations in Exchange Rate of Russia to Balance of Payments is significant and had positive effects over the entire time period. Exchange Rate of India to Balance of Payments is significant had a negative effect. Exchange Rate of China to Balance of Payments is significant and positive till the end of twelfth month. Exchange Rate of South Africa to Balance of Payments had significantly positive effect till the end of twelfth month.

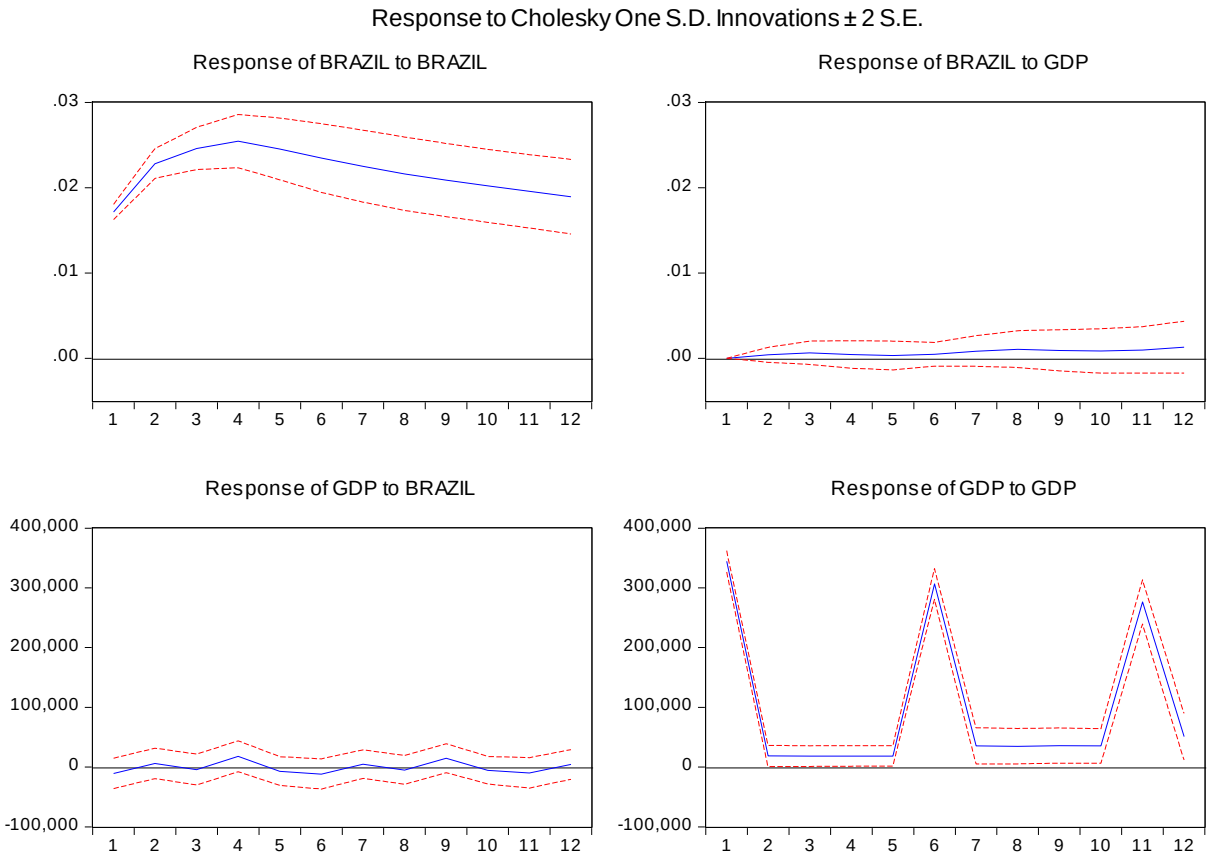
According to the impulse response functions Exchange Rates with Balance of Payments of BRICS had a positive effect except India.

4.3.12 Effect of one time Shock - Impulse response Function of GDP with Exchange Rate of BRICS Countries

The below displayed graph produces the time path of one-time shock of GDP with Exchange Rate of BRICS Countries

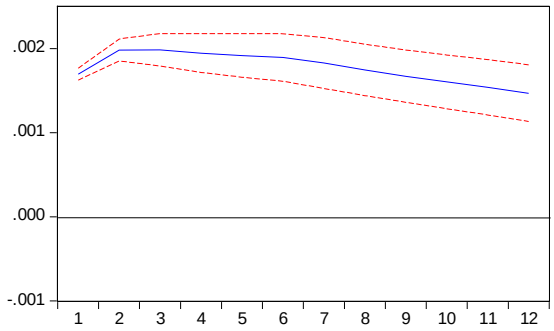
Graph 4.76.4

Impulse response Function of GDP with Exchange rate of BRICS Countries

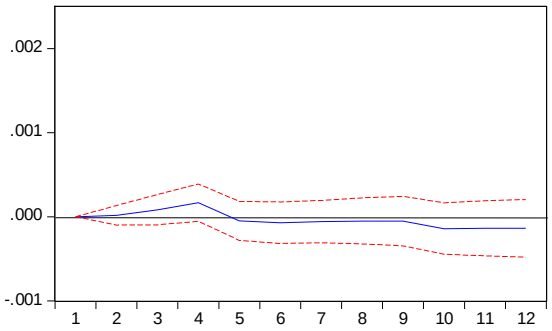


Response to Cholesky One S.D. Innovations ± 2 S.E.

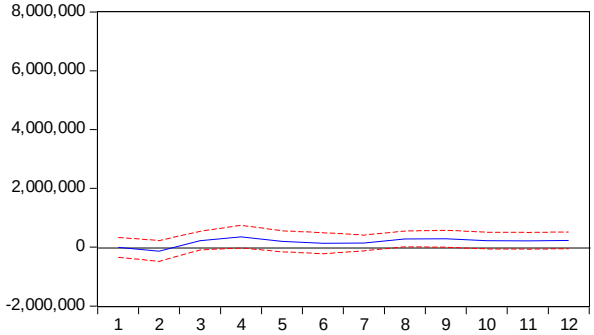
Response of RUSSIA to RUSSIA



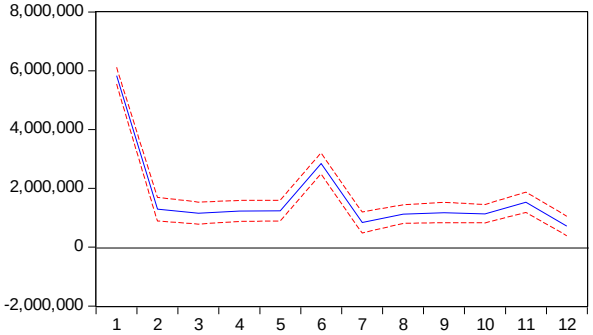
Response of RUSSIA to GDP



Response of GDP to RUSSIA

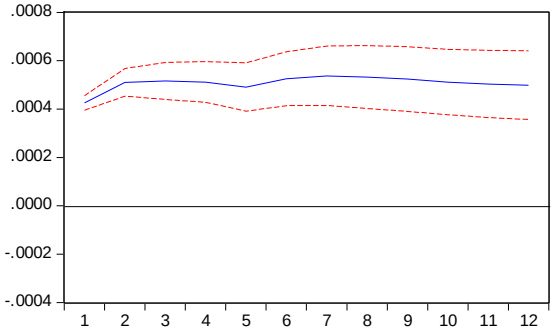


Response of GDP to GDP

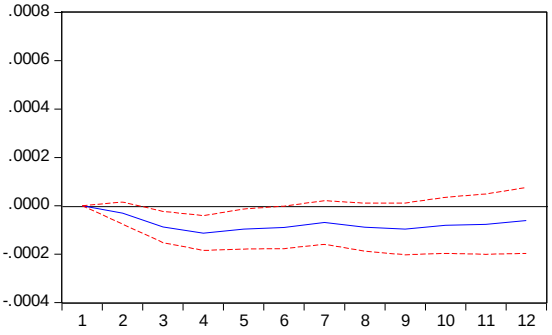


Response to Cholesky One S.D. Innovations ± 2 S.E.

