

A Study on Selected Macroeconomic Variables of Brics Nations

By

Dr. P. Roopa

Assistant Professor, Department of Business Management, Sri Padmavati Mahila
Visvavidyalayam

Mrs. P. Nishitha

Assistant Professor, Department of Business Management, Sri Padmavati Mahila
Visvavidyalayam

Abstract

GDP growth rate is considered as one of the major factors influencing the economic growth of a country. This paper intends to identify the key macro-economic variables that influences the economic growth of a nation. The macro-economic variables which are considered for the study are GDP growth rate, inflation rate, real interest rate and real effective exchange rate. In this paper BRIC countries are considered for study. The study is done for a period of 10 years, that is from 2011 to 2020. BRICS stands for Brazil, Russia, India, China and South Africa. BRICS nations are combination of fastest growing economies of the world. The aim of this combination is to promote peace, security, cooperation and development among these nations. This study focusses on the performance of selected key economic variables of BRICS countries.

Keywords: BRICS, GDP growth rate, inflation rate, real effective exchange rate, real interest rate

1. Introduction

Gross Domestic Product (GDP) is the final value of goods and services produced that are manufactured in an economy during a given period. GDP growth rate is the parameter generally used to measure the economic growth of a country. It is an indicator of the size of the economy and the general health of the economy. Growth rate of GDP measures the change in the production of goods and services over a specified period of time. The present study focusses on the relationship between selected macroeconomic variables namely GDP growth rate, inflation rate, real interest rate and real effective exchange of BRICS economies for a period of 10 years from 2011 to 2020. BRICS is the combination of five countries namely Brazil, Russia, India, China and South Africa. BRICS is an important grouping since it brings together the emerging economies of the world. Based on World Bank data of 2019, BRICS economies have a major role in the world economic growth because

- BRICS countries 41% of world's population.
- The total combined area of BRICS countries is 29.3% of the total land surface of the world.
- It contributes to 24% of world's GDP and 16% of world trade.

Each BRICS countries have their own advantages. For instance, China plays a major role as supplier of manufactured goods whereas India has made a mark as the provider of services across the globe. Russia and Brazil are the largest exporters of raw materials which China and India need for industrialisation. South Africa is known for its being the low-risk

destination for investment among African nations and also has a well-diversified economy. Hence cooperation of BRICS countries is in fact important as they are major contributor towards growth and development.

2. Review of Literature

Anwar Ali Shah G. Syed, Faiz Muhammad Shaikh (2013) in their paper examined the effect of certain macroeconomic variables on GDP growth rate of Pakistan and stated that since the size of GDP and GDP per capital was small, Pakistani economy remained. However, they concluded in a positive note that the situation has improved after 1990.

Dhiraj Jain, K. Sanal Nair and Vaishali Jain (2015) in their paper investigated the impact of macroeconomic variables like FDI, FII, Export and Import on GDP components. It was found that FDI and import has impact on GDP components but not export and FII.

Jearth, Palvi & Munjal, Shikhil & Singh, Gurcharan. (2019) analysed the effect of inflation and population on growth domestic product of India for a period of 20 years. The study concluded that population and inflation do influence the Indian economy, however inflation is unpredictable and unstable.

K. Hema Divya and Dr. V. Ramadevi (2014) attempted to find out the factors influencing the economic variables selected for the study on the GDP of a country for a period of 15 years. It was revealed that exchange rate and balance of payments had positive impact on GDP of the country.

Kira, Alex. (2013) in his paper analyses the factors that affect Gross Domestic Product of Developing countries with reference to Tanzania. The paper states that GDP in Tanzania is influenced by consumption and exports and investment need to be improved to improve GDP.

Lowe, P. (2016) in his paper discussed the important of BRICS nations for the global economy. The paper discusses the contribution of each nation towards growth of world economy.

Sunil J. Kulkarni (2017) in his paper stated that GDP is the indicator of economic growth of the country and it is estimated by output method, input method and expenditure method. The study stated that economic growth is driven by expansion of services and improvement in FDI.

