

# THE EFFECT OF MACROECONOMIC INDICATORS ON FOREIGN DIRECT INVESTMENT OF BRICS COUNTRIES – AN INSIGHT INTO ECONOMETRIC MODELS

P. Arun Prakash<sup>1</sup> and S. Gokul Kumar<sup>2</sup>

*School of Management Studies, Bannari Amman Institute of Technology, India*

## Abstract

*This empirical study analyses the linkage between foreign direct investment of BRICS countries and macroeconomic indicators for the period 2002-2003 to 2013-2014. The study aims to find the relationship between FDI of BRICS countries and macroeconomic indicators with the help of econometrics tools such as Unit Root Test Analysis, Johansen Co-integration test, Granger Casualty Test and Panel Data Regression Models such as Fixed Effect and Random Effect model). The analytical results revealed the long term relationship between FDI of BRICS countries and macroeconomic indicators during the study period. It is found that all the macroeconomic variables are co-integrated with FDI and variables such as log of Gross Capital Formation and Log of Trade Openness granger caused FDI of BRICS countries in bi-directional mode. It is also observed from the results that explanatory variables such as size, inflation, log of Gross Capital Formation, Log of Labour Cost, and Log of Trade Openness are having statistically significant relationship with FDI of BRICS countries.*

## Keywords:

*BRICS, Macroeconomic Indicators, FDI, Econometrics*

## 1. INTRODUCTION

BRICS has emerged as a new and promising diplomatic - political entity implying that it is not just an international financial market player. BRICS has eventually developed consensus among its members. In order to bring intra-cooperation among its members, it has entered into mutual accord in various areas such as agriculture, finance, economy and trade, combating transnational crime, science and technology, health, education, corporate and academic dialogue and security, among others. In this backdrop, financial sector has gained momentum as a new area of cooperation and development agenda. In tune with its motto, it has established New Development Bank, formerly known as BRICS Development Banks to support infrastructure and sustainable development projects among its member countries.

With this introductory note, the paper has been organized as follows: Section 2 reviews the previous literature related to FDI and economic growth. Section 3 delineates the research design and methodology. Section 4 discusses the results and section 5 concludes.

## 2. REVIEW OF LITERATURE

Mathipurani and Philip [1] examined the competitive position of India among countries such as Brazil, Russia and China in FDI inflow on the basis of various factors like position of BRIC's FDI in world FDI, performance of BRIC's FDI inflows in contributing to Gross Domestic Product and Gross Fixed Capital Formation

and the status of FDI inflows during the period 2001 to 2011 in BRIC countries. The study showed the fact that though India had ample scope in FDI attraction, the volume and rate of growth was less while compared to Brazil, Russia and China. Similarly, it was observed from the analysis that China and Brazil had attracted considerable volume of inflows. Vijayakumar et al. [2] identified the factors determining FDI inflows of BRICS countries using annual dataset for the period from 1975 to 2007. The study employed Panel data analysis found that the chosen variables such as Market size, Labour cost, Infrastructure, Currency value and Gross Capital formation were the appropriate determinants of FDI inflows of BRICS countries. The empirical results suggested a robust Industrial production for improving the performance of domestic economy. It led to the point that maintaining stability of the currency of the host country to attract high amount of FDI was inevitable. It also suggested that BRICS countries had to explore the new path of economic reform and liberalization measures. Fry et al. [3] investigated whether capital flows, particularly inflows of foreign direct investment, Granger-caused current account deficits or vice versa. The results of granger-causality showed mixed results. In some countries, Granger-causality ran from capital to current accounts and it ran from current to capital accounts in others. The results further indicated bidirectional Granger-causality in some countries and no causality in rest of the countries. The existence of limitations on capital account payments and special exchange rates reduced the probability of causation running from current to capital accounts. It was also further observed that the probabilities of causation running from current to capital accounts and of FDI being independent of the current account were minimized in countries where export proceeds had to be surrendered to the monetary authorities. The empirical results suggested that the more liberal was a country's foreign exchange system the more probability that the FDI was independent. Guadalupe and Castro [4] studied the determinants of foreign direct investment (FDI) and its effect on income inequality within and between regions using panel data analysis of 32 federal entities in Mexico for the period 1994-2006. It was observed from the empirical results that the level of development and the size of the market were directly related with FDI which caused the inequality gap between regions. It was also further shown that the determinants of foreign of direct investment in México were consistent with the economic and geographical features or location advantages in the context of eclectic theory or OLI paradigm. The result also suggested that investment in more developed regions with higher amount of population, were related with higher levels of education. Duan [5] identified the determinants of foreign direct investment in BRICs and compared the overall trends and industrial patterns of inward foreign direct investment. It was observed from the analysis that the overall trend of the inward FDI in the BRICs was showing an increasing

