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MONETARY POLICY AND DOMESTIC INVESTMENT IN NIGERIA: THE ROLE OF THE INFLATION RATE

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Abstract. Economic theory suggests that monetary policy can be used to stabilize an economy. However, the ability of monetary policy targets—interest rates and money supply—to stabilize an economy depends on their ability to achieve price stability. Using data from 1981 to 2018 and applying the vector error correction model, this paper seeks to determine how the changes in the inflation rate affect the ability of monetary policy tools to stabilize the Nigerian economy and stimulate investment. Empirical results suggest that the impact of the interest rates on investment depends on the level of the inflation rate. The size of the effect of interest rates on investment gets weaker as the inflation rate increases suggesting that monetary policy tools, such as the monetary policy rate (MPR), that directly change the interest rates are robust stabilization tools during periods of declining inflation rates but not relevant during periods of rising inflation rates. This is attributable to low bank lending rates. Additionally, the impact of the money supply target on investment does not depend on the level of the inflation rate. This suggests that monetary policy tools, such as open market operations, that directly change the money supply can be relevant stabilization tools during economic booms and recessions. As a result, the Central Bank of Nigeria should work to deepen the scale, capacity, and efficiency of its open market operations by ensuring that most of the people can participate with minimal transaction cost and by making different financial instruments available.

Keywords*: Inflation rate, Investment, Monetary policy, Nigeria, Vector error correction model.*

JEL Classification: E22, E31, E43, E52, E58

INTRODUCTION

The monetary authority of a country uses its monetary policy framework to manage the value, cost, and supply of money. In Nigeria, the main goal of monetary policy is price stability (Central Bank of Nigeria, 2011) and the conduct of monetary policy has been the achievement of a 6 to 9 percent inflation rate through a contractionary monetary policy. Price stability is expected to improve the value of the Nigerian Naira, discourage capital flight, achieve a favourable balance of payments, increase aggregate savings and investment, and stimulate the production, distribution, and consumption of goods and services. This monetary policy objective suggests that monetary policy works through the price level to be able to achieve its macroeconomic goals. Analysing the ability of monetary policy tools to

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stimulate investment in Nigeria during booms (rising inflation rates) and recessions (falling inflation rates) is the primary aim of this study.

To achieve its objectives, the Central Bank of Nigeria (CBN) uses its monetary policy tools to influence the market interest rates and money supply to stabilize the economy. For simplicity and clarity, it is assumed that the CBN has only two monetary policy tools for its two monetary policy targets: the monetary policy rate (MPR), which it uses to influence the market interest rates, and the open market operations, which it uses to directly alter the money supply. Additionally, only the CBN can significantly change the money supply using its open market operations. During economic recessions and/or falling inflation rates (deflation), the CBN adopts an expansionary monetary policy that involves the reduction of the monetary policy rate, the purchase of domestic assets on the open market, or both. The idea behind these policies is to enhance the ability of the deposit money banks to advance loans and credits by decreasing the cost of borrowing and increasing the money supply. It is expected that reducing the market interest rates, increasing the money supply, or both will stimulate aggregate demand and investment. On the contrary, the CBN will typically adopt a contractionary policy during periods of economic booms and/or high inflation to stabilize the economy.

The transmission mechanism of monetary policy raises an important question. How do the changes in the inflation rates affect the ability of monetary policy tools to stabilize the economy and stimulate investment? In other words, can the CBN always count on its monetary policy tools (monetary policy rate and open market operations) to stabilize the economy irrespective of the prevailing rate of inflation? The link between monetary policy and economic growth is inconclusive (Twinoburyo and Odhiambo, 2018). Therefore, investigating whether the stabilization impact of monetary policy depends on the price level is important because it improves our understanding of the effectiveness of monetary policy tools when the Nigerian economy is in a recession or boom.

This study employs different empirical approaches to address this research question. First, a unit root test is conducted on the variables and the results show that they are stationary after first differencing, $I(1)$. However, the Johansen cointegration test shows evidence of a long-run relationship among the variables. The author of the paper estimates the model using the vector error correction model (VECM), which is convenient for parameterizing and estimating integrated but cointegrated processes. This study provides some interesting findings. First, the results show that the impact of the monetary policy rate on investment depends on the level of the inflation rate. The size of the effect of the monetary policy rate on investment gets smaller as the inflation rate increases. This suggests that the MPR is a robust stabilization tool during periods of declining inflation rates but not relevant during periods of rising inflation rates and economic booms. Additionally, the impact of open market operations on investment does not depend on the level of the inflation rate. This suggests that monetary policy tools that directly change the money supply, such as open market operations, can be a relevant stabilization tool during economic booms and recessions.

The remainder of the paper is organised as follows. Section 1 reviews the results of past studies related to the study and Section 2 presents the methodology and results. A final section gives the conclusion and recommendations.

1. LITERATURE REVIEW

Research has been conducted on the area of monetary policy, investment, and economic growth. This section critically reviews the results of those studies with emphasis on Nigeria and developing countries.

