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Interest Rate Variation and Investment Determination in Nigeria

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Abstract: This study examines variations in interest rate and investment determination in Nigeria. The study is necessitated by the fact that previous studies only examined the effect of interest rate on investment determination without accessing the bi-casual effects of these macroeconomic variables. Investment decision is seen as demand for credit in an economy and this study calculated the annual variance of interest rate from monthly interest rate data for the period 1970-2002 and examines the determinants of interest rate variation and its impact on investment determination. The study employed dynamic model of two equations using instrumental variable technique of estimation. Data for the study were extracted from the World Development Indicator. 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 facilitating investment in Nigeria.

Key words: Interest rate variation, investment decision, demand for credit, supply of credit, government spending, instrumental variable technique

INTRODUCTION

The variability of short-term and long-term interest rates is a prominent feature of the economy. Interest rates change in response to a variety of economic events such as changes in federal policy, crises in domestic and international financial markets and changes in the prospects for long-term economic growth and inflation. However, economic events such as these tend to be irregular (Keith, 1996). There is a more regular variability of interest rates associated with the business cycle, the expansions and contraction that the economy experiences over time. For instance, short-term interest rates rise in expansions and fall in recessions. Long-term interest rates do not appear to co-vary much with the level of economic output. The term cyclical volatility of interest rates refers to the variability of interest rates over periods that correspond to the length of the typical business cycle.

The variation of interest rates affects decisions about how to save and invest. Investors differ in their willingness to hold risky assets such as bonds and stocks. When the returns to holding stocks and bonds are highly volatile, investors who rely on these assets to provide their consumption face a relatively large chance of having low consumption at any given time. For example, before retirement, people receive a steady stream of income that helps to buffer the changes in wealth associated with changes in the returns on their investment portfolios. This steady return from working helps them maintain a relatively steady level of consumption. After retirement, people no longer have the steady stream of income from working hence a less volatile investment portfolios is called for. The lower volatility of investment returns allows retirees to maintain a relatively even level of consumption overtime.

Nigeria experienced severe macroeconomic problems towards the end of 1970s through the first half of the 1980s when output declined substantially. The real GDP growth rate averaged only 1.5% per annum during the period 1973-1980 (registering negative growth rate in 6 years during the period) (CBN, 1990). In response to this deteriorating economic situation, the Nigerian authorities launched policy programmes contained in the Structural Adjustment Programme (SAP). Several forms of corrective measures were undertaken including financial sector reform policies.

Prior to 1986 in Nigeria, a common practice has been the support of certain economic projects considered to be essential part of development strategy. Government adopted policies aimed at accomplishing specified objectives such as interest rate ceilings and selective sectoral policies. Those policies were introduced with the intension of directing credit to priority sectors and securing inexpensive funding for their own activities. The ceiling on interest rates and quantity restrictions on loanable funds for certain sectors ensure that a larger

share of funds is made available for favoured sectors. Such a practice hinders financial intermediation since the financial markets will only be accommodating the credit demands of the government plan and ignoring risks. The practice has been disfavoured as a growth policy by the repressionist school led by McKinnon (1973) and Shaw (1973).

According to the McKinnon (1973) and Shaw (1973) financial repression paradigm, governments efforts to promote economic growth by such indiscriminate measures have repressed financial system. This discourages financial intermediation. Thus, the repressionist school calls for financial liberalization the removal of ceiling on interest rates, among others as a growth promoting policy. According to them, the removal of interest rates ceiling will raise savings rates because the interest elasticity of private savings is positive.

The interest rate policy in Nigeria is perhaps one of the most controversial of all financial policies. The reason for this may not be farfetched because interest rate policy has direct bearing on many other economic variables such as investment decision. Interest rates play a crucial role in the efficient allocation of resources aimed at facilitating growth and development of an economy and as a demand management technique for achieving both internal and external balance.