trend. However, industrial patterns of inward FDI were significantly different from each other. The results identified the three major factors such as develop courses, resources and the business environment as determinants of the industrial patterns of inward foreign direct investment in the BRICs. It was found from the analysis that the overall trend of the inward FDI in the BRICs was increasing. It was also further observed from the results notwithstanding the positive development in FDI inflows, the industrial patterns of FDI inflow varied significantly from each other. In countries like Brazil, Russia and India, the tertiary sector received the highest FDI inflow, whereas the primary sector received the minimal. Nistor [6] analyzed the impact of FDI flows on host country based on their size and the structure of FDI inflows. The analysis on evolution of FDI in BRICS economies showed that these nations witnessed huge volume of annual inflows and FDI stock. The increasing trend in FDI flows of these emerging economies during the period 2004-2008 indicated the rapid pace of development with which they grew. In spite of the financial crisis, BRICS had shown remarkable growth in terms of FDI flows while their counterparts showed declining trend. The analytical results showed that FDI flows contributed positively to the economic development of BRICS economies at par with the developed economies Huean [7] examined the major factors attracting the foreign direct investment capital in Thanhhoa Province of Vietnam based on the primary data collected from foreign companies through structured questionnaire. The survey encompassed various factors which were clustered under the following groups such as political stability and policy mechanism, social and cultural environment, economy and market conditions, availability of group of resources, infrastructure facilities and financial surpluses. The empirical analysis showed the following results. In political stability and policy mechanism cluster, tax and used land incentives, investment safety, intellectual property safety and public order had enormous influence on decisions of foreign investors. In financial resources cluster, fluctuating exchange rate and mobilization of funds mattered much in foreign investors' decision making process. In infrastructure cluster, the quality of infrastructure resources in road, airways, ports and communication and low transportation and logistics costs had a major impact on investors' decisions. Orisvika [8] evaluated the key determinants of FDI in EU Countries based on the panel data regression models. The analysis had specifically focused on the implications of effective corporate and statutory taxes rate on foreign direct investment. It was found from the analytical results that there was a significant impact of factors such as labour costs, openness of the trade economy, firing costs and public debt on foreign direct investment inflow. It was also observed from the analysis that there was a negative impact of financial and economic crisis on FDI. The results also indicated the negative impact of corporate and statutory taxes on FDI but it was not statistically significant. Samal and Raju [9] explored the FDI of manufacturing industry in India. The study is focused on the impact of FDI in manufacturing industry and its influence on the GDP of our country. The statistical tools such as Correlation, Trend Analysis and Ratio Analysis have been deployed. From the results, it is clear that the factors such as Import, Export, Foreign Exchange Reserves, GDP and Exchange Rate are the main determinants of FDI in India. In addition, it is also found that the FDI is having significant control on the level of GDP in India Vyas [10] inspected the FDI in India in terms of the contributions

made by individual country to it and the factors influencing those countries to invest in the various sectors in India by using the trend and percentage growth analysis. The study results revealed that the financial services sector attracts the highest FDI inflow due to its profitability which is followed by construction development sector. According to the results, in India Mumbai attracts the maximum FDI followed by New Delhi, Chennai and Bangalore. Finally, the results conclude that Mauritius country contributes the maximum FDI in India during the study period from 2000-2015. Kirti and Prasad [11] scrutinized the impact of FDI on employment generation and GDP growth in India. Further the study aimed at analyzing the sector-wise inflow of FDI in India which helps in identifying the employment generation opportunity and productivity in our country. The study results portrayed a negative impact of FDI on employment generation whereas showed a positive sign between the GDP growth and employment generation. In addition, the results clearly showcases that the manufacturing and service sectors got a considerable growth in FDI. Finally, the results prove that Mauritius holds the majority of FDI in India compared to other countries.