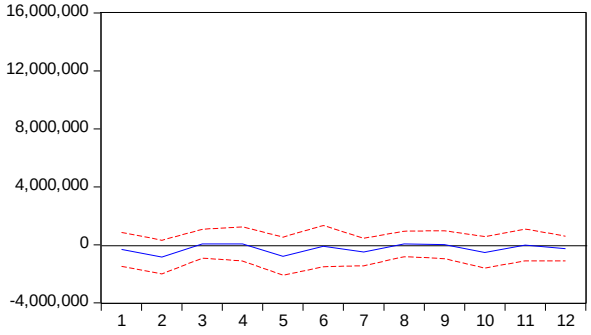
Response of INDIA to INDIA



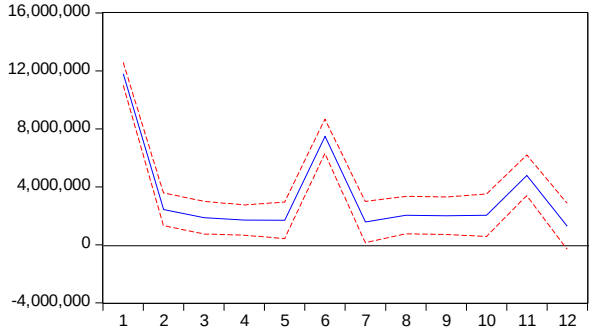
Response of INDIA to GDP

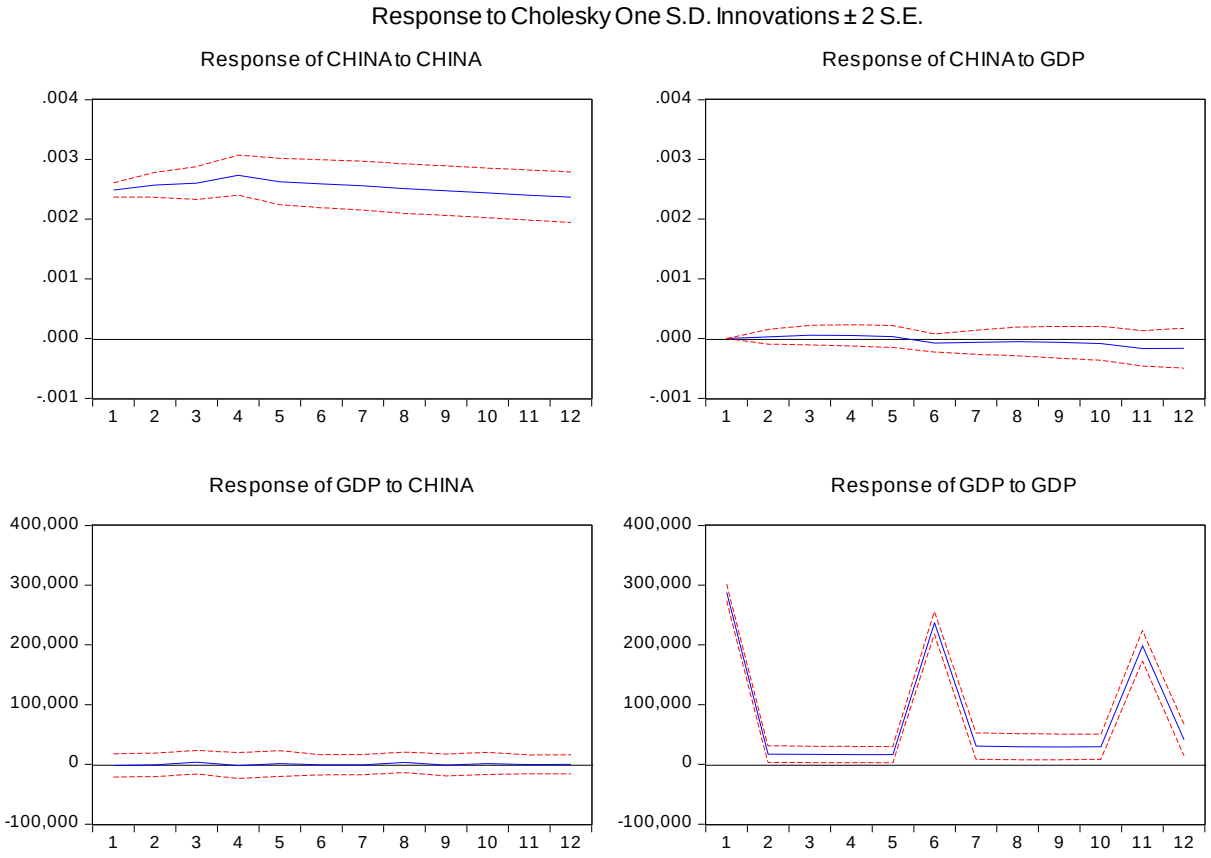


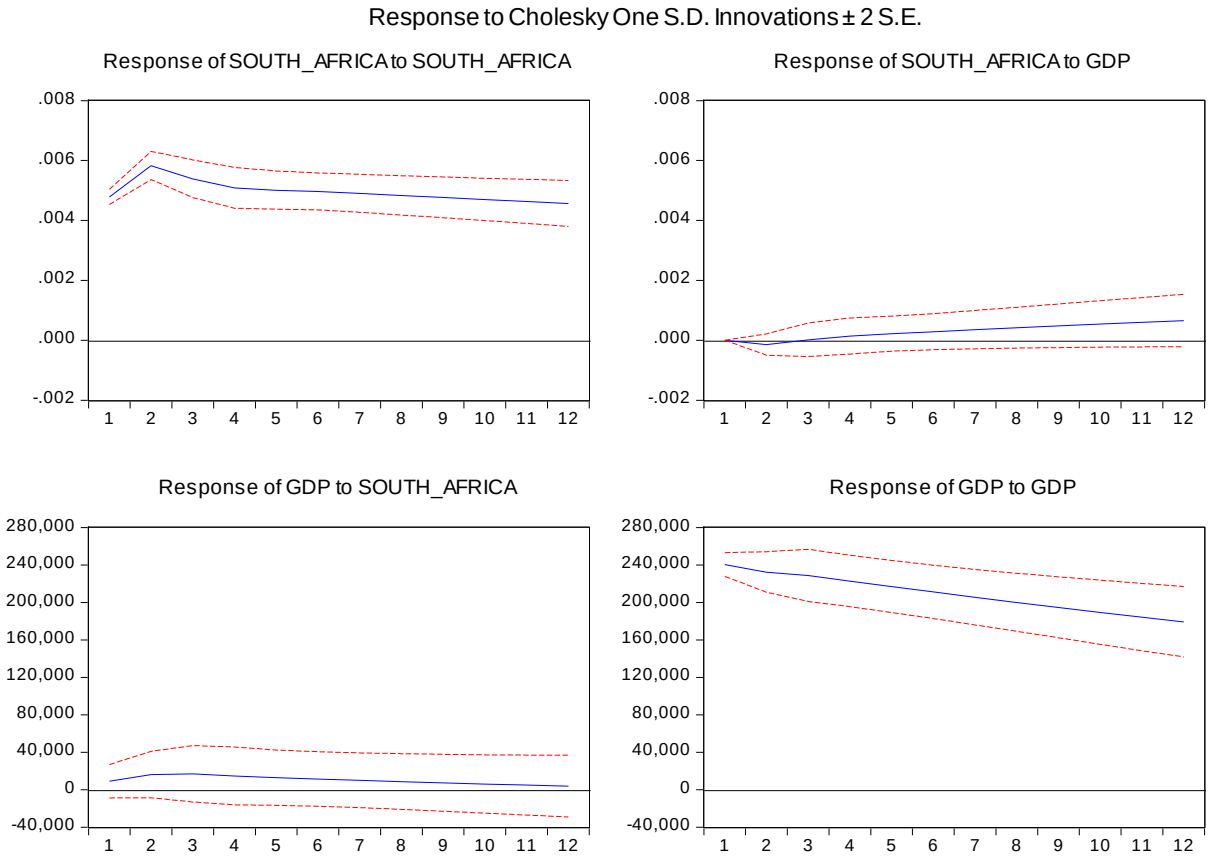
Response of GDP to INDIA



Response of GDP to GDP




Response to Cholesky One S.D. Innovations ± 2 S.E.
Response of CHINA to CHINA
Response of CHINA to GDP
Response of GDP to CHINA
Response of GDP to GDP


Response to Cholesky One S.D. Innovations ± 2 S.E.
Response of SOUTH_AFRICA to SOUTH_AFRICA
Response of SOUTH_AFRICA to GDP
Response of GDP to SOUTH_AFRICA
Response of GDP to GDP

A generalised impulse response function analysis was conducted to further investigate the dynamic relationships among the Exchange Rates and GDP. The above graph show the generalised impulse response functions of BRICS countries Exchange Rates for the period January 2018 to December 2018. The combined graphs are based on the output of the unrestricted VAR with analytic response standard error over 12 periods and Cholesky degrees of freedom adjusted, showing the response to Cholesky one standard deviation innovation.

This analysis provides the dynamic response of each Exchange Rate to innovations in GDP within the system. Analysis of an impulse response function shows the extent to which the shocks in Exchange Rate are persistent in terms of their effects on their own and on GDP.

Each graph as shown in plots includes a point estimation of impulse response functions as well as lower and upper bounds for a 95 percent confidence interval. As usual, the solid lines depict the variable percent change in response to a standard deviation of one in the respective macroeconomic variables. The dotted lines represent the 95 percent error bands.

The impulse response function for Exchange Rate of Brazil to GDP had significantly positive effects over the entire time period. Innovations in Exchange Rate of Russia to GDP is statistically significant and had positive effects. Exchange Rate of India to GDP had negative effects. Exchange Rate of China to GDP is significant and positive Exchange Rate of South Africa to GDP is statistically significant and remains positive till the end of twelfth month.

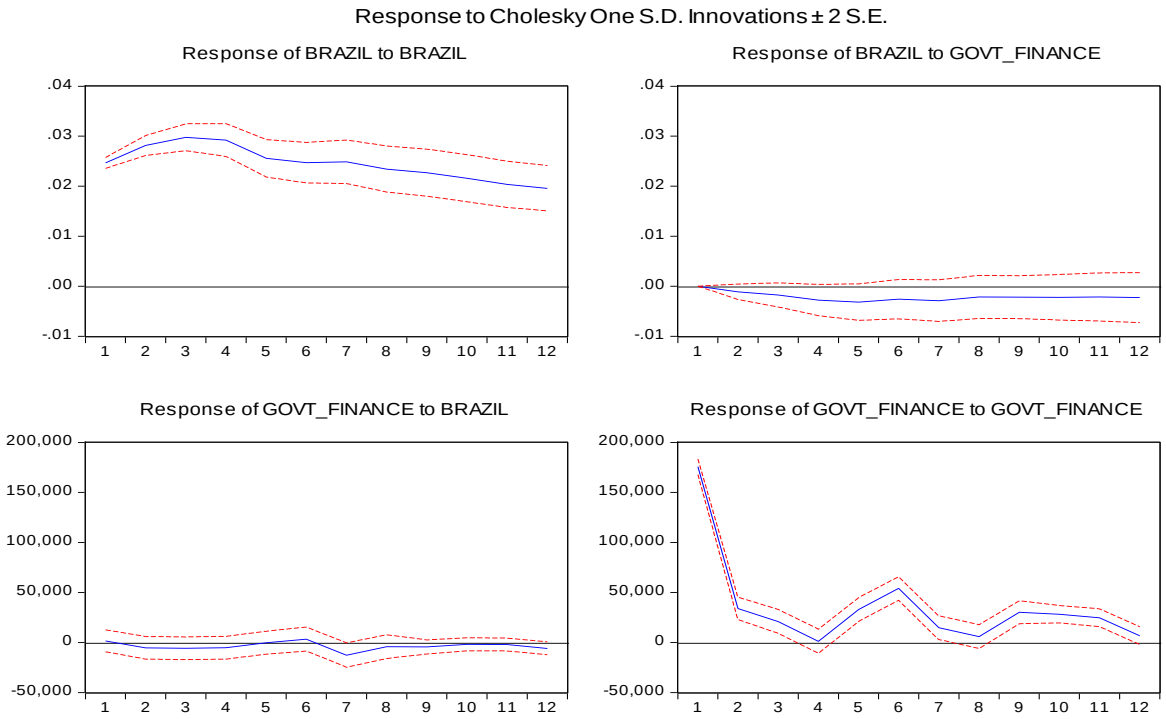
According to the impulse response functions with Exchange Rate to GDP of BRICS remains had a positive effect except India over the entire time period of twelve months.

