EVALUATION OF THE INFLUENCE OF INTEREST RATE ON PRIVATE DOMESTIC INVESTMENT IN NIGERIA

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Abstract

The study evaluated the effect of interest rates on private domestic investment in Nigeria from 1986 to 2019. The paper employed the Auto-Regressive Distributed Lag model in the analysis. To achieve robust results, the study conducted a structural break test in the time series and co-integration analysis. The main findings of the study were that interest rates had a negative and significant effect on private domestic investment in both the short run and the long run. It was also revealed that interest rates had multiple structural breaks in the years 2002, 2009 and 2014, respectively. The study recommended that the monetary authorities should utilize the monetary policy, the interest rate, in particular, to promote private domestic investment by keeping interest rates low. In so doing, private domestic investment will improve leading to increased employment, productivity, and growth of the economy.

Keywords: Evaluation, Domestic, Influence, Investment, Interest rate, Private.

1   Introduction

The role of interest rate in the determination of investment cannot be overemphasized. Interest rate which is the unit price paid on borrowed money influences the consumption and investment behaviours in countries across the world. It allocates financial resources in any economy by acting as a financial intermediary between savings and investments. A change in interest rate structure leads to shifts in the market portfolio (Inimino, Abuo & Bosco, 2018). A rise in interest rate according to Keynes (1936), reduces investment while its decrease stimulates investment. In the same vein, Solomon and Kofi (2020) noted that an increase in interest rate increases the borrowing cost which is detrimental to investment and a decline in interest rate lowers borrowing cost thereby encouraging investors to borrow.

In Nigeria, the policy thrust of successive governments on the promotion of private domestic investment has been anchored on the country's interest rate policy. The growth and development of private domestic investment are believed to be pivotal in solving macroeconomic problems such as poverty, unemployment, and unfavourable terms of trade and price instability. Given this, Anyanwu and Oaikhenan (1995) noted that the monetary authority for the period of 1970 to 1985 steadily maintain a very low fixed interest rate regime of 4.94 per cent, 5.58 per cent, 5.78 per cent and 7.80 per cent for the Treasury Bill, Deposit rate, Minimum Rediscount rate and Lending rate respectively. Consequently, in 1970, the aggregate private sector credit sluggishly grew from ₦1.14 billion to ₦10.8 billion and to ₦32.7 billion in 1980 and 1985 respectively (Amassoma&Nwosa, 2011). The

sluggish growth in private sector credit may have been undermined by the economic recession of the 1980s necessitated by a decline in the global oil price of the late 1970s.

In an attempt to overcome the challenge of financial intermediation, Nigeria adopted corrective measures through the structural adjustment policy of 1986. This saw the deregulation of interest rates on the 1st of August 1987 and was fully deregulated in October 1996 (Davis &Emerenini, 2015). By 2002, the market-driven interest rate policy resulted in an all-time high as the Treasury bill, Monetary Policy rate and lending rate rose to 18.9 per cent, 19 per cent and 24.9 per cent respectively. On the other hand, the deposit rate persistently remained low at 4.1 per cent within this period and reached its lowest level of 1.8 per cent in 2012 (CBN, 2012).

The deregulation of interest rates allows the market to determine the level of interest rate. Davis and Emereni (2015) opined that the deregulation of interest rates allows for the determination of the rates of interest for lending and bank deposits by the market forces for loanable funds. Interest rate inversely relates to private domestic investment indicating that an increase in interest rate will lower private domestic investment while decreases in interest rate, encourage private domestic investment. Contrary to this theoretical postulation, a rise in interest rates in Nigeria appears to have a positive relationship with private domestic investment. For instance, in 1986 when the interest rate was 10.50%, the private domestic investment as a percentage of total gross domestic products stood at 16.7%. In 1996, interest rates increased to 17.74% when private domestic investment rose to 32.6%. On the other hand, when the interest rate declined to 16.94% in 2007, private domestic investment as well decreased to 20.18%. By 2016, when the rates of interest slightly decreased to 16.87%, private domestic investment declined further to 14.72%; while in 2019, the interest rate decreased to 15.53%, and the rates of private domestic investments appreciated to 24.62% (CBN, 2019; World Bank, 2020).