### 3. RESEARCH DESIGN

#### 3.1 STATEMENT OF THE PROBLEM

FDI is one of the crucial issues of developing economies. It is the much debated topic in the international finance. Since its inception, BRICS has gained prominence in attracting high foreign direct investment from developed nations. According to UN Report, the contribution of global FDI inflows to BRICS countries has doubled to 22 % during the year 2013. After the US Sub crime crisis episode, global investors are considering alternative avenues to park their funds where returns would be immensely high. BRICS has been a new destination for these investors. FDI inflow of a nation, is not just determined by market-specific or institutional attributes, but also predominantly influenced by macroeconomic conditions prevailing in an economy. In this scenario, the researcher has taken a maiden effort to investigate the linkage between FDI of BRICS countries and macroeconomic indicators.

#### 3.2 OBJECTIVES OF THE STUDY

The study has framed the following objectives.

- 1) To analyze the long run and causality relationship between FDI of BRICS countries and macroeconomic indicators.
- 2) To ascertain the impact of macroeconomic indicators on FDI of BRICS countries.

#### 3.3 STATEMENT OF HYPOTHESES

In accordance with the above mentioned objectives, the following null hypotheses have been formulated and tested.

- **H<sub>01</sub>**: Macroeconomic Indicators and FDI of BRICS countries do not have stationary.
- **H<sub>02</sub>**: FDI of BRICS countries are not co-integrated with macroeconomic indicators.
- **H<sub>03</sub>**: Macroeconomic indicators do not granger cause FDI of BRICS countries and vice versa.

- **H<sub>04</sub>**: Macroeconomic indicators are not having significant relationship with FDI of BRICS countries.

### 3.4 RESEARCH METHODOLOGY

#### 3.4.1 Nature of Study:

The study is descriptive and analytical in nature. It describes the state of FDI inflow in BRICS countries. The study examines the relationship between macroeconomic indicators and FDI of BRICS countries.

#### 3.4.2 Sources of Data:

The study is predominantly based on secondary data. It consists of various macroeconomic indicators. The required data have been taken and compiled from “World Bank Indicators”, published by World Bank from 2003 to 2014. The scope of the study is confined to twelve years data of BRICS Countries only.

#### 3.4.3 Sampling Framework:

Most of the studies on FDIs have focused on country specific FDI Indicators, FDI and Economic Growth, FDI Capital flow and Current Account Deficit, FDI and Stock Market and FDI in developed countries. But, there are only few studies available on FDI of BRICS countries. Therefore all BRICS countries have been taken which may constitute the entire population of the study.

#### 3.4.4 Research Instruments:

The study has employed the following econometrics tools for analysis of macroeconomic data on FDI of BRICS countries.

1. Unit Root Test
2. Johansen Co-integration Test
3. Granger Causality Test and
4. Auto Regressive Condition Heteroscedasticity Model

Unit root test is used to check whether the time series data has stationary or non-stationary. Stationary refers to the movement of time series around a mean value. Augmented Dickey Fuller test has been applied to find out the stationary of time series data. After stationary of data has been confirmed, the analysis has proceeded to check the co-integration between the endogenous and exogenous variables. The study has used Johansen Co-integration Test to analyze the co-integrating relationship among the selected variables. Co-integration analysis validates the long run relationship between endogenous and exogenous variables. In this study, bivariate co-integration has been taken into consideration for analysis. Granger causality is also employed in the analysis to examine whether one time series helps to predict another. Granger causality consists of both bi-directional and unidirectional relationship between variables analyzed. Auto Regressive Conditional Model is adopted to assess the impact of macroeconomic indicators.

#### 3.4.5 Period of the Study:

The study is analytical in nature and the present study uses the latest available secondary data published by World Bank for the 12 years starting from 2002-2003 to 2013-2014.

#### 3.4.6 Limitations of the Study:

1. The study has heavily dependent on secondary data which does not reflect the qualitative aspects involved in foreign direct investment.

2. The study can describe only the changes in the FDI of BRICS countries due to macroeconomic indicators but could not explain the reasons for fluctuations.

