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Real Interest Rate and Investment Nexus: The Case of Ghana

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Keywords: *investment, interest rate, inflation.*

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Real Interest Rate and Investment Nexus: The Case of Ghana

Daniel Ofori [α] & George Asumadu [σ]

Abstract- This study examines variations in interest rate and investment determination in Ghana. The study is necessitated by the fact that previous studies only examined the effect of interest rate on investment determination without assessing the bi-casual relationship between these macroeconomic variables. Investment decision is seen as demand for credit in an economy and this study calculated the annual time series for the period 1990-2014 and examined the determinants of interest rate variation and its impact on investment. Unit roots and co-integration tests were conducted. Data for the study were extracted from the World Development Indicators Database. The study revealed that variation in interest rate played a negative and highly significant role in investment decision in the economy and demand for credit also had negative and significant influence on interest rate variations in both the short run and long run. Although, the study deduced that investment has an indirect relationship with interest rate variation, other variables such as debt burden, economic stability, foreign exchange, shortage and lack of infrastructure affect gross domestic investment. Improvement in these key macro-economic variables is a necessary condition towards promoting investment. The findings and recommendations provide vital information relevant for policy formulation and implementation aimed at boosting investment in Ghana.

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I. Introduction

The role of investment in economic growth can hardly be overemphasized in any economy (Chhibber 2016). Both economic theories as well as empirical work have concluded that there is a positive relationship between investment and economic growth (Blanchard and Summers, 1984; Hansen & Seshadri, 2013). As a result, policy makers and economists are often concerned with the factors that determine the level of investment in an economy. One of such factors that exert greater influence on investment is the real interest rate.

The relationship between investment and the real interest rate has generated interesting discussions in economic theory. As much as real interest rate plays a crucial role in the monetary policy transmission mechanism, the relationship between the real interest rate and investment is of great importance to policy makers.

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According to the neoclassical theory of investment, there is a negative relationship between investment and the real interest rate. Thus, a rise in the real interest rate raises the real cost of capital and as a result reduces investment level. However, a reduction in the real interest rate lowers the real cost of capital and hence raises investment level (Haavelmo, 1960 and Jorgenson, 1963).

There are two conflicting views of the effect of the real interest rate on the level of private investment. A high interest rate level raises the real cost of capital and therefore dampens the private investment level. On the other side, poorly developed financial markets in less developing countries (LDCs) and inadequate access to foreign financing for most private projects; both imply that private investment is constrained largely by domestic savings. These in theory, are expected to respond positively to higher real interest rates.

In Ghana, investment growth has often been linked with the real rate of interest. Like in many other countries, the Central Bank (i.e. Bank of Ghana) fixes the prime rate and the commercial banks compete with each other in determining the level of interest rate on loanable funds.

In an interview organized by Joy FM, an Accra-based radio station, about *my Business 2010*, Alhaji Asuma Banda, an astute entrepreneur in Ghana lamented over the high interest rate charged by the commercial banks in Ghana. He said “the slow growth of the private sector is a result of the high interest rate” (www.myjoyonline.com).

Ghana’s persistently high interest rates have awful consequences for sustainability and long term prospect for the country’s economy. In fact, high – interest rate, high cost of credit translate into high cost of doing business. High cost of doing business translates into the cost of production for industries which are then passed on to consumers in the form of higher prices of goods and services. The overall consequence is that high cost of credit affects the national growth potentials.

The objective of this paper is therefore to investigate the links or impact of interest rate on the level of investment in Ghana, using data covering periods 1990 to 2014.

The paper is structured into five sections namely, the introduction, reviewed literature, econometric methodology, discussion of results and the conclusion.

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II. Reviewed Literature

Investment decisions follow certain determinants as they are the precursor of real interest rates just as opined in the introduction of this paper. Macroeconomic variable like inflation, exchange rate, unemployment, interest rate, etc affects investment through productivity or economic growth. Many studies have investigated the relationships of these variables on GDP in both advanced and developing countries (Kiichi, 2012, Gokal and Hanif 2004, Mckinnon and Shaw, 1973, Mundell, 1963). Mckinnon (1973) and Shaw (1973) posit that letting market forces determine the real interest rate leads to increase in savings that spur economic growth through higher interest rate by inducing savings. They predicted positive relationship between real interest rate and economic growth. In emerging market like India, Kiichi (2012) found negative impact of higher real interest rate on corporate investment with macroeconomic data. On the firm level variables like profitability, liquidity and leverage were considered as key determinants of corporate investment *ibid*. Many studies on interest rates have been done in Asian countries with contrasting results Fry (1978) and Giovannini (1983).