The trend analysis seems to negate the theoretical postulation of the relationship between interest rates and private domestic investment. Economic theories postulated an inverse relationship between interest rates and investment rates. However, the above trend analysis shows the revised case; as investment rates decline alongside the decrease in interest rates. This situation, no doubt, contradicts the theory that postulated an inverse relationship between interest rates and investment. Consequently, the multiplier effect of the disconnections appears to have significantly caused misalignment in macroeconomic variables in Nigeria as predominantly shown by the economy's unsustainable economic growth, high unemployment level, balance of payments deficits, loss of social welfare and a decline in savings rate, among others. It is against the above problem, that the study examined the degree of influence of interest rates on private domestic investments in Nigeria.

2.0 Literature Review
2.1 Theoretical Review
The classical theory of interest rates viewed interest rates as determinants of the interplay of demand and the supply of capital. From the perspective of the supply side of the capital, the theory conceived that a high-interest rate would increase by saving rate, if people postponed present consumption to earn a higher rate of interest on their capital; and through this, adequate funds are provided for productive investments. However, on the demand side of capital, the

classicalist postulated that high rates of interest lower demand for capital that in turn, decreases investment level. According to Onuchuku, Nenbee, Vincent and Agbonjaru (2018), the demand for capital is a function of the output of the estimated capital whereas time preference determines the quantity of the capital supplied in the economy. However, the classicalists' viewpoint that income is constant in the economic model was criticized by Keynes by arguing that income in reality is a variable; and not constant as indicated in the theory. The theory was also criticized for its failure to recognize the influence of investment on the income of the nation.

The theory of Liquidity identified three motives for money holdings including transactional, speculative and precautionary motives. Money demand is more linked to the speculative motive, and the volume of money is functionally related to the rate of interest. The interest rate, in turn, is determined by the market mechanism. In the three motives for the demand for money, as identified by Keynes, the first two motives depend on income while the third depends on the interest rate. Total demand for money can be obtained by adding together the precautionary, speculative and transactional motives for money holdings. Thus, the precautionary and transactional motives constitute the calls for active cash balances while the speculative motive shows the demand for idle balances and hence, depends on the rate of interest. The interest rate liquidity theory was criticized for the reason that the theory conceived that money considered as a mass of wealth is unproductive. However, it was argued that money like any other asset is productive. More so, Keynes postulated that the reward obtained by parting liquidity is interest rate; however, it was proclaimed that one's fund still yields interest even when held in time deposits.

Another theory reviewed in this study is the theory of investment multiplier. It looked at the multiplier concepts with a focus on direct and indirect improvement in investment and employment. The theory conceived that a rise in either private or public expenditures has more than equal positive impact on national income. In this case, the concept of a multiplier tries to measure the additional effects of investment expenditures on the economy. Hence, Adenuga (2020) identified that the higher the multiplier investment is, the more efficient it will be in generating and distributing income in the whole sector of the economy.

The theory of investment no doubt, is rooted in the employment theory of the Keynesian economy. In the theory, Keynes (1936) stated that the multiplier has a definite relationship, regarding the consumption propensity existing between total income and employment, and investment rates. Meanwhile, the key factor utilized in the multiplier theory is the multiplier coefficient (K). It represents the exponent at which the expenditure on initial investment can be raised to yield an additional income. In the view of Adenuga (2020), the proportion of income spent on consumption is the major determinant of the worth of the multiplier. Similarly, the theory received criticism for only recognising the effect of induced consumption on income; but failed to take into account the negative influence of consumption induced on induced investment. More so, the theory blatantly paid no attention to the relationship existing between the call for consumable goods and the industrial goods which act as derived demand.

Similarly, the theory of financial investment published in 1949 by James Duesenberry conceived a rate of interest as a cost of borrowing capital. Meanwhile, the interest rate does not vary alongside the undertaken amount of investment. Invariably, there are unlimited financial resources available for investors at a prevailing market rate of interest. This means that the supply of financial resources to producers is perfectly elastic. However, the unrestricted view on the allocation of resources to producers all the time at a predetermined rate of interest is untrue in real life. This is because; the more financial resources are needed for finance investment projects, the more rate of interest on capital rise. Thus, to provide the required funds for investment expenditure, investors need to source funds from the market at the prevailing rate of interest (Adenuga, 2020).