Using a structural vector autoregression model, Kutu and Ngalawa (2016) study how monetary shocks affect industrial output in BRICS countries. The results of the study provide evidence that an exchange rate shock (a depreciation) has a relevant positive impact on industrial output over time. Furthermore, the variations in the money supply explain the variations of the exchange rate better than the variations in the interest rate. Therefore, the money supply exerts more influence on industrial output than the interest rates. In addition, Afrin (2017) explores the transmission mechanism of monetary policy in Bangladesh. The result suggests that money supply targeting plays an important role in influencing the price level while the role of bank credit is not meaningful.

Using data for the period from 1970 to 2002, Eregha (2010) investigates the association between the interest rate and investment in Nigeria. The result shows that the interest rate is negatively correlated with investment. Similarly, Musa *et al*. (2013) study the impact of monetary and fiscal policies on Nigeria's inflation rate and economic growth using annual time series data from 1970 to 2010. They find that the money supply is a strong positive contributor to growth. Tran *et al*. (2019) use data for 250 Vietnamese firms to study the impact of expansionary monetary policy on corporate investment. They find that an expansionary monetary policy increases firm borrowing and enhances corporate investment.

In addition, Greene and Villanueva (1991) examine the determinants of private investment in 23 developing countries from 1975 to 1987. They find that national income per capita is positively associated with growth in private sector investment, while real interest rate and inflation rate are negatively associated with growth in private sector investment. However, using panel data for 97 developing countries from 1973 to 2002 to investigate the factors that affect investment in developing countries, Salahuddin and Islam (2008) show that real interest rate is not important for explaining cross-country differences in the level of investment.

Mehrara and Karsalari (2011) explore the non-linear relationship between the real interest rate and private investment in 101 developing countries. They find that the real interest rate has a diminishing marginal effect on investment. Specifically, the real interest rate has a positive impact on private investment up a threshold of about 6 %; after this point, the real interest rate reduces the level of private investment in these countries. Using data for 37 sub-Saharan African countries from 1980 to 2012 to study the impact of monetary policy on investment through the credit channel, Ndikumana (2016) finds that the adoption of a contractionary monetary policy to control inflation has adverse effects on the investment and national income of these countries. Likewise, Ho and Yeh (2010) find that monetary

policy in Taiwan is effective and that monetary tightening significantly reduces the national income, money supply, and the price level.

Some results have found evidence that both monetary policy instruments can be relevant. For example, Bhat, Kamaiah, and Acharya (2019) examine the differential impact of monetary policy instruments, such as the money supply and the interest rate, on the price level, aggregate demand, and supply. The result proves that both money supply and interest rates are important monetary policy instruments because they have a relevant impact on the price level, aggregate demand, and supply. Similarly, Anwar and Nguyen (2018) analyse the monetary policy transmission in Vietnam using the structural vector autoregression. The finding is that the interest rate and money supply shocks in the monetary aggregates robustly determine the level of output. Karim (2012) examines how the interest rate and broad money channels of monetary policy affect the investment spending of firms. The results suggest that both instruments are relevant for determining investment expenditure in Malaysia.

On the other hand, some results have found that monetary policy is ineffective. For instance, Alam (2015) argues that monetary policy is not important for explaining economic swings in the short run primarily due to the counteracting effects of public sector borrowing and the dominance of microcredit. Similarly, Cyrus and Elias (2014) conclude that monetary policy is ineffective largely due to inferior institutional and structural structures, while fiscal policy robustly influences real national income in Kenya. Lastly, Montiel *et al*. (2012) prove that monetary policy does not exert a robust influence on real output in Tanzania.

Past studies have mostly analysed the association between monetary policy and investment, or economic growth and the bulk of the evidence points to the fact that interest rates and the inflation rate are negatively associated with investment, while national income and money supply are positively associated with investment in developing countries. Other studies suggest that structural and institutional deficiencies are the reasons why monetary policy transmission is weaker or less effective in developing countries. However, an extensive review of the literature does not provide any evidence of an empirical study that attempts to investigate how the changes in the inflation rate affect the impact of monetary policy on investment in Nigeria. This is the gap this study seeks to occupy. Also, this paper builds on the previous research by employing the VECM, which is more appropriate for parameterizing the dynamic interrelationships among macroeconomic variables. Previous studies have employed the ordinary least squares method, which is not adequate for capturing the interdependencies among macroeconomic variables. Lastly, this study uses more recent data for Nigeria that extends the period of analysis to 2019.

2. METHODOLOGY AND RESULTS

2.1. Model Specification

This study is based on the flexible accelerator theory, which accounts for lags in the adjustment process between changes in output (income) and changes in investment. The linear model of this study in compact form is given as:

$$Investment_t = \alpha + \boldsymbol{X}_{t-1}\boldsymbol{\beta} + U_t \ , \tag{1}$$

where *Investment*, the dependent variable, is the natural logarithm of real gross capital formation, which measures the outlays on additions to Nigeria's fixed assets (for example, plants, machinery, equipment, land improvements, buildings, etc.) plus net changes in inventories (stocks of goods held by producers to meet unforeseen changes in production or sales); **β** is a vector containing the coefficients of the explanatory variables and the interaction terms and ***X*** is a vector containing the explanatory variables and the interaction terms between the monetary policy rate and the inflation rate, and broad money (a measure of the money supply) and the inflation rate. α is the intercept and U_t is the error term.