According to Uchendu (1993), interest rate policy is among the emerging issues in current economic policy in Nigeria in view of the role it is expected to play in the deregulated economy in inducing savings which can be channel to investment and thereby increasing employment, output and efficient financial resource utilization. Also, interest rates can have a substantial influence on the rate and pattern of economic growth by influencing the volume and disposition of saving as well as the volume and productivity of investment (Leahy, 1993).

Rama (1990) investigated the theoretical and empirical determinant of private investment in developing countries and identified macroeconomic and institutional factors such as financial repression, foreign exchange shortage, lack of infrastructure and economic instability as important variables that explained private investment.

Chetty (2004) shown that the investment demand curve is always a backward-bending function of the interest rate in a model with non-convex adjustment costs and the potential to learn. At low interest rates, an increase in the rate of return raises the cost of learning and increases aggregate investment by enlarging the set of firms for whom the interest rate exceeds the rate of return to delay. An increase in interest rate is more likely to stimulate investment when the potential to learn is larger and in the short run rather than the long run. Akintoye and Olowolaju (2008) examined optimizing macroeconomic investment decision in Nigeria. The study employed both the Ordinary Least Square and Vector Autoregression frameworks to stimulate and project intertemporally private investment response to its principal shocks namely public investment, domestic credit and output shocks. The study found low interest rate to have constrained investment growth. The study then resolved that only government policies produce sustainable output, steady public investment and encourage domestic credit to the private sector will promote private investment.

Obamuyi (2009) studied the relationship between interest rate and economic growth in Nigeria. The study employed cointegration and error correction modeling techniques and revealed that lending rate has significant effect on economic growth. The study then postulated that investment friendly interest rate policies necessary for promoting economic growth needs to be formulated and properly implemented.

Albu (2006) studied trends in the interest rate, investment, GDP growth relationship. The study used two partial models to examine the impact of investment on GDP growth and the relationship between interest rate and investment in the case of the Romanian economy. The study found that the behavior of the national economy system and interest rate-investment relationship tend to converge to those demonstrated in the normal market economy.

Oosterbaan examined the relationship between the annual economic growth rate and real rate of interest. The study employed the Ordinary Least Square method of econometric analysis. The study revealed that the relationship between the real rate of interest and economic growth might be an inverted U-curve.

To date, Nigeria has pursued two-interest rate regime. The 1960s to mid-1980s with the administration of low interest rates which was intended to encourage investment. However, the advent of the Structural Adjustment Programme (SAP) in the third quarter of 1986 ushered in an era when fixed and low interest rates were gradually replaced by a dynamic interest rate regime, where rates were more influenced by market forces. Hence, the pursuit of the two interest rate regime in Nigeria provided a case study of the Keynesian interest-rates-investment relationship and the McKinnon (1973) and Shaw (1973) interest and investment hypotheses.

The gradual deregulation of the Nigerian economy between 1986 and 1992 affected these key economic variables interest rates and investment. In the Nigerian context, interest rates were extensively regulated prior to

the adoption of SAP in 1986. But the economic rationale behind this control of interest rates and other elements of financial markets has been motivated by a variety of factors including the desire to influence the flow of credit to preferred sectors of the economy and the concern that market determined interest rate could result in serious imperfection in the market.

Moreover, the upsurge in real interest rates observed worldwide in the early 1980s has raised widespread concern about their possible detrimental economic effects. Therefore, in response to these concerns, numerous studies were carried out to measure the effect of high interest rate on the key macroeconomic variables. Nevertheless, the concurrent increase in interest rates resulting from the deregulation seems to lay credence to McKinnon (1973) and Shaw (1973) interest rate and investment hypotheses.

The main thrust of this study is to examine what happened to investment with variation in interest rates and what is the relationship between short-term and long-term interest rate and investment in Nigeria. This is necessitated by the fact that previous studies in this area never examined variations in interest rate and its effect on investment in Nigeria and the more reason that investment which is the demand for credit might have impact on the determination of interest rate and this study intends to examine the impact of investment on interest rate variation in Nigeria.

