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Modeling the Effect of Exchange Rate on Rwanda Gross Domestic Product using Co-integration Approach

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Abstract:- This research project aims at Modeling the Effect Exchange rate (US dollar-Rwandan franc) on Rwanda Gross Domestic Product by using co-integration approach of time series. Since, there are few studies talking about this topic of the effect of exchange rate on gross domestic product all over the world and particularly no clear study referred to Rwandan data, that is the reason why the researcher is investigating to see if there is a clear effect that exchange rate can make on gross domestic product.

The quarterly time series data of both variables for the period of 2006−2016 were sourced from National Institute of Statistics of Rwanda and central bank and analyzed, the Population under study altogether forms the sample, and data were analyzed using some statistical software such as E-views and STATA. The Unit roots test was checked for stationary of time series data at 5% level of significance.

Johansen methodology was used to see whether there is a long run relationship or not. The results revealed that the variables were co-integrated using trend and intercept model with one co-integrating equation, so, we applied vector Error Correction Model. Other tests were verified to test the presence of autocorrelation and heteroscedascticity and they were found to be absent.

A causality test was also applied and the results showed data there is One directional causality running from Gross Domestic Product to Exchange Rate but not in reverse. Thus, a clear relation was detected; stabilizing monetary policies will boost economy.

Keywords:- *Exchange Rate, Gross Domestic Product, Vector Auto Regressive.*

I. INTRODUCTION

It has been identified that the economic growth of any country depends on the increase production of goods and services. Therefore the economic growth can be defined as the increase in gross domestic product of that country. The exchange rate is defined as the measure of international competitiveness, the change of exchange rate of a country will cause the fluctuation of foreign trade and thus imbalance of international balance of payments.

At around 1916, the German East African Rupie was replaced by the Belgium Congo franc, this was after Belgium took over Rwanda as a colony from German. This went and lasted until 1960 when both Rwanda and Burundi franc started being used. Thereafter in 1964, Rwanda started delivering its own francs.

According to BNR annual report 2015−2016; Rwanda's total trade grew from US$ 2.3 billion 2010 to US$ 3.9 billion in 2014, an average increase of 14% over the last five years. Total exports from both goods and services amounted to US$1.3 billion, up 18% over the last five years. Total imports amounted to US$ 2.6 billion an increase of 13% between 2010 and 2014. Rwanda's trade deficit has increased by 9% over the last 5 years, from US$956.7million to US$1.3 billion. Despite the persistent trade deficit, exports coverage of imports increased from 42% in 2010 to 49% in 2014. Import coverage by foreign exchange reserves increased slightly from 4.5 months at the end of 2013 to 4.6 months by the end of 2014.

Rwanda's trade deficit is driven primarily by an imbalance in merchandise trade, where the deficit in 2014 stood at 16% of GDP compared to minor deficit of 0.01% of GDP for services. In 2014, Rwanda's total merchandise trade was US$ 3.1 billion in 2014, of which merchandise exports from both formal and informal trade accounted for 23% or US$710.3 million, while merchandise imports accounted for US$ 2.4 billion.

This study focused on the effect of exchange rate on gross domestic product in Rwanda and greatly concerned on analyzing the relationship between exchange rate and gross domestic product.

A. Exchange rate fluctuations

Exchange rate is defined as the rate at which one country's currency may be converted into another. It may change daily with the changing market forces of supply and demand of currencies of one country to another. Exchange rate fluctuations are caused by changes in the demand and supply

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of the currency in the FOREX market, when demand exceeds supply, the exchange rate will appreciate and rise in value. If however the supply exceeds demand, the exchange rate fall in value and depreciate.

As the currency depreciates, imported goods become more expensive to domestic buyers while at the same time exports become less expensive to foreign buyers.

There have been ongoing debates on the appropriate exchange rate policy in developing countries. The debates focus on the degree of fluctuations in the exchange rate in the face of internal and external shocks. Exchange rate is likely, in turn, to determine economic performance.

In this study, in order to concentrate on exchange rate only, we assume exchange rate to be independent from changes in other macroeconomic variables even if exchange rate frequently moves in reaction to other developments in economy

B. Research objectives

To assess the effect of both Rwanda dollar exchange rate and gross domestic product time series data using co-integration approach

The specific objectives of this study are

- Evaluate the stationary of the exchange rate and GDP time series data by unit root test.
- Modeling Exchange rate using time series approach 'co-integration'.
- To build a causality model between our variables (ER and GDP)
- Fitting the Error Correction Model

C. Research hypotheses

Ho_1: there is no significant fact that the data are stationary.