In another version, Duesenberry's postulation rooted in his book, "Business Cycle and Economic Growth" fused the investment acceleration theory and theory of profit. The theory identified a key determinant of investment as the aggregate cash flow in the economy. It was also identified in the theory that gross investment occurs when the growth of capital stock exceeds depreciation. Hence, the income and capital stock growth rates are ascertained by the ratio of capital to income; and savings are below investment when income grows. Investment, therefore, is conceived as a function of capital stock, income, capital consumption allowances and profit.

2.2 Empirical Review

Thuy, Anh and Diem (2020) did research the influence of Vitnam's monetary policy on private domestic investment through the application of GMM. The finding indicated that private domestic investment is significantly and positively affected by monetary policy variables including domestic credit, interest rate and money supply, but no significant influence of exchange rate is found in the study. Majed and Ahmad (2020) carried out research on the influence of interest rates on the level of Jordan's domestic investment from 1990 to 2005 using the co-integration test, the variance decomposition and the impulse response function. It was discovered that interest rate negatively influenced internal investment in Jordan, whereas income positively influenced private investment in the economy.

Solomon and Kofi (2020) investigated the extent to which private investment was affected by changes in the interest rates and as well examined the threshold level of interest rate; above which private investment was affected negatively in Ghana for the period 1986-2016. ARDL model and threshold regression model were the methods of analysis employed in the research. The finding showed evidence of both long-run and short-run significant and positive influence of Ghana's interest rate on private domestic investments. Amanu (2020) examined the influence of private investment determinants in Ethiopia from 1975 to 2009 using the OLS technique. It was shown in the study that the real GDP, credit and private sector credit significantly and positively affected private domestic investments; whereas domestic market liberalization influence private investment insignificantly and positively. Contrarily, public investment, the nominal lending rates and the rate of inflation had a negative and insignificant effect on the private domestic investment of Ethiopia.

Furthermore, Monica, Willy and Agnes (2020) estimated the significant effect of interest rates on the growth of Kenya's private domestic investment from 1997 to 2018, using the vector autoregressive (VAR) technique. The results indicated that the lending rate significantly affected Kenya's private internal investment. Adenuga (2020) empirically carried out a study on the impact of interest rates on the private investment of Nigeria for the period 1986-2018; with the applications of the Johansen method of co-integration test and was estimated using the error correction model. The results show that private investment was insignificantly and negatively affected by changes in interest rates in Nigeria.

Osuji (2020) empirically researched the significant influence of the liberalization of interest rates on Nigeria's private domestic investment from 1961 to 2017. Johansen's method of co-integration test and error correction model were utilized in the investigation. The results indicated that Nigeria's private investment was within the aforementioned period affected insignificantly and negatively by the prime lending rate. Similarly, Obinna (2020) investigated the degree to which the domestic investments in Nigeria were influenced by the changes in the monetary policies for the period 1981-2018, using advanced econometrics techniques such as the co-integration test as well as the vector error correction model. It was discovered that the impact of interest rates on investment in the economy is predicated upon the level of the nation's inflation rate. Thus, this implies that the degree of interest rates' effect on investment appears weaker as the rate of inflation rises.

Selçuk and Alper (2020) carried out an investigation on the private sector investments' determinants in Turkey for the period ranging from 1975 to 2014, using the ARDL model. The finding indicates that real interest significantly and negatively influences investment in the private sector of the economy. Similarly, Daniel and George (2018) researched the variations in the determination of investment and interest rates in Ghana for the period 1990-2014, by employing a co-integration test. The finding showed that interest rate variation negatively and significantly affected the investment decision of Ghana. More so, Okoroafor (2020) researched the significant impact of monetary policy variables on internal investment as well as the economic growth of Nigeria for the period 1970-2018. The ARDL model was the advanced econometric technique employed in the study. It was shown that monetary indicators such as commercial bank interest rates had an insignificant influence on domestic investments.

3.0 Data and Methodology
3.1 Model Specification
The study followed Duesenberry's (1949) financial theory of investment. The theory posited that the total flow of cash is the main driver of investment. An increase in the inflow of cash increases investment while decreases in cash flow discourage investment. The Duesenberry (1949) financial theory of investment is specified as follows:

$$\text{P}Ri = f(Yi_{t-1}, Kc_{t-1}, \pi i_{t-1}, Ri_t) \qquad\qquad 1$$

Equation 1 asserts that private investment (PRi) is a function of the level of past income (Yi_{t-1}), capital stock (Kc_{t-1}), profit (πi_{t-1}) and capital consumption allowances (Ri_t). Solomon and Kofi

