Determinants of Investment in the Nigerian Economy: An ARDL Approach

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Abstract

This study analysed the determinants of investment in Nigerian economy, applying the Autoregressive Distributed Lag Model to show both long run and short run relationships. The result shows that government expenditure (GEXP) is negative and significant at 1%. Statistically, this implies that a decrease in Government expenditure will reduce investment by -0.02% through capital expenditure in the economy. Exchange rate (EXHR) is negative both in the long run and short run. Although it is not significant in the long run, it is significant at 1%. Interest rate (INR) is negative and significant at 5% in the short run; however, in the long run, it is positive and significant at 1%. Inflation rate (INFR) is positive and significant at 1% in the long run which means that an increase in the general price level in the country will reduce the growth of investment in the economy by 0.02%, while it is negative by-0.04% and not significant in the short run. This could be as a result of effect of inflation which decreases the purchasing power of the consumers in the country due to a higher price of consumable goods and services. Therefore the researcher recommended that policy makers should work together with the government in formulating, evaluating and implementing new monetary policies that will have an efficient and effective impact on the Nigeria economy

Keywords: Expenditure, Inflation, Investment, ARDL, Nigeria

JEL Classification: H54, P24, R42

1. Introduction

Investment is the consignment of resources made with the hope of realising benefits which are anticipated to occur over a long period of time.It is an economic movement where an individual, group, or government purchases assets with the hope of receiving adequate risk premium (returns) overtime (Duruechi & Ojiegbe, 2015).

Investment plays a very important and positive role for progress and prosperity of any country. However, investment is one of the economic tools which countries depend or rely on to resolve issues such as poverty, unemployment and so on. In the same vein, a lot of economies rely on investment to solve different economic problems, crises and challenges. Less developed countries in African such as Nigeria are introducing several economic policies that will attract and also keep hold of private investors. This is due to the fact that investment in different sectors of the economy can rapidly transform the various economic

challenges the countries are facing. Therefore, the government should critically look into investment in different sectors of the economy so as to boost high productivity, employment level, standard of living and reduce poverty and so on (Ayeni, 2014).

The experience of East Asia countries suggested that an investment rate of between 20 and 25 percent could endanger growth rate of between 7 and 8percent with adequate attention on such factors that may affect investment and its trends (Bage, 2003). For example, during the investment boom gross investment as a percentage of GDP was 12.33% in 2009 and later declined to(-10.62%) in 2010 due to recession (World Bank, 2010).

No doubt, many factors influence investment both internally and externally. However, other researchers have studied domestic or FDI seeing them as different entities but both are needed to work hand in hand to boost overall investment and subsequently economic growth of Nigeria. To this end this study aims at analysing the factors that determine investment in Nigeria (both foreign and domestic) with the objective of throwing more light on the factor of overall investment in economy as an important tools of achieving stable and sustainable economy growth in the economy.

Contemporary growth theory takes the view that economic growth is particularly the result of capital accumulation, it is generally accepted that more capital goods will be required if there is to be growth. However, it is based on this fact that one of the principal objectives of the Nigeria government is fostering sustained economic growth through the promotion of enabling investment environment. A balance between capital formation and factors that affect capital formation gives a sustained economic growth (Anthony, 2015).

The lack of regularity of investment in Nigeria has become a wellspring of worry to all the government who are concerned about the economic growth of the country. The low level of investment has appeared to be the major issue facing the economy. Despite different programs and policies made by various government of Nigeria at different tenure to tackle the problem, the menace still exists.

2. Literature Review

Empirical review
Khan and khan (2001) analysed the determinant of private investment by using ARDL co-integration technique to inspect the existence of long-run equilibrium relationship as well as short-run dynamic of investment. The result showed that provision for suitable environment should be provided for market, such as protection of policy rights, enforcement of contract and voluntary exchange at market determined price.

Olusegun (2010) empirically assessed macroeconomic reforms, government size and investment behaviour in Nigeria, from his investigation he finds out that government size does not complement domestic investment and credit allocated to private sector was a major factor in stimulating domestic investment in Nigeria.