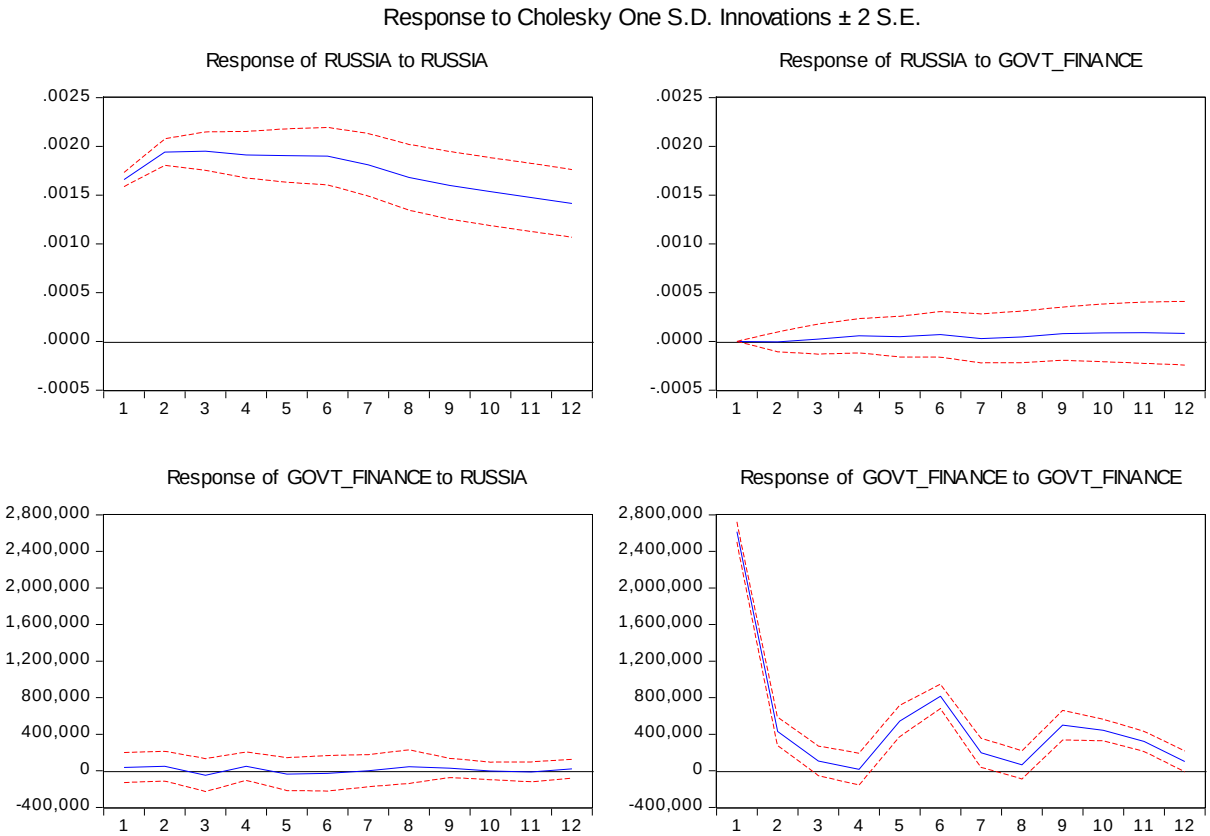
4.3.13 Effect of one time Shock - Impulse response Function of Government Finance with Exchange Rate of BRICS Countries

The below displayed graph produces the time path of one-time shock of Government Finance with Exchange Rate of BRICS Countries

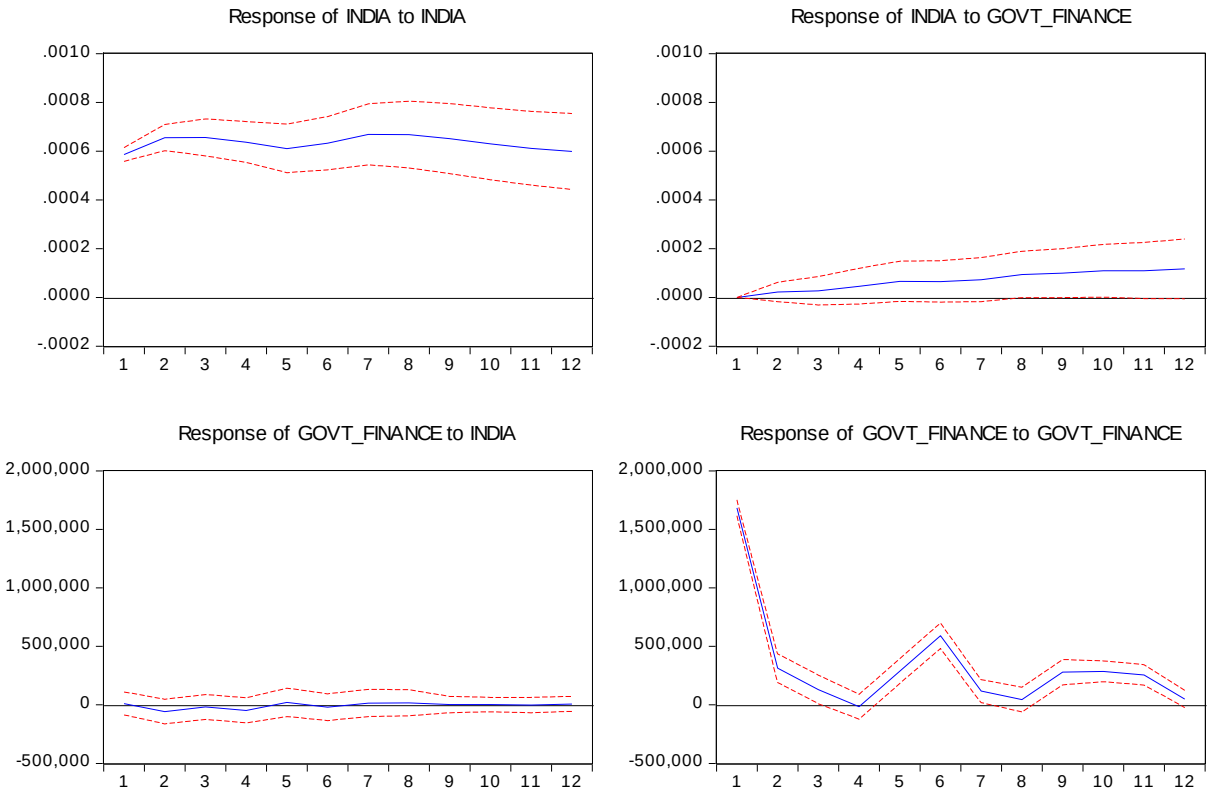
Graph -4.76.5

Impulse Response Function of Government Finance with Exchange rate of BRICS Countries

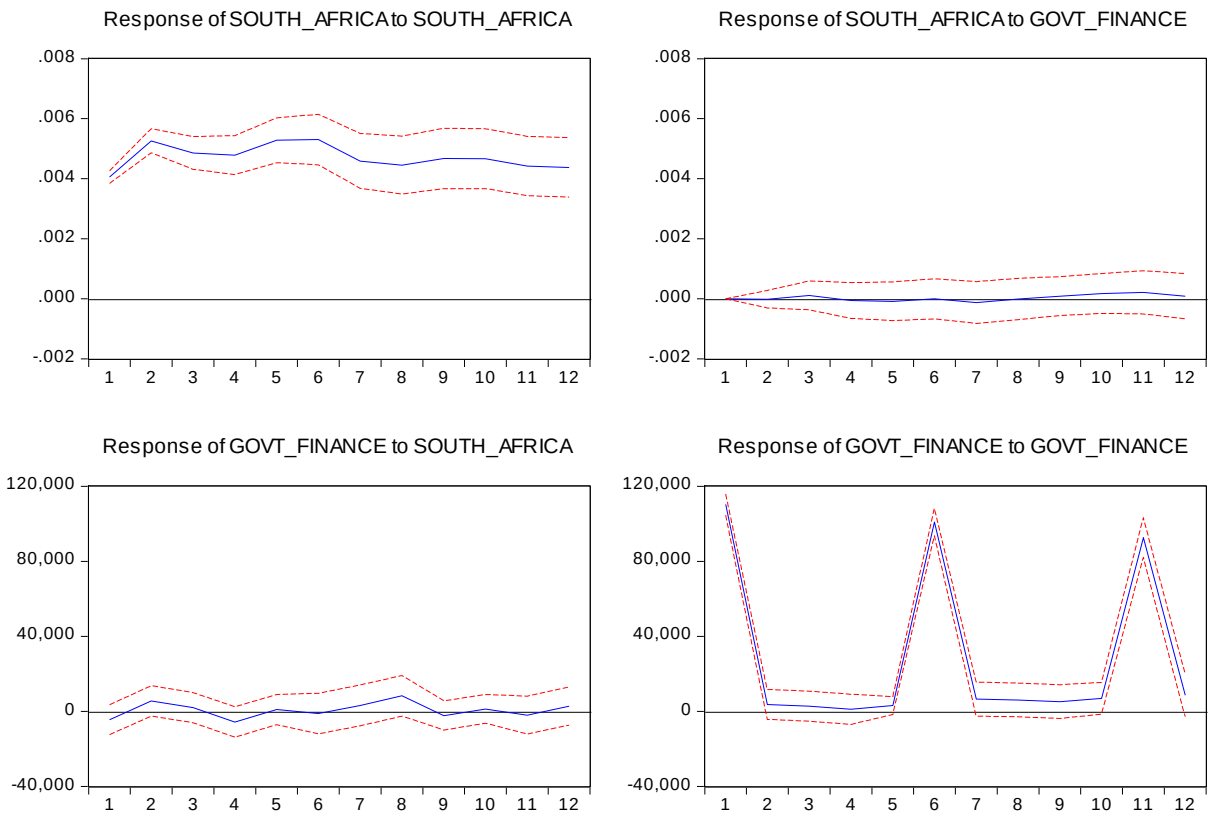




Response to Cholesky One S.D. Innovations ± 2 S.E.



Response to Cholesky One S.D. Innovations ± 2 S.E.



A generalised impulse response function analysis was conducted to further investigate the dynamic relationships among the Exchange Rates and Government Finance. The above graph show the generalised impulse response functions of BRICS countries Exchange Rates for the period January 2018 to December 2018. The combined graphs are based on the output of the unrestricted VAR with analytic response standard error over 12 periods and Cholesky degrees of freedom adjusted, showing the response to Cholesky one standard deviation innovation.

This analysis provides the dynamic response of each Exchange Rate to innovations in Government Finance within the system. Analysis of an impulse response function shows the extent to which the shocks in Exchange Rate are persistent in terms of their effects on their own and on Government Finance.

Each graph as shown in plots includes a point estimation of impulse response functions as well as lower and upper bounds for a 95 percent confidence interval. As usual, the solid lines depict the variable percent change in response to a standard deviation of one in the respective macroeconomic variables. The dotted lines represent the 95 percent error bands.