(2020) later modified equation 1 by incorporating exchange rate, external debt, inflation and public investment in their analysis of interest rate and its threshold on private investment in Ghana. Equation 1 is however re-specified thus:

$$PRi = f(ITi, PBi, IFr\ XDt, EXr, Yg) \qquad 2$$

Where PRI denotes private investment, ITi is the interest rate, IFr is inflation, PBi denotes public investment, XDt stands for external debt, EXr is the exchange rate, and Yg represents the growth rate of gross domestic product. Equation 2 is expressed in a log-linear form as:

$$InPRi_t = \emptyset_0 + \emptyset_1 ITi_t + \emptyset_2 InPBi_t + \emptyset_3 InIFr_t + \emptyset_4 InXDt_t + \emptyset_5 InEXr_t + \emptyset_6 InYg_t + \varepsilon_t \qquad 3$$

To effectively capture the interest of this study, however, equation 3 is further modified to accommodate credit for private investment (CRi) because of its role in private domestic investment financing. Inflation (IFL) and growth rate of gross domestic product (Yg) are substituted with credit for private investment (CRi) and gross domestic product (Yg) respectively. Therefore, equation 3 was re-specified as:

$$InPRi_t = \emptyset_0 + \emptyset_1 ITi_t + \emptyset_2 InPBi_t + \emptyset_3 InCRi_t + \emptyset_4 InXDi_t + \emptyset_5 InEXr_t + \emptyset_6 InGDP_t + \varepsilon_t \qquad 4$$

$\emptyset_1 < 0$ and $\emptyset_2$, $\emptyset_3$, $\emptyset_4$, $\emptyset_5$, $\emptyset_6 > 0$

Where; PRi is the explained variable; whereas ITi, PBi, CRi, XDt, EXR, and GDP are the explanatory variables; ε_t = error term; $\emptyset_{0\ =}$ constant term; and $\emptyset_s$ = coefficients of the regression model and In is the natural log.

The study evaluates the influence of interest rates on private domestic investment in Nigeria from 1986 and 2019 using Ex-post-facto research design on time series data such as private domestic investment, interest rate, public expenditure, and credit for private investment, external debt, exchange rate and gross domestic product. The rationale behind this research design is the fact that it looks at the cause and effect between variables. Also, it is mostly used when secondary data is required without manipulation.

PRi is the private domestic investment measured as gross capital formation expressed in the logarithm. ITi is the interest rate which is measured as the maximum lending rate. Rise or decline in interest rate discourages or encourages private domestic investment respectively. PBi is public investment defined as total public expenditure expressed in the logarithm form. Public investment is theoretically believed to have a direct effect on private domestic investment. CPI is the credit for private investment defined as deposit money bank credit to the private sector expressed in logarithm. It is expected to have a positive effect on private domestic investment. XDt is external debt in naira value expressed in logarithm. External debt is expected to exhibit a positive impact on private domestic investment. EXr represents the exchange rate of naira against dollars. It is expressed in logarithm form. Theoretically, the exchange rate is negatively related to private domestic investment. GDP is gross domestic product at current year price expressed in logarithm form. An increase in gross domestic product will positively lead to a rise in private domestic investment. These data were sourced Central Bank of Nigeria Statistical Bulletin, volume 30, 2019 and reports Securities and Exchange Commission (SEC) Reports 2019.

3.2 Estimation Procedure
3.2.1   Unit Root Test
The order of integration of each series is ascertained to avoid the problem of spurious analysis. The test is performed using Augmented Dickey-Fuller (ADF) unit root test. Spurious regression occurs when non-stationary variables are regressed against stationary or another non-stationary variable. The results, according to Green (2003) may show a very high coefficient of determination (R^2), where it does not show a relationship between the variables. However, if the series is non-stationary at level, the test can proceed to first or second differencing until when it becomes stationary. Gujarati (2009) noted that the order of integration of each variable indicates the number of times the series were differenced to achieve stationarity.

$$\Delta Z_t = \omega_0 + \rho_t + Z_{t-1} + \sum_{i=1}^{p} \omega_1 \Delta Z_{t-i} + \epsilon_t \qquad\qquad 5$$

Where Z is the series whose order of integration is being determined, t is the trend variable, Δ is the differencing sign, ϵ_t represents the nuisance or white noise error term, ω_0 stands for the intercept and p stands for optimum lag length.