Upreti, Parash (2015) in their paper uses used the cross-country data from 2010, 2005, 2000, and 1995. The data included 76 countries. High investment rates, large volume of exports, plenty of resources etc have positive impact on GDP growth rate.

3. Need for the Study

The study is aimed to know the economic performance of BRICS countries based on selected macro-economic variables namely GDP growth rate, inflation rate, real interest rate and real effective exchange rate. BRICS countries are all considered as fastest growing economies of the world and hence a comparative study on basic macroeconomic parameters of these countries is considered as useful.

4. Scope of the Study

The study is limited to BRICS countries and analysis is based on the data collected from world bank.org and fred.stlouisfed.org. The study is based on selected macro-economic factors,
Res Militaris, vol.13, n°3, March Spring 2023

namely GDP growth rate, inflation rate, real interest rate and real effective exchange rate for a period of 10 years from 2011 to 2020. BRICS countries are having different financial year. For instance, financial year for India and South Africa is from April 1st to March 31st of the subsequent year. For other countries namely China, Brazil and Russia the financial year is from January 1st of December 31st. World bank data is based on the country's financial year.

5. Objectives of the Study

- To make the comparative study on the GDP growth rate and macro-economic variables taken for study of the BRICS nations.
- To find out the relationship between key macro-economic variables studied with the GDP growth rate of the BRICS nations.
- To know if there is any significant relationship among the macro-economic variables selected for the study for BRICS nations.

6. Hypothesis of the Study

- H₀: There is no significant relationship between the macro-economic variables taken for study namely GDP growth rate, Inflation rate, Real Interest rate and Real Effective Exchange Rate of BRICS nations.
- H₁: There is significant relationship between the macro-economic variables taken for study namely GDP growth rate, Inflation rate, Real Interest rate and Real Effective Exchange Rate of BRICS nations.

7. Research Methodology

The study is collected from secondary sources, The data was collected from data.worldbank.org and fred.stlouisfed.org. The data so collected was analysed and interpreted using statistical tools like correlation analysis and ANOVA. The macro-economic variables considered for study are GDP growth rate, inflation rate, real interest rate and real effective exchange rate. The study is done for a period of 10 years from 2011 to 2020.

GDP growth rate is the percentage change in the GDP of the country compared to its previous year. Gross domestic product takes into account to total value of goods and services manufactured in a country during a particular period. GDP growth rate indicates the financial health of the country and is used as a measure of growth of the economy.

Inflation is increase in the prices of goods and services in an economy and thus decreases the purchasing power of money. Inflation rate based on consumer price index tracks the changes in prices of goods and services consumed by household. Inflation rate based on consumer price index is considered for this study.

Real interest rate is interest rate after deduction nominal interest rate with inflation. It is the rate the lender receives after adjusting for inflation. Real interest rate is considered as one of the macroeconomic variables in this study.

The real effective exchange rate indicates the strength of the domestic currency in relation to basket of other major currencies. An increase in real effective exchange rate implies that exports are becoming more expensive and imports are becoming cheaper. It means that the country is losing its competitive edge.