Bakare (2011) investigated the determinants of private domestic investment (PDI) in Nigeria, for the period 1986 to 2009 applying the cointegration method with error correction mechanism with the result that political crisis might have created a climate hostile to positive investment in Nigeria. Ghirmay (2001) probed the relationship between export-led and investment-led growth for about 19 underdeveloped nations. They used co-integration

test and granger causality test. The result showed that exports and investment are cointegrated with economic growth in Malaysia economy. Carkovic and Levin (2002) in Oyetoye *et al*. (2011) looked at the rational for offering special motivations to attract FDI to the host country base on the belief that FDI produce externality in form of technology transfer and spill-over. Foreign direct investment based on economic theory and empirical fact have the likely potential to affect less developed host countries positively. Oyeranti (2003) and Ayoola (2009), factors like economic and technology conditions, financial system effective, skills, institution framework, infrastructures and economic stability in host country influence the effectiveness of FDI in improving the growth of that country.

Teddy (2015) in Osemene (2018) probed the effect of exchange volatility on private investment in Zambia, using GARCH model to examine volatility in exchange rate and johansen max likelihood for co-integration and ECM. This research revealed that volatility of the nominal exchange rate exerts significant negative impact on the flow of foreign portfolio capital inflow in Zambia. Reetika and Pani (2013) in Osemene (2018) also researched on determinant of foreign portfolio investment flow in India, with the range of 1995-2011 using ARDL. The result found out that, there is a negative significant relationship between exchange rate volatility and foreign portfolio investment. The estimation on determinants of investment in Nigeria by Duruechi and Oyiegbe (2015) used OLS model, unit root test to check for stationary with Johansen cointegration test for long relationship between the variables. They found out that there is a significant relationship between the selected macroeconomic variables and level of investment in Nigeria.

Chidoko (2015) examined on the impact of capital formation on economic growth from the year 1980-2013. He made use of linear function model in his analysis and used unit root test to check for the stationarity. The study revealed that investment positively affects economic growth in Zimbabwe. However, the result showed that all component of capital inflow has a relationship with economic growth.

Adam (2011) probed the causality and effect of corruption on the FDI inflow to Nigeria, which he analyses using OLS model with ADF test. The Johansen and cointegration test for the long run relationship between foreign investment and level of corruption showed that, there is a presence of inverse relationship between foreign capital inflow and corruption. Also relationship, between foreign direct investment and Economic growth is positively significant. Finally, the research concluded that, for Nigeria to attract a large volume of foreign direct inflow and corruption at every level of governance have to be drastically reduced and checkmated. Wafure and Nurudeen (2010), researched on determinant of FDI in Nigeria. They measured the relationship between foreign investment and its determinant. Result shows that the determinants of FDI inflow are the size of market in host countries, depreciation of exchange, political volatility, and deregulation. Oregwe and Onucha (2013) investigated the determinants of foreign direct investment in Nigeria, from the period of 2001-2010. They employed secondary data from Central Bank of Nigeria's statistical bulletin and annual report. The result showed that there is absence of direct correlation between the Nigeria Gross domestic product and the level of foreign direct investment to the country.

Theoretical framework
This analysis adopts the flexible version of acceleration principle. The theory established a link between cost of capital and investment output. The theory is based desired level of investment, which depends on the level of output and use of cost of capital, which in turn relies on the price of capital goods, the real rate of interest and depreciation rate, the flexible wording of acceleration theory base with the time lag on filling the space between the actual capital stock (kt-1) in period (t-1) and optimal capital stock (k) in period t. the period (t), hence, only a fraction (λ) of (kt) is obtained. This can be expressed mathematically as:

$$Kt\text{-}kt1= \lambda(kt\text{-}kt\_1) \quad (0< \lambda<1) \dots\dots\dots\dots\dots\dots\dots\dots1$$

Where; kt = actual capital stock in period t, Kt-1= actual capital stock in period t-1, Kt = optimal capital stock in period t, and λ = a constant (proportion).

Where Kt-Kt-1= net investment and net invt = (It - Rt), where Rt is replacement capital in period t (depreciation). Equation 2

$$It\text{-}Rt=In= \lambda (Kt\text{-}kt\_1) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots2$$

Equation 2 explains that net investment in period t is the same as a fraction of the difference between the desired or optimal capital stock in period (t) and actual stock in period t-1 since, given technology, kt equals capital output ratio (k), the output in period t.

$$In = \lambda (kYt \text{-} Kt\text{-}1) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots3$$

gross investment (Ig) is express as

$$Ig = \lambda (kYt – Kt\_1) + Rt \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots4$$

Equation 4 explains that gross investment is the total of net investment + depreciation and represented the generally used flexible accelerator theory.

Therefore, the fundamental theory remains the same between optimal and actual capital stock. Nevertheless, the flexible wording of the acceleration principle confirms a partial adjustment instead of instant adjustment. In addition, the flexible acceleration principle is a useful theory in discussing the deficiency of the simple acceleration principle. The flexible acceleration theory provides a sufficient explanation of investment demand.

