Impact of Selected Macroeconomic Variables on Per Capita Income in Nigeria (1990-2022)

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Abstract

Per capita, income is a crucial factor in determining economic growth and productivity. However, statistics from 2015 to 2022 indicated that Nigeria has a low and declining per capita income even in the class of developing countries in Sub-Saharan Africa such as South Africa and a developing country of a similar population such as Brazil. Arguably, effective management of macroeconomic variables such as broad money supply, inflation rate, unemployment rate, and interest rate can lead to higher per capita income. This study investigated the influence of selected macroeconomic factors on the per capita income in Nigeria from 1990 to 2022. The study utilised time series data and Dynamic Ordinary Least Squares technique to analyse the influence of selected macroeconomic variables on per capita income in Nigeria. The results indicated among others that broad money supply in Nigeria has a substantial and positive effect on per capita income. This makes it a crucial variable among the macroeconomic factors that contribute to the growth of per capita income in Nigeria. Conversely, the unemployment rate, inflation rate, and interest rate impede per capita income. This is due to the adverse effect that the rise in these three macroeconomic variables has on per capita income in the country. The paper therefore, suggested that the Federal Government, through the Central Bank of Nigeria, should regulate the quantity of broad money supply to ensure its favourable influence on the enhancement of human capital in Nigeria. This could be done by allocating more resources towards education and healthcare services, thereby fostering human capital development. Also, lowering unemployment by implementing policies that stimulate aggregate demand and promote a conducive environment for private sector investors will enhance productivity and raise per capita income. Thus, the management of these significant macroeconomic variables is key to the growth of per capita income in Nigeria, hence, the paper also recommended that the Central Bank of Nigeria in collaboration with the Federal Ministry of Labour and Productivity, and the Federal Ministry of Finance should effectively manage these selected macroeconomic variables to enhance the growth of per capita income in Nigeria.

Keywords: *Per Capita Income, Human Capital, Economic Growth, DOLS, Nigeria*

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Background to the Study

Globally, economic development is a process in which a nation is being sustainably transformed and improved in the spheres of the economic, political, and social well-being of its people. It encompasses progress in economic growth, improved living standards, increased per capita income, human capital development and social transformation. Economic development is attained through the process of human and physical infrastructural development that is based on the principles of productivity, equity and rule of law. The different indicators that economists use to measure the level of economic development in a country include per capital income, poverty rate, literacy rate, infant mortality, life expectancy, real gross domestic product, capacity utilization, human capital development and industrial output etc (Samal & Ibrahim, 2019). Therefore, it can be concluded that economic development leads to the creation of more opportunities in the sector of education, health, research, human development, capacity utilization, industrial output, full employment and environmental conservation. It equally implies an increase in the per capita income of the citizenry (Adegbemi, 2018). Thus, the correlation between macroeconomic variables and per capita income is a matter of great global interest, as these variables fundamentally determine economic stability and growth, and macroeconomic indicators, such as broad money supply, inflation rate, unemployment rate, exchange rate, and interest rate, play a crucial role in determining a country's economic woe and success as well as the prosperity of individuals.

Government and policy makers in Nigeria have embarked on various macroeconomic policies to address these issues. Some of the policies involved the use of monetary and fiscal policy, export promotion strategy, import substitution strategy, and national economic empowerment development strategy (NEEDS). The fundamental objectives of the policies included price stability, maintenance of balance of payments equilibrium, and promotion of employment, growth and sustainable development. These objectives are necessary for the attainment of internal and external balance of the value of money and the promotion of long-run economic development (Nwoko *et al.* 2016). Despite the multiple governmental measures targeted at stabilizing the macroeconomic conditions, the country has continued to face challenges in achieving consistent enhancements in per capita income. For example, the focus of policies in 1990's was the moderation of inflation, stimulation of the private sector output, minimization of unemployment as well as reduction of pressure on the external sector, which informed setting the monetary and credit targets of M1 at 13.0 percent, government credit at 10.9 percent, and credit to private sector at 15.8 percent (Central Bank of Nigeria, 2020). Rather than experiencing the expected targets, the stance of monetary policy during the period remained moderately restrictive and the implemented policies did not achieve the anticipated economic advantages.