Price of loanable funds do not come cheap and the market forces has a role to play in line with classical dogma, that is, demand and supply in such market (Mishkin, 1986).

The work of Onwumere et al (2012) about interest rate liberalization on savings and investment in Nigeria, using data from 1976 to 1999 concluded that there was negative non significant impact on savings but at the same time, negative significant impact on investment in Nigeria.

In the Ghanaian scene, Mensah and Okyere's study (2015) about the impact of interest rate, inflation and GDP on real economic growth rate in Ghana concluded that interest rate has a negative influence on real growth rate, using data for the period 1980 – 2012.

III. Empirical Strategy

The study used annual time series data for the period 1990 – 2014 obtained from published sources. The major sources of data included World Bank's World Development Indicators, 2008 CD-ROM and IMF International Financial Statistics, 2006. Other sources included annual reports of Bank of Ghana and Ghana Macroeconomic Review by Centre for Policy Analysis (CEPA). All estimations as well as the various econometric tests were carried out using the Microfit 4.1 econometric software.

The dependent variable in this study is represented by Gross Domestic fixed investment which includes plants, machinery and equipment. It also includes the construction of roads, railways, and others such as schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings and it is used as a proxy for investment. It refers to real capital calculated using 2000 constant prices.

The explanatory variables include real interest rate (R), inflation (INFL) and real Gross Domestic Product (Y). Interest rate here refers to the real interest rate and measures the annual percentage increase in the real value of a financial asset. It is calculated by making adjustments for increase in price (or inflation). In this study, the Bank of Ghana's prime rate is used as a proxy for interest rate. Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a fixed basket of goods and services that may be fixed or changed at specified intervals, such as yearly.). Gross Domestic Product is the total value of goods and services produced within the borders of an economy or a country during a given period of time measured in market prices. It is calculated using 2000 constant prices.

a) *Model Specification*

According to neoclassical economic theory, the level of investment mainly depends on interest rate. This is expressed as:

$$I_t = f(R_t) \quad (1)$$

Where,

$I_t \rightarrow$ The Level of Investment

$R_t \rightarrow$ Rate of Interest

$t \rightarrow$ Time

However, there are several other variables that determine the level of investment. Thus, in this study we will introduce the level of income as well as inflation as other variables that affect the level of investment.

Consequently, eqn (1) becomes

$$I_t = f(R_t, INFL_t, Y_t) \quad (2)$$

Where,

$INFL \rightarrow$ Inflation

$Y_t \rightarrow$ The Level of Income

Eqn (2) can be expressed as

$$I_t = \beta_0 + \beta_1 R_t + \beta_2 INFL_t + \beta_3 Y_t + \varepsilon_t \quad (3)$$

Where ε_t is the error term. All the other variables have already been defined.

From eqn (3) the specific model for the level of investment for the Ghanaian economy in log-linear form is given as:

$$\ln I_t = \beta_0 + \beta_1 \ln R_t + \beta_2 \ln INFL + \beta_3 \ln Y_t + \varepsilon_t$$

Where the β_s represent the elasticity coefficients

IV. Empirical Results

a) *Test for Stationarity*

The stationary test is based on the DF-GLS[1]. The results of the unit root test are presented in Table 1.

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The DF-GLS test involves testing the null hypothesis of non-stationarity of the variables against the alternative hypothesis of stationarity. The test regression included both an intercept and a linear trend for the log levels as well as intercept with no linear trend for the first differences of the variables.

Table 1: Results of the Stationarity Test

Log Level			First Difference		
Variable	Lags	DF-GLS stat	Variable	Lag	DF-GLS Stat
LI	3	-1.0647	ΔLI	1	-5.6974**
LR	3	0.1032	ΔLR	1	-3.8842**
LINFL	3	-1.3271	ΔLINFL	1	-3.3271**
LY	3	-1.6410	ΔLY	1	-3.0901**

*** denotes the rejection of the null hypothesis of non-stationarity at 1% significance level. Results were obtained from Microfit 4.1*

The results from the table indicate that all the variables are integrated of order 3 (i.e. I(3)). However, all the variables become stationary after the first difference as they are integrated of order 1 (i.e. I(1)). Thus, the null hypothesis of non-stationarity can be rejected and the alternative hypothesis of stationarity accepted.