Hypothesis Testing

Equation (1) states that investment is determined by the variables of interest—monetary policy rate and broad money—alongside a set of control variables, which include: real gross domestic product per capita (log), inflation rate (consumer price index), and imports (% of GDP). Broad money is a proxy for money supply-changing instruments, and it depends on open market operations. The interaction term between the monetary policy rate and the inflation rate and the interaction term between broad money and the inflation rate are expected to shed light on the impact of the variations in the monetary policy rate and money supply as the inflation rate changes. The total impact of monetary policy rate and money supply can be calculated by deriving the partial derivatives of investment with respect to the inflation rate as given in (2) and (3), respectively.

$$\frac{\partial\, Investment}{\partial\, MPR} = \beta_1 + \ \delta Inflation\, rate. \tag{2}$$

$$\frac{\partial\, Investment}{\partial\, Broad\ Money} = \beta_2 + \ \theta Inflation\, rate\,. \tag{3}$$

β_1 and β_2 are the coefficients of monetary policy rate and broad money, respectively. While δ and θ are the coefficients of the interactions between the monetary policy rate and the inflation rate and broad money and the inflation rate, respectively. If all the coefficients are positive and the interaction terms statistically significant; then, the impact of monetary policy rate and broad money on investment is larger as the inflation rate increases. On the contrary, the impact of monetary policy rate and broad money on investment gets smaller as the inflation

rate increases if the interaction coefficients are negative and statistically significant. Finally, if the interaction terms are not statistically relevant; then, the conclusion is that the impact of the monetary policy tool on investment does not depend on the price level.

2.2. Data

The type of data used in this study is an annual time series data. All the data were sourced from the World Bank's World Development Indicators except the monetary policy rate, which was obtained from the Central Bank of Nigeria's statistical bulletin. The period covered is from 1981 to 2018. Each variable contains 38 observations. This entails the collection of 228 observations for the six variables used in the study.

2.3. Descriptive Statistics

The descriptive statistics of the variables are presented in Table 1. The Jarque-Bera is a test for normality, and a normally distributed dataset has a *p*-value that is greater than 0.05. All the variables, except the inflation rate, are normally distributed at a 5 % level. The problem of skewness is not observed since all the variables (except inflation) have a skewness value that is approximately zero. There is no missing observation.

Table 1. Summary Statistics (Sample: 1981–2018)

	Investment (log)	**MPR (%)**	**Broad Money (% of GDP)**	**RGDP Per Capita (log)**	**Inflation (CPI)**	**Imports (% of GDP)**
Mean	24.73495	13.06579	15.72410	7.443700	19.32377	13.01174
Median	24.71164	13.25000	13.21323	7.344674	12.54718	12.99237
Maximum	25.37776	26.00000	25.44805	7.849285	72.83550	22.81126
Minimum	24.35339	6.000000	9.063329	7.188637	5.382224	3.029761
Std. Dev.	0.213507	4.100381	5.370345	0.238318	17.25517	5.374572
Skewness	0.664177	0.669171	0.678351	0.517032	1.742258	−0.029710
Kurtosis	3.816636	4.231054	1.858870	1.657000	4.837185	2.408297
Jarque-Bera	3.849744	5.235529	4.976130	4.548816	24.56874	0.559935
Probability	0.145894	0.072966	0.083071	0.102858	0.000005	0.755808
Obs.	38	38	38	38	38	38

Source: The author's computation (2020)

2.4. Stylized Facts

Figures 1 and 2 present the stylized facts of investment (log), on the Y-axis, with monetary policy rate and broad money, on the X-axis, respectively. The regression line was fitted to show the direction of the association. The results agree with the *a priori* expectation: there is a negative association between investment

and the monetary policy rate and there is a positive association between investment and money supply. Higher interest rates raise the cost of borrowing, thereby discouraging consumption and investment, while higher money supply increases investment because of an increase in domestic aggregate demand and vice versa.

