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Monetary Policy Variables and the Performance of the Nigerian Economy

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Abstract

This study investigates the influence of selected monetary policy variables on Nigeria's economic performance over the period from 1981 to 2022. The monetary policy variables considered include money supply and interest rates, while economic performance indicators are represented by real GDP growth and price stability. Data analysis was conducted using the Ordinary Least Squares (OLS) technique. The findings indicate that money supply, interest rates, and government spending on education have a positive and statistically significant effect on real GDP growth. In contrast, the impact of population growth on real GDP growth was found to be statistically insignificant. Additionally, the analysis reveals that both money supply and government expenditure on education positively and significantly affect price levels. Conversely, interest rates were found to have a negative and significant effect on price levels, while population growth exhibited a negative but statistically insignificant effect on price levels. These results suggest that the central bank may consider tightening monetary policy by increasing interest rates, reducing money supply, or employing other strategies to manage inflationary pressures. Furthermore, policymakers are encouraged to prioritize policies that foster productivity growth, drive innovation, enhance education and skill development, and improve infrastructure and institutional quality.

Keywords: *GDP, Interest Rate, Money Supply, Price Stability, Productivity*

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Background to the Study

Governments generally aim to achieve primary macroeconomic goals, such as maintaining low and stable domestic prices and ensuring robust, sustainable economic growth. These objectives are also common indicators of economic performance. A thriving economy not only enables poverty reduction but also enhances the productive potential of the economy, leading to increased goods and services supply, job creation, and individual income. Economic growth also raises living standards by making essential goods and services available, while simultaneously strengthening economic power and social status (Dauda & Abdulkareem, 2023; Ukangwa, Iheukwumere, Ogonda, 2023). One approach to improve economic performance is the strategic use of monetary policy variables, including interest rates and money supply.

Interest rates determine the cost of borrowing. Various interest rates exist in an economy, such as the Monetary Policy Rate (MPR), previously known as the Minimum Rediscount Rate (MRR), the prime rate, and the savings rate. The MPR, the central bank's lending rate to sound Deposit Money Banks, influences credit availability and savings, ultimately affecting the supply of reserves and monetary aggregates. A shift in the MPR triggers corresponding changes in other interest rates within the economy as banks adjust loan rates. Interest rate fluctuations also affect price levels, as higher rates make investment borrowing more expensive for businesses, either through increased loan costs or through the higher opportunity cost of using funds for investment rather than lending them out. Consequently, higher interest rates tend to lower the price level, while the reverse is true for lower interest rates (Olasehinde Williams, Omotosho & Bekun, 2024; Idris, 2019).

Another avenue to achieve monetary policy objectives is through money supply control. Money supply is categorized into narrow money (M1), which includes currency in circulation and demand deposits, and broad money (M2), which encompasses M1 plus savings deposits, time deposits, and foreign-denominated deposits. Broad money reflects the overall volume of money circulating in the economy. An increase in the money supply tends to lower interest rates, thereby encouraging domestic investment and output expansion, which may ultimately reduce prices. According to monetary theorists, money supply adjustments stimulate both new and existing investments in real and financial assets (Majeed, Hambur & Breunig, 2024; Dauda & Abdulkareem, 2023).

In Nigeria, the Central Bank of Nigeria (CBN) is legally empowered to implement monetary policy through Decrees 24 and 25 of 1991 (Okpara, 2010). Over time, the CBN has employed various tools, including the MPR, which represents the rate at which the CBN rediscounts high-quality bills of exchange prior to maturity. When the CBN raises the MPR, bank lending rates increase accordingly, influencing the real interest rate, price levels, and economic growth (Olasehinde Williams, Omotosho & Bekun, 2024; Maiga, 2017). In 1986, Nigeria introduced the Structural Adjustment Program (SAP), which led to deregulation and numerous monetary policy changes, such as establishing exchange markets, removing interest rate controls, unifying foreign exchange markets, and liberalizing bank licensing in 1987. By 1989, banks were permitted to pay interest on demand deposits, and interest rate administration was

implemented in 1991. The CBN introduced a new monetary policy framework in 2006, replacing the MRR with the MPR (Adeoye, Ojapinwa, & Odekunle, 2014; Maiga, 2017).