Ho_2: there is no significant fact of co-integration between ER and GDP.

Ho_3: ECM Model can't be filled to the Rwandan data of exchange rate on GDP. Ho_4: Granger causality does not exist.

II. LITERATURE REVIEW

This chapter looks at research previously done on the effect of exchange rate on GDP, as such the chapter will review the relevant theories will regard exchange rate fluctuations, review of empirical studies.

Here, we focus on more recent studies and those closer to the objectives of this paper.

McPherson et al (1998) researched on "Exchange rates and Economic Growth in Kenya based on the data for the period 1970 to 1996. They analyzed the possible direct and indirect relationship between the real and nominal exchange rates and GDP growth. They derived these relationships in three ways: within the context of a fully specified macroeconomic model, as a single equation instrumental variable estimation, and as a vector auto regression model. The estimation results from the three different settings showed that there was no evidence of a strong direct relationship between changes in the exchange rate and GDP growth.

Chen(2012) researched on 'R eal exchange rate and economic growth': his paper studied the role of the real exchange rate on economic growth and in the convergence of growth rates among provinces in China. Using data from 28 Chinese provinces for the period 1992-2008 together with dynamic panel data estimation, he found conditional convergence among coastal provinces and also among inland provinces. The results reported here confirm the positive effect of real exchange rate appreciation on economic growth in the provinces.

Tarawalie (2010) researched on "Real exchange rate behavior and economic growth: evidence from Sierra Leone". The main focus of this paper was to examine the impact of the real effective exchange rate on economic growth in Sierra Leone. First, an analytical framework was developed to identify the determinants of the real effective exchange rate. Using quarterly data and employing recent econometric techniques, the relationship between the effective real exchange rate and economic growth was then investigated. A bivariate granger casuality test was also employed as part of the methodology to examine the casual relationship between the real exchange rate and economic growth. The empirical results suggested that the real effective exchange rate correlates positively with economic growth, with a statistically significant coefficient. The results also indicated that monetary policy was relatively more effective than fiscal policy in the long run, and evidence of the real effective exchange rate causing economic growth was profound. In addition, the results showed that terms of trade, exchange rate devaluation, investment to GDP ratio and an excessive supply of domestic credit were the main determinants of the real exchange rate in Sierra Leone.

Prudence Attah-Obeng and Patrick Enu (2013) examined the relationship between GDP growth rate and exchange rate in Ghana for the period 1980 to 2012. Their research employed the graphing of the scatter diagram for the two variables which are GDP growth rate and exchange rate, established the correlation between GDP growth rate and exchange rate using the PPMC and finally estimated the simple linear regression using OLS. Further tests were performed to ascertain the presence of autocorrelation, heteroscedasticity and multicollinearity. Autocorrelation and heteroscedasticity were found to be absent. The regression results was also found to be very sensible since the DW>R^2. The scatter diagram showed a positive linear relationship between GDP growth rate and exchange rate. The PPMC showed a very significant relationship between GDP growth rate and exchange rate (3.6523>2.04). Also, the regression results showed that there is a positive relationship between GDP and exchange rate in Ghana.

Habib Ahemed and et al, (2011) in this study analyses rthe impact of exchange rate on macroeconomic aggregates in Nigeria, based on the annual time series data for the period 1970 to 2009, the research examines the possible direct and indirect relationship between the real exchange rates and GDP growth, the estimation results show that there is no evidence of a strong direct relationship between changes in the exchange rate and GDP growth.

Joseph and et al (2011) in this study based on the relevant data from 1985 to 2010, in this study uses a quintile regression model to make an empirical research about the effect of GDP and exchange rate on foreign exchange reserve. The findings show that both GDP and exchange rate have a remarkable influence on the size of foreign exchange reserve and the effect of exchange rate on foreign exchange reserve is higher than GDP at mean place and middle and lower quintile, smaller than GDP at higher quintile.

Kennedy m oude (2013) conducted a research on the impact of exchange rate on GDP in Kenya, findings indicates that the exchange rate fluctuations has significant adverse effects on GDP, contrasting the growth of real output and demand for investment and exports, while raising inflation.