3.2.2 ARDL Bound's Cointegration Technique
Autoregressive distributed lagged (ARDL) is used since the time series variables were integrated in a different order. The approach is suitable especially when Johansen and Juselius (1990) are inappropriate. The beauty of the application of Autoregressive Distributed Lagged (ARDL) is that it is simple to interpret since it involves the use of a single equation unlike Johansen and Juselius (1990) whose equations are dependent on the number of variables. Each series forms a single equation which expresses a long-term influence of the lagged values of the dependent and other explanatory variables on the current dependent variable. However, if cointegration exists, the ARDL is reparameterized into an error correction model (ECM) to account for both the short-term and long-term effects of explanatory variables on the dependent variable. The term Distributed lag connotes the inclusion of lagged regressors in the model. The outcome of this model shows whether the variables are cointegrated. The equation is expressed as:

$$\Delta lnPIV_t = \omega_0 + \sum_{i=1}^{p} \omega_1 \, InPIV_{t-i} + \sum_{i=1}^{p} \omega_2 \, INT_{t-i} + \sum_{i=1}^{p} \omega_3 \, InPUI_{t-i} + \sum_{i=1}^{p} \omega_4 \, InCPI_{t-i}$$
$$+ \sum_{i=1}^{p} \omega_5 \, InEDT_{t-i} + \sum_{i=1}^{p} \omega_6 \, InEXR_{t-i} + \sum_{i=1}^{p} \omega_7 \, InGDP_{t-i} + \phi_1 \, INT_t$$
$$+ \phi_2 InPUI_t + \phi_3 InCPI_t + \phi_4 InEDT_t + \phi_5 InEXR_t + \phi_6 InGDP_t + \phi_7 ECT_{t-1}$$
$$+ \varepsilon_t \qquad\qquad\qquad 6$$

Where PIV stands for private domestic investment, t is the current time, INT denotes interest rate, PUI stands for public investment, CPI is bank credit for private investment, EDT represents external debt, EXR denotes exchange rate, and GDP represents gross domestic product. Also, ECT is the error correction term, In is the natural log, ε is the error term, and p is the maximum lag term. The symbol Δ denotes the first difference. $\omega_1 - \omega_5$ measures the short-run effect while $\phi_1 - \phi_4$ determines the long-

run effect. Engle and Granger (1987) noted that the error correction term occurs when the variables are found to be cointegrated. If cointegrated, it implies that there is a linear combination among the variables. The error-correction term (ECT) measures the speed of adjustment and the degree to which the short-run disequilibrium is corrected in the long run. Theoretically, interest rates are expected to have an inverse relationship with private domestic investment. Contrarily, public investment, external debt, gross domestic product and exchange rate are expected to exhibit a direct relationship with private domestic investment.

4.0 Result and Discussions

4.1 Stationarity Test Result

Essentially, a stationarity test is necessary for any time series-related research, mainly to discover the integration rank of the variables used in the study, and apply much required econometric technique to estimate the variables. To this effect, the PP (Phillips-Perron), as well as the ADF (Augmented Dickey-Fuller) stationarity tests, is engaged to unveil the unit root status of the variables employed. A variable is said to be nonstationary if its t-statistic is less negative compared to the critical value or the value of probability exceeds a 5% significant level. On the other hand, the variable is stationary if otherwise. The stationarity test results are illustrated in Tables 1 and 2 below:

Table 1: ADF Stationarity TestResult

	At Level		At First Difference		
Variables	ADF Statistic	5% CV	ADF Statistic	5% CV	Remarks
In(PDI)	-0.426513	-3.552973	-4.243686*	-3.557759	I(1)
INR	-3.768794	-3.552973	-	-	I(0)
In(PINV)	-1.692987	-3.552973	-6.671998*	-3.557759	I(1)
In(CPS)	-0.940059	-3.557759	-4.273741*	-3.557759	I(1)
In(EXD)	-2.152360	-3.557759	-4.071273*	-3.557759	I(1)
In(EXR)	-1.910318	-3.552973	-6.651413*	-3.557759	I(1)
In(GDP)	- 0.131641	-3.552973	-4.211316*	-3.557759	I(1)

