

THE IMPACT OF MONETARY POLICY ON PRIVATE CAPITAL FORMATION IN NIGERIA- AUTOREGRESSIVE DISTRIBUTED LAG APPROACH

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Abstract

The study examines the impact of Monetary Policy on Private Capital Formation in Nigeria over the period 1980 to 2020. The study adopts Keynes theory of capital formation as its theoretical framework. The stationarity tests result shows that there is mixed level of stationarity among the variables. Consequently, the study employs ARDL as its estimation technique. The study reveals that Monetary Policy has a positive impact on Private Capital Formation in Nigeria. Based on the findings, the study recommends that government should implement appropriate Monetary Policy which will continue to have more positive impact on Private Capital Formation. Secondly, the government should maintain a reasonable percentage of Monetary Policy rate (MPR) and as well as Real Gross Domestic Product (RGDP) and Reasonable Exchange Rate (EXCHR) to improve the level of Private Capital Formation in Nigeria. Lastly, the government should embark on policies that will curb inflation or help to reduce the rate of inflation in order to increase the level of Private Capital Formation.

Keywords: Monetary policy, private capital formation, ARDL

1. Introduction

One of the major objectives of Macroeconomics is maintaining a sustainable economic growth and the role of Private Capital Formation in achieving this objective is of a great importance (Robert, 2014). For a country to achieve impactful Private Capital Formation, the role of a government policy as well as its impact can never be over emphasized. Capital formation which is an increase or expanding of the stock of real capital such as machines, tools, factories, transport equipment in a country are usually geared towards future production of good (Suman, 2018). Savings and investment are indispensable in the addition of capital stock, and this can mainly be stimulated by monetary policy.

Due to the claim that monetary policy as one of the government policies determines the rate of accumulation of physical capital (otherwise called capital formation) through its mechanism, it therefore becomes an important factor in the increase of productive activities of the country and contributes to growth generally. monetary policy which is a deliberate action imposed by the government through the Central Bank in order to maintenance domestic price and exchange rate stability, balance of payment equilibrium, among others has been identified as a vital instrument that enhance private capital formation either by affecting the level of money supply through expansionary or ³contractionary measures. It also influences the level and structure of interest rates and thus the cost of funds in the market depending on the prevailing economic conditions (Nzotta, 2004). Capital formation is otherwise said to be a prerequisite to an increase in physical capital stock of a country with investment in social and economic infrastructures (Atuma and Nweze 2017).

Over the years, the Nigerian government has adopted various monetary policies through the Central Bank in order to attain stabilization in economic growth which is one of the objectives of Monetary Policy. To achieve this, the Central Bank relies on Monetary Policy tools as its major barometer for adjusting economic activities designed by the monetary measures to be either expansionary or contractionary (Nwoko, Ihemeje and Anumadu, 2016). These policies seek to

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impact directly or indirectly on the supply of money, supply of credit to economy, the structure of interest rate with the purpose of achieving price stabilization, balance of trade equilibrium and sustainable rate of growth (Uwazie and Aina, 2015), which will result to either an increase or decrease in capital formation of the country which has the tendency of boosting the private sector or the public sector through increased economic activities.

Unfortunately, these policies are yet to drive the country's capital formation to its desired point. Hence the authority has moved further to introduce privatization and commercialization to encourage private investment as well as public investment due to the low productivity in the country which when encouraged will result to an increase in the Gross Domestic Product (GDP) of the country and ultimately the total capital formation. Private Capital Formation has the tendency to increase the level of investment and capital stock in the country which will also give rise to a stable Economic Growth (Osundina & Osundina, 2014). Despite the increase in the regulations of the Monetary Policy by the monetary authorities in Nigeria, the problems of shortage of private capital formation still persist as such this study will investigate to determine the impact of monetary policy on private capital formation in Nigeria.

As a matter of fact, the reason for this current research is as a result of the desire to investigate the extent to which Monetary Policy instruments has contributed to Private Capital Formation in Nigeria. More so, the study seeks to add to existing body of knowledge. It will also be of great benefit to the government and policy makers in terms of helping them to understand the influence of monetary policies on private investment as well as building policies that will ensure increase and sustainable private investment growth in Nigeria. This study will be of vast help to policy makers, government and its agents as well as researchers in the area of Monetary Policy and Private Capital Formation.