MATERIALS AND METHODS

Data definition and source: With the aim of examining interest rate variation and its impact on investment both at the short run and long run and as well the impact of credit demand (investment) on interest rate determination, this study shall employ Nigeria annual series data from 1970-2002.

These series include Gross Domestic Investment (I_t), Interest rates (R_t), Money Supply (M2), Government Spending (GSP), Inflationary rate [proxy for macroeconomic environment(If)], Real income (Y_t), Debt-income ratio [proxy for debt overhang (D/Y)]. The variables under consideration for the study were mainly sourced from the World Development Indicator.

Model specification: For the purpose of this study, two equations model should be adopted.

Interest rate equation: Besides the theoretical hypotheses of Keynesian liquidity preference, the classical and the loanable funds theories of interest rate (Anyanwu and Oaikhenon, 1995), the CBN (1990) postulated that interest rate behaviour depends on savings (supply of credit), investment (demand for credit), government spending, money supply (monetary policy) and taxation. For the purpose of this research work we shall construct the equation of interest rates determination thus: the model in a functional form is:

$$R_t = f(M_2, I_t, GSP_t\ I_f, R_{t-1})$$

The econometric model to be estimated in a linear form is:

$$R_t = \alpha_0 + \alpha_1 m_{2t} + \alpha_2 I_t + \alpha_3 Gs_t + \alpha_4 IF_t + \alpha_5 R_{t-1} + U_t$$

Where:

α_0 = Intercept
$\alpha_1 - \alpha_5$ = Coefficient

$$\alpha_1<0,\ \alpha_2<0,\ \alpha_3<>0,\ \alpha_4>0,\ \alpha_5>0$$

Investment equation: Based on the combination of all the theories of investment ranging from the classical to Keynesian and a recent study on Sub-Sahara African countries investment determination model by Iyoha (2004) which included debt overhang proxied by debt-income ratio variable we shall present the investment equation as follow:

$$I_t = f\ (Y_t, R_t, (D/Y)_t, Exr_t)$$

The eurometric model in a linear form will be, using distributed lag on interest rates we have:

$$I_t = \alpha_0 + \alpha_1 Yt + \alpha_2\ (D/Y)_t + \alpha_3 Rt + \alpha_4 I_{t-1} + U_{2t}$$

Where:

α_0 = Intercept
α_1-α_4 = Coefficient
α_3 = Short run impact or coefficient of interest on investment

Let $I_t = I_{t-1}$ at the steady state, we have the long run coefficient of interest rate on investment after solving.

$$\alpha_1>0,\ \alpha_2<0,\ \alpha_3<0,\ \alpha_4>0$$

Interest rate variation is calculated by the use of interest rate monthly data where we calculated the annual variance.

Model: The study employs a simultaneous equation model of two equations.

$$INT_t = a + aM2_t + a_2INV_t + a_3GSP_t + SAV_t + a_5INT_{t-1} + U_t$$

$$INV_t = \alpha_0 + \alpha_1 RY_t + \alpha_2 INT_t + \alpha_3 D / Y_t + \alpha_4 EXR_t + \alpha_5 INV_{t-1} + U_2 t$$

where, a_1-a_4 is short run coefficients, α_1-α_4 is short run coefficients, $a_1/1\text{-}a5$; $a_2/1\text{-}a5$; $a_3/1\text{-}a5$; $a_4/1\text{-}a5$ are long run coefficients, $\alpha_1/1\text{-}\alpha5$; $\alpha_2/1\text{-}\alpha5$; $\alpha_3/1\text{-}\alpha5$; $\alpha_4/1\text{-}\alpha5$ are long run coefficients. U_1 and U_2 are stochastic error terms, t is the end of period. Using reduced form we have the net effects as thus:

$$INTt = \pi_0 + \pi_1 M2 + \pi_2 RY + \pi_3 D/Y + \pi_4 EXR + \pi_5 GSP + \pi_6 SAV$$

$$INTt = \pi_0 + \pi_1 M2 + \pi_2 RY + \pi_3 DYR + \pi_4 EXR + \pi_5 GSP + \pi_6 SAV$$

The model is a log-linear specification.