The impulse response function for Exchange Rate of Brazil to Government Finance had negative effects till the entire time period. Innovations in Exchange Rate of Russia to Government Finance is statistically significant and positive over the entire time period. Exchange Rate of India to Government Finance had a significant and positive effect. Exchange Rate of South Africa to Government Finance is statistically significant till the end of twelfth month.

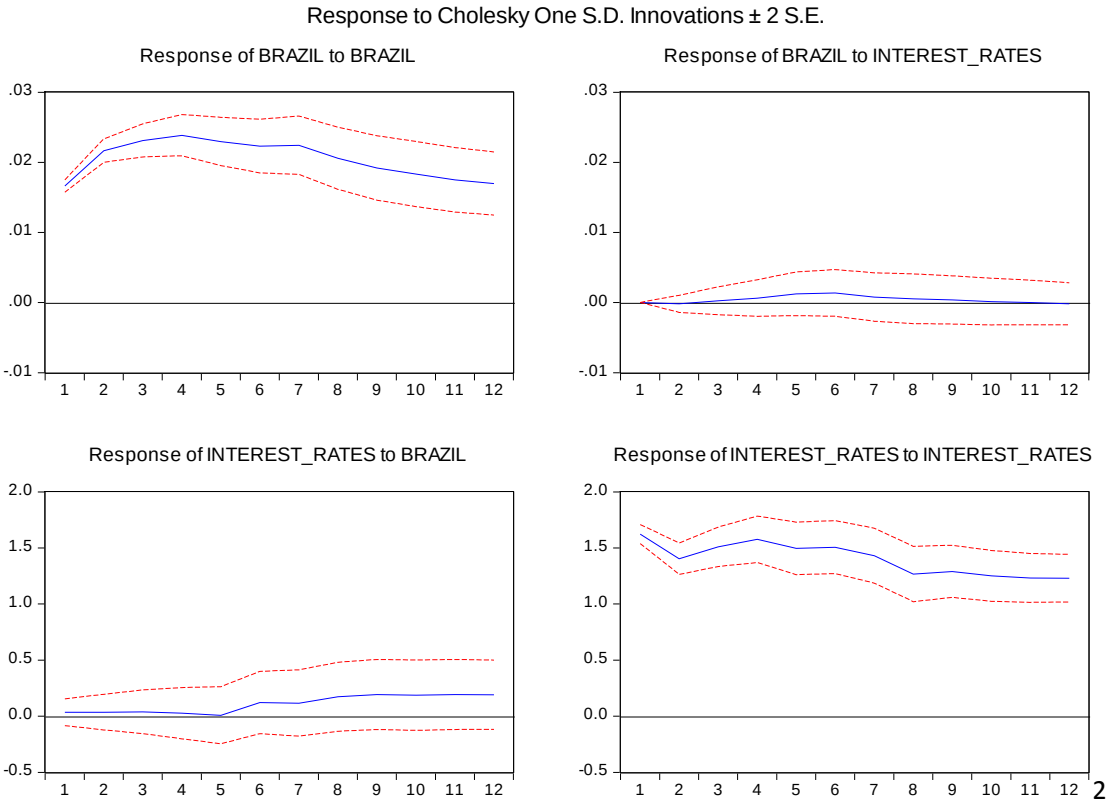
According to the impulse response functions of Exchange Rates to Government Finance had significant positive effect on Russia, India and South Africa.

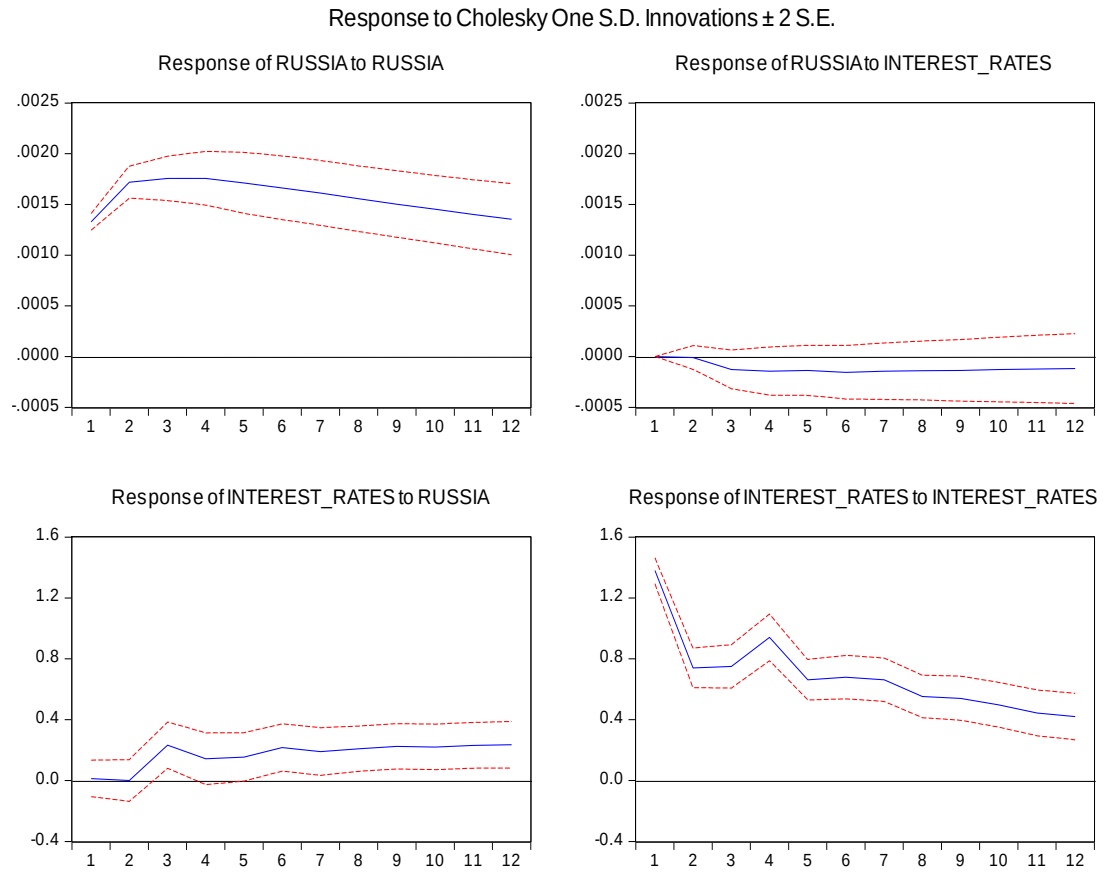
4.3.14 Effect of one time Shock - Impulse response Function of Interest Rates with Exchange Rate of BRICS Countries

The below-displayed graph produces the time path of the one-time shock of Interest Rates with Exchange Rate of BRICS Countries

Graph – 4.76.6

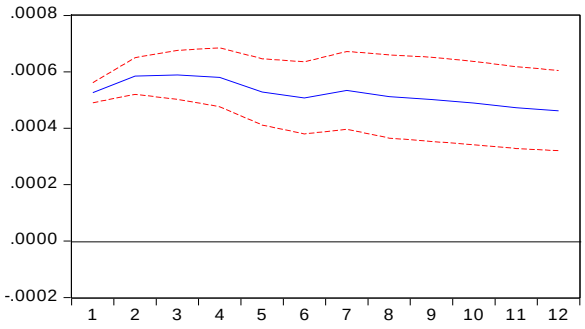
Impulse response Function of Interest Rates with Exchange rate of BRICS Countries



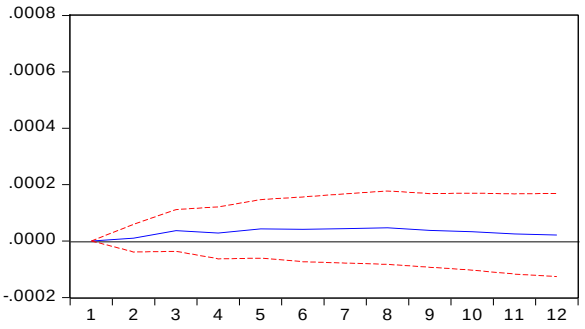


Response to Cholesky One S.D. Innovations ± 2 S.E.

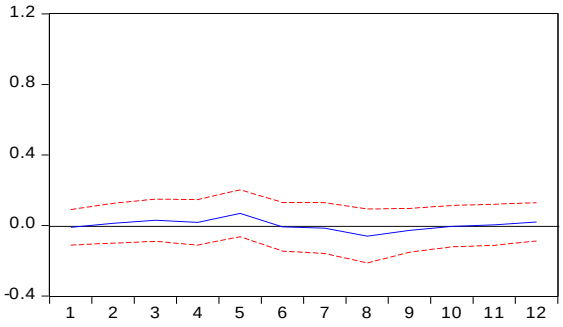
Response of INDIA to INDIA



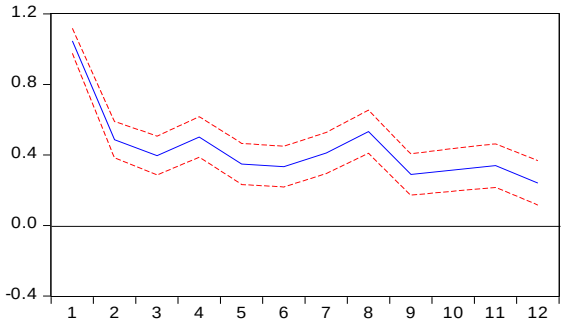
Response of INDIA to INTEREST_RATES



Response of INTEREST_RATES to INDIA

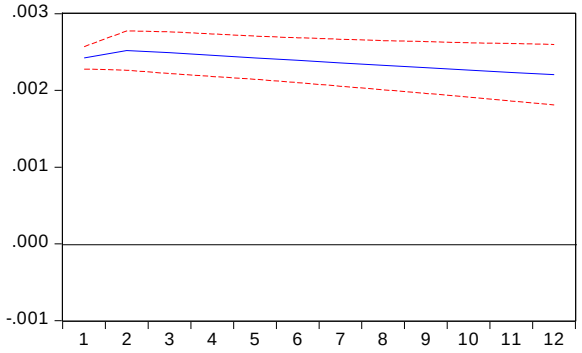


Response of INTEREST_RATES to INTEREST_RATES

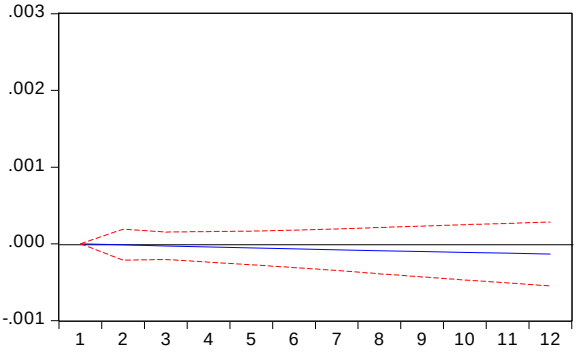


Response to Cholesky One S.D. Innovations ± 2 S.E.