Dr.G. Jayachandran (2013) provided empirical estimates of the economic relationship between exchange rate, Inflation, Government Revenue and Income growth in India. In the long run the exchange rate and income may not drift a part, but in the short run their relationship is weak and indirect. Together these results provide confirmation that there is no evidence of a strong direct relationship between changes in the exchange rate and GDP growth. Rather India's Economic growth has been directly affected by fiscal and monetary factors. Particularly the growth of government revenue and economic growth.

Vuranok(2009). In this term project, Vuranok examines the relationship between the two in Turkey by investigating Gross Domestic Product as an economic indicator, on a quarterly basis. The theoretical Johansen's test procedure for analyzing time series is discussed in details but the results presented were analyszed using Schwarz Criteria. Residuals did not show any autocorrelation. There existed no long run association between the two variables. Vuranok explains this as a failure of existence of a strong financial system with developed financial markets. It was suggested that, if the same procedure is done in a well-developed financial markets, then a perfect positive relation will be observed.

III. METHODOLOGY

Time series data on the exchange rate have been collected from the central bank Files while GDP data were from the National Institute of Statistics of Rwanda files (exchange rate, GDP quarterly data for the period 2006−2016). The collected data were analyzed using statistical Packages such as E-views and STATA.

A. Research design

This research was designed to assess the effect of exchange rate on GDP in Rwanda.

B. Size of population

The target population for this study contained all the quarterly average of exchange rate, GDP growth rate, for the period under study.

C. Sampling

All the population under study was used to form the sample

D. Data collection

The research depended on secondary data which were collected from the central bank of Rwanda and national institute of statistics of Rwanda files for the period under study (2006-2016) for further analysis.

E. Data analysis

This study intended to assess the effect of exchange rate on Rwanda GDP. Many tests such as unit root test, Johansen test, Vector error correction (impulse response and variance decomposition), granger casuality test ,… were checked/treated using statistical package E-Views.

III. RESULTS AND DISCUSSIONS

In this section we examined the effect of exchange rate on gross domestic product in Rwanda using co-integration approach. We considered the quarterly data where the data for the exchange rate were sourced from the National Institute of Statistics of Rwanda (NISR) and those for GDP were sourced from National Bank of Rwanda.

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The first step here, we checked the order of integration of each variable using the Augmented Dickey Fuller to clearly see if the variables are stationary or co-integrated, means integrated with the same order and errors are stationary. If that so, the co-integrated variables are defined to have a long run equilibrium relationship. We check the order of integration by conducting a Unit root test.

The second step was, estimating the model called co-integrating equation and test whether the residuals are stationary. Third, we check for the Johansen method of co-integration, the VECM for short run relationship together with the use of impulse response and variance decomposition to forecast the behavior of a variable given both its present and previous data and the data of another variable. Finally we used the granger casuality to study the link between exchange rate and GDP of Rwanda data in the specified period.

A. Results and interpretation

The results of unit root test are based on the assumption that,

H_0: the process has unit root (non-stationary) vs.

H_1: the process has no unit root (Stationary) and we need to compare the ADF test statistics with the critical value.

After determining the number of lags to be used in the VECM/VAR, we then ran the Augmented Dickey Fuller to test if the two processes are unit root. ADF states that the if the test statistics is smaller (larger) thaan the critical values we do not reject (reject) the null hypothesis of unit root in the data.

That is, if t*< ADF critical value, accept the null hypothesis, i.e, unit root exist which means data are not stationary.

If however, t*>ADF critical value, we reject null hypothesis, i.e, unit root does not exist means the data are stationary.

Alternatively, we look at our p-values. if the p-value is less than 0.05, reject your null hypothesis at 5% significance level.

series	Model	lag	Cv 1%	Cv 5%	Cv 10%	ADF Stats	p-values
DLGDP	Intercept and trend	4	-4.21186	-3.52975	-3.19641	-7.23602	0.0000
	intercept	4	-3.61045	-2.93898	-2.60793	-6.22537	0.0000
	none	4	-2.62896	-1.95011	-1.61133	-1.25508	0.1889
DLER	Intercept and trend	4	-4.19850	-3.52362	-3.19290	-4.37584	0.0063
	intercept	4	-3.60098	-2.93500	2.60583	-2.45134	0.1346
	none	4	-2.62401	-1.94931	-1.61171	-0.49499	0.4954