8. Data Analysis

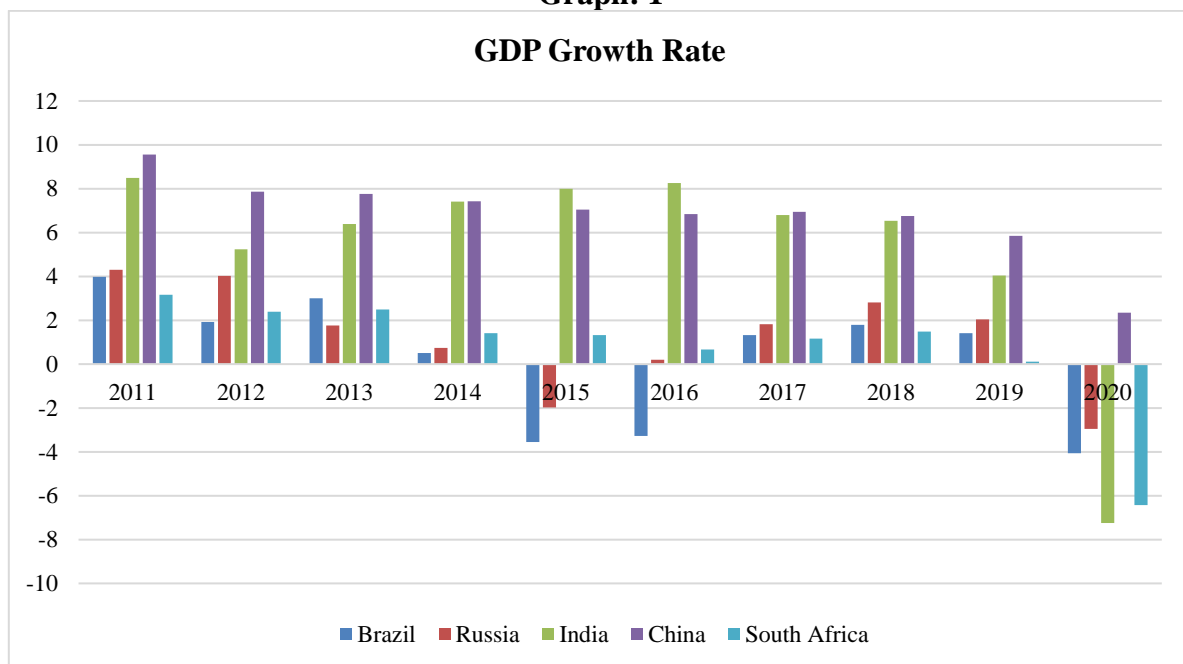
BRICS countries namely Brazil, Russia, India, China and South Africa are considered as world's fastest growing economies due to abundant natural resources and low labour cost. The BRICS countries have emerged as powerful force in the world economy. In this paper we will analyse the major macro-economic variables to make a comparative study of BRICS countries.

Table: 1 GDP Growth Rate

Year	Brazil	Russia	India	China	South Africa
2011	3.974	4.3	8.498	9.551	3.169
2012	1.921	4.024	5.241	7.864	2.396
2013	3.005	1.755	6.386	7.766	2.485
2014	0.504	0.736	7.41	7.426	1.414
2015	-3.546	-1.973	7.996	7.041	1.322
2016	-3.276	0.194	8.256	6.849	0.665
2017	1.323	1.826	6.795	6.947	1.158
2018	1.784	2.807	6.533	6.75	1.488
2019	1.411	2.033	4.042	5.85	0.113
2020	-4.059	-2.951	-7.252	2.348	-6.432

Source: World bank data

Graph: 1



Source: World bank data

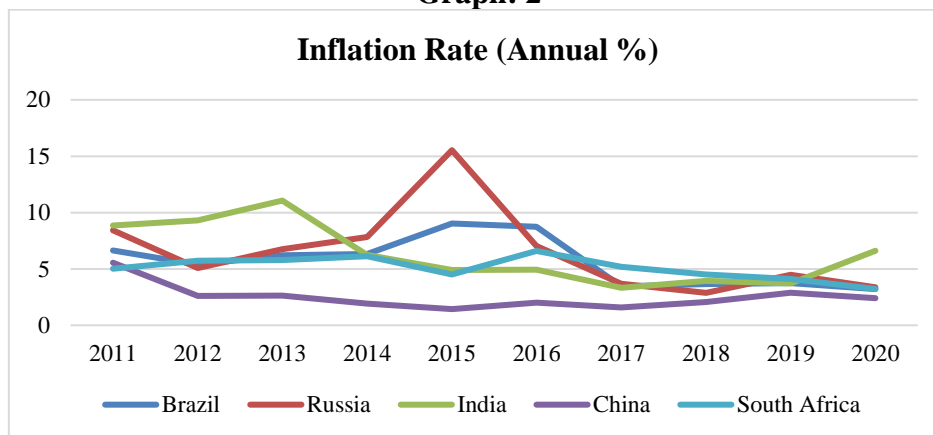
It is evident from the above table and graph that GDP growth rate is highest for China during majority of the study period. During 2020 when the world economy slowed down due to COVID 19 pandemic, the GDP growth rate of all the BRICS countries showed a negative growth except China. India's growth rate was highly negative during 2020. Brazil and Russian Federation has the lowest GDP growth rate during the study period. For Brazil, it was negative during 2015, 2016 and 2020. Russia had negative GDP growth rate during 2015 and 2020.