This study will reveal that for Nigeria economy to be put along the path of sustainable growth and development particularly through an increase in private investment, Monetary Policy that directs credit to the private sector is expected to be embarked upon so as to encourage private investment in Nigeria. Given the important role of Monetary Policy and Private Capital Formation in Nigeria, this study will contribute enormously to the planning and implementation of Monetary Policy to contribute in increasing private investment in Nigeria.

2. Literature Review

Dang, et al (2020) sheds new light on the relationship between Monetary Policy and private investment in Vietnam. They found that private investment is positively affected by monetary policies through broad money, domestic credit and interest rate channels and no credible evidence yet regarding the effect in the exchange rate. Similarly, Okumoko and Akarara (2016) investigated the impact of Monetary Policy rate on savings and investment in the Nigerian economy over the period of 1960-2016. The study employed Vector Autoregressive (VAR) technique to estimate the data and they found that shocks such as increase in Monetary Policy Rate (MPR), increases both Savings Rate (SAVR) and Total Investment (INVR) in the short-run and in the long-run.

Hassan (2015) explored the impact of Monetary Policy on Private Capital Formation in Nigeria. The study covers the period of 1986-2013 and made use of Ordinary Least Square Multiple regression technique. The study showed that the GDP growth rate has not been attracting significant private investment, while money supply and the exchange rate have been relatively stable which has encouraged increase in private investment and has to an extent promote sustainable Economic Growth in the country through private investment. Ayodeji and Oluwole (2016) investigated the impact of Monetary Policy on Economic Growth in Nigeria between 1881 and 2016 using Johansen co-integration and vector error correction model. The findings revealed that money supply and exchange rate are positively related but has a fairly insignificant impact on Economic Growth also interest rate and liquidity ratio are

negatively related but has a high significant impact on Economic Growth. The study advised that full autonomy should be in place for Central Banks of developing countries and Government interference should be encouraged.

Olatunbosun (2015) investigated the impact of Monetary Policy on corporate investment in Nigeria. The study revealed that there is no significant relationship between the volume of investment and interest rate and there exist a weak relationship between the cost of capital and interest rate. Ndidi (2015) examined the Private Capital Formation impact on the Nigerian economic growth between 1980 and 2013. From the empirical findings, it was discovered that there is a significant relationship between capital formation and Economic Development in Nigeria. The study recommended that the government should continue to encourage savings, create conducive investment climate and improve the infrastructural base of the economy to boost capital formation and hence promote sustainable growth. Anowor and Okorie (2013) reassessed the impact of Monetary Policy on Economic Growth in Nigeria between 1982 and 2013 They found that interest rate and Monetary Policy rate has a negative relationship with Economic Growth and cash reserve ratio has a positive relationship with Economic Growth. Ugwuegbe and Urakpa (2013) researched the impact of capital formation on Economic Growth in Nigeria over the period of 1982-2011 using Ordinary least square (OLS) technique. The study revealed that capital formation.

3. Method

3.1 Theoretical framework

This study adopts Keynes theory of capital formation as its theoretical framework. The theory places its emphasis that given the marginal efficiency of capita, a fall in the rate of interest will increase the volume of investment (capital formation). Keynes believes that the economy is always at or near the natural level of real GDP. The main function of this approach is to act as a medium of exchange and to determine the general price level of which goods and services are to be exchange (Blinder, 1987). The quantity theory of money is usually discussed in term of fisher’s equation of exchange where it was believed that there is full employment in the economy. Thus, the amount of investment taken depends both on the expected returns and the cost of capital (interest rate). Investment will only be profitable at the point where the marginal efficiency of capital is equal to the cost of capital, assuming the price of capital goods changes over time, it becomes necessary to draw a distinction between marginal efficiency of capital (MEC) and marginal efficiency of investment (MEI).

