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Does exchange rate has any impact on economic growth in India? An empirical analysis

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Abstract. *In the present globalization economic world exchange rate plays a major role in every countries economic activity. Here, Exchange rate policy has been identified as one of the endogenous factors that can affect the economic performance of a nation. Exchange rate plays a key role in international economic transactions because no nation can remain in isolation due to varying factor endowment. Movements in the exchange rate have ripple effects on other economic growth. The study used secondary data and which was collected from the World Development Indicators data base respectively and were analysed. The study used the Ordinary Least Square (OLS) method of estimation for data covering the period from 1990 to 2017. The results from the econometric analyses show that there is a short-run relationship between exchange rate, inflation rate, interest rate and GDP. The result obtained from the unit root analysis indicates at least one time series variable property is stationary. The study concludes that in India, the factors that influence the level of growth rate are extent of Exchange rate and its variables. Based on the findings, from the Granger causality investigation procedure at 5% critical value are EXCH, INT, INF, IMP and EXP among other variables affects economic growth. The study recommends the need to be technological incline in all sectors of Indian economy, excess and over budgetary inflation and implementation should be cut to barest minimal level to avert the ideal of external borrowing which most consequently result in external debt and services. The Indian government should show to the path of redirecting its investment profile by channeling it towards capital projects of the government.*

Keywords: exchange rate, Ordinary Least Square (OLS) structural adjustment programme, Granger causality test, foreign currency, economy.

JEL Code: D51, E00, E6, F430.

1. Introduction

Exchange rate refers to the value of one currency (the domestic currency) in relationship of another (foreign currency). It can also be define as the price at which one unit of a country's domestic currency exchanges for any other country in the world. Osiegbu and Onuorah (2012) posit that exchange rate plays a key role in international economic transactions because no nation can remain in isolation due to varying factor endowment. Movements in the exchange rate have screw up effects on other economic variables such as interest rate, inflation rate, import, export and output, etc. These facts underscore the importance of exchange rate to the economic well-being of every country that opens its doors to international trade in goods and services. The importance of exchange rate derives from the fact that it connects the price systems of two different countries making it possible for international trade to make direct comparison of traded goods. In other words, it links domestic prices with international prices. Through its effects on the volume of imports and exports, exchange rate exerts a powerful influence on a country's balance of payments position.

In emerging market economies like India, exchange rate have gained more importance after adopting of flexible exchange rate system. Devaluation means officially lowering the value of currency in terms of foreign currencies. There could be many motives of the devaluation. It stimulates exports of commodities and it restricts import demand for goods and services. It also helps in creating a favorable balance of payments. Almost all the countries of the world have devalued their currencies at one time or the other with a view to achieving certain economic objectives. During the great depression of 1930 devaluation was carried by most countries of the world for the correcting their over-valuation. Since 1951, despite government attempts to obtain a positive trade balance, India has experienced severe balance of payments deficits. Inflation caused Indian prices to go high. When the exchange rate is fixed and a country experiences high inflation relative to other countries, that country's goods become more expensive and foreign goods become cheaper. Therefore, inflation tends to increase imports and decrease exports. From 2006, Indian currency continuously appreciated and have the trade balance. Another reason, which played an important role in the 1966 devaluation, was war with Pakistan. The US and other countries withdrew their aid, which further necessitated devaluation. To improve fiscal position, Government of India need to consider the country's attractiveness to foreign investors is increasing and signals optimism about the Indian economy more generally. India still had a fixed exchange rate system, where the rupee was hooked to basket of currencies of major trading partner countries. Between 2003-2004 and 2005-2006, however, the rupee appreciated against the dollar by 3% on average a year-although there was considerable two-way movement of the rupee from month to month. The average rupee-US dollar rate in May 2007 was lowest since 1990-2000. Although rupee-US dollar exchange rate has the greatest impact on the Indian economy and business sector; the rupee has also appreciated against other currencies (Jashandeep et al., 2018).