On the contrary, the implementation of these measures has led to elevated inflation and unpredictable currency rates, which eroded economic stability and hindered growth. The resulting macroeconomic instabilities have had a substantial impact on the country's per capita income (Abah *et al.* 2016). Also, the statistics showed that the per capita income in Nigeria between 1990 and 2022 is on an average of 2000 dollars (World Bank 2022). While, Brazil a developing country of similar population as Nigeria and South Africa a fellow Sub-Saharan

African country with a population of about 59 million people have pursued comparable macroeconomic strategies and achieved more favourable outcomes in comparison, with a per capita income averages of 8,600 dollars and 7,070 dollars respectively. Their adept handling of inflation and unemployment through strategic management, along with the implementation of sound monetary policies, has resulted in substantial enhancements in per capita income. The discrepancy in results emphasizes the necessity for a more thorough analysis of the contextual elements that influence the effectiveness of macroeconomic policies (Gatawa *et al.* 2017; Olawale, 2015). Thus, the paper examined the impact of selected macroeconomic variables on the per capita income in Nigeria between 1990 and 2022. To achieve this objective, the following hypotheses were stated and tested.

H_{01}: Broad money supply has no significant impact on per capita income in Nigeria.

H_{02}: Inflation rate has no significant impact on per capita income in Nigeria.

H_{02}: Unemployment rate has no significant impact on per capita income in Nigeria.

H_{04}: Exchange rate has no significant impact on per capita income in Nigeria.

H_{05}: Interest rate has no significant impact on per capita income in Nigeria.

Literature Review

Conceptual Review

Macroeconomy is a term used to describe the behavior of the entire economy which can be regional, national or international (Abdul, 2016). Macroeconomic variables are, therefore, the variables used in the analysis of the economic-wide study of the performance, behaviour and pattern of the economy. Muhammad (2020) infers that the macroeconomic environment is the overall aspects and working of the national economy, such as income, output, and interrelationship among diverse economic sectors. Adegbemi (2018) posits that macroeconomic variables deal with the performance, structure, behaviour, pattern and decision-making of an economy as a whole, rather than individual markets. Therefore, macroeconomic variables are key indicators that provide insight into the overall health and performance of an economy which comprises broad money (M2), inflation rate, unemployment rate, exchange rate and interest rate etc. Broad money refers to small-time deposits along with narrow money (M1), while M3 (money supply) is indicative of M2 plus large time deposits. M2 is an economic index that is used to predict inflation while M3 comes to include short-term repurchase agreements, large liquid assets, and institutional money-market funds (Dare & Okeya, 2017). Inflation is the persistent increase in the general price level within the economy which affects the value of the domestic currency (Fatukasi, 2012).

Unemployment, as defined by Madito and Khumalo (2014), as the state in which individuals who are both eager and able to work are unable to secure suitable paid employment. Monitoring and regulating macro-economic problems is a fundamental responsibility of every responsible government. Ogini (2022) categorizes unemployment into two types: frictional unemployment and temporary unemployment. Frictional unemployment refers to the transitory unemployment that occurs when persons are transiting between occupations, entering the labour for the first time, or re-entering the workforce after a period of absence. Structural unemployment occurs when there is a discrepancy between the skill set possessed by

the labour force and the qualifications demanded by the job opportunities that are now available. These outcomes can arise from technical progress, alterations in consumer tastes, or transformations in the structure of the economy.

Unemployment is associated with fluctuations in the economic cycle. During economic downturns or recessions, there is a fall in demand for goods and services, which results in lower production and, as a result, layoffs. Seasonal unemployment refers to the phenomenon where specific industries or sectors see swings in employment as a result of seasonal patterns. Illustrative instances encompass agriculture, tourism, and retail during festive periods (Ndzwayiba, 2020). The exchange rate refers to the rate at which one country's currency is exchanged for another country's currency. It may also be seen as the price of one country's currency in relation to another country's currency (Anyanwu *et al.* 2017). Currency exchange rates in a country can either increase (appreciate) or decrease (depreciate). Currency appreciation happens when the domestic currency is traded for a smaller amount of foreign currency (Greetings, 2022). The interest rate is the fee that a borrower incurs for the funds borrowed for business or other transactional purposes. Investors obtain loans from banks and other financial entities and the impact of interest rates on investment expenses is highly sensitive and is a key consideration in financial analysis (Abdul, 2016). Per-capita income is a metric that gauges the level of economic prosperity. It has an indirect impact on sustainable development by influencing economic growth (Fagbohun & Adekoya, 2016). Historically, income per capita has been a widely used metric to assess the economic welfare of individuals during a particular time frame. Typically, the inter-temporal component, which includes the impact of income-per-capita level on sustainable development, is often overlooked in this process. The level of per capita income can have an indirect impact on sustainable development by influencing economic development (Adegbemi, 2018).