3.2 Model Specification

This study employs the model of Hassan (2015) with modifications.

$$GFCF = F(MPR, INF, RGDP, EXCHR, PUBEXP) \dots\dots\dots (1)$$

where

- GFCF = Gross Fixed Capital Formation
- MPR = Monetary Policy rate
- INF = Inflation rate
- RGDP = Real Gross Domestic Product
- EXCHR = Exchange rate
- PUBEXP = Public expenditure

The econometric form of the model above is stated as:

$$GFCF_t = \beta_0 + \beta_1 MPR_t + \beta_2 INF_t + \beta_3 RGDP_t + \beta_4 EXCHR_t + \beta_5 PUBEXP_t + \mu_t \dots\dots\dots (2)$$

- μ_t = stochastic error term
- β_0 = constant intercept
- $\beta_1 - \beta_5$ = coefficient of the associated variables

However, the dependent variable and one of the independent variables were not in the same unit, hence, they were logged so as to bring the data to the same level. Thus, the above equation (2) can be re-specified as;

$$\text{LOG}(GFCF)_t = \beta_0 + \beta_1 \text{MPR}_t + \beta_2 \text{INF}_t + \beta_3 \text{RGDP}_t + \beta_4 \text{EXCHR}_t + \beta_5 \text{LOG}(PUBEXP)_t + \varepsilon_t \dots (3)$$

where

4. Data analysis

4.1 Descriptive Statistics

The descriptive statistics of the variables used in this study are shown in table below:

Table 1: **The descriptive statistics:**

	GFCF	MPR	INF	RGDP	EXCHR	PUBEXP
Mean	630714.4	6.209944	18.89225	4.893821	97.62067	3869836.
Median	154362.5	6.709583	12.15500	5.260085	97.40000	1211066.
Maximum	2442704.	11.06417	72.84000	14.60438	365.9000	12700000
Minimum	10597.00	0.316667	5.380000	-1.583065	0.550000	14697.41
Std. Dev.	869090.4	3.056790	16.91599	3.669652	106.1097	4422113.
Skewness	1.196938	-0.234382	1.823960	0.409243	1.187449	0.601925
Kurtosis	2.728945	2.069166	5.151077	2.695332	3.795190	1.668728
Jarque-Bera	9.673521	1.810319	29.89076	1.271236	10.45412	5.369234
Probability	0.007933	0.404477	0.000000	0.529608	0.005369	0.068247
Sum	2522858	248.3977	755.6900	195.7529	3904.827	1.55E+08
Sum Sq. Dev.	2.95E+13	364.4147	11159.88	525.1876	439111.5	7.63E+14
Observations	40	40	40	40	40	40

Source: Author's own computation from the E-views result

From the result table above, the descriptive statistics indicates that from 1980 to 2020, all of the variables under consideration show an averaged positive mean value with 40 observations. The standard deviation showed that the highest standard deviation of (869090.4) is recorded by the GFCF while the least standard deviation is recorded by MPR. The skewness statistics from the table revealed that five of the variables are positively skewed, while one variable is skewed negatively. The kurtosis coefficients show that two of the variables are leptokurtic, suggesting that the distributions are high relative to normal distribution, three variables are mesokurtic, indicating not too flat topped, while one other variable is platikurtic, suggesting that the distributions are flat topped. The Jarque-Bera (JB) test statistic was used to determine whether or the variables (control variables) follow the normal probability distribution. The JB test of normality is a large-sample or asymptotic test that computes kurtosis and the skewness measures. We therefore examine the Sample mean, standard deviation, skewness and kurtosis, and the Jacque-Bera statistics as well as the p-values. The probabilities of Jarque-Bera test of normality for the variables indicates that four of the variables have values greater than 5% level of significance, thus indicating that the variables are normally distributed.

4.2 Correlation

Under the correlation test, we conduct the test to ascertain the degree of relationship that exists between the dependent variable and the independent variables. This is done using the correlation matrix. In the correlation test, we test the variables to ascertain the degree of relationship that exist between the independent variables and the dependent variable. The

relationships among the studied variables depicted in the model were tested using correlation matrix and the result presented below:

Table 2: The Correlation matrix:

	GFCF	MPR	INF	RGDP	EXCHR	PUBEXP
GFCF	1.000000	0.603761	-0.300488	-0.173753	0.872786	0.846234
MPR	0.603761	1.000000	-0.190167	-0.092143	0.615049	0.547866
INF	-0.300488	-0.190167	1.000000	-0.208966	-0.308031	-0.362926
RGDP	-0.173753	-0.092143	-0.208966	1.000000	-0.090602	0.050619
EXCHR	0.872786	0.615049	-0.308031	-0.090602	1.000000	0.815902
PUBEXP	0.846234	0.547866	-0.362926	0.050619	0.815902	1.000000

Source: Author's own computation from the E-views result

The correlation result shows that three of the variables have positive relationships with the private investment. The relationships are actually at 60%,87% and 84% respectively, while two variables, INF and RGDP indicate negative signs ranging from -30%, and -17% respectively. Hence, we conclude that there is no Multicollinearity among the variables under consideration.