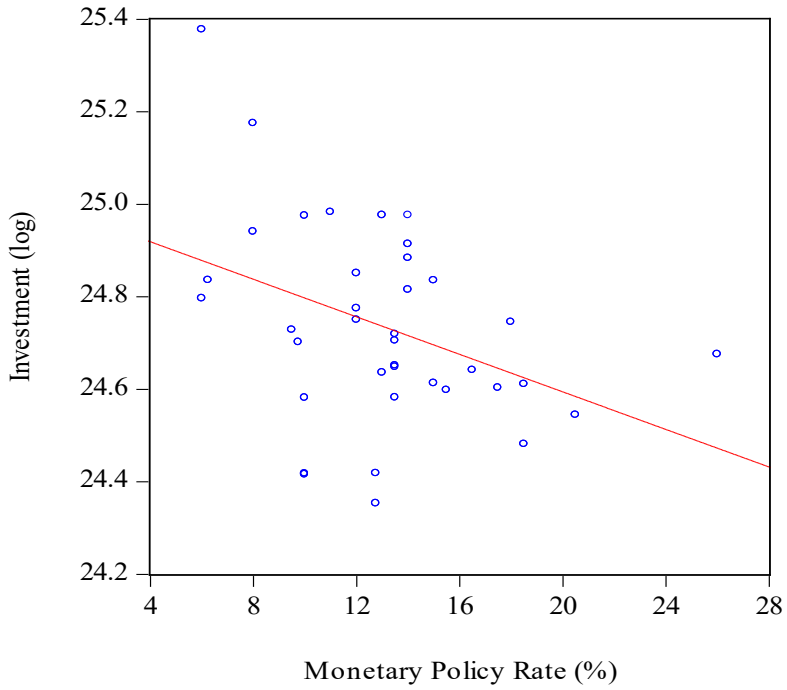

Fig. 1. Investment and MPR, the author's computation (2020).

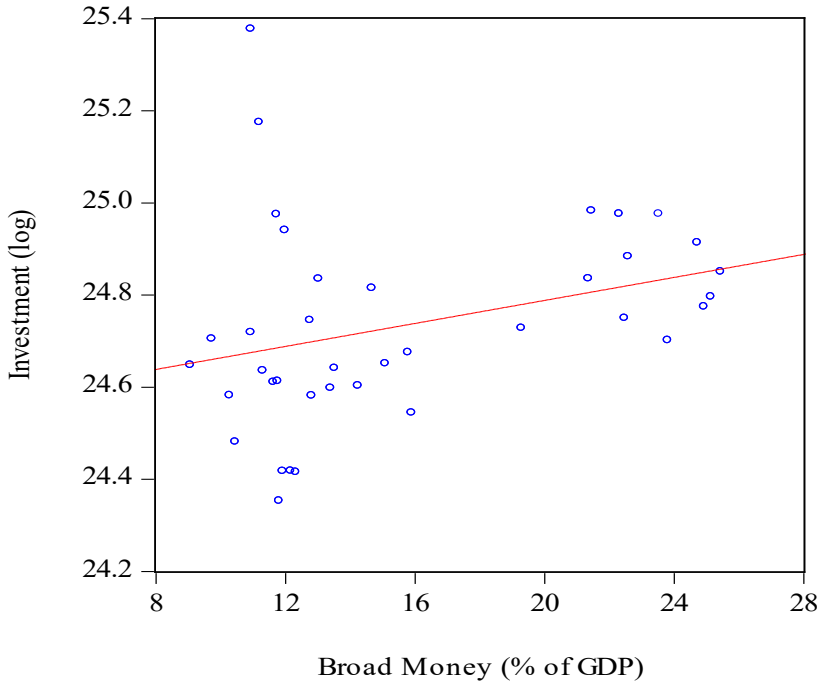

Fig. 2. Investment and broad money, the author's computation (2020).

2.5. Unit Root Test

The results of the Augmented Dickey-Fuller test (with intercept and with intercept and trend) are shown in Table 2 and Table 3, respectively, for all the variables. All the variables are integrated of order one, *I*(1); i.e., they are stationary after first differencing at 0.1 significance level.

Table 2. ADF Test on all the Time Series – with Intercept

Variable	ADF Value (Level)	ADF Value after First Differencing	Order of Integration
Investment (log)	−0.7717	−2.7493*	I(1)
MPR	−2.4241	−5.7712***	I(1)
Broad Money	−0.5567	−3.1907**	I(1)
RDGP Per Capita (log)	−0.8799	−3.8263***	I(1)
Inflation (CPI)	−2.2349	−4.4391***	I(1)
Import	−1.9724	−4.6483***	I(1)

Source: The author's computation (2020)
Notes: ADF critical values: 1 % level: −3.63; 5 % level: −2.95; 10 % level: −2.61.
***, **, and * denote stationary at 1 %, 5 %, and 10 % levels of significance, respectively.

Table 3. ADF Test on all the Time Series – with Intercept and Trend

Variable	ADF Value (Level)	ADF Value after First Differencing	Order of Integration
Investment (log)	−2.4451	−2.5090	I(1)
MPR	−2.4715	−5.7666***	I(1)
Broad Money	−2.1153	−3.2087	I(1)
RDGP Per Capita (log)	−1.5105	−3.7421**	I(1)
Inflation (CPI)	−2.8081	−4.4079***	I(1)
Import	−2.3184	−4.6140***	I(1)

Source: The author's computation (2020)
Notes: ADF critical values: 1 % level: −4.23; 5 % level: −3.54; 10 % level: −3.21.
***, **, and * denote stationary at 1 %, 5 %, and 10 % levels of significance, respectively.

2.6. Cointegration Test

This paper employs the Johansen cointegration test to determine if there is a long-run relationship among the variables since all the time series are non-stationary. The author adopts the VAR (Vector Autoregressive) order of 2 as selected by the Akaike criterion based on the levels of VAR model. The results of the trace and maximum eigenvalue tests are presented in Tables 4 and 5, respectively.