Empirical Review

Muhammad *et al.* (2023) investigated the impact of inflation on the standard of living in Nigeria for the period 1991 to 2021 using the Autoregressive Distributed Lag [ARDL] model. The empirical results showed a long-run and short-run relationship between GDPPC and the independent variables. It indicated that past inflation was the important determinant that affected the people's standard of living in Nigeria. The result also discovered that the consumer price index positively impacts gross domestic product per capital in the short run. In contrast, interest rate and exchange rate have a negative impact on gross domestic product per capita in the short run. The study recommended that the government should improve and increase the production capacity in all sectors, encourage exportation in the country, and decrease the interest rate that will encourage investment in the country.

In another study, Ogini (2022) determined the effect of the inflation rate on per capita income in Nigeria and assessed the effect of unemployment rate variables on per capita income in Nigeria. The study employed econometric techniques, including Descriptive Statistics, Augmented Dickey-Fuller for unit root and the Autoregressive Distributive Lag (ARDL). The findings revealed that money supply, exchange rate, interest rate, inflation rate and unemployment rate have (65% long run and 73% short run) significant policy effects on the

standard of living of an average Nigerian. The study concluded that selected macroeconomic variables have been effective short-run and long-run policy instruments that can largely influence the standard of living of an average Nigerian citizen. This is supported by macroeconomic variables' short-run and long-run influences on the standard of living of the average Nigerian citizen. In a related study, Olabiyi (2022) investigated the empirical analysis of inflation and people's well-being in Nigeria from 1981 to 2019, using life expectancy as the proxy for the dependent variable, while Consumer Price Index (CPI), Gross Domestic Product Per capital (GDPPC), Unemployment and Trade Openness were the independent variables. The study used the Autoregressive Distributive Lag (ARDL) model and found that a percentage increase in the inflation rate hampers the well-being status of Nigerians by 0.24%.

Furthermore, Ejieh (2022) investigated the effect of macroeconomic variables in Nigeria, and the data used for the study was sourced from the Central Bank of Nigeria (CBN) statistical bulletin and World Bank Development Indicator. The Autoregressive Distributive Lag (ARDL) was used to determine the effect of the relationship between macroeconomic variables and per capita income. The result obtained indicated that macroeconomic variables had a significant long-run and short-run effect on per capita income in Nigeria and the study recommended that relevant policy instruments be put in place to increase per capita income through the creation of a favourable socio-economic environment.

The work of Jabaru and Jimoh (2020) examined the relationship between unemployment rates and per capita income in Nigeria from 1980 to 2017. The study used gross domestic product as dependent variable, to represent the economy and examined the impact of various macroeconomic variables including unemployment rate on GDP. The result shows among other things that unemployment rate was not significant in determining the change in GDP. Their finding is contrary to Okun's law (1962), which states that for every 1% increase in unemployment, per capita income decreases by approximately 3%. However, it was Salam and Ibrahim (2019) that investigated the effect of government expenditure on per capita income in Nigeria using the Vector Error Correction Model for its analysis for the period 1986 to 2017. The data were diagnosed with a unit root test for stationary in which Per Capital Income (PCI), Population (POP) and Government Expenditure (GEX) were stationary at the second difference while investment (INV) was stationary at the first difference. The result of the VEC model shows that GEX posits a negative relationship in the short-run and 0.85 percent of adjustment. It recommends that government should inject more funds into the economy, but ensure all loopholes or leakages are blocked as well as ensure proper guidelines of policy implementation of fund appropriation so much so that the purpose is achieved.

Also, Siyasanga and Hlalefang (2017) investigated the dynamic impact of broad money supply on per capita income in South Africa using time-series data from 1980 to 2016. The study has employed the autoregressive distributed lag (ARDL)--bounds testing approach to cointegration and error correction model to investigate the impact of M3 on per capita income. The model was specified with four macroeconomic variables, namely, Gross Domestic Product (GDP) per capita, Broad money supply (M3), Interest rate (INT), and Inflation rate (INF). The findings revealed a statistically significant positive relationship between money

supply and per capita income both in the short and long run. In another study, Khaysy and Gan (2017) examined the impact of money supply on the economic development of Nigeria using annual time series data from 1989 to 2016. The unit root testing result suggests that all variables were stationary at first difference; therefore, the Johansen Cointegration and Error Correction Model were employed to analyze the association between the variables. The finding showed that money supply, interest rate and inflation rate have negative effects on per capita income in the long run and only the real exchange rate has a positive sign. The error correction model result indicated the existence of short-run causality between money supply, real exchange rate and per capita income.