Nigeria's economic growth has historically been volatile, marked by periods of recession and recovery. Notably, the economy experienced two recessions within four years: the first in 2016, which ended in 2017, and another from 2020 to 2021. In recent years, growth rates have remained modest, ranging from 1.92% to 2.27% (National Bureau of Statistics, 2021; Macrotrends, 2022). Price stability remains a significant challenge, as consumer price index growth rates have consistently been in double digits, indicating poor economic performance. Nigeria's economic performance is often linked to its monetary policy variables.

While monetary policy measures have aimed to address Nigeria's economic challenges, policymakers' focus has largely been on reducing inflation to a single-digit level and achieving moderate growth. Interest rate and money supply targets are frequently adjusted to meet economic performance objectives. However, despite these efforts, price stability and sustainable growth remain elusive. The persistence of high inflation and recurrent recessions has raised ongoing concerns about the link between monetary policy variables and Nigeria's economic performance.

Previous research has analyzed the effect of monetary policy variables on various economic performance indicators. However, most studies have primarily used economic growth as a proxy for economic performance, with only a few empirically exploring the relationship between variables like interest rates, money supply, and price levels.

This study aims to fill that gap by contributing to the empirical literature on the relationship between monetary policy variables and economic performance.
The study seeks to answer the following research questions:

i. How do monetary policy variables affect real GDP growth in Nigeria?
ii. What impact do monetary policy variables have on Nigeria's price level?

Objectives of the Study

The specific objectives are to:

i. Evaluate the effect of monetary policy variables on real GDP growth in Nigeria and
ii. Assess the impact of monetary policy variables on the price level in Nigeria.

Conceptual Literature

Monetary Policy Variables

Gul, Mughal, and Rahim (2012) describe monetary policy as the regulation of money supply and interest rates to fulfill the objectives of the governing party. In this study, however, monetary policy is defined as the set of actions through which the central monetary authority establishes conditions for money circulation within the economy and determines interest rates. Monetary policy goals are achieved by controlling the money supply, which can be categorized into narrow and broad money. Narrow money (M1) includes currency held by the public and demand deposits or checking accounts in banks. Broad money (M2) includes M1

along with savings and time deposits, as well as foreign-denominated deposits. Broad money provides an aggregate measure of the money supply in the economy. When the money supply increases, interest rates generally fall, which in turn encourages domestic investment and boosts economic performance. According to monetarist theory, fluctuations in the money supply stimulate both new and existing investments in real and financial assets, which are essential for economic progress (Olweny & Chiluwe, 2012).

Additional methods to achieve monetary policy objectives include manipulating rates such as the Monetary Policy Rate (MPR), also known previously as the Minimum Rediscount Rate (MRR), the prime rate, and the savings rate. The MPR, which represents the rate at which the Central Bank lends to stable financial institutions, influences credit supply and investment levels, which subsequently affect employment and GDP. Changes in the MPR eventually cause shifts in other interest rates within the economy, impacting the rates offered by financial institutions to borrowers.

Economic Performance

Economic performance refers to the growth rate or substantial increase in a nation's economic activities, commonly measured by indicators such as Gross Domestic Product (GDP) and the price level. GDP represents the total market value of final goods and services produced within a country, encompassing output by both residents and foreigners within its borders. This study uses GDP based on this definition. In contrast, the price level is defined, per Investopedia (2015), as the average current prices across all goods and services produced in an economy. Similarly, Whiting (2015) describes the price level as an indicator of the prevailing prices of goods and services within a country. Here, price level is understood as the average price of goods and services in Nigeria. High and rising price levels are typically linked to inflation, while low price levels correspond with deflation, and stable price levels indicate price stability.

The relationship between monetary policy variables and economic performance lies in the fact that monetary policy variables can directly influence domestic investment and financial outcomes via channels such as the interest rate, credit availability, and money supply adjustments.

