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The empirical effect of real interest rate on Investment in Rwanda (1998-2016)

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Abstract: **The main objective of this study was to examine the effect of real Interest rate on investment level in Rwanda over the period (1998-2016).For long run, Johansen Co-integration test was employed. Whereas, vector error correction model (VECM) was used to find short run association over the period of 1998-2016. The results indicated that there was a long-term relationship association among variables.**

Keywords: **Investment, Real Interest Rate, Gross Domestic Product, and Rwanda.**

1. INTRODUCTION

The Real Interest rate is an important economic variable that plays an important role in both macro and micro economy activity. Therefore, a change in Real Interest rates is one of the main factors to judge the macroeconomic situation and the Real Interest rate trend analysis is the main method to predict the macroscopic economic situation. Western economists believe that the market rate of interest, the total social savings and investment are closely linked. Therefore, the current Real Interest rates affect the investment activities. If the Real Interest rate rises, bond prices fall, if the Real Interest rate falls, bond prices rise. The influence of Real Interest rate on investment scale is operate as the opportunity cost of investment on total investment, the rising Real Interest rates increase the cost of investment and then inevitably cause lower income investors to withdraw from the area of investment, so that the demand for investment is reduced.

In view of the fact that banks come in the deposit market as borrowers given they can go insolvent as well as investors, there is no motivation to take for fixed so as to banks' capability to accumulate funds on the interest rate expenses of the funds which will not be biased through their bank resources. To the amount so as the financial shocks have an effect on banks net value it strengthens the influence of banks' ability to attract customers for loans of investing finance International Monetary Fund (2012).

Different from the traditional theory, some scholars concluded that there was a positive correlation between Real Interest rate and investment. Based on the evidence of 21 developing countries, 1971 to 1980, the analysis about the real financial assets showed that there was a positive relationship between the growth of real Interest rates and financial assets. (Lanyi and saracoglu, 1983). And the higher volatility the Real Interest rate had, the more positive the correlation would be (Andrea Beccarini, 2007).

In the field of microeconomics, impulse response was used to analyze the effect of rate policy on investors. Based on the data of Real Interest rates and ISE national 100 index, 2002-2010, the result showed that investors can't cope with the impact of Real Interest rates in the short term (Mustafa and Ayhan, 2012).

Many scholars draw different conclusions about the relationship between Real Interest rate and investment according to a large number of empirical analyses. If investment was added as an endogenous variable into a monetary utility function

model, the result turned out that investment indeed has a certain impact on Real Interest rates (Qing and Chong, 2004). If discount rate was replaced by stochastic Real Interest rate in a real option model, the result turned out that the uncertainty of Real Interest rate had obvious effects on investment (Ingersoll and Ross, 1992).

The research gaps of these thesis scholars forgot to indicate that foreign investors are more attracted by economies where local investment itself is dynamic, and that FDI complements national investment more than substituting for it or competing with it. While FDI brings specific benefits to an economy, it is illusory for any country to expect it to substitute for a lack of national investment .The vast majority of foreign investors do not operate in enclaves. To the contrary, they seek and benefit from a dynamic local private sector, and are dependent upon the availability of skills, infrastructure, and networks of suppliers, all of which are determined mostly by the level of national investment (public and private).

2. MATERIAL AND METHODOLOGY

The study will use time series secondary data. This was enhanced by easy accessibility of secondary data from government's data base and also to be consistent with the previous researchers who also used secondary data such as Fasoranti (2012) and Kosimbei (2013).

The data was obtained from World Bank, in publications and National Institute of Statistics of Rwanda annual report data base.

Model specification

The standard economic theory proposes that investment level depends mainly on two factors: the real Interest rate and the level of income. Accordingly, the variables of this study are as follows:

The dependent variable is investment level, which is proxied by the Gross Fixed capital formation (GCF), since yearly investment levels are not available for Rwanda. The dependent variables are: The real Interest rate (R), which is calculated according to the Fisher equation, i.e. by subtracting the inflation rate from the lending nominal Real Interest rate, and the level of income which is proxied by Gross Domestic Product (GDP).

This study covers the (1998-2016) time period for the following reasons:

First, the nominal Real Interest rate in Rwanda was determined by the International Monetary Funds (IFM) authority represented by Central Bank of Rwanda before 1998, this rate has been floating since 1998.

Second, the categorization of the Real Interest rate into lending rate and deposit rate by Central bank of Rwanda is published in its bulletins since 1998.

The monthly and quarterly data are not available in Rwanda, the data used based on annually data.