Also, in another study, Gatawa *et al.* (2017) examined the impact of money supply, inflation, and interest rate on Nigeria's economy using time series data from 1973-2013. VAR Model and Granger Causality test within the error correction framework were used. The results of the VEC model provide evidence in support of a positive impact of broad money supply while inflation and interest rate negatively impact growth and development, especially in the long run. The short-run parsimonious results revealed that except inflation, broad money supply and interest rate were positively related to per capita income. The study by Fagbohun and Adekoya (2016), investigated the impact of investment on long-run per-capital income growth in Nigeria for the period 1970-2014. It also examined other macroeconomic determinants of long-run output per capita growth. The study employed Ordinary Least Square (OLS) estimation techniques to establish the link based on the sourced data from the Central Bank of Nigeria (CBN) Bulletin. Empirical findings revealed that trade openness has a positive and significant impact on Nigeria's growth rate of per capita income.

Similarly, Ifionu and Akinpelumi (2015) examined the effect and implication of selected macroeconomic variables on money supply (M2), using secondary data obtained from the Central Bank Statistical Bulletin (2013) and the application of econometric techniques such as the O.L.S. causality test and Cointegration of time series data to estimate the long and short-run relationships and causality of employed variables. The results revealed that all variables were stationary at various lags and there existed a long-run relationship between variables employed. It was discovered that inflation and Exchange Rate (EXR) had an inverse significance relationship with money supply (M2) while gross domestic Product (GDP) was found to have a positive impact on money supply. Finally, Khalid *et al.,* (2015), studied and analyzed the impact of inflation on the per capita income of emerging economies. To achieve the objective of the study, the researchers took five major emerging economies of the world for the period 1999 to 2011. After employing the regression model, the result confirmed that the independent variable (inflation) do not statistically influence the dependent variable (per capita income) in three developing countries which are Brazil, India and South Africa. However, in the two developed countries (Ettina and Russia), the findings affirmed the independent variable (inflation) to statistically influence the dependent variable (per capita income). Therefore, it concluded that a change in inflation cannot necessarily bring about a change in the per capita income of the undeveloped countries.

Theoretical Framework

This study adopted the Neoclassical Growth Theory which was independently developed by Robert Solow and Trevor Swan in the mid-1950s. Solow's seminal paper "A Contribution to the Theory of Economic Growth" was published in 1956. The key framework in neoclassical economics explains long-term economic growth based on capital accumulation, labour or population growth, and technological progress. The model emphasizes the role of savings and investment in physical capital as primary drivers of economic growth, while also acknowledging the importance of technological advancements. The model is used to examine how changes in the unemployment rate affect the labour force and, consequently, economic output and per capita income. Lower unemployment typically leads to higher productivity and income levels. Also, foreign direct investment is viewed as a form of capital accumulation. The Solow-Swan model highlights the importance of investment in physical capital, which FDI contributes to. Increased FDI can lead to higher economic growth and per capita income by enhancing the capital stock and bringing in new technologies and management practices and the model also helps analyze the impact of inflation on economic stability and growth. While the Solow-Swan model itself doesn't explicitly focus on inflation, it provides a framework for understanding how macroeconomic stability (or instability) can affect savings, investment, and growth. High inflation can erode savings and investment, negatively impacting capital accumulation and growth (Dimand & Spencer, 2018). Therefore, the theory established a functional relationship between macroeconomic indicators and per capita income in developing countries like Nigeria.

Methodology

Sources and Nature of Data

The research design for this study is ex-post facto research and the secondary annual time series data from 1990 to 2022 was sourced from the Central Bank of Nigeria (CBN) Statistical Bulletin December 2022 and World Bank Online Data Bank, 2022. The per capita income was sourced from the World Bank (Online Databank) 1990-2022 and the Trading Economic.com, the unemployment rate was sourced from the National Bureau of Statistics (NBS) 2022 and other macroeconomic data were sourced from CBN Statistical Bulletin, December 2022.