Theoretical Literature

Endogenous or New Growth Theory

This study is based on the Endogenous Growth Theory, also known as the New Growth Theory, which emerged in the 1980s. This theory posits that policy interventions can significantly influence an economy's long-term growth trajectory. Proponents of the theory argue that advancements in productivity can be driven by increased innovation and greater investment in human capital. Endogenous growth theorists emphasize the importance of supportive government and private sector institutions and markets that foster innovation, alongside incentives for individuals to be inventive. Furthermore, the theory highlights knowledge as a core factor in driving economic growth. According to Ijieh (2014), the development of endogenous growth models suggests that internal factors, including policies like monetary policy, human capital, education, and investment, can impact economic

growth. The theory also implies several key points:

1. Policies that encourage openness, competition, change, and innovation tend to support economic growth.
2. Policies that restrict or slow progress by protecting certain industries or firms may hinder growth over time.
3. Sustained economic growth involves ongoing transformation.
4. Economies that fail to continually evolve risk declining and falling behind on the path of growth.

Empirical Literature

Dauda and Abdulkareem (2023) explored the influence of monetary policy on Nigeria's economic growth from 1990 to 2020, applying the ARDL regression model for data analysis. Their findings highlight monetary policy as a key driver of economic growth, with variables like the Monetary Policy Rate (MPR) and the money growth rate (M2) demonstrating significant effects on economic development in Nigeria.

In a study spanning 2004 to 2022, Adeleke, Moses, and Ezeilo (2023) assessed the impact of monetary policy on Nigeria's economic growth, also utilizing the Autoregressive Distributed Lag (ARDL) method. The study concluded that the MPR and Money Supply (MS) positively impacted economic growth, while LNR was found to negatively affect it.

Oseni and Oyelade (2023) investigated the roles of monetary and fiscal policies on Nigeria's economic growth from 1980 to 2021 using the OLS technique. Their study revealed that gross capital formation, employment numbers, and broad money supply positively and significantly influenced the GDP. In contrast, the lending interest rate was found to negatively impact GDP. Ogwuche and Obiaje (2023) conducted an analysis on the effect of monetary policy on Nigeria's economic growth from 1985 to 2022. Using the ARDL model, they observed that in the long term, only the interest rate significantly influenced economic growth. Furthermore, while exchange rate, money supply, and interest rate maintained a positive relationship with growth, inflation rate was noted to have a negative association.

A study by Igbafe (2022) covering the years 1990 to 2019 analyzed the effectiveness of monetary policy in enhancing Nigeria's economic growth. Employing the ARDL Bounds Test and Error Correction Mechanism (ECM), it was found that long-term growth is heavily influenced by interest rates and reserve requirements.

Mehar (2022) analyzed data from 186 countries over an 18-year period to understand the role of monetary policy in economic growth. Using panel least squares analysis, the study found that credit expansion to the private sector and foreign debt investments in infrastructure significantly contributed to GDP growth. Victor, Iheukwumere, and Ogonda (2022) examined monetary policy's impact on Nigeria's economic growth from 1981 to 2021, employing the ARDL bound co-integration technique. The findings demonstrated a substantial relationship between monetary policy and economic growth in Nigeria. Muhammed, Babawulle, and Tahir (2021) utilized the Vector Error Correction Mechanism (VECM) and OLS to investigate monetary policy's effect on the Nigerian economy from 1981

to 2016. The study revealed that the money supply positively impacted GDP growth while exerting a negative influence on inflation rates.

Henry and Sabo (2020) focused on monetary policy management's impact on inflation in Nigeria from 1985 to 2019. Their ARDL analysis demonstrated that while the monetary policy rate and exchange rate negatively influenced inflation, broad money supply positively impacted it. Ayodeji and Oluwole (2018) analyzed the impact of various monetary policy instruments, including Money Supply (MS), Exchange Rate (ER), Interest Rate (IR), and Liquidity Ratio (LR), on economic growth from 1981 to 2016 using VECM. They found that the money supply and exchange rate had a positive but limited effect, whereas interest rate and liquidity ratio had a significant negative effect on economic growth. Maiga (2017) explored the relationship between interest rates and economic growth in Nigeria from 1990 to 2013 through the OLS method. Findings suggested that interest rates had a modest effect on growth.

In the context of South Africa, Chipote and Makhetha-Kosi (2014) evaluated monetary policy's role in promoting economic growth from 2000 to 2010. Their findings indicated that while inflation significantly influenced growth, money supply, interest rate, and exchange rate were relatively insignificant drivers. Fratzscher, Duca, and Straub (2014) assessed the impact of the European Central Bank's non-standard monetary policies on asset prices both in the euro area and globally. The study revealed that ECB interventions had a favorable effect on asset prices in the eurozone, decreased bond market fragmentation, and lowered credit risks among G20 banks and sovereigns without causing notable regional asset reallocation. Kamaan (2014) examined monetary policy's effects on economic growth in Kenya, applying the VAR technique. The study concluded that a standard deviation shock to monetary policy had an initially negative but insignificant impact on output, eventually turning positive and insignificant in subsequent months.