3. Methodology

Unit root analyses
This study employs the unit root test to examine the properties of the series if it is stationary or not. In case, it is not stationary, the first difference is administered using the DF and ADF test technique.

Measurement of variables
Capital formation is a term used to describe the net capital accumulation during an accounting period for a specific country. The term refers to additions of capital goods, such as equipment, electricity, tools, and transportation assets. Investment in this context stands as a proxy variable for capital formation (World Bank, 2014).Government Expenditure is the current spending and investment by central government and local authorities on the provision of social goods and services such as health, education, roads and so on (Adeoye, 2010; World Bank, 2014). Interest rate is the rate that is usually set aside to catch up with

both short-term, medium-term fund needed by the private organisation or sector based on the credit value and percentage of the borrowers and the sole aim of financing the private sector in the country. It is measured in percentage (World Bank, 2014). Exchange rate is the rate at which a domestic currency is sold for another country, currency that is generally or globally known and accepted as means of exchange. It is measured in it natural logarithm (World Bank, 2014). Inflation is the persistence general rise in price of goods and service over a specific period of time in an economy, it influences the up and down activities of the economy either positively or negatively, that is moderate or hyper. It represents independent variable in this research work. It is measured in percentage (World Bank, 2014).

Model specification
The specification of this model is base on the theoretical framework of flexible acceleration principle. Hence, the model can be specified mathematically as follows while some of the variables that are not in percentage were logged, and those already in percentage were not logged. The mathematical model is written as:

CAF = F (GEXP, EXHR, INR, INF) …………………………………………………...…5

Where:

CAF represents capital formation, GEXP is represented as government expenditure, EXHR represents exchange rate, INR represents interest rate and INF stands for inflation

The econometric model is specified as:

$CAF = \beta_0 + \beta_1 GEXP + \beta_2 EXHR + \beta_3 INR + \beta_4 INF + \mu_t$…………………………………….6

AF	=	The real capital formation
GEXP	=	the government total expenditure
EXHR	=	exchange rate
INR	=	Interest rate
INF	=	inflation
μ_t	=	Error term which capture other factors that are not included in the model.
β_0	=	parameter constant/ intercept
B_s	=	coefficient or parameter estimates

However, CAF is regarded as dependent variable (DV) in the model, while government expenditure, exchange rate, interest rate and inflation are the independent variables (IV). Dependent variables are those variables that are determined within the model, while the independent variables are the variables that are exogenously determined. That is, variables determined outside the model.

Estimation procedure
This research work uses econometric techniques of (Autoregressive Distributed Lag Model) to show and analyse econometric relationship of the variables involved in the determination of investment in Nigeria economy between the ranges of 1981 to 2018. The rationale of choosing the sample frame is due to availably of data due to non-probability sampling technique.

Autoregressive Distributed Lag Model (ARDL)

It is more preferable when ARDL cointegration technique deals with variables that are integrated in different order, I(0), I(1) or combination of the both. It is robust when there is a single long run relationship between the underlying variables in a small sample size. .

The ADRL model specification is expressed as;

$\Phi(L)yt = \varphi + \theta(L)xt + ut$, ………………………………………………………………7

with$\Phi(L) = 1 - \Phi 1L - ... - \Phi pLp$, ……………………………………………..…8

$\theta(L) = \beta 0 - \beta 1L - ... - \beta qLq$. ……………..……………………………………………..…9

 Hence, the general ARDL(p,q1,q2......qk) model;

$\Phi(L)yt = \varphi + \theta 1(L)x1t + \theta 2(L)x2t + \theta k(L)xkt + \mu t$ ……………………………………..10

Using the lag operator L applied to each component of a vector, Lky=yt-k, is convenient to define the lag polynomial $\Phi(L,p)$ and the vector polynomial $\beta(L,q)$. So far, it can be assumed that the error term ut is a white noise process, is stationary and independent of xt, xt-1, … and yt, yt-1, …, the ARDL models can be estimated consistently by ordinary least squares.