RESULTS AND DISCUSSION

The data used for estimating the model are mainly from secondary sources which were extracted from the CBN Statistical Bulletin. The estimation is done by using the instrumental variable technique contained in the Microfit. The inclusion of other variables to complement interest rate and investment is to avoid the specification problem which is capable of biasing estimation results and complicating policy formulation.

The subsequent section will elaborate on the presentation and analysis of the results. The estimation results of the model are shown in tabular form followed by a detailed analysis.

Using relevant data obtained for each variable for the period 1970-2002, it is estimated the model using instrumental variable technique to obtain the parameter estimates. The results obtained are shown in Table 1.

In Table 1, the R^2 indicates that all the explanatory variables account for 86% of the variation in interest rate during the sample period. The F-value of 31.76 which is significant at the 1% level indicates considerable harmony in the relationship between interest rate and he explanatory variables put together. The Standard Error of Regression of 0.23 and Durbin Watson (DW) statistic of 2.24 imply minimal estimation error and auto-correlation which are good attributes of econometric estimation results.

Table 1 shows that all the explanatory variables are well behaved as the signs of their coefficients are in conformity with apriori expectations of the model. A careful examination of the result indicates that money stock has a short-run coefficient of 0.02 and t-value of 0.47. The long-run coefficient is calculated to be 0.07 which means that a 10% change in money stock in the long-run would generate 7% change in interest rate. The coefficient of investment proxied by capital formation has a short-run coefficient of 0.07 and t-value of 3.51 which is highly significant at the 5% level and has negative effect on interest rate. The long run coefficient is calculated to be 0.24 meaning that a 10% change in investment in the long run would generate or cause 24% change in interest rate.

Table 1: Estimation results for the (dependent variable is LNINT) interest rate equation 32 observations used for estimation from 1971-2002

Regressors	Co-efficient	Longrun coefficients	T-ratio
C	0.30	1.03	1.80
LM_2	0.02	0.07	0.47
LINV	-0.07	0.24	-3.51
LGSP	-0.01	0.03	-0.35
LSAV	0.11	0.38	1.16
$LINT_{-1}$	0.71	-	5.45

R^2 = 0.86; S.E of regression = 0.23; Mean of depend. var. = 2.55; F-statistic F (5,26) = 31.76; DW-statistic = 2.24

Table 2: Results for the investment equation (dependent variable is LNINV) 32 observation employed for estimation (1971-2002)

Regressor	Co-efficients	Longrun coefficients	T-ratio
C	-10.07	19.00	-2.79
LRY	1.36	2.57	4.73
LINT	-0.32	0.61	-3.99
LDYR	0.09	0.17	0.42
LEXR	0.32	0.61	0.97
$LINV_{-1}$	0.47	-	2.25

Computer estimation; R^2 = 0.96; S.E of regression = 0.32; Mean of depend var. = 10.07; F-statistic F (5, 26) = 139.79; DW-statistic = 1.69

The coefficients of government spending and aggregate savings as well as their t-values in parenthesis are 0.01 (0.35) and 0.11 (0.16) with their long run coefficients of 0.03 and 0.38, respectively. It could be deduced that a 10% change in the long run of government spending and aggregate savings in the economy would generate 3.0 and 38% change, respectively on interest rate.

The estimation has clearly shown that investment decisions play a negative role in interest rate which is significant at the 5% level and it shares this status with government spending which is through not significant at the 5% level. The other variables (aggregate savings and money stock) are indicated to have played positive role in interest rate though they are not significant.