Research Design

This study adopts a longitudinal research design, which allows for the observation of changes within the same subjects over an extended period. In a longitudinal study, participants are tracked over time, enabling the researcher to monitor their development, shifts, or outcomes across various intervals. The data for this study is organized chronologically with annual frequencies, capturing a sequence of observations over an extended timeframe. Longitudinal research typically involves individual subjects or units of analysis that are repeatedly assessed at consistent intervals over a large number of observations.

Data Source

Data for this research has been gathered from multiple editions of the Central Bank of Nigeria Statistical Bulletin and comprises all variables included in the models. This annual time series data spans from 1981 to 2022, covering the necessary variables over the study period.

Model Specification

The first objective is to assess the impact of monetary policy variables on real GDP growth. The model's functional form is defined as follows:

$$RGDPG = (MS, INTR, EXEDU, POGR) \quad \ldots 1$$

Where:
RGDPG = real GDP growth, a measure of economic growth
MS = money supply (M2)
INTR = interest rate
EXEDU = government expenditure on education, a proxy for human capital
POGR = population growth rate

The econometric form of the model is specified as follows:

$$RGDPG = b_0 + b_1 MS + b_2 INTR + b_3 EXEDU + b_4 POGR + u_{1t} \quad \ldots 2$$

In this model, all variables are as previously defined, and u1tu_{1t}u1t represents the stochastic error term. It is anticipated that MS and EXEDU will have a positive effect on the dependent variable, whereas the other variables may exhibit either a positive or negative effect on the dependent variable.

For the second objective, which seeks to assess the impact of monetary policy variables on the price level, the functional form of the model is defined as follows:

$$CPI = f(MS, INTR, EXEDU, POGR) \quad \ldots 3$$

Where:
CPI = consumer price index
MS = money supply (M2)
INTR = interest rate
EXEDU = government expenditure on education, a proxy for human capital
POGR = population growth rate

Expressing equation (3) in econometric terms results in the following equation:

$$CPI = a_0 + a_1 MS + a_2 INTR + a_3 EXEDU + a_4 POGR + u_{2t} \quad \ldots 4$$

Here, all variables remain defined as previously, with u2tu {2t}u2t representing the stochastic error term. Each variable is expected to have either a positive or negative influence on the dependent variable.

Definition of Variables in the Model

Money Supply (M2): This refers to the total amount of currency in circulation, including coins and notes, as well as other cash equivalents that can be easily converted to cash. It also encompasses short-term time deposits in banks and other money market instruments. The Central Bank of Nigeria (CBN) regulates this variable. An increase in the money supply typically leads to lower interest rates, which can stimulate investment and further increase the money available for investment, making it a significant determinant of economic growth.

Interest Rate (INTR): The interest rate is the expense incurred when borrowing money, or the earnings generated from lending money, represented as a percentage of the principal amount.

Consumer Price Index (CPI): This index measures the prices of commonly purchased goods and services, such as food and other consumer items, and monitors how these prices fluctuate over time.

Government Expenditure on Education (GXE): This encompasses government spending on education at the primary, secondary, and tertiary levels. It is generally believed that nations with higher levels of education have more human capital and are likely to enjoy better income levels compared to those with less educational development. Investment in human capital, which includes educational expenditure, is critical for both economic growth and price stability.

Population Growth Rate (POGR): This rate indicates how quickly the size of a population increases over a certain period, usually expressed as a percentage.

Real GDP Growth (RGDPG): Real GDP serves as a proxy for economic growth, measuring the expansion of economic activities within a country. It assesses the availability of goods and services. In economic terms, a thriving economy is often defined by an increase in real GDP, making it a key indicator of economic performance globally.