4. Result

Table 1: Unit root test (ADF)

Variable	Constant without trend		Constant with trend	
	Level	1st Difference	Level	1st Difference
GCAF	-3.277789**	-4.876630***	-3.695048**	-5.388942***
GEXP	0.448611	-5.701944***	-1.679292	-5.742884***
EXHR	-2.019199**	-4.170436***	-1.991045	-4.151697**
INR	-2.492017	-5.317842***	-2.294271	-5.536296***
INFR	-2.884754*	-5.593834***	-3.962449**	-5.522986***

Note: (***1%), (**5%) and (*10%)represent significance level respectively. T-statistics is use for testing the null hypothesis that the series has unit root. Schwarz information criteria is use to determine the lag length automatically.
Source: e- views Computation

It can be seen from Table 1 above that, all the variables passed the unit root test of ADF at 1st difference and few at Level with co integration order of 1(0) and 1(1). Therefore, the null hypothesis of non-stationary is rejected at 1st difference and the alternative hypothesis of stationary is accepted. This evidence precedes the use of data in analysing the determinants of investment in Nigerian economy.

Bound test for co integration
Bound test was conducted to check for the long run relationship among the variables analysed in the model. F-statistic value was used to test for the hypothesis. Therefore, if the value of the f-statistic is higher than 1% upper bound test, we can reject the null hypothesis and accept the alternative hypothesis.

Table 2: The result of ARDL co integration test

CointegrationBound Test		
F (GCAF, GEXP, EXHR, INR, INFR)		
Optimal lag structure	ARDL (1, 3, 4, 4, 3)	
F-statistic	12.86482	
Significant level	critical value {Lower bound 1(0)}	critical value {upper bound 1(1)}
10%	2.2	3.09
5%	0.56	3.49
2.5%	2. 88	3.87
1%	3.29	4.37

Source: e- views Computation

The value of f-statistic figures tests for null-hypothesis that, there is no co-integration among the variables used for the analysis. To describe the co-integration relationship among gross capital formation (GCAF) and its determinants, the null hypothesis of no co-integration relation was analysed by overall significance of f-test. 12.86482 is the result of F-test for co-integration test which is greater than 1% upper bound test critical value of ARDL co-integration. This means that there is long run relationship among the variables used in the analysis. The long run relationship denotes the influence of investment in an economic growth, such that, in the long run investment will influence economic growth in Nigeria under the period studied.

ARDL Long Run and Short Run Analysis Results

Table 3: Long Run Analysis

Dependent variable (GCAF)				
Variable	Coefficient	standard error	t-statistic	(p-value)
GEXP	-0.027628	0.002215	-12.47383	(0.0000) ***
EXHR	-0.001329	0.011705	-0.113572	(0.9112)
INR	-0.594023	0.254174	-2.337076	(0.0348) **
INFR	0.202180	0.050376	40.13427	(0.0000) ***
C	49.44540	6.965688	7.098423	(0.0021) ***

*Note: *, **, *** represent 10% 5% and 1% significant level respectively.*
Source: e- views Computation

Determinant of investment in Nigeria economy was analysed by the long run ARDL test through its signs and p-value of the model. The long run effect and significance of the variables was shown through the coefficient and p-value of the model (Table 3).
EC =GCAF-(0.0276*GEXP-0.0013*EXHR-0.5940*INR+0.2022*INFR+49.4454

Table 4: Short Run Analysis

Variable	Coefficient	standard error	t-statistic	(p-value)
Δ(GEXP)	-0.007588	0.002098	-3.616489	(0.0028) ***
Δ(EXHR)	-0.021352	0.007150	-2.986194	(0.0098) ***
Δ(INR)	0.601703	0.156257	3.850739	(0.0018) ***
Δ(INFR)	-0.046374	0.035753	-1.297095	(0.2156)
CoinEq (-1)*	-1.107217	0.108179	-10.23506	(0.0000)***

Source: e- views Computation

From Tables 3 and 4, both long run and short run results shows that government expenditure (GEXP) is negative and significant at 1% (***). The long run result implies that a decrease in Government expenditure will reduce investment by -0.02% through capital expenditure in the economy. Exchange rate (EXHR) is negative both in the long run and short run results but, not significant in the long run though it is significant at 1% (***) in the short run. This implies that an increase in exchange rate will lead to a fall in investment. Interest rate (INR) is negative and fairly significant at 5% (**), which implies that an increase in interest rate will decrease investment in the country by 0.59%, while in the short run, it is positive and significant at 1% (***), which means that a decrease in interest rate will lead to an increase in investment in the economy. Inflation rate (INFR) is positive and significant at 1% (***) in the long run, which means that an increase in the general price level in the country will reduce the growth of investment in the economy by 0.02%, while it is negative by-0.04% and not significant in the short run. This could be as a result of effect of inflation which decreases the purchasing power of the consumers in the country due to a higher price of consumable goods and services. These findings are almost in line with the outcome of Agwu (2015) who investigated the determinant of investment in Nigeria, using ARDL to examine both the long run and short run coefficient of variables relationship with unit root test and bound test for co-integration. The result shows that there is a long run relationship among the variables (interest rate, size of government, capital investment) in Nigeria.