4.3 Unit Root Test

Economic variables are generally non-stationary and they are a random process. Linear combination of non-stationary series in general is a non-stationary series and closely associated with economic theory. Because economic theory guarantees stagnation of combination of economic variables, in this study Dickey Fuller's generalized Test for investigation of stationary variables is used. In order to assess the time series properties of the data, a unit root test was conducted. As Engle and Granger (1987) argued, if individual time series data are non-stationary, their linear combinations could be stationary if the variables were integrated of the same order. The assumption is stated as follows: If the absolute value of the Augmented Dickey Fuller (ADF) test is greater than the critical value either at 1%, 5% or 10% level of significance at order zero, one or two, it shows that the variable under consideration is stationary otherwise it is not. The results of the Augmented Dickey Fuller (ADF) test obtained are as follow:

Table 3: The Unit root test:

Variable	Level difference	Probability	Order of integration	First difference	Probability	Order of integration
GFCF	4.713284	1.0000		-4.470275	0.0010	I(1)
MPR	-2.007436	0.2826		-12.68686	0.0000	I(1)
INF	-3.001260	0.0435	I(0)			
RGDP	-3.412167	0.0165	I(0)			
EXCHR	0.314309	0.9761		-3.863114	0.0052	I(1)
PUBEXP	-0.505734	0.8786		-10.80370	0.0000	I(1)

Source: Author's own computation from the Eviews result

The stationarity tests result indicates that three of the variables under consideration are stationary at level difference, while four other variables are integrated of order one at 5% level of significance. Since there exists a mixed order of cointegration, a bound cointegration test is therefore conducted.

4.4 Bound Auto Regressive Distributed Lag (ARDL) Testing Approach

Conducting the ARDL bounds test procedure, it is expected that the variables are I(0) or I(1), otherwise, the variable may be considered spurious. In the conduct of the ARDL test, we adopt the Augmented Dicky Fuller (ADF) test to determine the difference levels of the variables. We therefore compute an F-statistics test procedure to test the long-run relationship in which the maximum lag length p is 2 in the ECM. The results for the bounds F-test is therefore presented as follows:

Table 4: **The ARDL Bound test results:**

ARDL Bounds Test		
Null Hypothesis: No long-run relationships exist		
Test Statistic	Value	K
F-statistic	4.327165	5
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.26	3.35
5%	2.62	3.79
2.5%	2.96	4.18
1%	3.41	4.68

Source: Author's own computation from the Eviews result

The Bound test result from the table above indicates that the underlining ARDL model can be established to determine the long-run slope-estimated coefficients and the short-run dynamic-estimated coefficients for the private investment in Nigeria. The ARDL (1, 4) is selected based on Akaike information criterion (AIC).

4.5 The Short run Error Correction Coefficients

There is long-run equilibrium relationship among the variables in the regression model; however, it is the short-run that transmit to the long-run. Thus, Error Correction Mechanism (ECM) is therefore used to correct or eliminate the discrepancy that occurs in the short-run. The assumption of the ECM states that if two variables are cointegrated, then, there is error correction mechanism to revise instability in short term (Engle and Granger, 1987). ECM is used to see the speed of adjustments of the variables to deviations from their common stochastic trend. ECM corrects the deviations from the long run equilibrium by short-run adjustments. This shows us that changes in independent variables are a function of changes in explanatory variables and the lagged error term in cointegrated regression. The ECM result is therefore presented below:

Table 5: The short run error correction coefficients results:

ARDL Cointegrating And Long Run Form				
Dependent Variable: LOG(GFCF)				
Variable	Coefficient	Std. Error	t-Statistic	Prob
DLOG(GFCF(-1))	0.246864	0.167130	1.477076	0.1545
D(MPR)	0.037702	0.021846	1.725788	0.0991
D(MPR(-1))	-0.036036	0.021048	-1.712079	0.1016
D(INF)	-0.000966	0.002467	-0.391460	0.6994
D(RGDP)	-0.003000	0.011148	-0.269118	0.7905
D(EXCHR)	0.000441	0.000850	0.518653	0.6094
DLOG(PUBEXP)	-0.047848	0.065888	-0.726204	0.4757
DLOG(PUBEXP(-1))	0.070593	0.071935	0.981340	0.3376
DLOG(PUBEXP(-2))	-0.009619	0.070308	-0.136806	0.8925
DLOG(PUBEXP(-3))	-0.268678	0.069576	-3.861621	0.0009
ECM(-1)	-0.374290	0.094476	-3.961763	0.0007
R-squared	0.641354	Mean dependent var	0.132075	
Adjusted R ²	0.402256	S.D. dependent var	0.238203	
S.E. of regression	0.184164	Akaike info criterion	-0.251645	
Sum squared resid	0.712243	Schwarz criterion	0.408155	
Log likelihood	19.52961	Hannan-Quinn criter.	-0.021357	
F-statistic	2.682396	Durbin-Watson stat	2.453156	
Prob(F-statistic)	0.020083			

Source: Author's computation from the Eviews result

From the results table above, the equilibrium error-correction coefficient ECM (-1) is -0.374290. The coefficients have the expected negative sign and are statistically significant at 5% significant levels. This implies that there is a long run impact running from independent variables to dependent variable. It also confirms that all the variables are cointegrated or have long run relationship. We can therefore state that 37 percent gaps between long run equilibrium values and the actual values of the dependent variable have been corrected. It can be also said that the speed of adjustment towards long run equilibrium is 37 % annually. Its t-ratio is -3.961763 and the probability of the null hypothesis being true for zero is [0.0007], which is significant even when $\alpha = 0.05$. Thus, it can also be concluded that the adjustments are quite meaningful in the short-run ARDL relationship.

Statistically, the coefficient of determination R-squared is 0.641354. This implies that the independent variables explain the dependent variable to the tune 64%. The F-statistic

shows that the overall estimate of the regression has a good fit and is statistically significant. Also, the Durbin Watson (DW) statistics $DW = 2.453156$ which is greater than the R^2 shows that the overall regression is statistically significance. Thus, the result indicates no serial auto correlation among the variables under consideration.

4.6 The Long run Relationship of Monetary Policy Rate and Private Investment in Nigeria

Table 6: **Long Run Coefficients results:**

Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
MPR	0.112365	0.061282	1.833583	0.0809
INF	-0.002580	0.006556	-0.393471	0.6979
RGDP	0.029949	0.037186	0.805393	0.4296
EXCHR	0.001178	0.002087	0.564343	0.5785
LOG(PUBEXP)	0.604552	0.096080	6.292199	0.0000
C	3.478699	0.944730	3.682215	0.0014

From the long-run elasticity of the independent variables contributing to private investment growth in Nigeria shows that the coefficient of MPR indicates a positive sign and significant statistically. It shows that the Monetary Policy rate in the long run affect the private investment positively in the long run. The results conform to the findings by Auer (2014) on the impact of Monetary Policy shock in the United States and Canada on the range of domestic aggregates, trade flow and exchange rate but also foreign investment income, that Monetary Policy action has a statistical and economic significant impact on both gross and net foreign investment income flow in both countries. The coefficients of RGDP and EXCHR show a positive sign and are insignificant statistically, while the coefficient of LOG(PUBEXP) indicates a positive sign and significant statistically. This conforms to the study conducted by Hassan (215) on the impact of Monetary Policy n Private Capital Formation in Nigeria find that Monetary Policy rate and exchange rate positively impact on Private Capital Formation in Nigeria. On the other hand, the coefficient of INF shows a negative sign and insignificant statistically

4.7 Diagnostic Test

To ensure the goodness of fit of the model, diagnostic test are conducted. Diagnostic tests examine the model for serial correlation, functional form, non-normality and heteroscedasticity.