#### 3.4.7 Summary of Relation between FDI of BRICS countries and Macroeconomic Variables:

Table.1. Summary of Relationship between FDI of BRICS Countries and Macroeconomic Indicators

FDI VARIABLE	MACROECONOMIC VARIABLES	EXPECTED RELATIONSHIP
FDI – Log of FDI inflow in Current US \$	SIZE – Market Capitalization of listed companies	+
	GDP– Gross Domestic Product	+
	INFL – Inflation Rate	+/-
	LGCF – Log of Gross Capital Formation	+
	LLC – Log of Labour Cost	-
	LTO – Log of Trade Openness	-
	REER –Real Effective Exchange Rate	+/-

## 4. ANALYSIS AND DISCUSSION OF EMPIRICAL RESULTS

### 4.1 ECONOMETRICS ANALYSIS OF LINKAGE BETWEEN FDI OF BRICS COUNTRIES AND MACROECONOMIC INDICATORS

The empirical evidence on the FDI of BRICS countries and macroeconomic indicators based on data of banks over the period 2006-2015 is presented in this section. This section highlights the descriptive statistics of the selected variables, the correlation matrix and finally the empirical model. The data was diagnosed for the presence of autocorrelation and heteroscedasticity. An econometric specification for the FDI has been estimated using Auto Regressive Conditional Heteroscedasticity.

The Table.2 presents the summary of descriptive statistics of the endogenous and exogenous variables captured in the Autoregressive Conditional Heteroscedasticity Model. These statistics are generated to give overall description of the data used in the model and enable to screen the data for any suspicious figure. The key descriptive measures are the mean, standard deviation, the minimum and the maximum values of the variables over the period under consideration. Mean explains the average value of observations and standard deviation indicates deviation/change of data from mean. It is particularly noted from the Table.2 that FDI of BRICS countries explain a moderate disparity among the BRICS countries with a minimum of 20.25% and a maximum of 26.40%. With respect to macroeconomic factors, Log of Gross Capital Formation (LGCF) has the highest standard deviation and it has a mean value of 28.34%. The economic growth as proxied by natural log of GDP shows a moderate growth in terms of mean

by 5.77% and it records a minimum of -7.80% and maximum of 14.20%.

Additionally, for the same period, inflation rate presents a minimum of -0.70% and a maximum of 14.70%. The average log of trade openness which is measured by the average of goods and services exported and imported as a percentage of GDP of the countries is 3.82% during the study period and it has minimum and maximum of 3.10% and 4.28% respectively. The log of Rear Effective Exchange Rate has an average of 4.52% and its data has deviated to the extent of 0.16 times from the mean value. The size as measured by log of market capitalization shows a high disparity of 5.16 % and 8.64 % in its minimum and maximum values during the study period and the average market capitalization is 6.69%. The summary statistics indicate that the macroeconomic series are normally distributed with the Jarque-Bera statistics probability value greater than the benchmark of 0.05 (values ranges from 2.24 to 19.01) and no essential variables are omitted from the descriptive statistics analysis.

The Table.3 describes the correlation matrix for all the variables incorporated into the model. The coefficient of correlation provides an index of the direction and the magnitude of the relationship between two set of scores without implying

causality. The sign of the coefficient is an indication of the direction of the relationship. The absolute value of the coefficient indicates the magnitude. Correlation matrix is useful to the extent that it reveals whether there are elements of multi-collinearity in the data. Multi-collinearity is the situation when some or all of the explanatory variables are highly related making it difficult to tell which of them is influencing the dependent variable. The severity of multi-collinearity would be manifested in a situation where all p-values of regression coefficients are insignificant but overall model having significant F statistic.

Size (measured as natural log of market capitalization) has positively associated with log of Gross Domestic Product (GDP), log of Gross Capital Formation (LGCF), log of labour cost (LLC), log of trade openness (LTO) and Real Effective Exchange Rate (REER) which are 0.56, 0.77, 0.74, 0.06 and -0.40. However, Inflation Rate (INFL) is negatively correlated with size. The correlation coefficient of all macroeconomic determinants indicates the absence of multi-collinearity problem as correlation co-efficient of all the variables are less than the cut-off point of 0.80. The log of Gross Capital Formation (LGCF) has high correlation coefficient with size followed by log of labour cost (LLC). But, these two variables do not exceed the limit of 0.80.