The Johansen cointegration test confirms the existence of a long-run relationship and provides evidence of one cointegrating equation. As a result, the cointegrating rank (*r*) is 1. This result implies that, for although all the time series are individually non-stationary, i.e., they have stochastic trends, their linear

combination is stationary, *I*(0). Cointegration makes regressions involving *I*(1) variables to be meaningful and not spurious.

Table 4. Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
r = 0*	0.815519	120.0313	95.75366	0.0004
r ≤ 1	0.508212	60.87391	69.81889	0.2095
r ≤ 2	0.348056	36.03414	47.85613	0.3946
r ≤ 3	0.288912	21.06127	29.79707	0.3538
r ≤ 4	0.196443	9.127715	15.49471	0.3537
r ≤ 5	0.041212	1.472972	3.841466	0.2249

Source: The author's computation (2020)
Notes: Trace test indicates 1 cointegrating eq(s) at the 0.05 level, *denotes rejection of the hypothesis at the 0.05 level, **MacKinnon-Haug-Michelis (1999) *p*-values

Table 5. Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
r = 0*	0.815519	59.15737	40.07757	0.0001
r ≤ 1	0.508212	24.83976	33.87687	0.3959
r ≤ 2	0.348056	14.97287	27.58434	0.7504
r ≤ 3	0.288912	11.93355	21.13162	0.5542
r ≤ 4	0.196443	7.654743	14.26460	0.4149
r ≤ 5	0.041212	1.472972	3.841466	0.2249

Source: The author's computation (2020)
Notes: Max-Eigenvalue test indicates 1 cointegrating eq(s) at the 0.05 level, *denotes rejection of the hypothesis at the 0.05 level, **MacKinnon-Haug-Michelis (1999) *p*-values

2.7. Model Estimation

Since the variables are integrated but cointegrated, the author applies the vector error correction model to estimate the short-run and the long-run relationships between the variables.

The author has established that equation (1) is cointegrated; however, there may be disequilibrium in the short run. Therefore, one can treat the error term in equation (1) as the error correction term (ECT). Having identified the VAR order *p* as 2 using the Akaike Criterion for the cointegration test, we can also use this VAR order to choose the number of lagged differences in a VECM because $p-1$ lagged differences in a VECM correspond to a VAR order *p* (Lütkepohl, 2005). The short-run model is formulated in a general form as follows:

$$\Delta \boldsymbol{Y}_t = \beta_0 + \sum_{i=1}^{p-2} \boldsymbol{\beta_i} \Delta \boldsymbol{Y_{t-i}} + \sum_{m=1}^{p-2} \Delta \boldsymbol{X}_{t-m} \boldsymbol{\beta_m} + \varphi ECT_{t-1} + \varepsilon_t, \quad (4)$$

where Δ is the first difference operator, p is the lag order and ε_t is the random error term. Based on *a priori* expectation, it is expected φ, the coefficient of ECT_{t-1}, to be negative and statistically significant.

The cointegrating equation for estimating the long-run relationships between the variables is specified as:

$$ECT_{t-1} = Investment\left(\log\right)_{t-1} - \beta_0 - \boldsymbol{X}_{t-1}\boldsymbol{\beta}, \tag{5}$$

where ECT_{t-1} is the lagged error correction term because a linear combination of Eq. (1) is stationary.

The results of equations (4) and (5) above, with 36 included observations, derived from the vector error correction model are presented in Table 6 below.

Table 6. Regression Result (Main Effects)

Short-Run Dynamics	**(1) D [Investment (log)]**	**Cointegrating Equation**	**(2) Investment (log)$_{t-1}$**
D[Monetary Policy Rate$_{t-1}$]	0.0116 (0.00957)	Monetary Policy Rate$_{t-1}$	−0.00298 (0.0055)
D[Broad Money (% of GDP)$_{t-1}$]	−0.0221 (0.01794)	Broad Money (% of GDP)$_{t-1}$	0.06737*** (0.00673)
D[RGDP Per Capita (log)$_{t-1}$]	0.7672 (1.3875)	RGDP Per Capita (log)$_{t-1}$	1.1088*** (0.15928)
D[Inflation (CPI)$_{t-1}$]	0.00014 (0.00252)	Inflation (CPI)$_{t-1}$	−0.00484*** (0.00133)
D[Imports (% of GDP)$_{t-1}$]	−0.00108 (0.00854)	Imports (% of GDP)$_{t-1}$	0.00378 (0.00365)
D[Investment (log)$_{t-1}$]	0.173 (0.1974)		
Error Correction Term	−0.503* (0.25365)		
Constant	0.013 (0.036)	Constant	14.76 (n/a)
Observations (after adjustment)	36		
R-squared	0.459		
F-Statistic	3.401***		
Autocorrelation LM Test (lag 2) [*p*]	84.5226 [0.2276]		
White Test (No cross-terms) [*p*]	284.0255 [0.6512]		

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

The cointegrating equation gives the long-run relationships between the variables. In line with economic theory, the money supply and income per capita are positively correlated with investment, while the inflation rate is negatively correlated with investment. The monetary policy rate and import, on the other hand, do not have a relevant direct impact on investment. An explanation of the impact of money supply on investment is straightforward. Increasing the money supply stimulates aggregate demand because consumers have more funds to spend on goods and services. To meet the higher demand, producers increase the amount of labour and capital, which eventually increase investment and output.