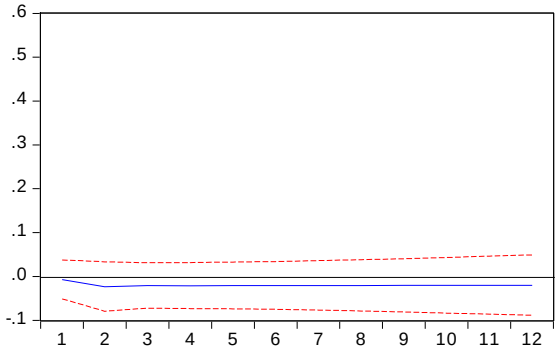
Response of CHINA to CHINA



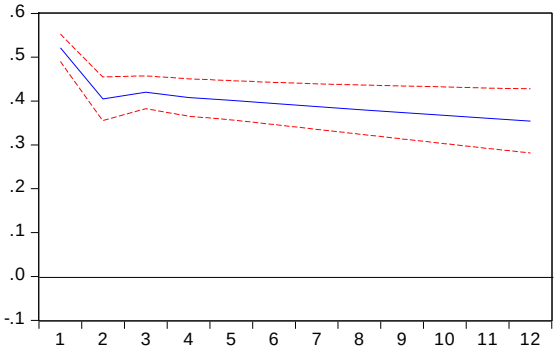
Response of CHINA to INTEREST_RATES

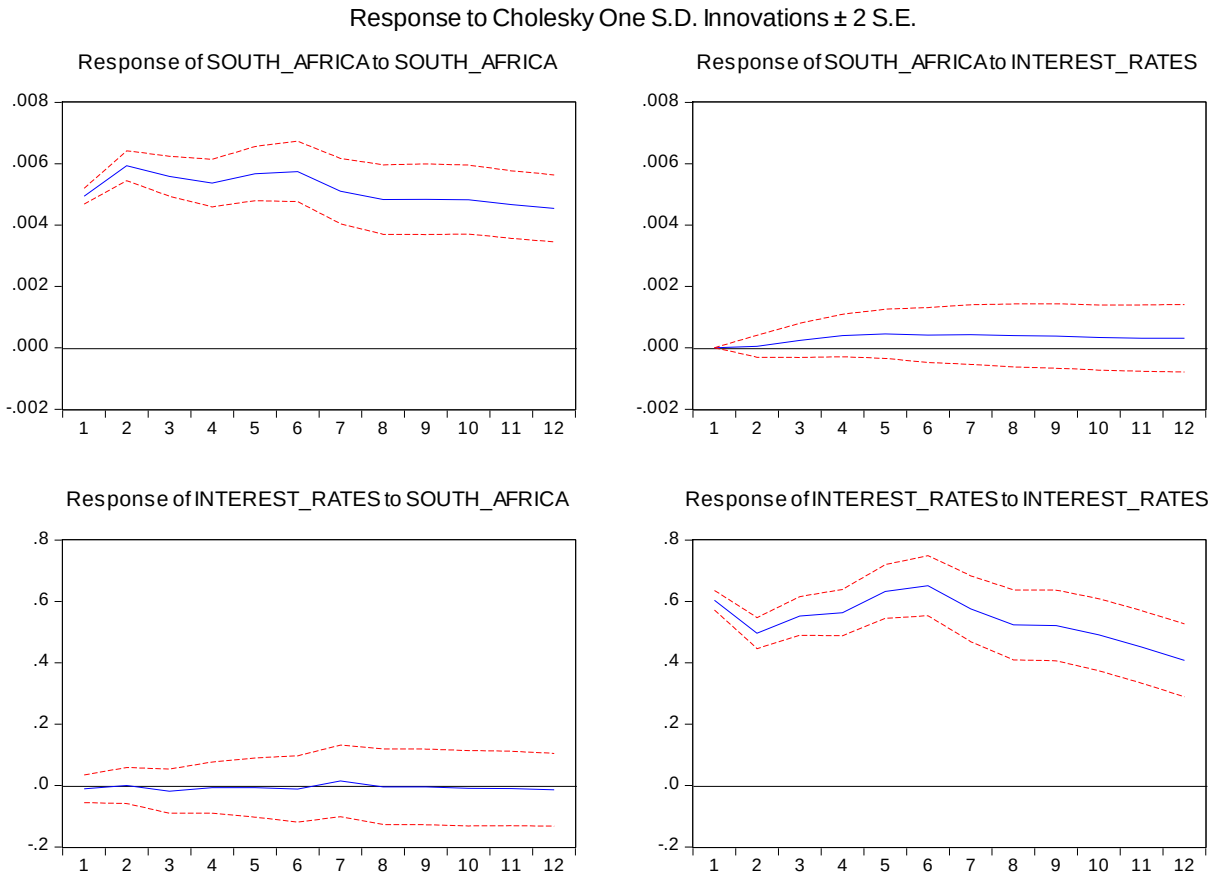


Response of INTEREST_RATES to CHINA



Response of INTEREST_RATES to INTEREST_RATES





A generalised impulse response function analysis was conducted to further investigate the dynamic relationships among the Exchange Rates and Interest Rates. The above graph shows the generalized impulse response functions of BRICS countries Exchange Rates for the period January 2018 to December 2018. The combined graphs are based on the output of the unrestricted VAR with analytic response standard error over 12 periods and Cholesky degrees of freedom adjusted, showing the response to Cholesky one standard deviation innovation.

This analysis provides the dynamic response of each Exchange Rate to innovations in Interest Rates within the system. Analysis of an impulse response function shows the extent to which the shocks in Exchange Rate are persistent in terms of their effects on their own and on Interest Rates.

Each graph as shown in plots includes a point estimation of impulse response functions as well as lower and upper bounds for a 95 percent confidence interval. As usual, the solid lines depict the variable percent change in response to a standard deviation of one in the respective macroeconomic variables. The dotted lines represent the 95 percent error bands.

The impulse response function for Exchange Rate of Brazil to Interest Rates is statistically significant and positive. Innovations in Exchange Rate of Russia to had negative effects. Exchange Rate of India to Interest Rates is statistically significant and positive. Exchange Rate of China to Interest Rates is significant and positive. Exchange Rate of South Africa to Interest Rates is statistically significant and positive till the end of the twelfth month.

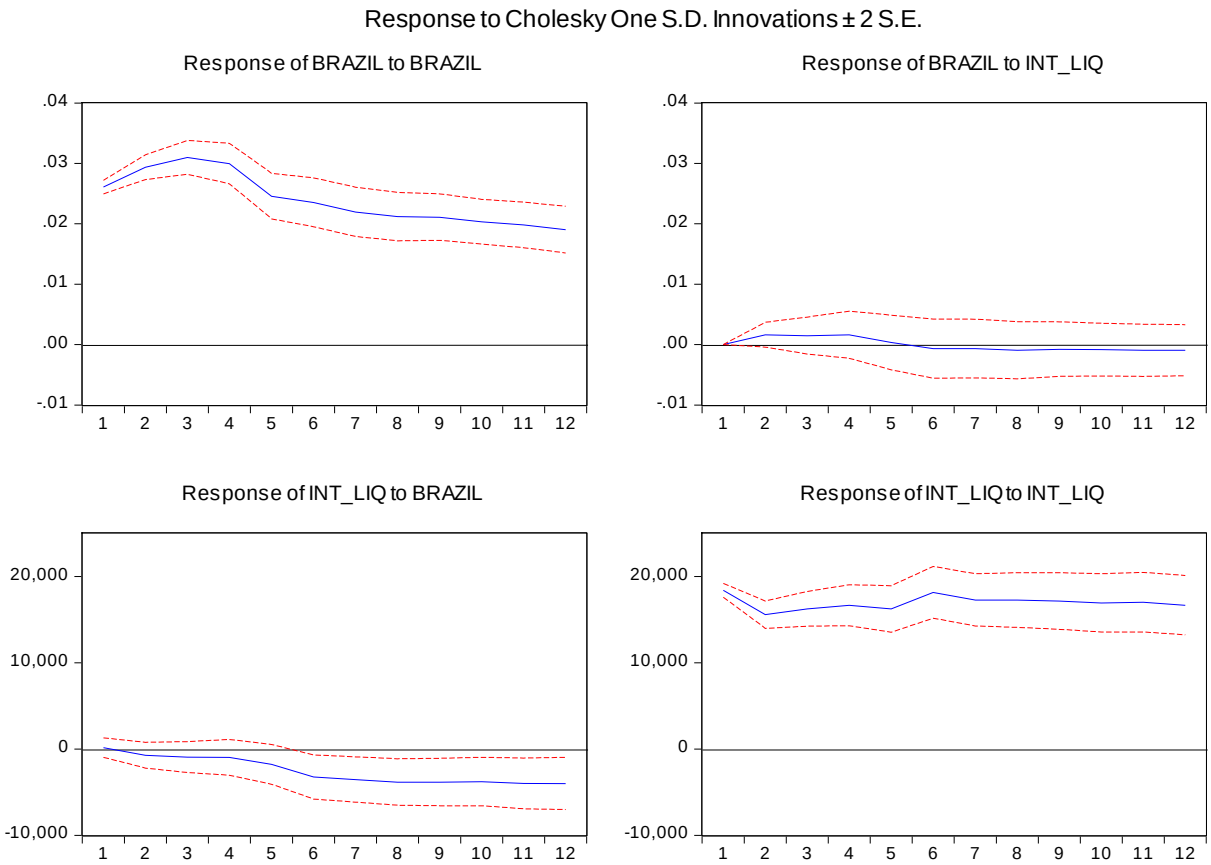
According to the impulse response functions of Exchange Rates of BRICS Countries with Interest Rates of is significant and positive except Russia.