Diagnostics Tests
Diagnostic test was used to determine how strong a model is, through R^2, adjusted R^2, F-statistic, Durbin Watson statistic, LM serial correlation test and heteroskedasticity.

The coefficient of determinant (R^2) is a key output of regression analysis and adjusted R^2 compares the explanatory power of a regression model that contains different number of predictors and also captures the fluctuation of data. Total significance of the repressor and its p-value is check by using F-statistic. Heteroskedasticity and Durbin Watson statistic was usedfor checking the autocorrelation of the series. LM serial correlation test was used to check for the serial or nature of the data and how related they are. Jarque- Bera statistic is use to check for the normality distribution of the model through the p-value.

Table 5: Diagnostic Test

Diagnostic	t-statistic	(p-value)
R^2	0.874805	
Adj R^2	0.782557	
F-statistic	63.29938	(0.0000) ***
Durbin Watson	1.657198	
Heteroskedasticity test:		
F-statistic	0.767403	(0.7094)
Jarque-Bera	0.463946	
LM serial correlation:		
F-statistic	1.590506	(0.2439)

Source: e- views Computation

From table 5, the R-square which explains the variation of the dependent variable that is explained by the regressors is 87%, which implies that 87% of the model is explained by the

regressors. The adjusted R^2 explains the variation of insensitivity of data fluctuation by 78% in the diagnostic test. F-statistic is 63.29938 and significant at (1%), which explained the overall significant of the model. The result is free from autocorrelation as shown by Durbin Watson (1.65), which means that the null hypothesis is rejected. Heteroskedasticity is explain by its F-statistic, the model is free from heteroskedasticity and therefore, reject the null hypothesis of no heteroskedasticity of the disturbing noise (Error term) and accept the alternative of homoscedasticity of the error term. The Jarque-Bera test shows the normality of the model by 0.46 while the LM serial correlation test shows that there is an absence of serial correlation through its p-value of F-statistic.

Stability test
The stability test is used through cumulative sum of recursive plot to check for the stability of the model coefficient. If the plot lies within boundary of 0.05% level of significant, then estimated coefficients are said to be stable.

5. Conclusion and Recommendations
The following findings were made from the ARDL result in the long run and short run. Government expenditure: there is a negative and significant impact of government expenditure on investment in Nigeria in both short run and long run. Exchange rate: there is a negative sign in both short run and long run but insignificant in the long run and significant in the short run. Interest rate: there is negative and significant impact of interest on investment in the long run; there is a positive and significant impact of interest rate on investment in Nigeria. Inflation rate: there is a positive and significant impact of inflation on investment in Nigeria, there is a negative but insignificant impact of inflation on investment in Nigeria. The ARDL diagnostic analysis explained that the model for the estimates is in good fit to check for the strength of the model and the stability test revealed that model through cumulative sum and cumulative sum of square analysis indicate that the model is stable.

This study has examined determinants of investment in Nigeria for the period which spanned between 1981and 2018. The study adopted econometric analysis to test the direction of economic relations between variables, and test have been carried out concerning model and other necessary tests. The study used the ARDL model to detect the integration, stability and the existence of both long run and short run (error correction model) relationship. However, investment in Nigeria has not been encouraging because government expenditure is very poor. According to this research outcome, government expenditure is negative which implies that government of the country has not been active in spending in the economy. If government spends in the country, it will increase the purchasing power of the people in the economy which will equally increase the level of investment and appreciate exchange rate in the long run., if government expenditure is effectively modified in the economy. However, increase in government expenditure could lead to inflation if not properly handle and the government expenditure might be negative, because of inappropriate use of government expenditure in the economy which is making the investment ineffective. For there to be a sustainable investment in Nigeria, there is need to reduce the level of interest rate. This is because a high level of interest rate will discourage investors in investing in the economy.

The policy thrust of this research for agencies (could be government and non-government organisation) and policy makers is that policy makers should work together with the government in formulating, evaluating and implementing new monetary policies that will have an efficient and effective impact on the Nigeria economy. Monetary authorities should promote policy that will encourage deposits and also make available loanable funds to improve and encourage investment. Government should edit or reassess its policies on investment and pay more attention to its determinants, they should invest more on resources in providing infrastructure which will raise the level of output, decline inflation, interest rate and exchange rate fluctuations, because they are indispensable or crucial ingredients for boosting investment in Nigeria.

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