In connection with the above discussion the Indian Rupee exchange rate has witnessed some period of relative stability since the implementation of the Structural Adjustment Programme (SAP) in 1991, its continued depreciation, however, mars the economic

performance of the country. The challenge of the combined effect of increase in oil prices and exchange rate instabilities on macroeconomic stability and economic growth for non-oil producing nations like India is really enormous. According to Usman (2009), huge inflow of oil revenues in Nigeria are more often associated with expansion in the level of Government spending while periods of dwindling oil revenues are usually accompanied by budget deficits. There is no gain saying that Nigeria relies so much on revenue from oil exports, but, it equally massively imports refined petroleum and other related products.

2. Literature review

Theoretical issues

Existing literature has two basic views on the transmission mechanism of the impact of exchange rate on economic activities. They are traditional point of view and empirical point of view.

From the traditional point of view, the exchange rate operates through the aggregate demand channel. It has become an argument that the depreciation of the exchange rate allows international competitiveness of domestic goods which helps to improve the current account balance of the country. The improvement of international competitiveness of domestic goods facilitates increase in export which in turn increases the aggregate demand in the economy. A study done by Edwards (1989) acknowledged that if there is any misalignment in exchange rate in form of currency devaluation, it will impair tradable activities and thus lowering net export and aggregate demand in the economy. He argues that, when there's a real depreciation, it generates adverse effects resulting in overall economic contraction. Contraction occurs through some fundamental process as described below:

Firstly, a nominal depreciation of currency causes a rise in the general price level resulting in low aggregate demand. This in turn causes economic contraction. Second, it is often an argument that a real depreciation can help transfer income from individuals with high marginal propensity to consume to those with a low marginal propensity to consume.

Exchange rate movements and exchange rate uncertainty are important determinants of international transactions. In India, these fluctuations according to Omojimite and Akpokodje (2010) have been influenced by changing pattern of international trade, institutional changes in the economy and structural shifts in production. Further, Ogunleye (2010) pointed that the real exchange rate in Nigeria has been principally influenced by external shocks resulting from the vagaries of world price of agricultural commodities and oil price, both major sources of Nigerian export and foreign exchange earrings; contending that when the economy depended on agricultural exports, real exchange rate volatility was less pronounced given the fact that these products were subject to less volatility and that there were more trading partners' currencies involved in the calculation of the country's real exchange rate. In connection with above discussion Lama et al. (2010) said this is minimally affected the real exchange rate fluctuating by only 0.14% between 1970 and 1977. The increased dependence of the country on oil resulted in severe trade shocks from global oil price stocks are fluctuating in the naira exchange rate by 10% in the year 1978-1985.

The movements in the exchange rate point of view some studies have highlighted. Iyoha and Oriakhi (2002), analysed the movements in real exchange rate during this period were nominal stocks resulting from fiscal deficits. Collaborating, Aliyu (2009) distinguished that the oil windfall resulted in excessive fiscal expenditure in ambitious development projects; and when the windfall ended, the government resorted to financing its expenditures through money creation. This expansionary monetary fiscal policy according to Lu and Zhang (2003) exerted upward pressure on inflation, aggravating sharp movements in real exchange rate movements.

From 1986, Oyejide et al. (1996) posits the adoption of the structural adjustment program (SAP) became a contributory factor in shaping the dynamics of real exchange rate in Nigeria. One of the cardinal points of this policy was floating nominal exchange rate policy. As the naira was allowed to float, the nominal exchange rate movement became more pronounced, contributing to stronger movements in exchange rate during this period.

Between 1986 and 1992, Alama et al. (2010) observed that the mean annual charge in real exchange rate in the country increased to 25% reducing to 4.5% between 2000 and 2006. Favorable terms of trade, less fiscal dominance, effective monetary policy induced by more independent and transparent central bank and well managed nominal exchange rate policy contributed to this decline in foreign exchange rate volatility.