Model Specification

The study adopted and used Dynamic Ordinary Least Squares (DOLS). The foundation of the model was based on the theoretical framework of the study. Also, the initial model was adapted from the work of Olawale (2015) who studied the impact of macroeconomic variables on human capital development in Nigerian using the Vector Autoregressive approach:

$$HCD = f(UPR, FDI, IFR) \qquad (1)$$

Where: HCD is the human capital development index, UPR is the unemployment rate, FDI is the foreign direct investment and IFR is the inflation rate. Equation (1) was modified and specified to follow the paper objective.

$$HDI = f(BMS, IFN, UEM, ECG, IRS) \qquad (2)$$

The study established the explicit relationship between selected macroeconomic variables and the human capital development in Nigeria as stated in equation (2):

$$hdi_t = \beta_0 + \beta_1 bms + \beta_2 ifn + \beta_3 uem + \beta_4 ecg + \beta_5 irs + \mu_t \tag{3}$$

From equation (3), HDI is the human development index in Nigeria which is the dependent variable while the following are the independent variables: BMS is the broad money supply in Nigeria, IFN is the inflation rate in Nigeria, UEM is the unemployment rate in Nigeria, ECG is the economic growth rate in Nigeria and IRS is the interest rate in Nigeria. However, to establish the relationship and the impact of selected macroeconomic variables on per capita income in Nigeria using Dynamic Ordinary Least Squares (DOLS), equation (4) was formulated as:

$$\begin{aligned}
pci_t = {} & \lambda_0 + \lambda_1 bms + \lambda_2 ifn + \lambda_3 uem + \lambda_4 exr + \lambda_5 irs + \sum_{i=1}^{m} \lambda_6^i \Delta bms_t + \sum_{i=1}^{n} \lambda_7^i \Delta bms_{t+i} + \sum_{i=1}^{o} \lambda_8^i \Delta bms_{t-i} + \\
& \sum_{i=1}^{p} \lambda_9^i \Delta ifn_t + \sum_{i=1}^{q} \lambda_{10}^i \Delta ifn_{t+i} + \sum_{i=1}^{r} \lambda_{11}^i \Delta ifn_{t-i} + \sum_{i=1}^{s} \lambda_{12}^i \Delta uem_t + \sum_{i=1}^{t} \lambda_{13}^i \Delta uem_{t+i} + \sum_{i=1}^{u} \lambda_{14}^i \Delta uem_{t-i} + \\
& \sum_{i=1}^{v} \lambda_{15}^i \Delta exr_t + \sum_{i=1}^{w} \lambda_{16}^i \Delta exr_{t+i} + \sum_{i=1}^{x} \lambda_{17}^i \Delta exr_{t-i} + \sum_{i=1}^{y} \lambda_{18}^i \Delta irs_t + \sum_{i=1}^{z} \lambda_{19}^i \Delta irs_{t+i} + \sum_{i=1}^{k} \lambda_{20}^i \Delta irs_{t-i} + \mu_t
\end{aligned} \tag{4}$$

Where PCI is per capita income in Nigeria, BMS is Broad money supply, IFN is the Inflation rate, UEM is the unemployment rate in Nigeria, EXR is the exchange rate and IRS is the interest rate in Nigeria. Also, β_1 to β_4 represent the long-run coefficients for each independent variable, indicating their impact on PCI in the long term. ($\sum$) represent the summation terms and captures the short-run dynamics; ΔBMS_{t-j} to ΔIRS_{t-j} represent lagged differences of the independent variables (j = 1 to n); ΔPCI_{t-j} represents lagged differences of the dependent variable (j = 1 to m), while ε_t represents the error term that captures the unexplained factors affecting PCI. Equation 4 presents the Dynamic Ordinary Least Square (DOLS) which shows the current and lagged relationship between selected macroeconomic variables and per capita income in Nigeria.