Table: 2 Inflation Rate (Based on Consumer Price Index)

Year	Brazil	Russia	India	China	South Africa
2011	6.636	8.44	8.858	5.554	5.017
2012	5.403	5.075	9.312	2.62	5.724
2013	6.204	6.754	11.064	2.621	5.776
2014	6.329	7.823	6.25	1.922	6.136
2015	9.03	15.534	4.907	1.437	4.509
2016	8.739	7.042	4.948	2	6.595
2017	3.446	3.683	3.328	1.593	5.181
2018	3.665	2.878	3.945	2.075	4.505
2019	3.733	4.47	3.723	2.899	4.124
2020	3.212	3.382	6.623	2.419	3.224

Source: World bank data

Graph: 2



Source: World bank data

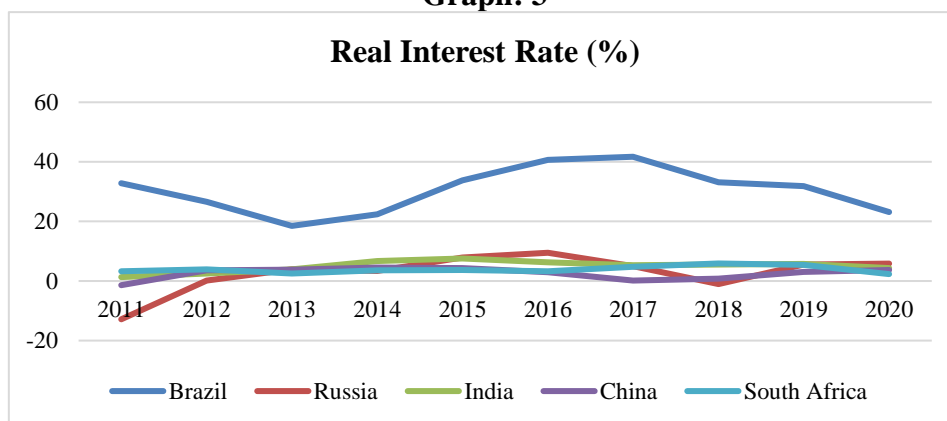
It is evident from the above table and graph that inflation rate is lowest for China among the BRICS nations. After China, South Africa has the lowest inflation rate and has seen less fluctuations during the study period compared to other BRICS countries. Brazil, India and Russia have seen fluctuations in the inflation rate during the study period. For Brazil, it was highest during 2015 and 2016, however it reduced in the later years. In case of Russia, the inflation was very high during 2015, but later decreased substantially during the study period. As far as India is concerned, inflation rate was highest during the initial part of the study period and was highest in 2013, later it showed a declining trend, however it increased slightly during 2020.

Table: 3 Real Interest Rate

Year	Brazil	Russia	India	China	South Africa
2011	32.833	-12.857	1.318	-1.402	3.279
2012	26.582	0.176	2.474	3.585	3.883
2013	18.499	3.937	3.866	3.755	2.509
2014	22.404	3.397	6.695	4.522	3.567
2015	33.832	7.895	7.556	4.353	3.668
2016	40.698	9.484	6.233	2.902	3.278
2017	41.714	4.946	5.328	0.113	4.747
2018	33.102	-1.028	5.511	0.822	5.894
2019	31.832	5.5	5.697	3.024	5.383
2020	23.125	5.828	4.338	3.702	2.313