The above table shows, ER and GDP after first difference because at the level the processes were not stationary. So we proceeded checking at their first difference and they show that ER and GDP are stationary process at their first difference. This means, both ER and GDP are integrated with order one (ER ~ 1 and GDP ~ 1). The test statistic shows that the GDP and ER have a unit root; it lies within the acceptance region. This has an indication that GDP and ER can be co-integrated, therefore we need to perform a test of co-integration. Two approaches will be checked here, ENGLE GRANGER co-integration analysis and JOHANSEN Juselius co-integration method

B. The Johansen Juselius Method For Cointegration

Having found that the variables are integrated or stationary at the first level, the research continued the process of testing cointegration. The Johansen Juselius method was applied. The results of both trace and maximum Eigenvalue tests are presented below.

If variables have different trends they can not stay in fixed long-run relations to each other, implying that you can't model them and when integrated variables are involved there is usually no valid base for inference based on standard distribution (Sjö, 2011).

The JJ method proposed two tests: the trace and the maximum eigenvalue test. The first one test the null hypothesis that there are at most "r" co-integrating vectors against the alternate hypothesis that there are more than 'r' vectors. The second one tests the null hypothesis that there are at most 'r' co-integrating vectors against the alternate of 'r+1' co-integrating vectors.

Date: 04/10/17 Time: 10:30
Sample (adjusted): 2006Q3 2016Q3
Included observations: 41 after adjustments
Trend assumption: Linear deterministic trend (restricted)
Series: LGDP LER
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.424549	35.14366	25.87211	0.0026
At most 1	0.262553	12.48702	12.51798	0.0506

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.424549	22.65664	19.38704	0.0161
At most 1	0.262553	12.48702	12.51798	0.0506

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

LGDP	LER	@TREND(06Q2)
-31.52042	-54.53902	1.455938
-0.763136	-2.070569	0.163688

Results: According to probabilities given in figure above, the analysis rejects the null hypothesis that there is no co-integrated vector (None), both Trace and Maximum Eigenvalues reveal that there is one cointegrating equation between these two variables at 5% level of significance for the linear deterministic trend model. The lag length selection of different information criteria is reported in the table below

VAR Lag Order Selection Criteria
Endogenous variables: D(LGDP) D(LER)
Exogenous variables: C
Date: 04/10/17 Time: 11:23
Sample: 2006Q1 2016Q4
Included observations: 37

Lag	LogL	LR	FPE	AIC	SC	HQ
0	180.1280	NA	2.26e-07	-9.628543	-9.541466	-9.597844
1	189.9517	18.05438	1.65e-07	-9.943338	-9.682108*	-9.851242
2	196.4448	11.23131	1.44e-07	-10.07810	-9.642717	-9.924607
3	203.0717	10.74629*	1.26e-07*	-10.22009*	-9.610557	-10.00520*
4	203.9418	1.316894	1.51e-07	-10.05091	-9.267219	-9.774621
5	207.1351	4.487888	1.60e-07	-10.00730	-9.049461	-9.669619

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

The AIC, HQ, FPE,LR selection show that the optimal lag length should be 3 while SC selected 2, Therefore it is up to the researcher to use one of the selection but mainly we are using a 3lags since it was selected by many Information Criteria..

C. Vector Error Correction Model

The presence of co-integration between variables suggests a long run equilibrium relationship among the process under consideration. This research is investigating the effect of ER on GDP for Rwanda time series data, the co-integration test results shows a long run relation between the variables considered,

As per Nasiruddin Ahmed (2001) the main feature of the ECM is its capability to correct for any disequilibrium that may shock the system from time to time. This is to mean that, it picks up such disequilibrium and guide the variables of the system back to the equilibrium. Here are the VECM Model test results.