Variable Description, Measurements and A-priori Expectation
Table 1: Description of the Variables Used for the Model

Variable	Description/Measure	Type	Source	Apriori Expectation
PCI	Per Capita Income in Nigeria	Dependent	Word Bank, 2022	
BMS	Broad Money Supply in Nigeria	Independent	CBN, 2022	$B_1 >< 0$
IFN	Inflation Rate in Nigeria	Independent	CBN, 2022	$B_2 >< 0$
UEM	Unemployment Rate in Nigeria	Independent	NBS, 2022	$B_3 >< 0$
EXR	Exchange Rate in Nigeria	Independent	CBN, 2022	$B_4 >< 0$
IRS	Interest Rate in Nigeria	Independent	CBN, 2022	$B_5 >< 0$

Source: Author Compilation, 2024

The a priori expectation is that $\beta_1, \beta_2, \beta_3,$ and $\beta_4 >< 0$ indicating a positive or negative relationship between the dependent and independent variables, that is, increase/decrease in selected macroeconomic variables like broad money supply, inflation rate, unemployment rate, exchange rate and interest rate will lead to decrease/increase in per capita income in Nigeria.

Method of Analysis

The study employed the Dynamic OLS (DOLS) model, which was proposed by Stock and Watson (1993) and eliminates the feedback in the co-integrating system by augmenting the co-integrating regression with lags and leads of the differenced values of the explanatory variables so that the resulting co-integrating equation error term is orthogonal to the entire history of the stochastic regressor innovations (or trend). DOLS is a valuable tool for analyzing time series data and estimating the long-run relationships between variables while considering their dynamic properties and potential endogeneity.

Presentation and Interpretation of Results
Descriptive Analysis
Table 2: Descriptive Analysis

	PCI	BMS	IFN	UEM	EXR	IRS
Mean	1263.682	11403.01	17.97242	4.824879	146.6512	18.19273
Median	1014.700	3797.910	12.90000	4.015000	129.3565	17.95000
Maximum	3203.300	43342.30	72.80000	9.788000	425.9811	29.80000
Minimum	153.1000	47.42000	5.400000	3.700000	8.037808	11.50000
Std. Dev.	1003.486	13620.38	16.13075	1.884382	116.5647	3.735045
Skewness	0.418454	0.993877	2.205488	1.781183	0.837449	0.846873
Kurtosis	1.638181	2.658856	6.836874	4.458855	2.932325	4.766244
Jarque-Bera	3.513078	5.592873	46.99517	20.37572	3.863561	8.234038
Probability	0.172641	0.061027	0.000000	0.000038	0.144890	0.016293
Sum	41701.50	376299.3	593.0900	159.2210	4839.491	600.3600
Sum Sq. Dev.	32223521	5.94000	8326.431	113.6287	434794.6	446.4181
Observations	33	33	33	33	33	33

Source: Researcher's Computation Using EViews-12 (2024)

Table 2 revealed that the average value of the per capita income in Nigeria between 1990-2022 is 1263.682, the maximum is 3203.300 and the minimum is 153.1000. The average value for the broad money supply is 11403.01, the maximum is 43342.30, and the minimum is 47.42000. The average value of the inflation rate is 17.97242, the maximum is 72.80000 and the minimum is 5.400000. The average rate for the unemployment rate is 4.824879, the maximum is 9.788000 and the minimum is 3.700000. The average rate for exchange rate is 146.6512, the maximum is 425.9811 and the minimum is 8.037808. The average rate for the interest rate is 18.19273 the maximum is 29.80000 and the minimum is 11.50000. Also, the Jarque-Bera statistic tests the hypothesis that the series is normally distributed and the high values for inflation rate and unemployment rate and their associated low probabilities confirm that these series deviate from a normal distribution. This is consistent with the observed skewness and kurtosis, which suggest that these variables have distributions with more pronounced tails and peaks than a normal distribution. While, high values for per capita income, broad money

supply, exchange rate and interest rate and their associated probabilities suggest otherwise, this means series were normally distributed.

Correlation Matrix Results
Table 3: Correlation Matrix Results

Correlation Probability	PCI	BMS	IFN	UEM	EXR	IRS
PCI	1.000000 -----					
BMS	0.783767 0.0000	1.000000 -----				
IFN	-0.392867 0.0237	-0.260114 0.1438	1.000000 -----			
UEM	0.391677 0.0242	0.752498 0.0000	-0.100987 0.5760	1.000000 -----		
EXR	0.695593 0.0000	0.947744 0.0000	-0.339506 0.0532	0.729679 0.0000	1.000000 -----	
IRS	-0.551521 0.0009	-0.628041 0.0001	0.306507 0.0828	-0.376313 0.0309	-0.618846 0.0001	1.000000 -----

Source: Author's Computation, using E-Views 12, (2024)