4.3.15 Effect of one time Shock - Impulse response Function of International Liquidity with Exchange Rate of BRICS Countries

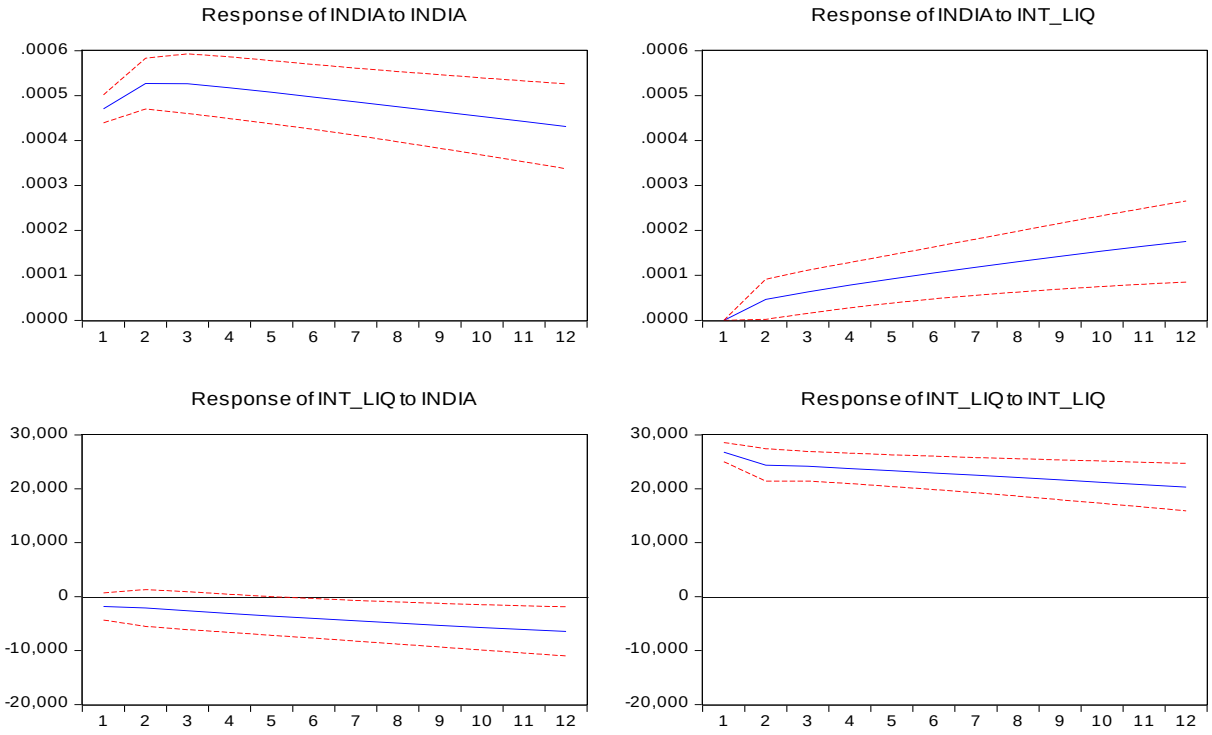
The below-displayed graph produces the time path of the one-time shock of International Liquidity with Exchange Rate of BRICS Countries

Graph – 4.76.7

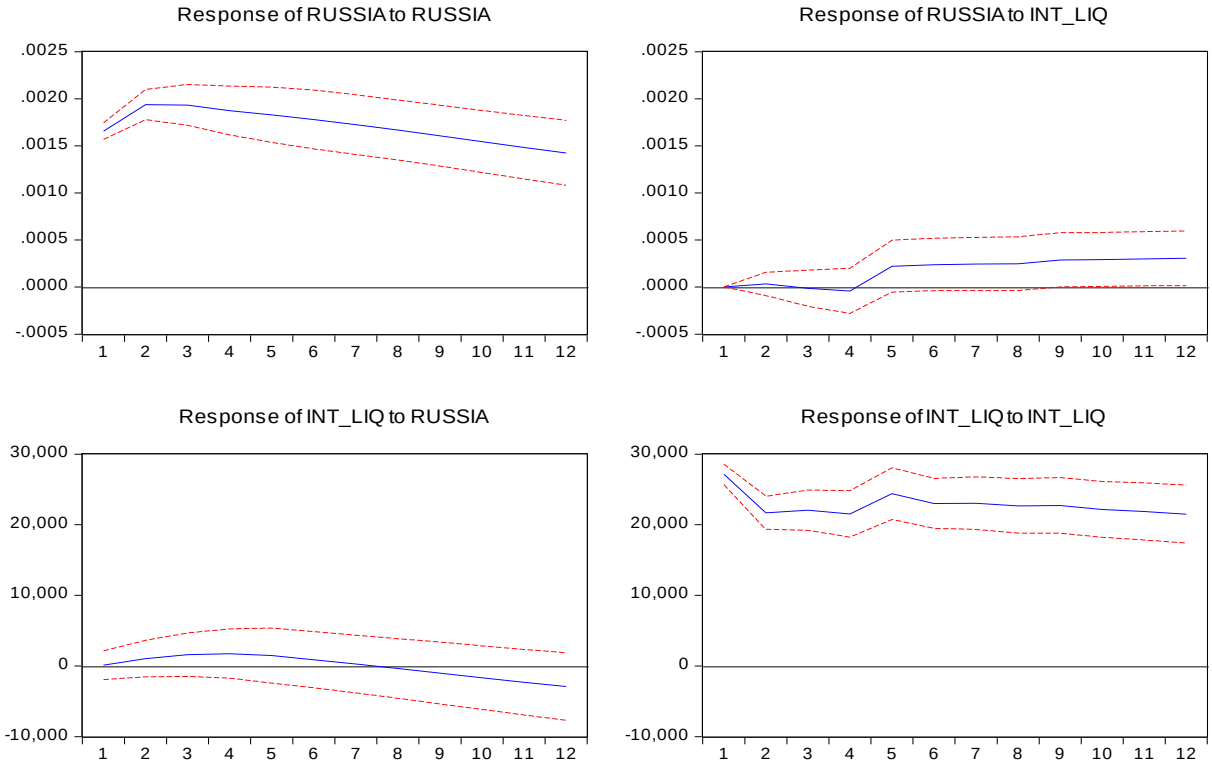
Impulse Response Function of International Liquidity with Exchange r ate of BRICS Countries



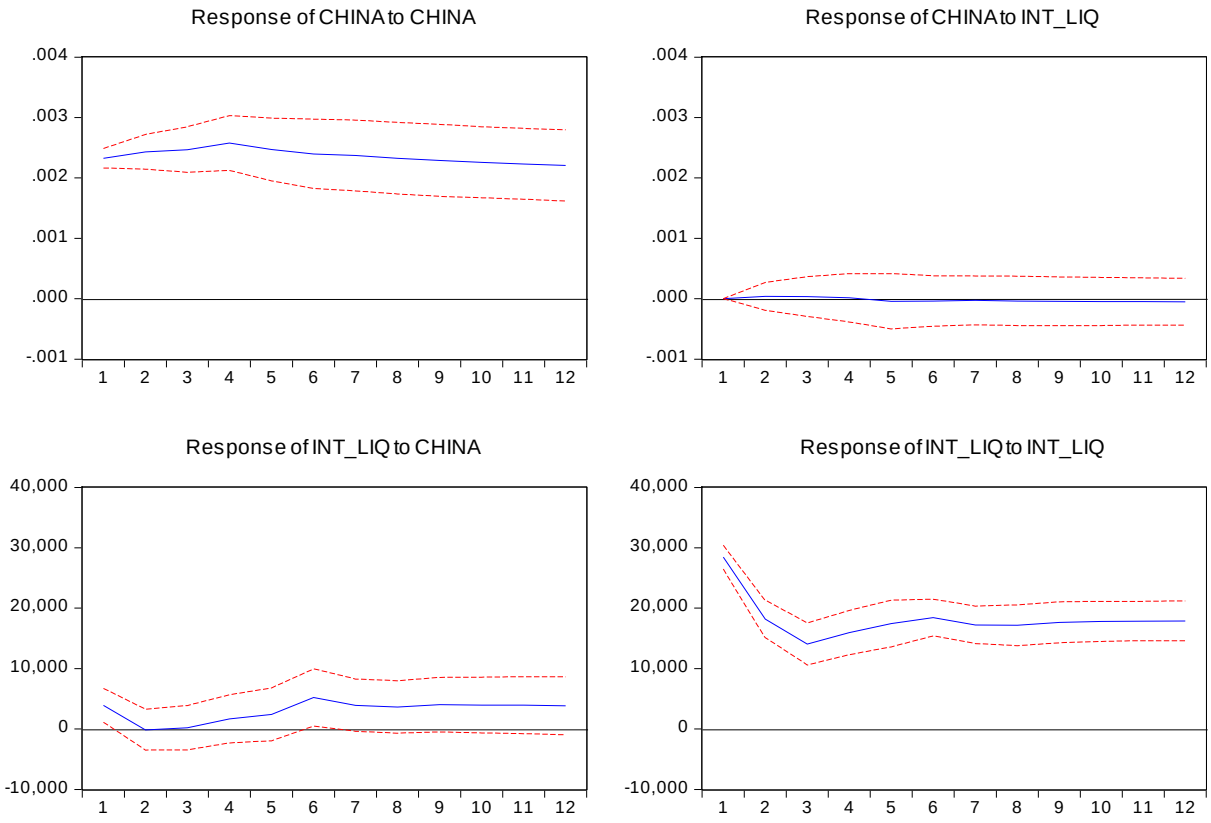
Response to Cholesky One S.D. Innovations ± 2 S.E.