The impact of income per head on investment is in line with the flexible accelerator theory of investment. An increase in per capita income leads to an increase in aggregate demand and investment since income finances consumption and production. A higher inflation rate, on the contrary, can increase input and product prices, and ultimately reduce aggregate demand, which can have adverse effects on firm profits. Additionally, rising inflation tends to increase market interest rates, which erode the return of assets, thereby discouraging investments in financial assets (like bonds), and discourage private-sector borrowing. This result corroborates the CBN's standpoint that price stability can encourage investment.

The short-run dynamics, which can be used for causality analysis, give the short-run relationships between the variables. As expected, the *ECT* is in line with *a priori* expectations. Furthermore, there is no evidence of causality as all the explanatory variables are not statistically relevant. The results of the diagnostic test show that the residuals are not serially correlated nor heteroscedastic. Accordingly, a stability test is performed using the Cumulative Sum (CUSUM and CUSUM of Squares) tests. The results, depicted in Figs. 3 and 4, show evidence of parameter stability and that there is no structural break.

The author estimates two models to test the hypotheses presented in equations (2) and (3). The first model contains an interaction term between the monetary policy rate and the inflation rate to determine how changes in the inflation rate affect the impact of monetary policy rate on investment.

The interaction term between the monetary policy rate and the inflation rate appears with a negative sign and is statistically significant. The significant interaction term provides an interesting finding. From the cointegrating equation, the impact of the monetary policy rate on investment depends on the level of the inflation rate and it is stronger as the inflation rate falls and weaker as the inflation rate rises. One way to understand the poor performance of the monetary policy rate during rising inflation is that bank lending has not been an important source of credit to Nigerian households and firms because of banks' unwillingness to lend largely due to a credit risk, the 2005 bank reforms and the CBN's 2019 directive to punish banks that do not meet lending limits sought to address. As a result, changes in the cost of borrowing do not significantly affect private sector credit and cannot reduce the inflation rate and stabilize the economy.

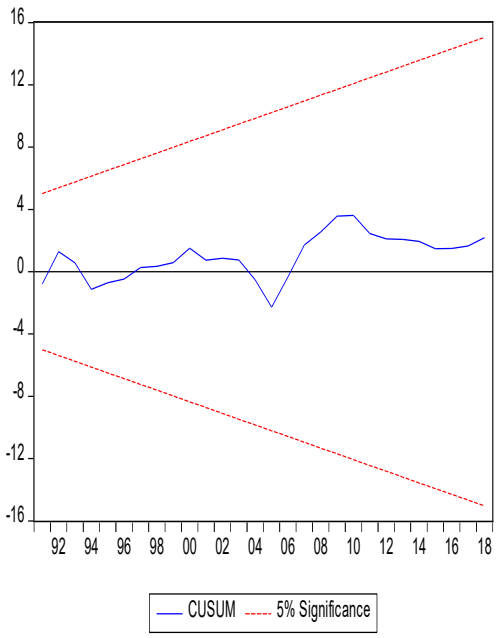

Fig. 3. CUSUM test.
Source: The author's computation (2020)

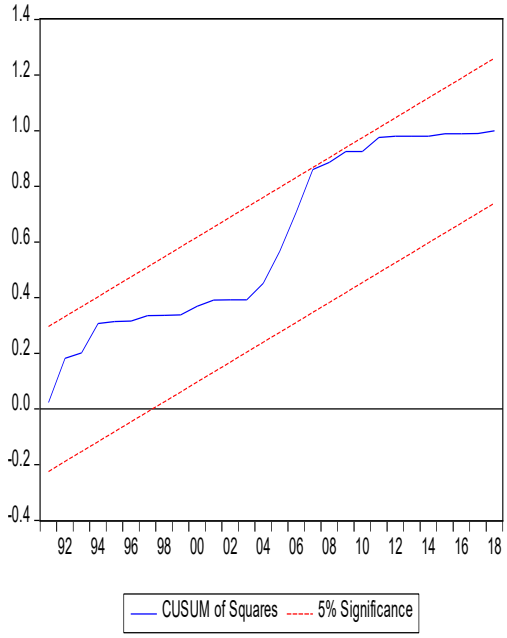

Fig. 4. CUSUM of squares test.
Source: The author's computation (2020)

The short-run result suggests that the interaction term involving the MPR and the inflation rate granger causes investment. A good way to understand this result is that the variations in the MPR, when the inflation rate is low (or declining), can predict the variations in investment. The result of the diagnostic tests shows that the residuals are not serially correlated and heteroscedastic at a 5 percent level. The stability tests presented in Figs. 5 and 6 show evidence of parameter stability and that there is no structural break.