Vector Error Correction Estimates
Date: 04/10/17 Time: 11:26
Sample (adjusted): 2007Q2 2016Q3
Included observations: 38 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1	
D(LGDP(-1))	1.000000	
D(LER(-1))	1.460457 (0.50148) [2.91231]	
C	-0.044338	
Error Correction:	**D(LGDP,2)**	**D(LER,2)**
CointEq1	-2.215485 (0.55932) [-3.96101]	-0.150232 (0.08347) [-1.79979]
D(LGDP(-1),2)	0.816198 (0.43935) [1.85772]	0.131876 (0.06557) [2.01129]
D(LGDP(-2),2)	0.242999 (0.30738) [0.79054]	0.116268 (0.04587) [2.53457]
D(LGDP(-3),2)	-0.061589 (0.18645) [-0.33033]	0.032244 (0.02782) [1.15883]
D(LER(-1),2)	2.608860 (1.36954) [1.90491]	-0.233596 (0.20439) [-1.14292]
D(LER(-2),2)	2.552040 (1.37775) [1.85232]	0.067616 (0.20561) [0.32886]

from the results we have that the transformed GDP into logarithm is a function of both logarithms of GDP and ER that is

LGDP = F(LER,LGDP) (4.1)

Results: the VECM results presented in this figure show that if there is innovation or shock, about 15% of LER disequilibrium is corrected every quarter.

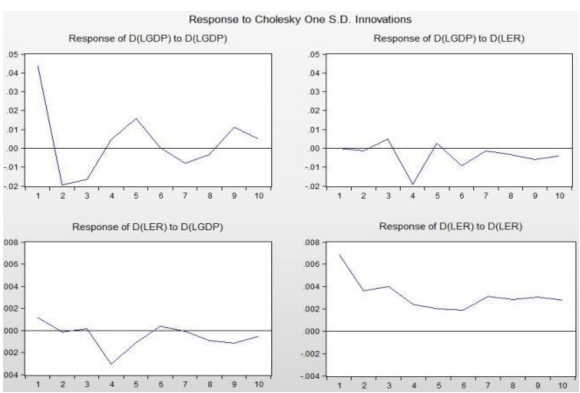
D. Residual tests

According to the results of the VEC residual heteroskedasticity test with p-value = 19.46% exceeding 5%, means residuals are homoscedastic. Looking to the LM test 11 over 12 found to be significant for null hypothesis of no residual correlation. Looking to residual portmanteau test no fact of serial correlation. Therefore we can use this model for forecasting or hypothesis testing.

E. Impulse response

We used the impulse response function to address to the question of how rapidly events in one variable are transmitted to the others, action and reaction analysis can be seen when representing one standard deviation shock for each series. The first line shows the responses of the change of LGDP, one standard deviation, to the change of both LGDP and LER. The second line shows the reaction of the change of LER, one positive deviation, to both LGDP and LER. Zero impulse response means immediate reaction to shocks or innovations. This is, the change of LGDP will be affected by the change of

LER.



Initially one standard deviation innovation or change of LGDP will make LGDP responds to its own innovations by decreasing positively, after first quarter it becomes negative continues changing signs but after eleventh quarter it gains to the equilibrium in the rest of the forecast period.. One positive standard deviation change in LER, make the change in LGDP to react negatively and gradually becomes steady. One positive standard deviation change in LGDP, will make the change in LER to decrease positively but after the first quarter it becomes negative and gradually get steady. One positive standard deviation change in LER, make the change in LER to react positively and becomes steady thereafter for rest of the forecast period.

F. Variance decomposition

Variance decomposition is used in order to get a fair view of the contribution of the variables to shocks, we looked at the proportion of the movement in the GDP that are due to 'own shocks' versus the shocks to the other variable. Here we need to know how much of the s-steps ahead forecasts error variable of GDP is explained by innovations in ER?

As discussed by Koop et al. (1996) and pesaran and shin (1998), for many variables, the ordering of the variables is important in deriving the s-step ahead forecast error variance decomposition.

As it can be observed in this table the contribution of each of these variables is high where when it comes to own innovations/shocks in either long run or short run. Contrary, the contribution of one variable in terms of another become very low, both in short run and long run. For example in short run 99.26% is contributed by LGDP to LGDP show a high contribution and 0.7317% contributed by LER to LGDP(in quarter two) while in long run say quarter 90.62% is contributed by LGDP to LGDP and 9.38% contributed by LER to LGDP.