Table.2. Descriptive Statistics Analysis of FDI of BRICS Countries and Macroeconomic Indicators

	FDI	SIZE	GDP	INFL	LGCF	LLC	LTO	REER
<b>Mean</b>	24.00472	6.690781	5.769492	6.474576	28.33898	22.43642	3.824140	4.521225
<b>Median</b>	24.24584	5.924256	5.700000	5.900000	23.00000	22.26364	3.939638	4.552824
<b>Maximum</b>	26.39634	8.638348	14.20000	14.70000	48.00000	24.97730	4.287716	4.779123
<b>Minimum</b>	20.25053	5.164786	-7.800000	-0.700000	17.00000	19.88940	3.100092	4.014580
<b>Std. Dev.</b>	1.456942	1.168336	3.790608	3.403375	10.32174	1.414179	0.316089	0.156290
<b>Skewness</b>	-0.524444	0.578224	-0.615850	0.536460	0.656347	0.159615	-1.021286	-1.166011
<b>Kurtosis</b>	3.136828	1.677550	4.436560	2.885099	1.894857	2.099912	2.805614	4.515178
<b>Jarque-Bera</b>	2.750604	7.587023	8.802770	2.862384	7.238584	2.242163	10.34931	19.01299
<b>Probability</b>	0.252763	0.022516	0.012260	0.239024	0.026802	0.325927	0.005658	0.000074
<b>Sum</b>	1416.278	394.7561	340.4000	382.0000	1672.000	1323.749	225.6243	266.7523
<b>Sum Sq. Dev.</b>	123.1155	79.17058	833.3851	671.8119	6179.220	115.9943	5.794922	1.416740

Table.3. Correlation Matrix of Macroeconomic Indicators

	SIZE	GDP	INFL	LGCF	LLC	LTO	REER
<b>SIZE</b>	1						
<b>GDP</b>	0.563923	1					
<b>INFL</b>	-0.18402	-0.27981	1				
<b>LGCF</b>	0.773695	0.694275	-0.34081	1			
<b>LLC</b>	0.743157	0.43979	0.046477	0.697954	1		
<b>LTO</b>	0.059333	0.169759	0.130736	0.236384	-0.04931	1	
<b>REER</b>	0.402862	0.118731	-0.24801	0.457995	0.425069	0.200352	1

Table.4. Unit Root Test of FDI of BRICS Countries and Macroeconomic Indicators

Variables	Augmented Dickey Fuller Test		
	Level	First Difference	Order of Integration
<b>FDI</b>	-1.076321	-3.017596*	I (1)
<b>SIZE</b>	-1.370045	-7.780891*	I (1)
<b>GDP</b>	-2.164156	4.164156*	I (1)
<b>INFL</b>	-5.289336	-4.289336*	I (1)
<b>LGCF</b>	-1.814747	-7.199789*	I (1)
<b>LLC</b>	-1.693060	-8.690630*	I (1)
<b>LTO</b>	-2.114841	-8.702144*	I (1)
<b>REER</b>	-4.025289	-4.025289*	I (1)

Note: The \*indicates significance at 1%

The Table.4 reveals the unit root test results of all the macroeconomic indicators of BRICS countries. It is important that macroeconomic data used in the study must be stationary. If the variables are not stationary, it is assumed that they include stochastic or deterministic trends. In order to check whether the time series data are stationary or non-stationary, Augmented Dickey-Fuller (ADF) Unit Root test has been applied on chosen variables. The analytical results showed that all the variables are stationary at first difference. The rejection of null hypothesis against the alternative hypothesis implies that all the time series variables are stationary and integrated the order of one i.e., 1(1).

The Table.5 summarizes the consolidated output of Johansen Co-integration test applied on FDI of BRICS countries and macroeconomic indicators. After checking the time series of properties of each macroeconomic indicator through Unit Root Test, the study is proceeded to test the co-integrating relationship

between FDI and macroeconomic variables of BRICS countries. Johansen Co-integration analysis helps to find out whether there exists a co-integrating relationship between the variables or not. It enables to identify more than one co-integration relationship between time series data. In order to accept the co-integrating relationship between variables, Trace and Max-Eigen Statistics value should be higher than the critical value at 10% significance level. The results exhibit that all the variables are co-integrated with FDI at 10% level of significance.