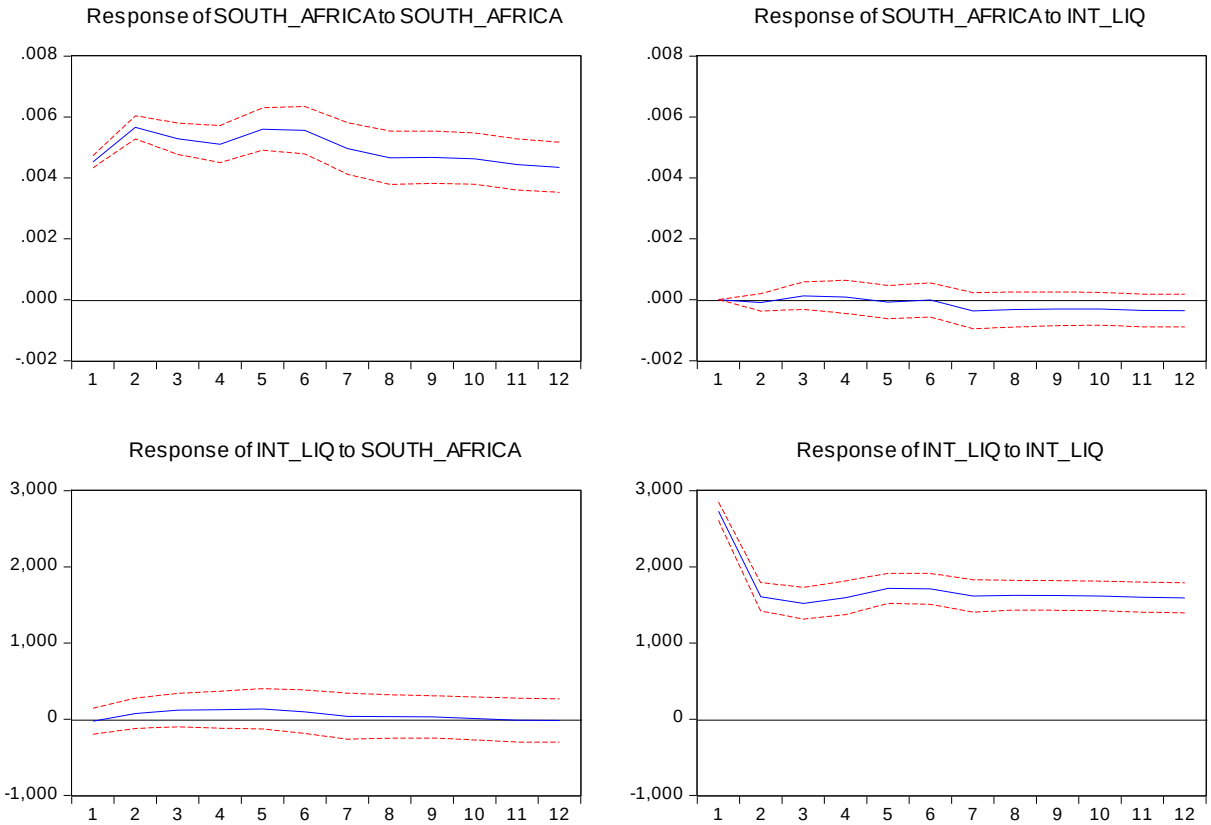
Response to Cholesky One S.D. Innovations ± 2 S.E.



Response to Cholesky One S.D. Innovations ± 2 S.E.



Response to Cholesky One S.D. Innovations ± 2 S.E.



A generalized impulse response function analysis was conducted to further investigate the dynamic relationships among the Exchange Rates and International Liquidity. The above graph shows the generalized impulse response functions of BRICS countries Exchange Rates for the period January 2018 to December 2018. The combined graphs are based on the output of the unrestricted VAR with analytic response standard error over 12 periods and Cholesky degrees of freedom adjusted, showing the response to Cholesky one standard deviation innovation.

This analysis provides the dynamic response of each Exchange Rate to innovations in International Liquidity within the system. Analysis of an impulse response function shows the extent to which the shocks in Exchange Rate are persistent in terms of their effects on their own and on International Liquidity.

Each graph as shown in plots includes a point estimation of impulse response functions as well as lower and upper bounds for a 95 percent confidence interval. As usual, the solid lines depict the variable percent change in response to a standard deviation of one in the respective macroeconomic variables. The dotted lines represent the 95 percent error bands.

The impulse response function for Exchange Rate of Brazil to International Liquidity is significant and positive. Innovations in Exchange Rate of Russia to International Liquidity had positive effects. The impact remains positive up to till the end of the twelfth month. Exchange Rate of India to International Liquidity is statistically significant and positive till a twelfth month. Exchange Rate of China to International Liquidity is statistically significant and positive. Exchange Rate of South Africa to International Liquidity is significant and positive.

According to the impulse response functions of Exchange Rate to International Liquidity of BRICS is significant and had a positive effect.

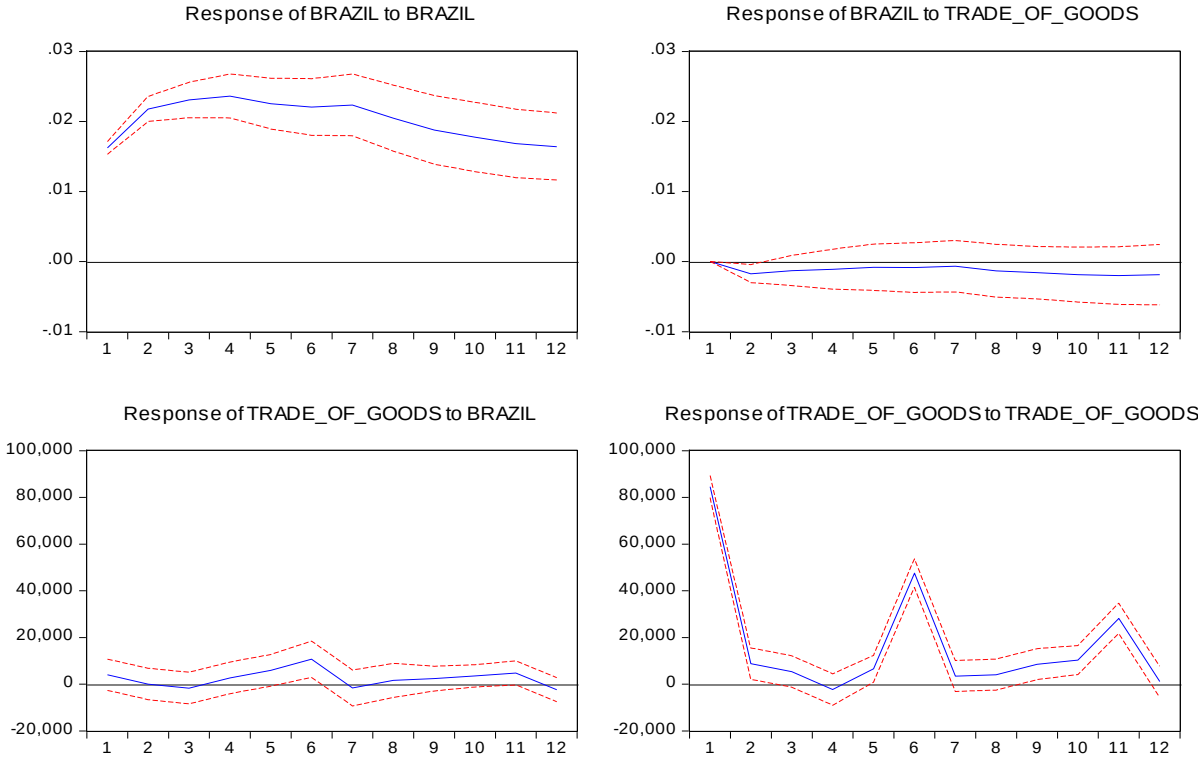
4.3.16 Effect of one time Shock - Impulse response Function of Foreign Trade with Exchange Rate of BRICS Countries

The below-displayed graph produces the time path of Foreign Trade with Exchange Rate of BRICS Countries.

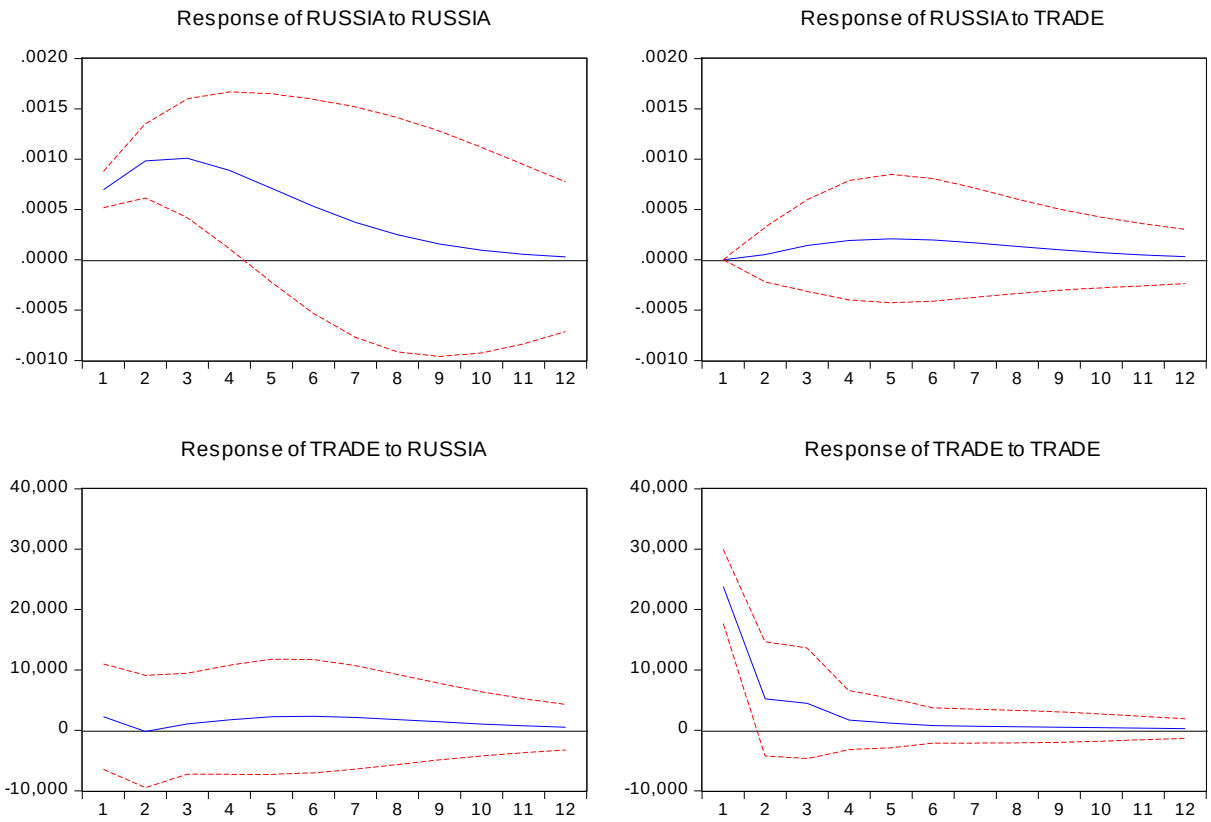
Graph – 4.76.8

Impulse Response Function of Foreign Trade with Exchange rate of BRICS Countries

Response to Cholesky One S.D. Innovations ± 2 S.E.