Again in short run, Real exchange rate depreciation or appreciation remains the principal driver of its own variations throughout the forecast period, that is quarter two, impulse or innovation/shock to lER account for 98.59% change to ER(own shock) and shock to GDP can cause 1.41% fluctuation in ER

Variance Decomposition of LGDP:			
Period	S.E.	LGDP	LER
1	0.045071	100.0000	0.000000
2	0.051035	99.90659	0.093406
3	0.051416	99.16236	0.837641
4	0.052391	96.89692	3.103080
5	0.058325	96.47891	3.521094
6	0.061643	96.58681	3.413189
7	0.063106	96.70073	3.299274
8	0.064372	96.48994	3.510056
9	0.066714	96.42701	3.572991
10	0.068752	96.35532	3.644676
11	0.070235	96.25658	3.743421
12	0.071550	95.95882	4.041177
Variance Decomposition of LER:			
Period	S.E.	LGDP	LER
1	0.006303	6.162222	93.83778
2	0.010401	6.489253	93.51075
3	0.014419	7.764847	92.23515
4	0.017106	5.611073	94.38893
5	0.018866	4.617814	95.38219
6	0.020073	4.294409	95.70559
7	0.021307	4.602033	95.39797
8	0.022587	4.758487	95.24151
9	0.023982	4.933057	95.06694
10	0.025443	5.208205	94.79179
11	0.026963	5.581809	94.41819
12	0.028451	5.860263	94.13974
Cholesky Ordering: LGDP LER			

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G. The Engle Granger Method for cointegration

The hypotheses are: Ho: GDP does not Granger causes ER while H1: GDP Granger causes ER Ho: ER does not Granger causes GDP while H1: ER does Granger cause GDP

The test of casuality was developed by Granger (1983) based on the intuition: if two variables x and y share a common trend , then the current change in x is partly the results of y moving into alignment with the trend value of x.

VEC Granger Causality/Block Exogeneity Wald Tests
Date: 04/10/17 Time: 12:05
Sample: 2006Q1 2016Q4
Included observations: 38

Dependent variable: D(LGDP,2)

Excluded	Chi-sq	df	Prob.
D(LER,2)	5.304297	3	0.1508
All	5.304297	3	0.1508

Dependent variable: D(LER,2)

Excluded	Chi-sq	df	Prob.
D(LGDP,2)	9.626281	3	0.0220
All	9.626281	3	0.0220

Results: According to the result in the table above we fail to reject the null hypothesis that the change in exchange rate does not granger causes change in GDP at 5% level of significance while we reject the null hypothesis that change of GDP does not granger causes change in Exchange Rate, means there is no clear facts that ER does Granger cause GDP but GDP can Granger cause ER. Therefore there is one directional causality moving from GDP to ER.

IV. CONCLUSION

Tis research investigated the effect of exchange rate on gross domestic product in Rwanda for the period 2006-2016 using cointegration approach; different tests were employed in order to get to the appropriate results. ADF test has been carried out, series found to be stationary. After establishing VAR equation, 3lags were specified to explain the variables according to the selection of LR, FPE, AIC and HQ. The Johansen cointegration test for long run relationship showed an existence of one co-integrating equation for the model of trend and intercept means there is evidence that Exchange rate has considerable impact in long run but not in short run.

Test of residuals proved no facts of heteroscedastcity, no serial correlation, characteristics of a good model ready for forecasting or hypothesis testing. The results of impulse response analysis of shocking series with one standard deviation revealed that the shock given to change in LER, make the change in LER to react positively and becomes steady thereafter for rest of the forecast period.

The variance decomposition analysis showed that each variable have been greatly affected by its own past values. Finally the test of causal relationship revealed that at 5% significance level of significance. We found one directional causality running from Gross Domestic Product to Exchange.

According to the normalized equation, exchange rate is the key determinant of GDP growth rate in Rwanda. Although there are many factors that are better in boosting the economy of a country, researcher conclude, the existence of a positive relationship between GDP growth rate and the exchange rate in Rwanda. Since our null hypothesis are all rejected and were proved that there is a significant relationship between the two variables, the model present a good fit for the data, therefore the objectives of the study were achieved.

V. RECOMMENDATION

In the long run, the authorities of Rwanda should prioritize stable monetary and fiscal policies. They should intervene in the foreign exchange market as needed to prevent excessive volatility in the real exchange rate. Policy makers should also ensure that resources are put to maximum use under the correct and right avenues such as technical education, better incentive and motivation for effective and efficient performance.

In addition, the authorities should support activities that might lead to increase in foreign exchange inflows and help stabilize the domestic currency and improving exchange rate modeling and forecast at the central bank level, while incorporating the impact of asset prices in domestic monetary policy could improve both the transparency and functioning of the foreign exchange market.

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