According to economic theory investment is a function of real Interest rate and level of income.

$I = f(R, Y)$……1

(-) (+)

Empirical model:

$LGCFt = \beta 0 + \beta 1 LGDP_t + \beta 2 RI_t + + U_t$ ……..……..……...…….……..2

Where:

GCF: The investment, proxied by Gross fixed capital Formation

RI: the Real Interest rate

GDP: The income level, proxied by Gross Domestic Product

U: error term

L: Logarithm

T: time.

Real Interest rate is used in this context because borrowers and lenders in their investment decisions care about the real Interest rate rather than the nominal.Where β_0 is the intercept and β's are slope coefficients. Based on the theories, expected sign of variables in the model are the following:

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Table 3.1: Variables and expected sign

Variables: LGCF,LGDP,RI	Gross capital formation proxied as Investment, Economic Growth proxied as Income , Real Interest rate	Expected sign is Negative or Positive

3. FINDINGS AND CONCLUSION

3.1 Findings

3.1.1 Data analysis

The data which will be used in estimating investment function in Rwanda are annual observations over the period of 1998 to 2016 on GCF proxied as investment, GDP proxied as Income and Real Interest rate. These three series were obtained from different sources includes: NISR, NBR, Mundi index.

3.1.2 Selection of lag length

The criteria for selecting the lag length consists of important step. These are different tests that would indicate the optimal number of lags. A critical element in the specification of VAR models is determination of the lag length of the VAR.

Table 3.2: VAR Lag Order Selection Criteria

VAR Lag Order Selection Criteria
Endogenous variables: LGCF LGDP RI
Exogenous variables: C
Date: 11/26/18 Time: 17:42
Sample: 1998 2016
Included observations: 16

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-36.70646	NA	0.028729	4.963308	5.108168	4.970726
1	20.08871	85.19276*	7.54e-05*	-1.011089	-0.431647*	-0.981417
2	29.59478	10.69433	8.29e-05	-1.074347*	-0.060325	-1.022421*
3	34.27788	3.512326	0.000225	-0.534735	0.913869	-0.460555

*** 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

Since LR, FPE and AIC suggest 1 lag, we use 1 lag in our VAR

Notes: The findings indicate the optimal lag length of 1 for the Johansen Co-integration test

3.1.3. Cointegration test

Table 3.3: Johansen cointegrating test for (trace test)

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.729461	39.51896	29.79707	0.0028
At most 1 *	0.576390	17.29423	15.49471	0.0265
At most 2	0.146463	2.692226	3.841466	0.1008

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

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Table 3.4: Johansen cointegrating test for (Max Eigen value)

Unrestricted Cointegration Rank Test (Maximum Eigen value)				
Hypothesized No. of CE(s)	Eigen value	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.729461	22.22473	21.13162	0.0350
At most 1 *	0.576390	14.60200	14.26460	0.0442
At most 2	0.146463	2.692226	3.841466	0.1008
Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level * denotes rejection of the hypothesis at the 0.05 level **MacKinnon-Haug-Michelis (1999) p-values				

Notes: These results give an indication for the existence of long-run relationship between real interest rate and investment.

The max and trace values statistic strongly reject the null hypothesis for "none "cointegration vector in favor of at least one cointegrating vectors at the 1 percent significance level .therefore the cointegrating vector indicated is given follows.

Table 3.5: Normalized co integrated coefficients for short and long run

Dependent Variable: D(LNGCF)
Method: Least Squares
Date: 18/10/18 Time: 16:14
Sample (adjusted): 2000 2016
Included observations: 17 after adjustments
D(LNGCF) = C(1)*(LNGCF(-1) +0.00915265417927*RI(-1) -
0.25702816514*LNGDP(-1) +0.266611616002*@TREND(98) +
33.5756053394) + C(2)*D(LNGCF(-1)) + C(3)*D(RI(-1)) + C(4)
*D(LNGDP(-1)) + C(5)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.172322	0.224766	-0.766674	0.4581
C(2)	0.305519	0.336224	0.908679	0.3814
C(3)	-0.001061	0.003969	-0.267393	0.7937
C(4)	-0.533821	0.540212	-0.988169	0.3426
C(5)	0.120926	0.019746	6.124232	0.0001
Prob(F-statistic)	0.870564			

SOURCE: EVIEWS 7, 2018

Looking at the sign of error correction term (that is negative) that is: - **0.172322**; it shows that there is long run relationship between variables running from independent variables (LNGDP, RI) to dependent variable LNGCF. That is; the variables may be cointegrated in the long run. And this leads as to rejection of hypothesis (H_0) in favor of (H_1). Those hypotheses are stated as:

Ho: There is no long run relationship between macroeconomic factors proxies and the level of economic growth in Rwanda.