Empirical evidence

Several empirical studies that have undertaken to identify the possible effects of economic growth in India and elsewhere have been identified as exchange rate and its variables. Anietie et al. (2004) using co-integration and error correction models analyzed the impact of real effective exchange rate on economic activities in Nepal to determine which of the transmission channels (aggregate demand channel and aggregate supply channel) the effect of variation in real exchange. The traditional view has it that the real exchange rate operates through the aggregate demand channel. By this, it means that the depreciation of real exchange rate, enhances the international competitiveness of domestic goods, boosts net exports and eventually enlarges GDP. Haker and Halemi (2004), follow the GDP function approach of Mordi (2006), which allows sufficient flexibility in terms of functional forms to provide estimates of import demand and export supply elasticity in 117 countries. The policy implications drawn from this study are therefore significant in view of their contributions to informed decision-making in India and others who share the same economic structure. Antonia (2008) examined the relationship between the real effective exchange rate and aggregate real trade balance for major OECD countries in the post-Bretton Woods era. Using a variety of parametric and non-parametric techniques, the results suggest that there is little evidence that the exchange rate significantly affects the trade balance.

Bahmaniet (2008) using VECM estimated the long-run effects of exchange rate Devaluation on the trade balance of South Africa. The results provide evidence supporting the view that devaluation of the exchange rate worsens the trade balance of South Africa in the long-run. Odusola (2006) applied co-integration and error correction model approaches investigated the behaviour of Indian aggregate import demand during the period 1971-1995. The results obtained indicate that import volume is co integrated with

relative import price and real GDP. The output of the econometric model estimate shows that import demand in India is largely explained by real GDP and generally less sensitive to import price changes.

Also, Obadan (2006) practicalised with the VECM to test for Marshall-Lerner condition in the exchange rate-balance relationship in the Baltic States. The condition is found to be met for Lithuania, but not for Estonia, while the results concerning Latria are ambiguous. Although the traditional influencers are sufficient at explaining trade dynamics in Baltic countries, the analysis reveals that a long-run equilibrium relationship among them exists.

Statement of the problem

In any country, foreign exchange policy is an important policy instrument. Up to the time of SAP, it appeared that India's exchange rate policy tended to encourage over-valuation of the Rupee, because in 1991, it was Rs 18.11 to Rs 25.79. This, in turn, encouraged exports, and discourages non-oil export and over dependence on exported inputs. India imports bulk of its oil imports and higher crude prices puts pressure on domestic inflation and current account and fiscal deficits.

India's exchange rate has been more volatile in the post-SAP period due to its excessive exposure to external shocks. The effect of the recent global economic meltdown on India's exchange rate was phenomenon as the Rupee exchange rate vis-à-vis the Dollar rose astronomically from about Rs 18.11/$ to more than Rs 53.01/$ (about 50% increase) between 1991 and 2011. This is attributable to the sharp drop in foreign earnings of India as a result of the persistent raise of crude oil price, which plunged from an all-time high of US$ 72.48 per barrel in November 2018. Although various factors like, demonetization, bank rate, and oil prices hike have been adduced to the economic performance of India, it is necessary to examine the growth process of India under the various exchange regimes that had been adopted in the country, the effect of inflation and interest rate and impact of trade. India's over dependent on importation and less emphasis in manufacturing local goods and services depreciated the value of the Rupee.

3. Objectives of the study

The main objective of this study is to examine the effects of exchange rate on the economic growth of India. Particularly focused on these objectives:

- To examine the effect of exchange rate, interest rate, import and export on the economic growth of India.
- To examine the impact of inflation rate on the economic growth in India.

4. Data and methodology

In order to analyse the above objectives the data for the study is collected from secondary sources, like; World Development indicator (WDI), Reserve Bank of India (RBI), International Financial Statistics (IFS). The study period has covered from 1990 to 2017 on the following variables like; gross domestic price (GDP), real exchange rate (EXCH),

inflation rate(INF), interest rate(INT), import(IMP) and export(EXP). The study examines the effect of economic growth (GDP) using exchange rate variables such as real exchange rate, inflation rate, interest rate, import and export as the exogenous variables.