Note: * indicate significance at 5% level

Sources: Computation, using E-view 9, 2020

Table 2: Phillips-Perron Unit Root Test Result

	At Level		At First Difference		
Variables	PP Statistic	5% CV	PP Statistic	5% CV	Remarks
In(PDI)	-0.743939	-3.552973	-4.252457*	-3.557759	I(1)
INR	-3.765461	-3.552973	-	-	I(0)
In(PINV)	-1.630072	-3.552973	-6.687117*	-3.557759	I(1)
In(CPS)	-0.556093	-3.552973	-4.140049*	-3.557759	I(1)
In(EXD)	-2.303866	-3.552973	-4.086785*	-3.557759	I(1)
In(EXR)	-1.861546	-3.552973	-6.701547*	-3.557759	I(1)
In(GDP)	-0.131641	-3.552973	-4.106358*	-3.557759	I(1)

Sources: Computation, using E-view 9, 2020

Tables 1 and 2 represent the estimation results of the ADF and PP stationarity tests of the time series data used in the research. From the results, the interest rate (INR) showed stationarity at level; thus, the interest rate is integrated of I(0). The result implies that interest rates had ADF statistics greater than 5 per cent critical value. Other variables including In(PDI), In(PINV), In(CPS), In(EXD), In(EXR) and In(GDP indicated no stationary at levels. However, the non-stationarity variables attained stationarity at the first differences. Hence, the series are integrated of I(1). Generally, the estimation shows that the variables possess long-run properties. In conclusion, the series has a mixed rank of integration, that is, order one and order zero. Thus, ARDL is utilized to determine the co-integration and the long-run coefficients of the variables used in the study.

4.2 Multiple Structural Breaks Unit Root Test Result

In the attempt to add to the conventional stationarity test of ADF as well as the PP test, this research utilized multiple structural breakpoints due to Bai and Perron (2003); in investigating the evidence of structural breaks in the variable of interest rate between 1986 and 2019 periods. The results indicate three (3) breakings, which could significantly affect private domestic investment. The outcome of the test is expressed in Table 3 below.

Table 3: Multiple Breakpoint Tests Result

Sequential F-statistic determined breaks:			3
Break Test	**F-statistic**	**Scaled F-statistic**	**Critical Value****
0 vs. 1 *	139.4324	278.8648	11.47
1 vs. 2 *	15.41959	30.83917	12.95
2 vs. 3 *	7.634580	15.26916	14.03
3 vs. 4	0.118710	0.237421	14.85

Break dates:

	Sequential	**Repartition**
1	2009	2002
2	2014	2009
3	2002	2014

Source: Compilation, 2020 using E-view 9

The results of the structural breaks test show the structural breakings in Nigeria's interest rate. From the estimation, significant breakings indicated by the results are three and these occurred in 2002, 2009 as well as 2014. The first breakpoint, which occurred in 2002, was as a result of the commencement of the medium-term monetary policy framework by Nigeria's apex bank, with the 2002 monetary policy programme. The 2002 monetary policy was put in place to realize the stabilities in the macroeconomic variables with a focus on exchange rates and price levels. In that, it was concentrated on the minimization of the constraints emanating from inconsistency in time as well as the excess reaction coming from temporary shocks in the system. Consequently, broad

103

money improved by 21.5% instead of the 15.3% target and narrow money rose by 15.9% instead of the targeted 12.4% (CBN, 2002).

Secondly, the significant breaking in 2009 was occasioned by the world's global economic crisis. As a result, Nigeria's apex bank was under intense pressure to retain low rates of interest and stabilizes the exchange rate of the naira, to enable commercial banks to assess short-term loan to easily finance their business firms, and hence, improvement in their businesses. This resulted in a significant ease of monetary policy to raise the level of liquidity in the economy. Hence, the system saw a reduction in interest rate benchmarking to 9.75 per cent and decreases cash reserve requirements from 4% to 2% (Ayano, 2010).

Finally, the third significant breakpoint in 2014 occurred due to the monetary authority's desire to combat price stability, specifically focusing on anchoring inflation within the range of a single digit. In this case, the monetary policy stance saw tightening, mainly to address an uprising inflation trend in the economy.