b) Test for Multicollinearity

There is multicollinearity when two or more independent variables have a log-linear relationship, or correlation, with one another. There are two important consequences associated with multicollinearity. First, standard errors of the coefficients would be very large thus, increasing the probability of type two error (failing to reject a false null hypothesis). Secondly, the most important consequence of perfect multicollinearity is that the Ordinary Least Squares method of estimation will not run. A correlation coefficient matrix is usually used to show correlation (multicollinearity) between independent variables. With absolute values greater than |0.70| on the correlation matrix, multicollinearity is present. Sensing the possibility of some correlation between the individual explanatory variables, the model was tested for multicollinearity and found no indication of significant problem of multicollinearity. A set of Pearson correlation matrix showing the correlation between the explanatory variables are given below:

Table 2: Correlations matrix

		Interest	Inflation	GDP
Interest	Pearson Correlation	1	-.376**	.417**
	Sig. (2-tailed)		.000	.006
	N	18	18	18
Inflation	Pearson Correlation	-.376**	1	-.283**
	Sig. (2-tailed)	.000		.000
	N	18	18	18
GDP	Pearson Correlation	.417**	-.283**	1
	Sig. (2-tailed)	.006	.000	
	N	18	18	18

***Correlation is significant at the 0.01 level (2-tailed). Results were obtained from Microfit 4.1*

Spearman's correlation coefficient was used to test the regression model for the presence of heteroskedasticity. It was discovered that heteroskedasticity was not a problem as none of the correlation coefficient was more than the |0.70| threshold. This is shown in the table below.

Table 3: Spearman's Rank Correlation coefficient for model

		GDFCF
Interest	Correlation Coefficient	0.467
	Sig (2-tailed)	.000
	N	200
Inflation	Correlation Coefficient	.189
	Sig (2-tailed)	.007
	N	200
National Income	Correlation Coefficient	.467
	Sig (2-tailed)	.000
	N	200

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The stability of model specification test was carried out using Cumulative Sum of Residuals Squares (CUSUMQ) and the results indicated that the model was stable and correctly specified at 5% error level. This is represented in the figure 1 below:

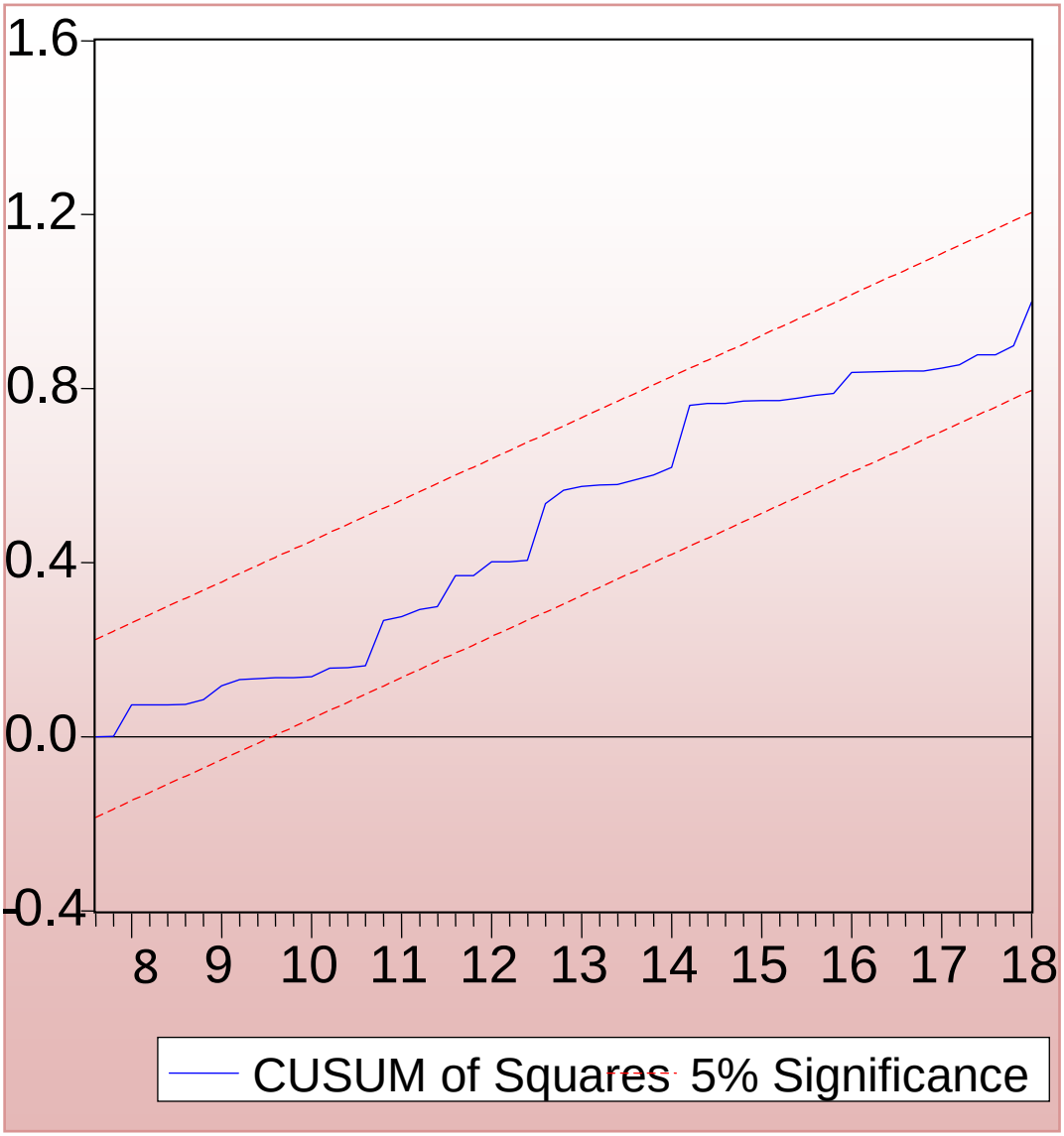

Figure 1: Cumulative Sum of Residuals Squares (CUSUMQ)

Results were obtained from Microfit 4.1

c) *Regression Results*

The table 4 lists the OLS estimates of investment expenditure on interest rate, inflation and GDP.

Table 4: The regression estimate of investment function

Variable	Coefficient	P–Value
Constant	28.787	0.000
Ln Interest Rate	-3.442	0.001
Ln Inflation	-0.319	0.051
LnGDP	0.209	0.046

Dependent Variable: Gross Domestic fixed capital formation

R Square = 0.650 Adjusted R Square = 0. 575
F – Statistics = 8.661 P-Value = 0.002 N =17

Results were obtained from Microfit 4.1

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Hypotheses Results

- H_o hypothesis is rejected in favour of H_1 which state that investment expenditure in does vary with interest rate.
- H_o hypothesis is accepted which state that investment expenditure rate does not vary with inflation.
- H_o hypothesis is rejected in favour of H_1 which state that investment expenditure does vary with National income.

d) Interest Rate

Estimates from table 4 suggest that there is a negative relationship between gross domestic fixed capital formation and interest rate level and this is statistically significant. The sign of the estimated coefficient is consistent with prior expectation. As domestic interest rate increases by one percent, real fixed capital formation decreases 3.44 percent. This is because interest rate serves as a cost of investment through capital formation, and so higher interest rate increases the opportunity cost of investment expenditure hence increases in domestic interest rate reduces real domestic fixed capital formation.

e) Inflation

Estimate from the regression results indicated however that inflation was not significant with real domestic fixed capital formation. The basic reason is that investors do not matter the level of inflation before undertaking investment expenditures.

f) Gross Domestic Product

The table 4 also shows that there is a positive relationship between real domestic fixed capital formation and the real national income and this is statistically significant. The sign of the estimated coefficient is consistent with prior expectation. As real national income increases by 1%, real domestic fixed capital formation increases 0.21%.

From table 4, R^2 is 0.650 which indicates that the independent variables together explain 65.0% of the variation in the Gross Fixed capital formation. The model as a whole is statistically significant (F – Statistics = 8.661, P - value = 0 .002).

V. Conclusion

It was found in the study that interest rate robustly determines investment expenditures in Ghana and that expected marginal propensity to invest is negatively related to interest rate. In other words higher interest rate makes the cost of borrowing to finance domestic fixed capital formation expensive to undertake. On the other hand, lower interest decreases the cost of borrowing and hence stimulates expenditures on domestic fixed capital formation.

The study found out that the gross domestic fixed capital formation is not affected by domestic price level. The reason may be that government often is seen to initiate measures with the aim of controlling inflation and that been the target of the government in her budget presentations - inflationary target budgets. Thus, price level has been fairly stable for a while; its effect on domestic fixed capital formation is almost negligible.

Further, the results also revealed that there is a positive relationship between gross domestic fixed capital formation and National income level. As National income increases, more monies are available for investment expenditure. This comes about as a result of increases in both households and corporate savings thus, making more loanable funds available to investors for investment purposes. The findings of the study send signal to policy makers and stakeholders involved in the management of the macro economy especially, where the primary objective is to increase investment level.

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