The functional linear regression equation is stated as follows:

$$RGDP = f(EXCH, INT, INF, IMP, EXP) \quad (1)$$

The econometric model is expressed as below:

$$RGDP = \beta_0 + \beta_1 EXCH + \beta_2 INT + \beta_3 INF + \beta_4 EXP + \beta_5 IMP + u \quad (2)$$

Where:
RGDP = Real Gross Domestic Product;
EXR = Exchange rate;
INT = Interest Rate;
INF = Inflation rate;
EXP = Export;
IMP = Import;
μ = Stochastic Disturbance (Error Term);
f = Functional Relationship;
β_0 = Intercept of relationship in the model/constant;
$\beta_1 to\ \beta_5$ = coefficients of each of the independent variables.

By log linearizing, the model becomes:

$$Log(RGDP) = \beta_0 + \beta_1 Log(EXCH) + \beta_2 \log(INT)$$
$$+\beta_3 \log(INF) + \beta_4 \log(EXP) + \beta_5 IMPT + u \quad (3)$$

5. Estimation and discussion of empirical results

Table 1. *Correlation test results*

Variable	RGDP	INF	INT	IMP	EXP	EXCH
RGDP	1	-0.354	-0.048	0.409	0.412	0.323
INF	-0.354	1				
INT	-0.048		1			
IMP	0.409			1		
EXP	0.412				1	
EXCH	0.323					1

Source: Authors calculations.

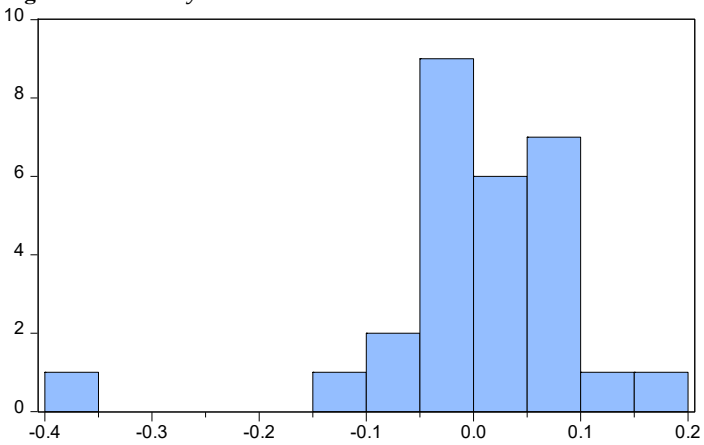
Table 2. *Summary of result of unit root test using augment Dickey-Fuller Test (ADF test) for time series variables*

Variable	ADF Test statistic @ Level	Probability	95% critical ADF Value	Remark
RGDP	-3.9292	0.0058	-2.9762	I(1)
LEXP	-2.3352	0.1688	-2.9762	I(0)
LIMP	-1.7321	0.4045	-2.9762	I(0)
LINF	-1.9720	0.2963	-2.9862	I(0)
LINT	-2.7513	0.0788	-2.9762	I(0)
LEXCH	-3.9155	0.0060	-2.9762	I(0)

Source: Author's calculations.

Table 2 shows that there is unit root among the time series when subjected to ADF test at various levels and order difference in the time series of Gross Domestic Product (GDP), Exchange rate (EXCH) interest rate (INT), Inflation Rate (INF), export (EXP), Import (IMP), have unit root at level, first and second order difference as the calculated ADF test values are less than the critical value at 5% irrespective of sign difference at iteration lag 2. In addition, there is no unit root in the series of Interest Rate (LINT) and Export (EXP) at order 1 and level I (0) respectively since the ADF-test statistic is greater than the critical value at 5% at lag 2. This confirms that all the time series variables are not stationary at level or order except Export and Interest rate. From the foregoing analyses, the result further does not inform co integration but Vector Auto regression Analysis (VAR) model application for estimation to determine the short and long run relationship rather suggests possible Granger Causality test to investigate the impact of exchange rate variables on GDP.