Table 3 shows the correlation matrix of the variables used in this paper and the correlation matrix results showed that there exists a strong and positive relationship between PCI in Nigeria and BMS in Nigeria given the correlation co-efficient value of 0.783767 and the probability value of 0.0000 showed a significant relationship between PCI in Nigeria and BMS in Nigeria. On the other hand, the PCI and IFN in Nigeria have a weak and negative relationship as the correlation coefficient value of -0.392867 and the probability value of 0.0237 showed a moderate negative correlation and significant relationship between PCI in Nigeria and IFN in Nigeria. Also, there is the existence of a weak and positive correlation between PCI and UEM in Nigeria, given the correlation coefficient value of 0.391677 and the probability value of 0.0242 showed a significant relationship between the PCI and UEM in Nigeria.

In contrast, existence of a strong and positive relationship between PCI in Nigeria and EXR in Nigeria exists given the correlation co-efficient value of 0.695593 and the probability value of 0.0000 showed a significant relationship between PCI in Nigeria and EXR in Nigeria. Finally, the result showed that there exists a moderate negative correlation between PCI and IRS in Nigeria, given the correlation co-efficient value of -0.551521 and the probability value of 0.0009 showed a negative and significant relationship between the PCI and IRS in Nigeria.

Stationary Tests (Unit Root Tests)
This section shows the unit root of the variables using the Augmented Dickey-Fuller (ADF) Test to check the stationary at a 5 per cent level of significance.

Table 4: Unit Root Test Result

| Variable | Augmented Dickey-Fuller (ADF) Test | | |
	ADF	@ 5%	Status
PCI	-4.888206	-3.562882	1(1)
BMS	-7.026428	-3.562882	1(1)
IFN	-9.379950	-3.587527	1(1)
UEM	-5.977566	-1.954414	1(1)
EXR	-4.319753	-3.562882	1(1)
IRS	-6.399382	-3.568379	1(1)

Source: Author's Computation Using EViews-12 (2024)

Table 4 shows the stationary test of the variables used in this study and the results revealed that all the variables were integrated at order one 1(1). This implies that they were not stationary at the level until they were differenced once and they were said to be integrated of order one 1(1). Given the result, as shown by ADF tests and the order of integration of the variables, there is no long-run relationship among the economic variables. Therefore, the paper went further to test for the long-run relationship by testing the co-integration using the Engle-Granger co-integration test.

Co-integration Test Results
The Engle-Granger residual-based co-integration test is a two-step procedure to determine whether a long-term equilibrium relationship exists between two or more non-stationary variables. The premise of co-integration is that if two or more series are individually non-stationary. Still, a linear combination of them is stationary, then the series is said to be co-integrated. This implies that despite short-term deviations, the variables tend to move together over time, suggesting a stable long-term relationship.

Table 5: Results of Engle and Granger (Residual Based) Co-integration Test

Variable	ADF Test Statistic	95% Critical ADF Value	Remarks
Residual	-4.419998	-1.952066**	Co-integrated
*Note: * significant at 5%*			

Source: Author's Computation Using EViews-12 (2024)

Table 5 shows the Engle and Granger (Residual Based) co-integration test and the variable under consideration, the residual from a long-run equilibrium equation estimated with the macroeconomic variables of interest exhibits an Augmented Dickey-Fuller (ADF) test statistic of -4.419998. This value is more negative than the provided 95% critical ADF value of -1.952066, which is significant at the 5% level. This indicates that the null hypothesis of no co-integration can be rejected, and thus, the study can conclude that the variables in the estimated

equation are co-integrated. This result has profound implications for our understanding of the relationship between macroeconomic variables and per capita income in Nigeria. It suggests that there exists a long-term equilibrium relationship between these variables, which means that any short-term imbalances between them will be corrected over time. This is crucial for policymakers because it implies that the impact of macroeconomic variables on per capita income in Nigeria are not just short-lived but have long-lasting impacts that will eventually lead to a greater per capita income in Nigeria.

Dynamic OLS (DOLS) Regression Results
This section presented the long-run DOLS regression analysis of the per capita income, broad money supply, inflation rate, unemployment rate and interest rate.