Source: World bank data

Graph: 3



Source: World bank data

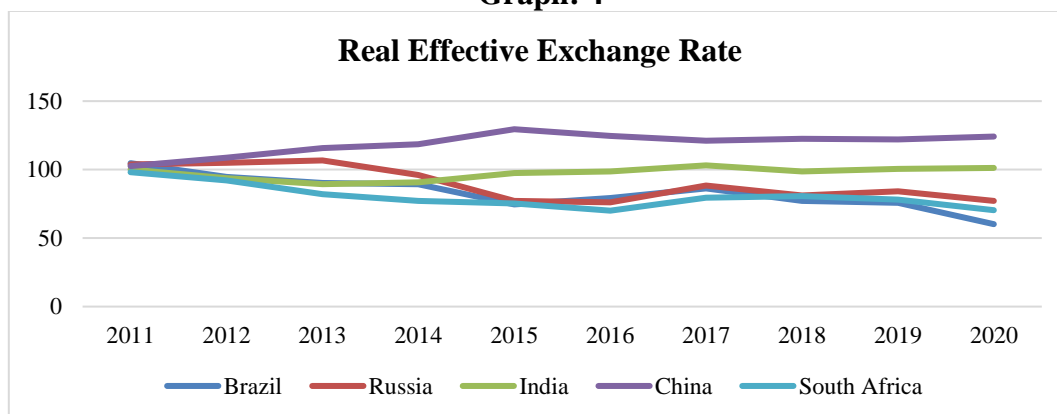
The real interest rate of Brazil is very high compared to all other BRICS nations. The reason is that the general interest rates in Brazil is generally very high. Hence real interest rate which is obtained after adjusting inflation to nominal interest rate is also very high for Brazil. Real interest rate is negative when the inflation rate is higher than the nominal interest rate. Real interest rate was negative for Russia during 2011 and 2018. Similarly, it was negative for China in the year 2011, but later recovered during the remaining part of the study period. However, it can be observed from the graph that real interest rate of all other BRICS countries except Brazil fall in the same range during the study period.

Table: 4 Real Effective Exchange Rate (Base year 2010)

Year	Brazil	Russia	India	China	South Africa
2011	104.71	103.75	100.06	102.58	98.11
2012	94.7	104.9	93.75	108.72	92.2
2013	90.22	106.71	89.37	115.72	82.01
2014	89.31	96.17	90.74	118.45	77.1
2015	74.62	77.21	97.53	129.49	75.25
2016	79.27	76.12	98.73	124.65	70.03
2017	86.35	88.37	103.11	120.99	79.5
2018	77.24	81.12	98.57	122.56	80.76
2019	75.83	84.07	100.6	122.04	78.18
2020	60.18	77.08	101.19	124.24	70.34

Source: fred.stlouisfed.org

Graph: 4



Source: fred.stlouisfed.org

The real effective exchange rate is highest for China. High rate indicates that the country is losing its competitive advantage. Real effective exchange rate for India is showing an increasing trend. For Brazil, Russia and South Africa, the real effective exchange rate is almost in the same range.

To understand the performance of each BRICS nations, the macroeconomic factors were studied for each countries using correlation analysis and ANOVA.

Table: 5 Correlation Analysis – Brazil

	GDP growth rate	Inflation Rate, (annual %)	Real Interest Rate (%)	Real Effective Exchange Rate
GDP growth rate	1			
Inflation Rate, (annual %)	-0.28676	1		
Real Interest Rate (%)	-0.16144	0.130994	1	
Real Effective Exchange Rate	0.778389	0.251559	-0.0202	1

Source: World bank data and fred.stlouisfed.org

It is evident from the above table that there is low negative correlation between GDP growth rate and inflation rate, real interest rate and GDP growth rate. It implies that these macroeconomic variables to some extent moving in the opposite direction. However, there is positive correlation between GDP growth rate and Real Effective Exchange Rate which implies that both move in the same direction. Inflation rate is positively correlated with real interest rate and real effective exchange rate. But real effective exchange rate and real interest rate have very low negative correlation

Table: 6 ANOVA – Brazil

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	43102.7	3	14367.57	252.2917	3.22E-24	2.866266
Within Groups	2050.137	36	56.94824			
Total	45152.84	39				

Source: World bank data and fred.stlouisfed.org

It is clear from the above table that the p value is less than the alpha of 0.05, it implies that there is significant relationship among the four macro-economic variables selected for study. Hence alternative hypothesis is accepted.