Estimation Techniques

This study employs the Ordinary Least Squares (OLS) estimation technique. The OLS estimator is recognized as the Best Linear Unbiased Estimator (BLUE) within the class of available estimators, provided certain assumptions are met, such as linearity, a zero expected value of the disturbance term, and uncorrelated disturbance terms. However, economic time series data may not always be stationary in their original form. Thus, the study will conduct a unit root test using the Augmented Dickey-Fuller (ADF) procedure to avoid potential inaccuracies. The Durbin-Watson test will be utilized to assess the models for autocorrelation. Additionally, tests for multicollinearity will be performed to ensure that the explanatory variables used in the estimation are not linearly dependent.

Results and Discussion

Descriptive Statistics of the Variables

The estimated descriptive statistics of the variables in this study are reported in Table 1.

Table 1: Descriptive statistics

Variables	Obs	Mean	Standard Deviation	Minimum value	Maximum value	P-value (Skewness)	P-value (Kurtosis)
RGDPG	42	3.0464	5.3194	-13.1278	15.3291	0.0227	0.0305
CPI	42	82.7229	105.5645	0.4893	421.0711	0.0002	0.0279
INTR	42	22.4731	6.0752	10	36.09	0.4925	0.9135
POGR	42	2.6167	0.0704	2.5191	2.7564	0.4666	0.0013
EXEDU	42	161.4098	209.7213	0.1621	702.9787	0.0019	0.4146
MS	42	22.7690	14.7300	-2.01	57.7815	0.0891	0.9873

Source: Estimated by the authors

The mean values were assessed alongside the standard deviation values, revealing that the mean values for all variables—real GDP growth, consumer price index, real interest rate, population growth rate, government expenditure on education, and money supply—are closely aligned with their respective standard deviations. This indicates that the data points for each variable are centered around the mean, suggesting a relatively tight distribution.

Additionally, the minimum values of the variables are all lower than their corresponding mean values, while the maximum values exceed the mean. This observation indicates that the data points are distributed between the minimum and maximum values, with no significant outliers present in the dataset.

Regarding skewness, the probability values for real GDP growth, consumer price index, government expenditure on education, and money supply are significant at the 5 percent level. These significant values lead to the rejection of the null hypothesis, indicating that the data for these variables is not normally distributed and may exhibit skewness. Conversely, the interest rate and population growth rate show insignificant skewness probability values, allowing us to accept the null hypothesis of normal distribution for these two variables. Thus, the data for interest rates and population growth rates appears to be normally distributed.

In terms of kurtosis, the variables of real GDP, consumer price index, population growth rate, and money supply exhibit statistically significant results, while real interest rate and government expenditure on education show insignificant results. Consequently, we reject the null hypothesis concerning kurtosis and normal distribution at the 5 percent level for the former group, indicating that their data diverges from the characteristics of a normal distribution in terms of tail behavior. In contrast, the real interest rate and government expenditure on education, being statistically insignificant, suggest that their data aligns more closely with a normal distribution in terms of tail behavior.

Unit Root Test

The stationarity of the time series variables in the models was assessed using the Augmented Dickey-Fuller and Phillips-Perron tests. The results of these tests are presented in Table 2.

Table 2: Augmented Dickey-Fuller and Philips–Perron unit root test results

Variable	Augmented Dickey-Fuller Result		Philips–Perron Result		Lag order	Order of Integration
	Level	1st Difference	Level	1st Difference		
RGDPG	-2.179	-4.079	-2.098	-10.921	2	I(1)
CPI	-1.709	-3.725	-3.104	-10.853	2	I(1)
INTR	-2.127	-3.740	-3.218	-8.941	2	I(1)
POGR	-2.234	-3.967	-2.840	-4.132	2	I(1)
EXEDU	-0.128	-4.874	-0.297	-5.789	2	I(1)
MS	-3.108	-4.289	-3.185	-9.061	2	I(1)

Where * denotes significance at 5% and the rejection of the null hypothesis of the presence of unit root. The optimal lag length of 2 was chosen using Akaike's Final Prediction Error (FPE), and Akaike's information criteria. The ADF 5% critical value at levels is -3.544, while at 1st difference is -3.548. The Philips–Perron critical value at levels and 1st difference are -3.536 and -3.540. A trend was included in both the Augmented Dickey -Fuller and Philips –Perron unit root test models estimated.