Figure 1. *Normality test*



Source: Author's calculation.

Table 3. *Normality test*

Series: Residuals	
Sample 1990 2017	
Observations 28	
Mean	-1.98e-15
Median	0.003416
Maximum	0.168953
Minimum	-0.368480
Std. Dev.	0.097060
Skewness	-1.905034
Kurtosis	8.756791
Jarque-Bera	55.60014
Probability	0.000000

The above Figure 1 and Table 3 explains the diagnostic behavior of the time series variables. The result indicated that the series of the Normality test is not statistically significant at 5% as the probability value of JB statistics is greater than 0.05 critical value. Hence, the test confirms non normality of the series.

Table 4. *Serial correlation test*

Breusch-Godfrey Serial Correlation LM Test			
F-statistic	1.790834	Probability	0.192600
Obs*R-squared	4.252741	Probability	0.119300

Source: Author's calculation.

Table 5. *Heteroscedasticity test ARCH test*

Heteroskedasticity Test ARCH Test			
F-statistic	0.552273	Probability	0.464300
Obs*R-squared	0.583563	Probability	0.444900

Source: Author's calculation.

Table 6. *Functionality test Ramsey RESET Test*

Functionality test Ramsey RESET Test			
F-statistic	5.787395	Probability	0.025400
Log likelihood ratio	6.815453	Probability	0.009000

Source: Author's calculation.

Coming to the Table 4 the probability value of the F-statistics of the LM test is 0.19 greater than critical value at 0.05, this shows that there is no presence of serial correlation in the series. We thereby fail to reject H0. From the Table 5 when we look into the p-value of the F-stat of the white heteroskedasticity is 0.46 greater than 0.05 showing absence of heteroskedasticity because there is presence of Homokedasticity in the model series. We fail to reject H0. In the case of RESET we can see in the Table 6 explains the probability value of F-Statistics of Ramsey Reset test is (0.0254) less than the critical value at 5% level. This results show that the model is stable and in functional form as the null hypothesis (H_0) is rejected in favour of the alternative hypothesis (H_1) that the model is structurally stable and fit for prediction.

Table 7. *Ordinary Least Square (OLS) method of regression analysis*

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.626206	0.912608	-2.877693	0.0090
LEXP	-5.878988	1.596174	-3.683174	0.0014
LIMP	7.187437	1.746442	4.115475	0.0005
LINF	-0.630414	0.253719	-2.484695	0.0215
LINT	0.042208	0.146128	0.288843	0.7555
LEXCH	1.832272	0.225020	-2.405701	0.0254

R-squared	0.926605	Mean dependent var	1.110302
Adjusted R-squared	0.905635	S.D. dependent var	0.317214
S.E. of regression	0.097445	Akaike info criterion	-1.606741
Sum squared resid	0.199406	Schwarz criterion	-1.273690
Log likelihood	29.49438	Hannan-Quinn criter.	-1.504924
F-statistic	44.18701	Durbin-Watson stat	2.022315
Prob(F-statistic)	0.000000		

*significant at 5% level, t-ratio > 2.0 rule of thumb, it is statistically significant.
Source: Author's calculation.