Table: 7 Correlation Analysis: Russia

	GDP growth rate	Inflation Rate (annual %)	Real Interest Rate (%)	Real Effective Exchange Rate
GDP growth rate	1			
Inflation Rate, Consumer Price (annual %)	-0.3046	1		
Real Interest Rate (%)	-0.69714	0.080318	1	
Real Effective Exchange Rate	0.686191	-0.03906	-0.59121	1

Source: World bank data and fred.stlouisfed.org

From the above table it's clear that there is negative correlation and hence inverse relationship between GDP growth rate and inflation and GDP growth rate and real interest rate. However, there is positive correlation between GDP growth rate and Real Effective Exchange Rate. Similarly, real effective exchange rate is negatively correlated with inflation rate and real interest rate. There is very low positive correlation between inflation rate and real interest rate.

Table: 8 ANOVA - Russia

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	55675.74	3	18558.58	351.5249	1.04E-26	2.866266
Within Groups	1900.602	36	52.79449			
Total	57576.34	39				

Source: World bank data and fred.stlouisfed.org

It is clear from the above table that p value is less than the significance level of 0.05, hence the alternative hypothesis is accepted and that there is significant relationship among the selected macro-economic variables.

Table: 9 Correlation Analysis: India

	GDP Growth rate	Inflation Rate (annual %)	Real Interest Rate (%)	Real Effective Exchange Rate
GDP Growth Rate	1			
Inflation Rate (annual %)	-0.02557	1		
Real Interest Rate (%)	0.122832	-0.69558	1	
Real Effective Exchange Rate	-0.26732	-0.64714	0.017268	1

Source: World bank data and fred.stlouisfed.org

The above table reveals that GDP growth rate is negatively correlated with inflation rate and real effective exchange rate whereas it is positively correlated with real interest rate. On the other hand, inflation rate is negatively correlated with real interest rate and real effective exchange rate whereas real interest rate and real effective exchange rate have very low positive correlation.

Table: 10 ANOVA – India

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	63263.48	3	21087.83	1578.908	3.04E-38	2.866266
Within Groups	480.8145	36	13.35596			
Total	63744.29	39				

Source: World bank data and fred.stlouisfed.org

It is understood that the p value is lesser than the significance level (0.05). It implies alternative hypothesis is accepted and that there is relationship among macro-economic variables selected for the study.

Table: 11 Correlation Analysis: China

	GDP growth rate	Inflation Rate (annual %)	Real Interest Rate (%)	Real effective exchange rate
GDP growth rate	1			
Inflation Rate, Consumer Price (annual %)	0.405142	1		
Real Interest Rate (%)	-0.38392	-0.572	1	
Real effective exchange rate	-0.61919	-0.805	0.460934	1

Source: World bank data and fred.stlouisfed.org

Above table reveals that inflation rate and GDP growth rate are correlated positively and hence move in the same direction. However, GDP growth rate is negatively correlated with real interest rate and real effective exchange rate and hence move in opposite direction. Similarly, inflation rate is negatively correlated with real interest rate and real effective exchange rate, whereas real interest rate and real effective exchange rate are positively correlated.

Table: 12 ANOVA – China

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	99277.73	3	33092.58	1803.535	2.82E-39	2.866266
Within Groups	660.5543	36	18.34873			
Total	99938.29	39				

Source: World bank data and fred.stlouisfed.org

It is clear that the p value is very much less than alpha of (0.05). It implies that the alternative hypothesis is accepted and that there is significant relationship between the macro-economic parameters selected.

Table: 13 Correlation Analysis – South Africa

	GDP Growth rate	Inflation Rate (annual %)	Real Interest Rate (%)	Real effective exchange rate
GDP	1			
Inflation Rate, Consumer Price (annual %)	0.645844	1		
Real Interest Rate (%)	0.284689	-0.15281	1	
Real effective exchange rate	0.626467	0.145719	0.084924	1

Source: World bank data and fred.stlouisfed.org

It is understood that inflation rate, real interest rate and real effective exchange rate are correlated positively with the GDP growth rate. Hence, they are directly related and increase in one variable leads to increase in another variable and vice versa. Similarly real effective exchange rate is positively correlated with inflation rate and real interest rate however real interest rate and real effective exchange rate is negatively correlated and are hence inversely related.