Table 7. Regression Result (with Interaction Term)

Short-Run Dynamics	**(1)** **D [Investment (log)]**	**Cointegrating Equation**	**(2)** **Investment (log)$_{t-1}$**
D[Monetary Policy Rate$_{t-1}$]	−0.0119 (0.01754)	Monetary Policy Rate$_{t-1}$	0.0134 (0.0095)
D[MPR*Inflation(CPI)$_{t-1}$]	0.000918** (0.00041)	MPR*Inflation(CPI)$_{t-1}$	−0.0014*** (0.00035)
D[Broad Money (% of GDP)$_{t-1}$]	−0.01779 (0.01418)	Broad Money (% of GDP)$_{t-1}$	0.07435*** (0.00715)
D[RGDP Per Capita (log)$_{t-1}$]	0.058 (1.1186)	RGDP Per Capita (log)$_{t-1}$	1.039*** (0.1606)
D[Inflation (CPI)$_{t-1}$]	−0.016** (0.00717)	Inflation (CPI)$_{t-1}$	0.02095*** (0.00564)
D[Imports (% of GDP)$_{t-1}$]	−0.00535 (0.00778)	Imports (% of GDP)$_{t-1}$	0.00277* (0.00366)

D[Investment (log)$_{t-1}$]	0.2175 (0.1923)		
Error Correction Term	−0.688*** (0.19316)		
Constant	0.019 (0.031)	Constant	14.86 (n/a)
Observations (after adjustment)	36		
R-squared	0.586		
F-Statistic	4.781***		
Autocorrelation LM Test (lag 2) [*p*]	55.8642 [0.2682]		
White Test (No cross-terms) [*p*]	467.6513 [0.2516]		

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

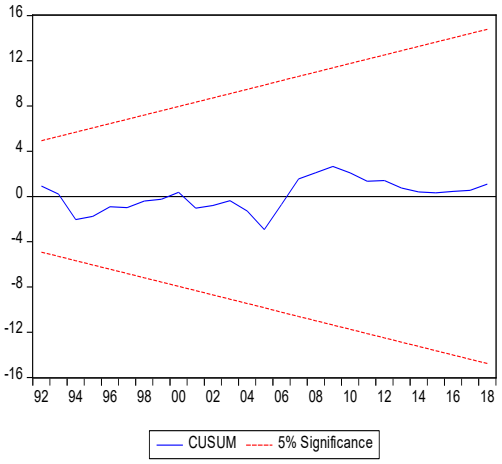

Fig. 5. CUSUM test.
Source: The author's computation (2020)

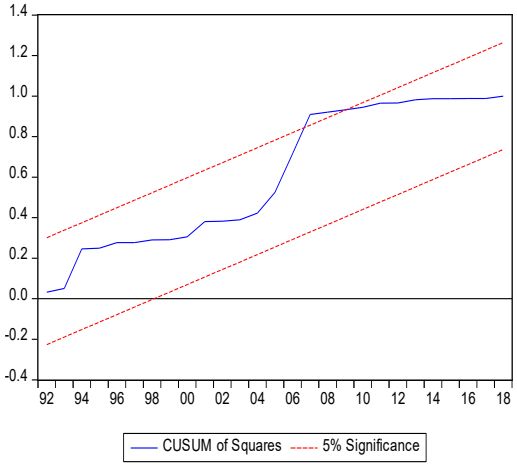

Fig. 6. CUSUM of squares test.
Source: The author's computation (2020)

Table 8 below presents the results of the model that tests the hypothesis presented in (3). An interaction term between the broad money and the inflation rate did not produce a statistically significant result.

This result provides evidence that the ability of open market operation (measured by broad money) to stimulate investment does not depend on inflation. Therefore, an open market operation is an effective stabilization tool during increasing and decreasing inflation rates. A possible explanation for this result is that, unlike the monetary policy rate that works through the banking channel, the open market operations directly change the level of funds available to the private sector for consumption and/or investment, during booms and recessions. During booms and rising inflation, the CBN can directly sell assets to domestic investors that can place orders through Nigerian banks. This action has the potential to mop

up excess liquidity and stabilize the price level. This is also true and works in reverse during recessions and lower inflation rates.