Source: Estimated by the authors

At this stage, the 5 percent critical value from the Augmented Dickey-Fuller test exceeds the test statistics for all the examined variables. This indicates that the variables are statistically insignificant at this level. Consequently, the null hypothesis suggesting the presence of a unit root is accepted, indicating that the variables are nonstationary and possess a unit root at the level. As a result, the variables were differenced once, and a new test was conducted using the first-differenced variables. The test statistics for these variables at the first difference surpassed the 5 percent critical value. Thus, the null hypothesis regarding the existence of a unit root is rejected at the first difference, confirming that all variables are stationary at this level. The results from the Phillips-Perron test corroborate those from the Augmented Dickey-Fuller test, showing that none of the variables were stationary at level but became stationary after first differencing. This confirms that all variables are stationary at the first difference.

Effect of Monetary Policy Variables on Real GDP Growth

The first objective is to analyze the impact of monetary policy variables on real GDP growth. The examination for this objective begins with a cointegration test of the variables in the model. The Johansen test for cointegration was employed to evaluate these variables, and the results are presented in Table 3.

Table 3: Result of Johansen tests for cointegration for the variables in the objective

Maximum rank	Eigenvalue	Trace statistic	5% Critical value
0	-	75.3527	68.52
1	0.5722	41.3807*	47.21
2	0.3166	26.1520	29.68
3	0.3094	11.3423	15.41
4	0.1679	3.9868	3.76
5	0.0948	-	-

Source: Estimated by the authors

The trace statistics are compared to the corresponding 5 percent critical values. The trace statistics for a maximum rank of 0 exceed the respective critical values, indicating that the variables possess a long-run relationship. In other words, the equation for objective one reveals one cointegrating equation. Therefore, the null hypothesis of no cointegration is rejected at the 5% significance level.

The primary results for objective one is presented in Table 4. All coefficients for the variables are positive, with money supply, interest rate, and government expenditure on education being statistically significant, while the population growth variable is not statistically significant.

Table 4: Estimates of the effect of monetary policy variables on real GDP growth

	Coefficient	Standard error	t-value	p-value
MS	0.0328	0.0128	2.56	0.019
INTR	0.4693	0.1659	2.83	0.008
EXEDU	0.0066	0.0029	2.30	0.041
POGR	23.9484	12.5472	1.91	0.064
Constant	-69.8517	34.2862	-2.04	0.049
R-squared		0.6093		
Adj. R-squared	0.5238			
F-statistics		29.45 (p = 0.0008)		
Durbin–Watson d-statistic (5, 41)		0.8915		
Breusch–Godfrey LM test		0.075 (p = 0.9026		
Breusch–Pagan/Cook–Weisberg test		0.14 (p = 0.7063)		

Source: Estimated by the authors

The coefficient for money supply is 0.0328, with a significant t-value of 2.56 and a p-value of 0.019, indicating statistical significance. This suggests that we can reject the null hypothesis stating that money supply does not significantly impact real GDP growth at the 5 percent level. Consequently, money supply has a positive and significant effect on real GDP growth, with a one percentage point increase in money supply leading to a 0.03 percent increase in real GDP growth.

For the interest rate, the coefficient is 0.4693, accompanied by a significant t-value of 2.83 and a p-value of 0.008. The significant t-value supports rejecting the null hypothesis that interest rate has no significant impact on real GDP growth at the 5 percent level, indicating that the

interest rate positively influences real GDP growth. A percentage increase in the interest rate correlates with a significant 0.47 percent increase in real GDP growth.

Government expenditure on education demonstrates a positive coefficient of 0.0066, signifying that a one percentage point increase in government spending on education results in a notable 0.01 percent growth in real GDP. Thus, government expenditure on education positively and significantly affects real GDP growth. The population growth rate presents a positive coefficient of 23.9484, with a t-value of 1.91. However, this t-value is not significant, leading to the acceptance of the null hypothesis at the 5 percent level. Therefore, while there is a positive association, the population growth rate does not significantly affect real GDP growth, with an increase resulting in a 23.95 percent rise that is not statistically significant.