Table: 14 ANOVA – South Africa

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	44694.76	3	14898.25	675.3969	1.1E-31	2.866266
Within Groups	794.1066	36	22.05852			
Total	45488.87	39				

Source: World bank data and fred.stlouisfed.org

It is evident from the above table that p value is less than the significance level of 0.05, hence there is significant relationship between the selected macro-economic parameters.

9. Results

The GDP growth rate is highest for China and it was positive even during the period of COVID 19 pandemic. Other BRICS nations showed negative growth rate during 2020. India's growth rate was also good during the study period except 2020 when it reduced drastically and can it can be attributed to general slowdown in the economy due to pandemic. The inflation rate was lowest for China followed by South Africa. For India inflation increased slightly in the year 2020. Russia showed wide fluctuations in inflation rate. The real interest rate was very high for Brazil because the nominal interest rate of the country is very high. For other BRICS countries, the real interest rate falls in the same range. The real effective exchange rate is very high for China followed by India which is not considered good as it indicates loss of competitive edge.

There is negative correlation between GDP growth rate and inflation for Brazil, Russia and India and the correlation is positive for China and South Africa. There is negative correlation between GDP growth rate and real interest rate for Brazil, Russia and China, however the correlation is positive for India and South Africa. There is positive correlation between GDP growth rate and real effective exchange rate for Brazil, Russia and South Africa where as the correlation is negative for India and China.

The alternative hypothesis is accepted in case of all BRICS countries which implies there is significant difference in the means of macro-economic variables taken for study namely GDP growth rate, inflation rate, real interest rate and real effective exchange rate.

10. Conclusion

BRICS countries are considered to be developing nations which are on the way to becoming the developed nations. They are emerging economies and play a major role in shaping the global economic environment. It is clearly understood from the study of selected macroeconomic variables that China is performing well in all parameters except real effective exchange rate. Its growth rate is high and the inflation rate is also less. India's performance is also good, however in the year 2020 the GDP growth rate was very negative and real effective exchange rate is also high compared to Brazil, Russia and South Africa. South Africa performance is also good however their GDP growth rate was negative in 2020. Brazil has very high interest rate structure and hence its real interest rate is very much higher compared to other BRICS nations. Russia is showing wide fluctuations in its inflation rate during the study period. All the BRIC countries except China had negative GDP growth rate in the year 2020. All the BRICS nations have been affected due to COVID 19 pandemic and it is hoped that these countries will be able to perform well from the next financial year and maintain as their position as the fastest growing economies in the world.

References

- Anwar Ali Shah G. Syed, Faiz Muhammad Shaikh (2013), Effects of Macroeconomic Variables on Gross Domestic Product (GDP) in Pakistan, *Procedia Economics and Finance*, Volume 5, Pp 703-711.
- Dhiraj Jain, K. Sanal Nair and Vaishali Jain (2015), Factors Affecting GDP (Manufacturing, Services, Industry): An Indian Perspective, *Annual Research Journal of SCMS*, Vol. 3, pp 38 – 56.
- Jearth, Palvi & Munjal, Shikhil & Singh, Gurcharan. (2019). An Emperical Study of GDP in Indian Economy on Inflation and Population, Vol 7, Issue 2, pp 397 – 402.
- K. Hema Divya and Dr. V. Ramadevi (2014), A Study on Predictors of GDP: Early Signals, [Procedia Economics and Finance, Volume 11](#),pp 375-382.
- Kira, Alex. (2013). The Factors Affecting Gross Domestic Product (GDP) in Developing Countries: The Case of Tanzania. *European Journal of Business and Management*. 5. 148-158.
- Lowe, P. (2016). The rise of the BRICS in the global economy. *Teaching Geography*, 41(2), 50–53. <https://www.jstor.org/stable/26455170>
- Sunil J. Kulkarni (2017), Factors Affecting GDP - Opinions, Studies and Interpretation, *International Journal of Research and Review*, Vol.4; Issue: 1, pp 7 -9.
- Upreti, Parash (2015) "Factors Affecting Economic Growth in Developing Countries," *Major Themes in Economics*, 17, 37-54.
- Retrieved from data.worldbank.org
- Retrieved from <https://brics2021.gov.in/>