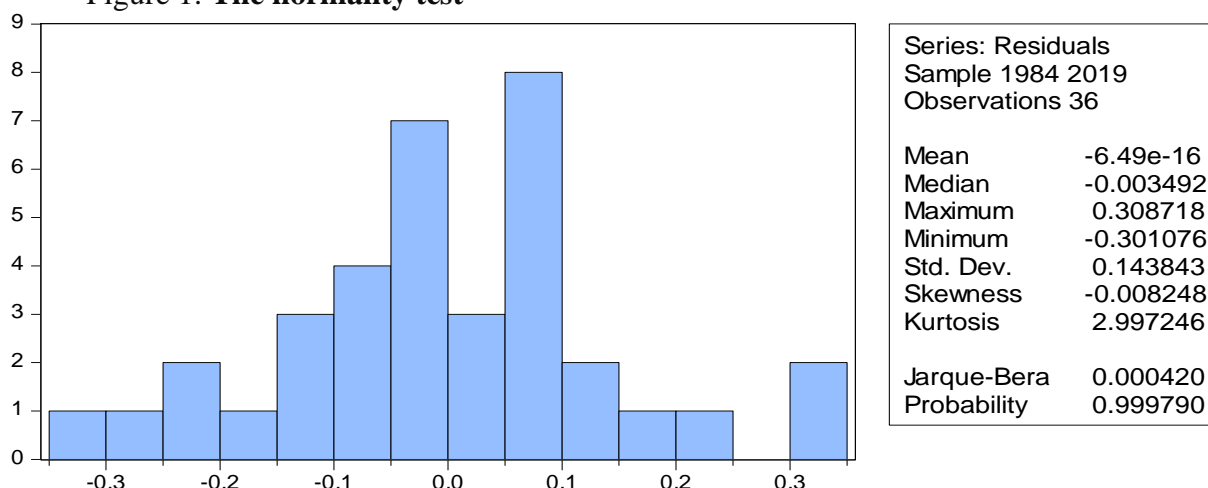
Table 7: **Serial correlation tests:**

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	5.070848	Prob. F(2,19)	0.0172
Obs*R-squared	12.52848	Prob. Chi-Square(2)	0.0019

Source: Author's computation from the Eviews result

The serial correlation test result obtained shows that the null hypothesis of a serial correlation is rejected and the corresponding probability values of the F-statistics are statistically insignificant at 5% level. Thus we conclude that there is no serial correlation among the variables under consideration.

Figure 1: **The normality test**



Source: Author's computation from the Eviews result

H₀: The sample data are not significantly different than a normal population

H₁: The sample data are significantly different than a normal population.

Probabilities > 0.05 accept the null hypothesis

Probabilities < 0.05 reject the null hypothesis

From the result, the probability is 0.999790 and this is greater than 0.05 at 5% significant level and therefore, the null hypothesis is accepted. This implies that the residuals are normally distributed.

4.8 The Heteroskedasticity Test

Table 8:

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	1.279684	Prob. F(14,21)	0.2965
Obs*R-squared	16.57333	Prob. Chi-Square(14)	0.2796
Scaled explained SS	5.631772	Prob. Chi-Square(14)	0.9749

Source: Author's computation from the Eviews result

H₀: homoscedasticity

H₁: heteroscedasticity

Probabilities > 0.05 accept the null hypothesis

Probabilities < 0.05 reject the null hypothesis

From the result, the probability of Chi-Square (14) is 0.2965 and this is greater than 0.05 at 5% significant level and therefore, the null hypothesis is accepted. This implies and therefore confirms the absence of heteroscedasticity in the model. That is the error terms are homoscedastic i.e., they have constant variance in repeated sampling.

5. Conclusion and recommendation.

The study examined the impact of Monetary Policy on Private Capital Formation in Nigeria over the period 1980 to 2020. The study adopts Keynes theory of capital formation as its theoretical framework. The stationarity tests result shows that three of the variables under consideration are stationary at level difference, while four other variables are integrated of order one at 5% level of significance. Based on the mixed result of the unit root test the study employs ARDL as its estimation technique. Based on the regression estimates, the study concluded that Monetary Policy has a positive impact on Private Capital

Formation in Nigeria, which means that Monetary Policy has contributed to the rising in the level of Private Capital Formation in Nigeria.

From the findings discussed above, the following recommendations were offered. Firstly, there is need for government to implement appropriate Monetary Policy which will continue to have more positive impact on Private Capital Formation. Secondly, the government should maintain a reasonable percentage of Monetary Policy rate (MPR) and as well as Real Gross Domestic Product (RGDP) and Reasonable Exchange Rate (EXCHR) to improve the level of Private Capital Formation in Nigeria. Thirdly, the government should embark on policies that will curb inflation or help to reduce the rate of inflation in order to increase the level of Private Capital Formation.

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