4.3 ARDL Co-integration Test Result

This method is motivated given evidence that the time series stationarity test indicated the integration of different ranks. The series is said to be integrated if the F-statistic result is greater than the chosen 0.05 critical value of the upper bound and rejected if otherwise. The cointegration result is expressed in Table 4 below:

Table 4: ARDL Bounds Test

Test Statistic	Value	K
F-statistic	3.646178	6

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.12	3.23
5%	2.45	3.61
2.5%	2.75	3.99
1%	3.15	4.43

Source: Compilation, using E-view 9, 2020

The results in Table 4 depict the ARDL bound co-integration test. It was conducted to examine the long-run effect of interest rates on Nigeria's private domestic investment. From the estimation, it was discovered that significant long-run nexus exists among the variables used. This claim is evidenced by the F-statistic of 3.646178, which significantly showed to exceed 2.45 critical lower Bounds and 3.61 critical upper Bounds borderline. Hence, the study concludes that evidence of equilibrium long-run association is found among the variables of the study.

4.4 ARDL Test Results

The short-run and long-run association between private domestic investment and the rate of interest are analyzed using the ARDL model. The coefficient estimate is said to be significant statistically if the probability value is less than the 0.5 critical value. Table 5 below illustrates the result of the estimate:

Table 5: Short/ Long-run Coefficient Tests

Variable	Short	Run Result			Long	Run	Result	
	Coefficient	Std. Error	t-Statistic	Prob.	Coefficient	Std. Error	t-Statistic	Prob.
Δ(INR)	-0.543934	0.176561	-3.080714*	0.0349	-0.606682	0.211553	-2.867754*	0.0489
Δ(In(PINV))	0.075432	0.055997	1.3470770	0.1917	0.307601	0.143122	2.149220*	0.0429
Δ(In(CPS))	0.585750	0.138726	4.222348*	0.0004	0.444658	0.200200	2.221063*	0.0370
Δ(In(EXD))	0.080074	0.031813	2.517024*	0.0196	0.136004	0.063745	2.133563*	0.0443
Δ(In(EXR))	-0.349503	0.071968	-4.856378*	0.0001	-0.826548	0.238345	-3.467868*	0.0022
Δ(In(GDP))	0.466308	0.137698	3.386450*	0.0027	0.792012	0.275450	2.875342*	0.0088
ECT(-1)	-0.588764	0.192167	-3.063813*	0.0057	-2.805013	0.917718	-3.056510*	0.0058
Test	Post Test	Result						
	F-stat	P-value						
LM Test	0.743117	0.4883						
ARCH	0.785182	0.3826						
RESETS	0.812361	0.4257						

Source: Compilation, using E-view 9, 2020

Table 5 represents the ARDL results of the tests of short-run and long-run coefficients. From the table, the rate of interest significantly and negatively affects private domestic investment in Nigeria, whereas public investment exerts an insignificant and positive effect on private internal investment in the economy. It also indicated that the credit to the private sector, external debt and the gross domestic product impact private domestic investment significantly and positively, while the exchange rate significantly and negatively affects the private domestic investment of Nigeria.

The above claims are evidenced by the parameters and the probability values of the coefficients of the variables obtained using the ARDL technique. From the model, the parameters or coefficients of INR, In(PINV), In(LCPS), In(EXD), In(EXR) and In(GDP) are -0.543934, 0.075432, 0.585750, 0.080074, -0.349503, and 0.466308, respectively; while corresponding probability values of the variables include 0.0349, 0.1917, 0.0004, 0.0196, 0.0001 and 0.0027, respectively. Similarly, the finding indicated a speed of adjustment [ECT(-1)] of -0.588764 with a probability of 0.0057. The result implies that the annual correction adjustment from short-run deviation towards equilibrium long-run association is 58.9%. The ECT(-1) is statistically significant, fractional and negative, which satisfies statistical and econometric necessary conditions.

In the long-run coefficient test, it was revealed that the rate of interest as well as the exchange rate significantly and negatively affects private domestic investment in Nigeria, whereas the external debt, gross domestic product, credit to the private sector, and the public investment impacted positively and significantly on the private domestic investment in the economy.

Similarly, the above claims are supported by the facts indicated by the coefficients and the probability values of the estimated variables. From the estimation, the parameters of INR, In(PINV), In(CPS), In(EXD), In(EXR) and In(GDP) include -0.606682, 0.307601, 0.444658,0.136004, -0.826548, and 0.792012, respectively, whereas the corresponding p-values are 0.0489, 0.0429, 0.0370, 0.0443, 0.0022 and 0.0088, respectively. Furthermore, the finding revealed an F-statistic of 2809.290 with a probability value of 0.000000. This result implies that the combined impact of the regressor variables on the regressand variable is significant statistically.