In Table 2, the value of R^2 in the estimation indicates that all the explanatory variables account for 96% of the variation in investment during the sample period. The F-value of 139.79 which is significant at the 1% level shows that there exists a strong linear relationship between investment and the explanatory variables combined together. The Standard error of regression of 0.32 and Durbin Watson (DW) statistic of 1.69 imply minimal estimation error and auto-correlation which are

Table 3: Showing the net effect

Variables	M2	RY	D/Y	EXR	GSP	SAV
INT	0.07	-0.76	-0.05	-0.17	-0.03	0.45
INV	-0.04	3.03	0.03	0.10	0.02	-0.27

Researcher's calculation

good attributes of econometric estimation results. The Table 2 shows that all the explanatory variables except debt-income ratio as a measure of debt-overhang hypothesis are well behaved as the signs of their coefficient are in conformity with apriori expectations of the model.

A proper examination of the result shows that real income proxied by GDP has a short-run coefficient of 1.36 and t-value of 4.73 which is significant at the 5% level. The long run coefficient with respect to investment is calculated to be 2.57 which means that the long run elasticity of investment with respect to income is 2.57. The study also indicates a short run coefficient of interest rate to be 0.32 and t-value of 3.99 which is also significant at the 5% level. The long run coefficient is calculated to be. 0.61 meaning that a 10% change in interest rate in the long run will generate 61% change in investment decision. The short run coefficient of exchange rate is 0.32 and t-value of 0.97 which is not significant.

The investment equation estimated has clearly shown that changes in interest rate and income are key determinants of investment decision which are also significant at the 5% level.

Table 3 shows the net effect of the explanatory variables on the dependent variables (INT and INV). The Table 3 shows that money stock net effect on interest rate is 0.07 indicating that a 10% change in money stock will generate 7.0% change in interest rate.

Table 3 also shows a negative relationship between interest rate and income. The other variables such as exchange rate and government spending has a net effect on interest rate negatively as shown in the Table 3 but the net effect of aggregate savings on interest rate is positive with a value of 0.45.

The Table 3 also shows the net effects of the explanatory variables on investment. The Table 3 shows that money stock has a negative effect on investment and income has an effect of 3.03 on investment. The elasticity of investment with respect to income or the income elasticity of investment is 3.03 which indicate the degree of responsiveness of investment to change in income.

CONCLUSION

In this research, an attempt is made to investigate the variation in interest rate and investment determination in Nigeria. The investigation covers the period 1970-2002 and employs the instrumental variable technique of estimation. A theoretical analysis was first undertaken to explain the relationship between changes in interest rate and investment determination with explanatory variables affecting both interest rate changes and investment followed by an empirical analysis that discussed estimation results. The study revealed that investment decision played a negative and significant role in interest rate behaviour in the short run and long run. However, aggregate savings and money stock played a positive role but they are not significant in interest rate changes in the sample period. It was also inferred that government spending played a negative role but not significant in interest rate change in the economy.

Secondly, the study revealed that variation in interest rate played a negative role and highly significant in investment decision in the economy. In other word, it has negative impact on investment decision both in the short run and long run investment decision. The other determinants being income played a positive role and it is highly significant in the short run and long run on investment decisions. Lastly, it was inferred from the study that exchange rate played a positive but not significant role in investment decision in the short run and long run.

We therefore postulate interest rate reform should be a component of the broad package aimed at facilitating financial inter-mediation and monetary management as well as enhancing economic growth in developing countries. However, in high inflation countries like Nigeria, a strong and credible stabilization programme and an equally strong set of prudential guide lines are generally the best initial policy measures.

Also, there is a need to review on a continuous basis interest rate developments even after liberalizing with a view to ensuring that level and structure of interest rates are adequate and consistent with policy objectives and that the unfolding scenario is suited to the circumstance of the country in which the reform is taking place.

Although, the empirical findings show 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 facilitating investment in Nigeria. Also, government should provide sound macro-economic environment by ensuring a non-distortionary but competitive tax system, low inflation rate through prudential fiscal and monetary policies, as well as a stable but non-misaligned interest rate. Nothing can hurt investment more than an uncertain or highly volatile

macro-economic environment. Perhaps, of great importance for the profitability of investment are the issue of efficient infrastructures and the availability of skilled labour. The financial sector should also be developed to encourage more loan availability. Moreover, strict guidelines should be made to ensure that loans are utilized for the purpose for which they are meant for.

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