Table 8. Regression Result (with Interaction Term)

Short-Run Dynamics	**(1)** **D [Investment (log)]**	**Cointegrating Equation**	**(2)** **Investment (log)$_{t-1}$**
D[Monetary Policy Rate$_{t-1}$]	0.0157 (0.00987)	Monetary Policy Rate$_{t-1}$	−0.0051 (0.00645)
D[Broad Money (% of GDP)$_{t-1}$]	−0.00306 (0.0218)	Broad Money (% of GDP)$_{t-1}$	0.0649*** (0.01193)
D[Broad Money*Inflation(CPI)$_{t-1}$]	−0.000894 (0.000676)	Broad Money*Inflation (CPI)$_{t-1}$	0.000417 (0.00063)
D[RGDP Per Capita (log)$_{t-1}$]	1.049 (1.294)	RGDP Per Capita (log)$_{t-1}$	1.0741*** (0.16795)
D[Inflation (CPI)$_{t-1}$]	0.0102 (0.00816)	Inflation (CPI)$_{t-1}$	0.0091 (0.00798)
D[Imports (% of GDP)$_{t-1}$]	−0.00301 (0.00870)	Imports (% of GDP)$_{t-1}$	0.00258 (0.00379)
D[Investment (log)$_{t-1}$]	0.183 (0.195)		
Error Correction Term	−0.466* (0.241)		
Constant	−0.0257 (0.0339)	Constant	15.07 (n/a)
Observations (after adjustment)	36		
R-squared	0.484		
F-Statistic	3.167***		
Autocorrelation LM Test (lag 2) [*p*]	52.65424 [0.3741]		
White Test (No cross-terms) [*p*]	456.2697 [0.3833]		

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

The result of the diagnostic tests shows that the residuals are not serially correlated and heteroscedastic at a 5 percent level. The stability tests show evidence of parameter stability and that there is no structural break.

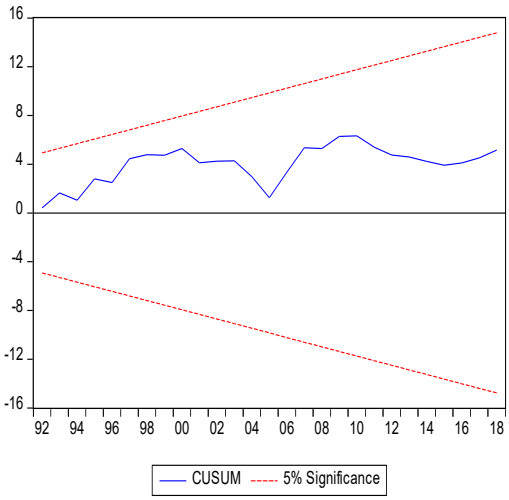

Fig. 7. CUSUM test.
Source: The author's computation (2020)

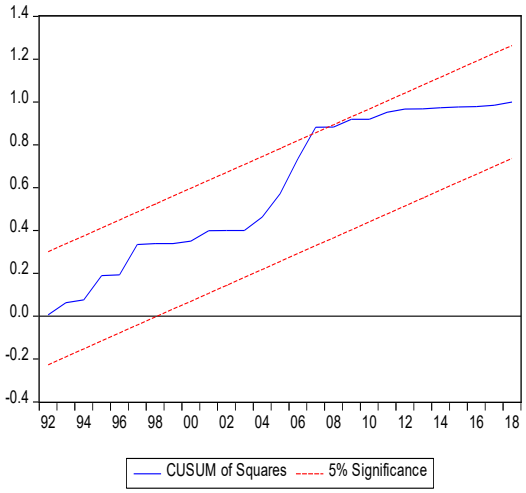

Fig. 8. CUSUM of squares test.
Source: The author's computation (2020)

CONCLUSION

The goal of CBN's monetary policy is to achieve a stable price level, which subsequently encourages investment and consumption. This paper has examined this notion to better understand how monetary policy affects domestic investment in Nigeria at falling and rising inflation rates. The unit root test shows that all the variables are stationary after first differencing, $I(1)$; however, the Johansen cointegration test has provided evidence of a long-run relationship, and the vector error correction model has been used to determine the short-run and long-run relationships between the variables.

This study provides some interesting findings. First, the results show that the monetary policy rate is not an effective stabilization tool during periods of rising inflation rates. The size of the effect of the monetary policy rate on investment gets smaller as the inflation rate increases. In addition, the impact of tools such as open market operations (tools that directly change the money supply) on investment does not depend on the level of inflation. Thus, an open market operation is a relevant stabilization tool both in recessions and booms. An implication of this result is that the Central Bank of Nigeria should prioritize monetary policy tools, such as open market operation, that directly influence the volume of money in circulation when the inflation rate is rising (or at a higher level) and can combine this instrument with the monetary policy rate when the inflation rate is falling (or at a lower level) to stabilize the economy. Given the robust stabilization impact of open market operations, this work recommends that the CBN should work to deepen the scale, capacity, and efficiency of its open market operations by ensuring that most of the people can participate with minimal transaction cost and by making different financial instruments available.

An important aspect that is not empirically explored in this paper is the interrelationship between monetary policy and fiscal policy and the implications for stabilization to stimulate domestic investment in Nigeria. Fiscal policy plays an

important role in the determination of the price level; as a result, efforts of the CBN to achieve price stability can be counteracted by the fiscal policy. For example, the Nigerian government spending tends to increase during election periods irrespective of the monetary policy target. Additionally, higher public debt could create a scenario of monetizing the debt, which ultimately creates inflation. In addition, it is worthwhile to identify the level of inflation rate at which the MPR becomes ineffective. These linkages are worth investigating in future research to better understand the impact of stabilization efforts on Nigeria's economy.

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