The Table.6 represents the results of Granger Causality Test of BRICS countries. Granger Causality Analysis is a statistical hypothesis test for determining whether one times series data is useful in predicting another. Granger causality test results have shown the unidirectional relationship between FDI and Log of Gross Capital Formation (LGCF), FDI and Log of Trade Openness (LTO).

The results of the regression estimation are summarized in Table.7. The estimation results show that Size is having a negative relationship as against the expected relationship. It has a significant relationship with FDI at 1% level of significance in both fixed and random effect models. Though the regression coefficient of Gross Domestic Product (GDP) is having a negative relationship in contrast to the expectation and its coefficient is having an insignificant association with FDI of BRICS countries. The coefficient of inflation (INFL) as measured by CPI indicates a positive relationship with FDI. At the same time, its coefficient has been significantly related with FDI at 1 % level of significance. The coefficient of Log of Gross Capital Formation (LGCF) is positively associated with FDI in ARCH model. It also implies that the increase in Gross Capital Formation leads to the growth in FDI. Further, it is also noted that this relationship proves to be statistically significant at 1% level. In contrast to the expected relationship, Log of Labour Cost (LLC) has shown a positive relationship with FDI of BRICS countries. The coefficient of Log of Labour Cost is statistically significant in the estimation model.

Table.5. Bivariate Co-integration Test of FDI of BRICS Countries and Macroeconomic Indicators

Pair wise	Eigen Value	Trace Statistic	Critical Value (5%)	Max-Eigen Value	Critical Value (5%)
<b>FDI – SIZE</b>	0.134842	10.98515	15.49471	8.111215	14.26460
	0.050026	2.873933	3.841466	2.873933	3.841466
<b>FDI– GDP</b>	0.268198	21.83926	25.87211	17.79800	19.38704
	0.068444	4.041255	12.51798	4.041255	12.51798
<b>FDI– INFL</b>	0.122849	13.35151	15.49471	7.471353	14.26460
	0.098018	5.880153	3.841466	5.880153	3.841466
<b>FDI – LGCF</b>	0.094926	8.514226	15.49471	5.685082	14.26460
	0.048422	2.829144	3.841466	2.829144	3.841466
<b>FDI– LLC</b>	0.120202	10.24945	15.49471	7.299557	14.26460
	0.050436	2.949897	3.841466	2.949897	3.841466
<b>FDI– LTO</b>	0.115761	10.28366	15.49471	7.012603	14.26460
	0.055771	3.271054	3.841466	3.271054	3.841466
<b>FDI– REER</b>	0.221286	20.51334	15.49471	14.25636	14.26460
	0.103961	6.256980	3.841466	6.256980	3.841466

Table.6. Granger Causality Test of FDI of BRICS Countries and Macroeconomic Indicators

Null Hypothesis H <sub>0</sub>	F- Statistic	P - Value	Conclusion
SIZE does not Granger Cause FDI	0.21538	0.8069	Accepted H <sub>0</sub>
FDI does not Granger Cause SIZE	0.17607	0.8391	Accepted H <sub>0</sub>
GDP does not Granger Cause FDI	2.39301	0.1012	Accepted H <sub>0</sub>
FDI does not Granger Cause GDP	0.59887	0.5531	Accepted H <sub>0</sub>
INFL does not Granger Cause FDI	0.38909	0.6796	Accepted H <sub>0</sub>
FDI does not Granger Cause INFL	2.32243	0.1079	Accepted H <sub>0</sub>
LGCF does not Granger Cause FDI	3.30172	0.0445	Accepted H <sub>0</sub>
FDI does not Granger Cause LGCF	0.55706	0.5762	Rejected H <sub>0</sub>
LLC does not Granger Cause FDI	0.22359	0.8004	Accepted H <sub>0</sub>
FDI does not Granger Cause LLC	0.33505	0.7168	Accepted H <sub>0</sub>
LTO does not Granger Cause FDI	0.05566	0.9459	Accepted H <sub>0</sub>
FDI does not Granger Cause LTO	0.51393	0.6011	Rejected H <sub>0</sub>
REER does not Granger Cause FDI	1.00157	0.3741	Accepted H <sub>0</sub>
FDI does not Granger Cause REER	1.01450	0.3695	Accepted H <sub>0</sub>

Table.7. FDI of BRICS Countries and Macroeconomic Indicators: Estimation Results on the basis of Auto Regressive Conditional Heteroscedasticity Model