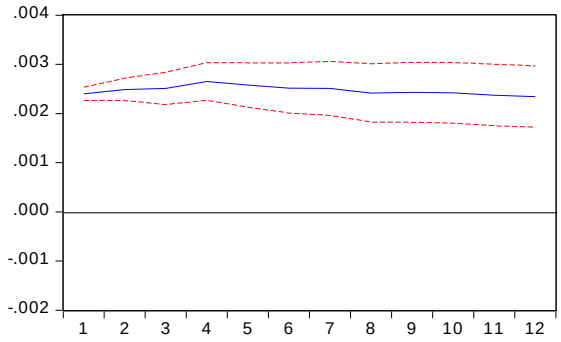


Response to Cholesky One S.D. Innovations ± 2 S.E.

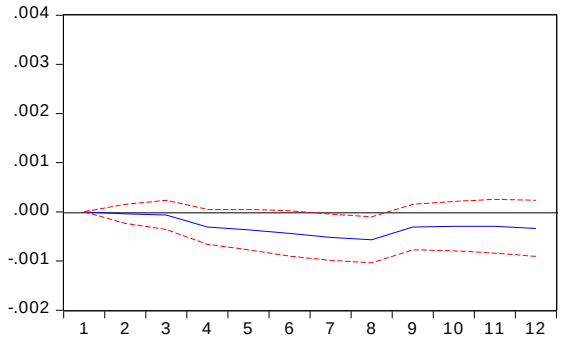


Response to Cholesky One S.D. Innovations ± 2 S.E.

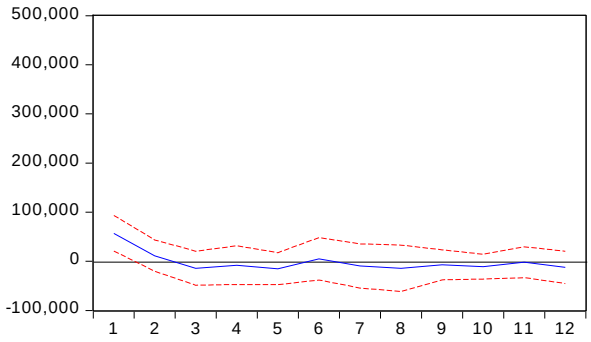
Response of CHINA to CHINA



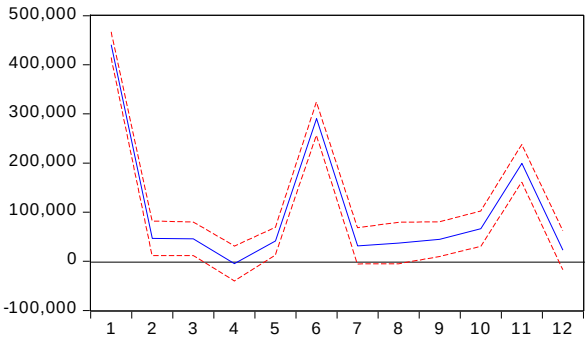
Response of CHINA to TRADE_OF_GOODS



Response of TRADE_OF_GOODS to CHINA

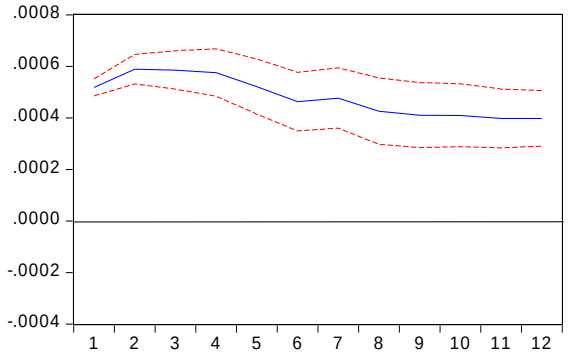


Response of TRADE_OF_GOODS to TRADE_OF_GOODS

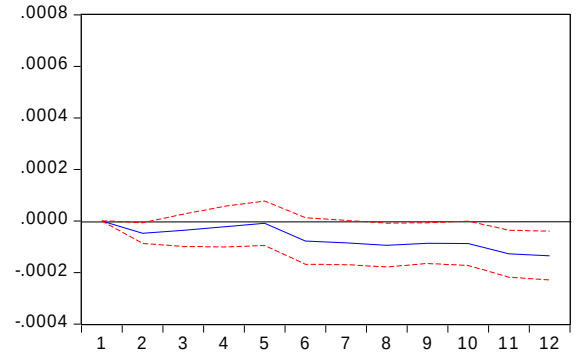


Response to Cholesky One S.D. Innovations ± 2 S.E.

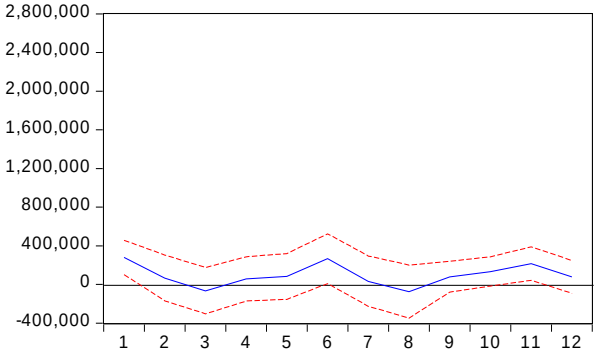
Response of INDIA to INDIA



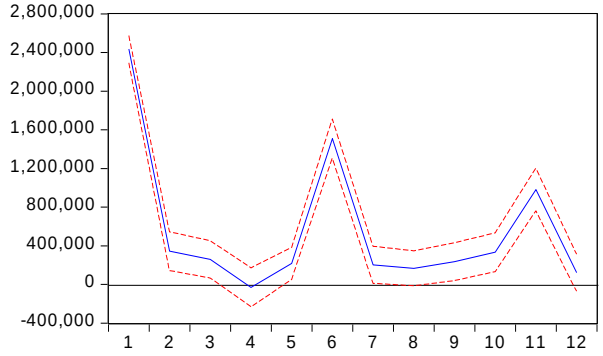
Response of INDIA to TRADE

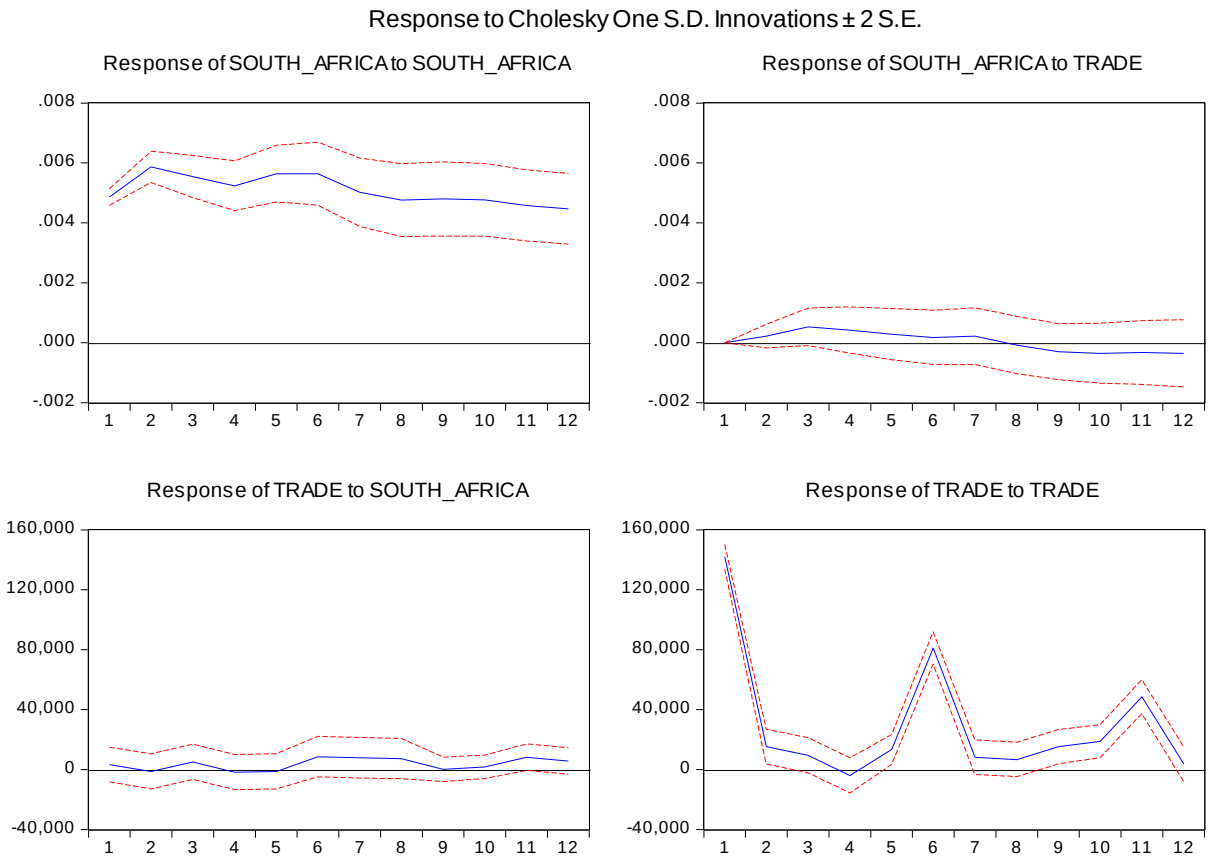


Response of TRADE to INDIA



Response of TRADE to TRADE





A generalized impulse response function analysis was conducted to further investigate the dynamic relationships among the Exchange Rates and Foreign Trade. The above graph shows the generalized impulse response functions of BRICS countries Exchange Rates for the period January 2018 to December 2018. The combined graphs are based on the output of the unrestricted VAR with analytic response standard error over 12 periods and Cholesky degrees of freedom adjusted, showing the response to Cholesky one standard deviation innovation.

This analysis provides the dynamic response of each Exchange Rate to innovations in Foreign Trade within the system. Analysis of an impulse response function shows the extent to which the shocks in Exchange Rate are persistent in terms of their effects on their own and on Foreign Trade.

Each graph as shown in plots includes a point estimation of impulse response functions as well as lower and upper bounds for a 95 percent confidence interval. As usual, the solid lines depict the variable percent change in response to a standard deviation of one in the respective macroeconomic variables. The dotted lines represent the 95 percent error bands.

The impulse response function for Exchange Rate of Brazil to Foreign Trade had a negative effect. Innovations in Exchange Rate of Russia to Foreign Trade had significantly positive effects. The impact remains positive up to till the end of the twelfth month. Exchange Rate of India to Foreign Trade had a negative effect due to fall in Exchange rates. Exchange Rate of China to Foreign Trade is significant. Exchange Rate of South Africa to Foreign Trade is significant and positive.

According to the impulse response functions of Exchange Rate with Foreign Trade was significant and had a positive effect on Russia, China, and South Africa.