The coefficient of determination (R^2) is 0.6093, indicating that the variables collectively account for 60.93 percent of the variance in real GDP growth, while other factors outside the model explain the remaining variation. The F-statistic of 29.45 is significant, supported by an F-probability value of 0.0008, which is below 0.05. This confirms that the variables jointly exert a significant influence on real GDP growth. The Durbin-Watson d-statistic is approximately 1, placing it in the zone of indecision regarding autocorrelation. Nonetheless, the Breusch-Godfrey LM chi-squared value is insignificant, suggesting acceptance of the null hypothesis that there is no serial correlation. The Breusch-Pagan test statistic is 0.14, with an insignificant p-value of 0.7063, indicating acceptance of the null hypothesis of homoscedasticity or constant variance. This reinforces the reliability of the estimated coefficients, confirming that they are unbiased with minimum variance.

Additionally, we assessed multicollinearity among the variables using the Variance Inflation Factor (VIF) test, with results presented in Table 4.5.

Table 5: Results of the model one VIF test for multicollinearity

Variable	VIF	1/VIF
EXEDU	1.86	0.538883
INTR	1.68	0.594878
POGR	1.29	0.773425
MS	1.23	0.814542
Mean VIF	1.51	

Source: Computed by the authors

The results indicated a very low variance inflation factor (VIF) value, well below the conventional threshold of 10. Since the VIF is less than 10, we accept the null hypothesis of no multicollinearity. This means that the independent variables in the model for objective one does not exhibit multicollinearity issues.

Effect of Monetary Policy Variables on the Price Level

Objective two aims to investigate the influence of monetary policy variables on the price level. The analysis for this objective begins with a cointegration test for the variables included in the model. The Johansen test for cointegration was employed to assess the variables, and the results are presented in Table 6.

Table 6: Result of Johansen tests for cointegration for the variables in the model for objective two

Maximum rank	Eigenvalue	Trace statistic	5% Critical value
0	-	74.9786	68.52
1	0.5784	40.4251*	47.21
2	0.3414	23.7138	29.68
3	0.2172	13.9151	15.41
4	0.1907	5.4495	3.76
5	0.1273	-	-

Source: Estimated by the authors

The trace statistics were compared to the corresponding 5 percent critical values. The trace statistics up to maximum rank 0 exceeded the respective critical values, indicating that a long-term relationship exists among the variables. This suggests that the variables in the equation for objective two have one cointegrating equation. Consequently, the null hypothesis of no cointegration is rejected at the 5% significance level.

The key results for objective two are presented in Table 7. The coefficients for money supply and government expenditure on education are both positive and statistically significant, whereas the real interest rate shows a negative and significant relationship. In contrast, the population growth rate is negative and statistically insignificant.

Table 7: Estimates of the effect of monetary policy variables on the price level

	Coefficient	Standard error	t-value	p-value
MS	0.0725	0.0321	2.26	0.044
INTR	-0.1155	0.0367	-3.15	0.000
EXEDU	0.5003	0.0237	21.14	0.000
POGR	-66.5264	58.7859	-1.13	0.265
Constant	176.9881	160.6373	1.10	0.278
R-squared		0.5559		
Adj R-squared		0.5512		
F-statistics		45.64 (p = 0.0000)		
Durbin–Watson d-statistic (5, 42)		1.8515		
Breusch–Godfrey LM test		0.586 (p = 0.2097)		
Breusch–Pagan/Cook–Weisberg test		0.16 (p = 0.2770)		

Source: Estimated by the authors

The coefficient for money supply is 0.0725, accompanied by a significant t-value of 2.26 and a p-value of 0.044, indicating significance. This suggests that we can reject the null hypothesis that the money supply does not significantly affect the price level at the 5 percent level. Consequently, it can be inferred that an increase in the money supply leads to a significant rise of 0.07 percent in the price level.

In contrast, the interest rate exhibits a negative coefficient of -0.1155, with a significant t-value of -3.15 and a p-value of 0.000. This significant t-value allows us to reject the null hypothesis that the interest rate has no significant impact on the price level at the 5 percent level. Hence, the interest rate has a negative and significant effect on the price level, indicating that a percentage increase in the interest rate results in a 0.12 percent decrease in the price level. The coefficient for government expenditure on education is positive and significant at 0.5003, implying that a percentage increase in government spending on education leads to a 0.50 percent significant increase in the price level. Thus, government expenditure on education positively and significantly affects the price level.