The results are in line with the investment multiplier theory postulated by Kahn in the 1930s. The theory revealed that an increase in either public or private investment expenditure would proportionately affect aggregate income positively as well as the economy as a whole. Hence, the rate of interest no doubt, is conceived as a key predictor of private investment. A low rate of interest attracts more investments and vice-versa. The results as well conformed to the postulation of the economic theory of financial investment as developed in 1949 by James Duesenberry. The theory conceived funds' supply to firms as elastic. Thus, as more funds are demanded for investment expenditure, is more interest rate increases in the economy.

Empirically, the findings align with the discoveries of Osuji (2020) and Obinna (2020) that investigated the impact of interest rates on Nigeria's private domestic investment; and discovered a significant and negative effect of the rate of interest on private internal investment. Contrarily, the results contradict the results found by Thuy, Anh and Diem (2020), Solomon and Kofi (2020), and Monica, Willy and Agnes (2020), who study on the effect of interest rates on individual firms (private) investment across countries including Vietnam, Kenya and Nigeria; and found positive nexus between the two variables.

The post-estimation result indicated no evidence of autocorrelation among the explanatory variables. The ARCH heteroskedasticity result showed that the results are homoscedastic; while the Ramsey RESETS test results revealed no error specification within the model used. As well, the above arguments are significantly supported by the insignificant value of the respective probability values of ARCH heteroskedasticity, LM test and RESETS test.

The CUSUM of squares and the CUSUM of residuals are tests of stability often utilized in time series research to determine whether there is evidence of constancy in error terms and stability in the parameters of the variables. The equations are stable if the blue line falls in between the critical bands at a 0.05 significance level. Given Figures 1 and 2, evidence of stability is found in the parameters of the variables as the CUSUMSQ and CUSUM's plots of the statistics lie in between the 5% critical value of the critical bands.
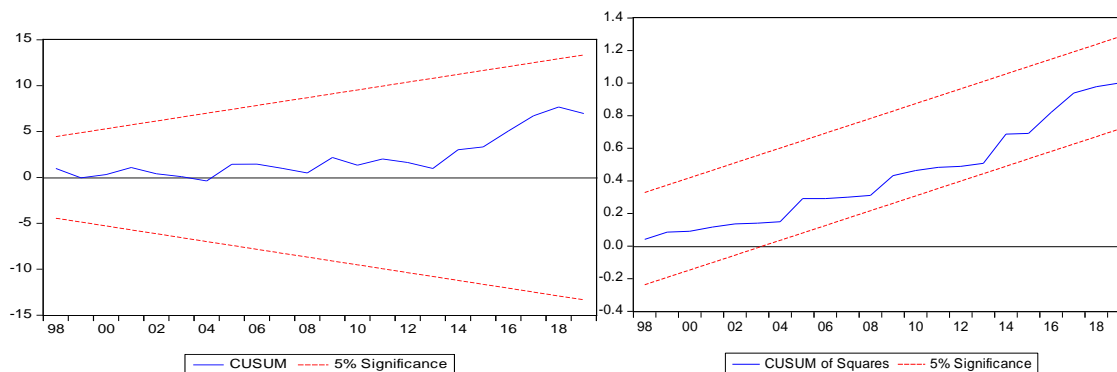
Figure 1: CUSUM Stability Test   **Figure 2: CUSUM of Square Stability Test**

5.0 Conclusions and Policy Recommendations
5.1 Conclusions
This paper evaluated the influence of interest rates on Nigeria's private internal investment. The findings indicated evidence of equilibrium long-run association of the variables employed. The estimation revealed that the rate of interest significantly and negatively influenced private internal investment both in the short run and the long run. This point to the significant influence interest rate has on Nigeria's private internal investment. The three breakpoints indicated in the paper show the nonlinearity of the interest rate, and it explained the reactions of private investment to changes in Nigeria's policy of interest rate.

5.2   Policy Recommendations
The study recommends that the nation's monetary authorities (CBN) should utilize more monetary policy, particularly interest rate policy to promote private domestic investment by keeping interest rates low. This will attract investors across the board to call for capital with positive effects on private domestic investments in Nigeria. Based on the results, a 1% fall in interest rate will result in a 0.5% and 0.6% rise in the nation's private internal investment both in the short-run and long-run, respectively.

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