Dependent Variable: FDI				
Method: ML - ARCH (Marquardt) - Normal distribution				
Pre-sample variance: Backcast (parameter = 0.7)				
GARCH = C(9) + C(10)*RESID(-1)^2 + C(11)*GARCH(-1)				
Variable	Coefficient	Std. Error	z-Statistics	P-value
C	22.52365	2.629751	8.564937	0.0000
SIZE	-1.475261	0.088752	-16.62229	0.0000
GDP	-0.030939	0.028396	-1.089535	0.2759
INFL	0.064681	0.026222	2.466702	0.0136
LGCF	0.180832	0.013571	13.32483	0.0000
LLC	0.629076	0.092711	6.785311	0.0000
LTO	-1.568264	0.233067	-6.728818	0.0000
REER	-0.474733	0.543713	-0.873131	0.3826

Variance Equation				
C	0.080962	0.047754	1.695402	0.0900
RESID(-1)^2	0.889203	0.506480	1.755652	0.0791
GARCH(-1)	0.007480	0.186960	0.040011	0.9681
R-squared	0.802766	Mean dependent variable		24.02625
Adjusted R-squared	0.776216	S.D. dependent variable		1.454143
S.E. of regression	0.687895	Akaike info criterion		1.879776
Sum squared resid	24.60636	Schwarz criterion		2.263740
Log likelihood	-45.39329	Hannan-Quinn criter		2.029965
Durbin-Watson stat	1.791959			

In line with the expectation, the coefficient of Log of Trade Openness (LTO) shows a negative association with FDI and significantly related with FDI at 1% level of significance. This result denotes that as Log of Trade Openness (LTO) increases, it leads to decline in FDI. The ARCH model result shows a negative relationship between Real Effective Exchange Rate and FDI. It can be inferred that exchange rate leads to decrease in FDI due to unfavorable conditions to traders in foreign exchange market.

The influence of macroeconomic indicators on FDI of BRICS countries is to the extent of 80% as R<sup>2</sup> value in ARCH model. R<sup>2</sup> explains the level of impact of exogenous variables on FDI. Likewise, the adjusted R<sup>2</sup>-value is fairly good which 78 % in the model is. These statistics imply the goodness of fit of the model. The Durbin-Watson statistics indicates the absence of autocorrelation as its value is less than 2.

## 4.2 SUMMARY OF FINDINGS

- The Unit Root Test analysis showed that all the variables are stationery and they are integrated order of 1. The data series are non-stationery at level and they are stationery when first difference is taken.
- The Johanson Cointegration test results indicated that all the chosen explanatory variables are cointegrated with explained variable FDI.
- The Granger causality test results have revealed the unidirectional relationship existing between FDI and Log of Gross Capital Formation (LGCF), FDI and Log of Trade Openness (LTO).
- The empirical results of ARCH model denoted that factors such as size measured in terms of market capitalization, inflation rate, gross capital formation (indicator of infrastructure resources of an economy), labour costs and trade openness are the key macroeconomic indicators of foreign direct investment inflows in BRICS Countries.

## 4.3 SUGGESTIONS

- The BRICS countries have to increase the market capitalization of the companies which are listed in their stock markets. Moreover, companies could list their

securities in the international stock exchanges which might be the indicator of performance of the companies worldwide.

- Labour cost is one of the predominant factors which influence the foreign direct investment. The overall labour costs of BRICS countries are slightly higher. So, labour costs could be streamlined in order to attract the FDI from developed nations.

## 5. CONCLUSION

This empirical study has analyzed the interaction between macroeconomic indicators and credit risk conditions in BRICS countries in India using the econometrics tools for the period 2003-2014. The bivariate co-integration results showed that all the macroeconomic indicators are co-integrated with FDI of BRICS countries. It is also found from the analysis that Log of Gross Capital Formation (LGCF) and Log of Trade Openness (LTO) have showed a unidirectional causality relationship with FDI of BRICS countries. It can be concluded that variables such as Size (as measured by market capitalization), Inflation (INFL) Log of Gross Capital Formation (LGCF), Log of Trade Openness (LTO) and Log of Labour Cost (LLC) are the macroeconomic Indicators those explain the FDI of BRICS countries.

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