On the other hand, the population growth rate has a negative and insignificant coefficient of -66.5264, with a t-value of -1.13. Since this t-value is not significant, we fail to reject the null hypothesis at the 5 percent level, indicating that the population growth rate does not have a statistically significant effect on the price level. This suggests that an increase in the population growth rate results in a 66.53 percent insignificant increase in the price level, leading to the conclusion that it has a negative and insignificant effect.

The coefficient of determination (R^2) is 0.5559, indicating that the variables collectively account for a 55.59 percent change in the price level, while the remaining variation is due to other factors not included in the regression model for objective two. The F-statistic, at 45.64, is significant, with an F-probability value of 0.0000, which is below 0.05, indicating that the variables jointly have a significant effect on the price level. The Durbin-Watson d-statistic is approximately 2, suggesting no autocorrelation.

Moreover, the insignificant Breusch-Godfrey LM chi-squared value supports the acceptance of the null hypothesis of no serial correlation. The Breusch-Pagan test statistic stands at 0.16, with an insignificant p-value of 0.2770, allowing us to accept the null hypothesis of homoscedasticity or constant variance. This further confirms the reliability of the estimated coefficients, assuring us that they are unbiased and have minimal variance.

We also assessed the multicollinearity of the variables using the Variance Inflation Factor (VIF) test, with the results detailed in Table 8.

Table 8: Results of the model two VIF test for multicollinearity

Variable	VIF	1/VIF
EXEDU	1.86	0.538883
INTR	1.68	0.594878
POGR	1.29	0.773425
MS	1.23	0.814542
Mean VIF	1.51	

Source: Competed by the authors

The results indicated a significantly low variance inflation factor, well below the conventional threshold of 10. Since the values are less than 10, we accept the null hypothesis of no multicollinearity. This means that the independent variables in the model for objective one does not exhibit multicollinearity issues.

Summary, Conclusion, and Recommendations

Summary of Findings

The key findings of this study are summarized as follows:

1. Regarding objective one, the research revealed that money supply, interest rate, and government expenditure on education positively and significantly influenced real GDP growth. Additionally, the population growth rate was found to have a statistically insignificant effect on real GDP growth.
2. In relation to objective two, the study established that money supply and government expenditure on education positively and significantly affected the price level. Furthermore, it was observed that the interest rate had a negative and significant impact on the price level, while the population growth rate exhibited a negative and insignificant effect on the price level.

Implications of the Findings

For objective one, the study found that money supply, interest rate, and government expenditure on education positively and significantly influenced real GDP growth. This indicates that the central bank's monetary policy actions, along with investments in human capital, play a crucial role in fostering economic expansion and enhancing overall economic performance and well-being. Nonetheless, policymakers need to be attentive to ensure that the advantages of economic growth are aligned with the sustainability of long-term economic performance. Furthermore, the finding that the population growth rate had a statistically insignificant impact on real GDP growth suggests that changes in population size do not significantly drive economic growth. This highlights the need for policymakers to consider broader measures of economic welfare and development, which may encourage the pursuit of alternative strategies for fostering sustainable and inclusive economic growth.

For objective two, the results indicated that money supply and government expenditure on education positively and significantly impacted the price level. This suggests that increases in the money supply exert upward pressure on prices, indicating potential inflationary trends within the economy, where the prices of goods and services are rising over time. Conversely, the negative effect associated with interest rates implies that higher interest rates correlate with a decrease in the price level.

Conclusion

This study has explored the connection between monetary variables and the performance of the Nigerian economy. Utilizing the Ordinary Least Squares (OLS) technique, several significant findings emerged. The results indicate that monetary policy variables have a meaningful impact on Nigeria's economic performance. Specifically, both money supply and interest rates are found to positively and significantly influence real GDP growth. Additionally, government expenditure on education also plays a crucial role in fostering economic growth. Furthermore, the analysis reveals that the money supply notably contributes to an increase in the price level, whereas the real interest rate is associated with a significant decrease in the price level. Conversely, the population growth rate exhibited a negative and statistically insignificant effect on the price level within Nigeria.

Recommendations for Policy

The following recommendations are suggested:

1. Central banks should contemplate tightening monetary policy through increasing interest rates, decreasing the money supply, or adopting additional measures to mitigate inflationary pressures.
2. Policymakers ought to prioritize initiatives that foster productivity growth, innovation, education, skills development, and enhancements in infrastructure and institutional quality.

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