H_1: There is long run relationship between macroeconomic factors proxies and the level of foreign direct investment in Rwanda. Therefore we confirm that: There is long run relationship between macroeconomic factors proxies and the level of Investment in Rwanda during the period of the study (1998-2016).

A significant Ect (-1) coefficient means that all things being equal, whenever the actual value of DLNGCF falls below the value consistent with its long-term equilibrium relationship, changes in DLNGDP, and RI help bring it up to the long term

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equilibrium value. The size of the coefficient indicates that the speed of adjustment to equilibrium (whenever there is an imbalance) is about **17.23** %. This is a moderate speed of adjustment to long run equilibrium. Thus, long run equations (check on the table above), relating GCF to its explanatory variables is explained bellow and its cointegration equation is based on the following residuals:

$$\varepsilon_{t-1} = Y_{t-1} - \beta_0 - \beta_1 X_{t-1}$$

D (LNGCF) = C (1)*(LNGCF (-1) +0.00915265417927*RI (-1) - 0.25702816514*LNGDP (-1) +0.266611616002*@TREND

For being able and easy to explain how explanatory variables (LNGDP, RI) affect the dependent

Variable LNGCF; the long run equation becomes:

LNGCF = 0.266611616002 - 0.00915265417927LNRI + 0.25702816514LNGDP

From the above result the following explanations is how each explanatory variable is affecting the dependent variable $ß_1$ = - 0.009152654: In the long run RI is negatively related to Rwandan GCF as we have expected to have positive or negative relationship in this case the result indicate that we have negative relationship with RI and GCF. If RI increases by 1%, GCF decline by 0.009153 %, ceteris paribus.$ß_2$ = 0.25702816514 this means that in the long run GDP is positively related to Rwandan GCF as we have expect to have positive or negative relationship in this case the variable GDP is a positive related to investment as indicated in the results above . If GDP increases by 1%, GCF increases by 0.25702816514 %, ceteris paribus. We expect to have positive or negative relationship, in this case the variable GDP is said to be a positive while RI negative with investment in Rwanda for the period of research and Wald test is used to test for the significance of coefficients of the model.

3.1.4. Test for Significance of Coefficients

Table 3.6: Wald test for significance of coefficients

Wald Test: Equation: Untitled			
Test Statistic	Value	Df	Probability
F-statistic	0.390491	(3, 12)	0.7620
Chi-square	1.171473	3	0.7599

SOURCE: EVIEWS 7, 2018

From the above test due to the P- value of chi-square is **(0.7599)** is greater than 0.05 therefore, there is no short run causality between variables running from RI and GDP to GCF but the variable that can help policy makers to correct the shock economic in the short run is GDP and RI respectively.

3.2. Conclusion

The results indicates a long run relationship in association with variables. If RI increases by 1%, GCF decline by 0.009153%, ceteris paribus. If GDP increases by 1%, GCF increases by 0.2570 %, and Wald test shows that there is no short run causality between variables running from RI and GDP to GCF but the variable that can help policy makers to correct the shock economic in the short run is GDP and RI..As, real interest rate is not dynamic further researches should be carried out.

REFERENCES

[1] Mustafa Ibicioglu, Ayhan Kapusuzoglu, (2012). An empirical analysis of impact of central bank policy interest rate on the decisions of share investors: evidence from Turkey. Procedia - Social and Behavioral Sciences, Vol 62, p. 489 -493

[2] Friedman, M. and Kutter, K. N. (1992). Money, Income, Prices and Interest Rates. American Economic Review, 82, 51-72

[3] Ingersoll J.E., Ross (1992). Waiting to Invest. Investment and Uncertainty. Journal of Business, Vol 65, p. l-29

[4] Beccarini A. (2007). Investment Sensitivity to Interest Rates in an Uncertain Context: is a Positive Relationship Possible? Economic Change and Restructuring 40: 223-234

[5] Fasoranti, M. M. (2012). The Effect of Government Expenditure on Infrastructure on Growth of Nigerian Economy. International Journal of Economics and Financial Issues.

[6] Lanyi, A. and Saracoglu, R. (1983) Interest Rate Policies in Developing Countries. Occasional Paper 22, Washington DC, International Monetary Fund.