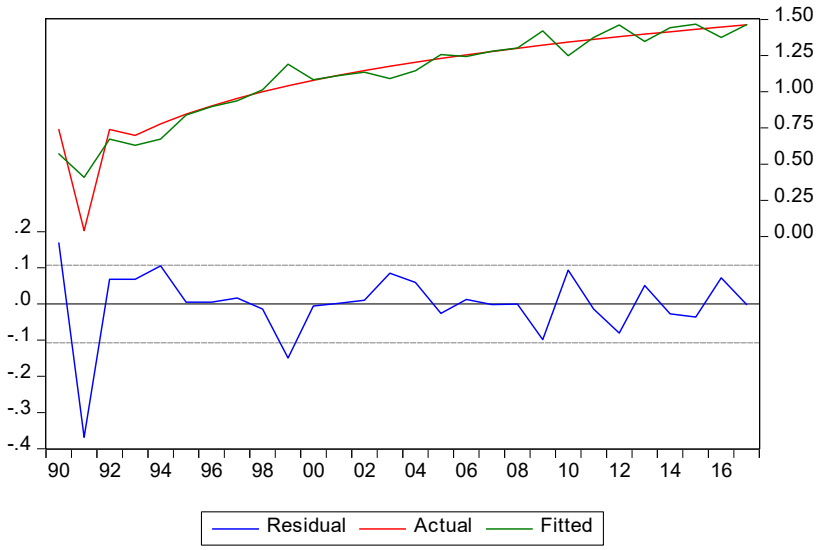
The relative statistics LEXP, LIMP, LINF, LINT, LEXCH Ordinary Least Squares model of Exchange Rate (LEXCH) is statistically significant to the Gross Domestic Product.

The estimated value of β_1 is 0.0014this shows that there is an increase relationship between Exports (LEXP) and Gross Domestic Product (GDP). That is, a relative change in B1 that is export will result in about 0.0014increases in Gross Domestic Product (GDP), which is very low. The estimated value of β_2 is 0.7755. This shows that an inverse relationship between Interest Rate (LINT) and Gross Domestic Product (GDP). That is, a relative change in Interest Rate (LINT) will result about 0.77decreases in Gross Domestic Product (GDP).The estimate of β_3 is 0.0215. This implies correspondent relationship among Inflation rate (LINF) and Gross Domestic Product (GDP). However, a relative change in Inflation Rate (LINF) will account for 0.0215 increase in Gross Domestic Product (GDP).The estimate of $\beta_4$is 0.0030 suggests inverse relationship between Exchange rate (LEXH) and Gross Domestic Product (GDP). This means that unit change in exchange rate (LEXH) brings about 0.003 decreases in Gross Domestic Product. The estimated value of β_5 is 7.1874. This shows a direct relationship between Importation (LIMP) and Gross Domestic Product. A relative change in Import (LIMP) will result in about 0.0005 increase in Gross Domestic Product.

Investigating the overall significance of the model. The R-square is 0.926605, implying that the coefficient of determination (R^2) is statistically significant at 92.6% which adjudge

the model as accurate and highly fitted. The adjusted R-square (ADJ^2) indicates that about 90.5% variation in the endogenous variable can be explained by the exogenous variables while 0.8% is accounted for error and other economic policies and structural change over time. To test for the significance of the individual parameter, we check if the probability value of t-stat for the coefficient of the regression parameters (β_i) is less than the 0.05 at 5%critical value, we accept alternative hypothesis (H_1) and conclude that they are statistically significant to the endogenous variable (LRGDP) otherwise is not significant. Based on these arguments, LEXCH, LINF, LINT, LIMP and LEXP are statistically significant to the Gross domestic product (LGDP). The result also confirm that the model has no presence of first order serial auto correlation as the DW-test statistic (2.02) as shown in Table 4, fall within the interval of rule of thumb 2.0 to 4.0 based on the concept of DWH at statistics. The value of F-statistics is 44.18 and the probability associated with it is (0.000) which is less than 0.05 at 5% level of significance. This means that there exists statistical significance between Exchange Rate variables (LEXCH) and Gross Domestic Product (GDP).

Figure 2. *Residual function analysis*



The Residual Function analysis of GDP to Exchange rate in the above Figure 2 reveals that one standard deviation shock of Exchange rate variables to GDP was negative between the periods 1 and 2 but became positive from period 3 to period 6. The shock was negative beginning from period 7 to 9. The pattern of the effect of Exchange rate to GDP variables experienced negative trend behavior from 7 to 9 periods. Raising trend set in from period 10 to period 16 respectively. The graphical behavior of the shock of Exchange rate to GDP variables as presented in Figure 2 above was observed to be negative from period 1 through to period 2 and period 7 to 9. This indicates one standard deviation positive shock of Gross domestic product to GDP. A negative shock exists within the periods of 3 to 6 and 10 to 16.

Table 8. *Granger causality test results*

Null hypothesis	F- statistics	Prob.	Granger cause	Direction
LRGDP does not Granger Cause LEXCH	0.22540	0.7994	No	None
LEXCH does not Granger Cause LRGDP	0.18756	0.8298	No	None
LINF does not Granger Cause LRGDP	8.36262	0.0011	Yes	Unidirectional
LRGDP does not Granger Cause LINF	0.52863	0.5942	No	None
LINT does not Granger Cause LRGDP	2.77156	0.0767	Yes	Unidirectional
LRGDP does not Granger Cause LINT	1.41098	0.2578	No	None
LIMP does not Granger Cause LRGDP	3.920290	0.0294	Yes	Unidirectional
LRGDP does not Granger Cause LIMP	0.49343	0.6148	No	None
LEXP does not Granger Cause LRGDP	8.88560	0.0008	Yes	Unidirectional
LRGDP does not Granger Cause LEXP	1.45559	0.2474	No	None

*significant at 5% level, p value < 0.05.
Source: Author's calculations.

The causality test points out effect of Exchange rate variables on Gross Domestic Product. It is significant in explaining the causal effect on the Exchange rate on Gross Domestic product. In other words, Gross Domestic Product (LGDP) Granger causes Exchange Rate (LEXCH) but Exchange Rate does not granger cause GDP. More so, Interest Rate granger causes Exchange Rate (LEXCH) but Exchange Rate (LEXP) does not granger cause Interest Rate, Inflation Granger cause GDP while GDP does not granger cause inflation. Import does not granger cause GDP and GDP does not granger cause import, Export does not granger cause GDP and GDP does not granger cause export. These imply short run causality effect of the variables, the variables have uni-directionally. However, the value of the joint significance implies that the previous values of Exchange rate, Interest Rate and inflation rate are more influential in determining the performance of the economy (GDP) among other values of the variables taken together. For (LEXCH), LINT, LINF, granger causes LGDP for LEXP and LIMP do not Granger causes Gross Domestic Product (LGDP) in any direction implying no joint significance which confirm that there is jointly no previous values of other Exchange rate variables that can exact influence on the value of Gross Domestic Product (LGDP) because the value of probability associated with the Granger F-statistic is greater than the critical value at 5% hence the significance of the variables do not cause and effect Gross Domestic Product (LGDP) at the 5% level. This means what drives inflow of Exchange Rate (LEXR) in India is the growth of other macroeconomic variables such as Interest Rate (LINT), LIMP and LEXP which give rise to economic performance in India.

6. Conclusion and policy implications

The study examined on the relationship between Gross domestic Product (GDP) and its affected variables like Exchange rate, interest rate, Inflation, Import and exports of India using time series data spanning 1990 to 2017. The study employed the Ordinary Least Square (OLS) method of estimation and Granger causality test for data covering the period from 1990 to 2017. The results from the estimation analyses reveled that there is a short-run relationship between exchange rate, inflation rate, interest rate and GDP. The result obtained from the unit root analysis indicates at least one time series variable property is stationary. The study concludes that in India, the factors that influence the level of growth

rate are extent of Exchange rate and its variables. Based on the findings, from the Granger causality investigation procedure at 5% critical value are EXCH, INT, INF, IMP and EXP among other variables affects economic growth. The study recommends the need to be technological incline in all sectors of Indian economy, excess and over budgetary inflation and implementation should be cut to barest minimal level to avert the ideal of external borrowing which most consequently result in external debt and services. The Indian government should show to the path of redirecting its investment profile by channeling it towards capital projects of the government. The policy implication of this work is that, economic growth can be relied upon for advancing economic in India. The research outcome could help policy makers and corporates to improve their domestic resources.

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