Table 6: Dynamic OLS (DOLS) Model Results

Dependent Variable: PCI

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BMS	0.177831	0.017272	10.29610	0.0000
IFN	-13.87411	7.296112	-1.901576	0.0897
UEM	-549.5225	64.79812	-8.480531	0.0000
EXR	-3.512588	1.997715	-1.758303	0.1126
IRS	-67.65635	63.09352	-1.072318	0.3115
C	4573.089	1213.663	3.768007	0.0044
R-squared	0.984143			
Adjusted R-squared	0.948904			
F-statistics	17.24300			
Prob(F-statistic)	0.000000			
Durbin-Watson stat	2.134500			

Source: Author's Computation, using E-views 12, (2024)

The DOLS results, as reflected in Table 6, exhibit the coefficients and their corresponding t-statistics and probability values for each macroeconomic indicator. Broad money supply shows a positive coefficient of 0.177831, with a t-statistic of 10.29610, which indicates a significant positive impact on per capita income in Nigeria at the 5% level (Prob. 0.0000). This suggests that an increase in broad money supply tends to have a favourable impact on the per capita income in Nigeria, possibly through enhanced the effective mobilization of fund for investment that will increase the gross domestic product for the benefit the per capita income in Nigeria. On the other hand, the inflation rate in Nigeria has a considerably larger coefficient of -13.87411, accompanied by a t-statistic of -1.901576, signaling an insignificant negative relationship with per capita income in Nigeria at the 5% level (Prob. 0.0897). The magnitude of this coefficient underlines the negative impact on per capita income in Nigeria and this may be due to that inflation reduces investments and economic activities due to high costs which in turn reduces the industrial productivity and per capita income in Nigeria.

Also, the unemployment rate presents an even more pronounced effect with a coefficient of -549.5225 and an impressive t-statistic of -8.480531, which is highly significant (Prob. 0.00000)

and exerts a negative impact on per capita income in Nigeria. The result reveals that for every 1% increase in unemployment rate in Nigeria per capita income decreases by 549.52 Naira. This implies high unemployment rate, and underscores that a large number of the population and the productive labour force are excluded from industrial activities which are the main source of our per capita income. Similarly, Nigeria's exchange rate has a negative coefficient of -3.512588 with a t-statistic of -1.758303, which is insignificant at the 5% level (Prob. 0.1126), and demonstrates that an increase in exchange rate is associated with little or no impact on per capita income in Nigeria. Finally, Nigeria's interest rate has a negative coefficient of -67.65635 with a t-statistic of -1.072318, which is insignificant at the 5% level (Prob. 0.3115). The insignificant result as shown by the high probability level shows that an increase in interest rate in Nigeria does not have impact on per capita income in Nigeria.

The R-squared value of 0.984143 indicates that the model explains a very high proportion of the variation in per capita income in Nigeria. The adjusted R-squared value of 0.948904 is also quite high, suggesting that the model fits the data well, while accounting for 95% of the number of explanatory variables included. The F-statistic of 17.243, with a probability of 0.0000, is highly significant. This indicates that the overall regression equation is statistically significant and that there is a collective impact of the macroeconomic indicators on per capita income in Nigeria. The very low probability associated with the F-statistic, being well below a common alpha level of 0.0000, essentially rejects the null hypothesis that the model with no independent variables would be as explanatory of the variation in per capita income in Nigeria as the current model. The Durbin-Watson statistic is 2.1345, which is similar to the value of 2. This statistic looks for autocorrelation in the residuals of a regression analysis. A number approaching 2 indicates that there is no autocorrelation in the sample; thus, the residuals are independent of one another. This is an important element of regression models because autocorrelation can invalidate normal statistical tests by inflating significance levels. In our scenario, the Durbin-Watson statistic provides further assurance against autocorrelation, validating the dependability of the regression results. Furthermore, the hypothesis that stated H_{01}: broad money supply has no significant impact on per capita income in Nigeria is rejected given that the value of 0.0000 is less than 5 percent level of significance. This implies that the broad money supply has a positive and significant impact on the per capita income in Nigeria. On the contrary, the hypothesis that stated H_{02}: inflation rate has no significant impact on per capita income in Nigeria is accepted given that the value of 0.0897 is greater than 5 percent level of significance. This implies that the inflation rate has a negative and insignificant impact on the per capita income in Nigeria. However, hypothesis that stated H_{03}: the unemployment rate has no significant impact on per capita income in Nigeria is rejected at a 5 percent level of significance given that the value of 0.0000 is less than 5 percent level of significance. This implies that the unemployment rate has a negative and significant impact on the per capita income in Nigeria.

On the other hand, the hypothesis that stated H_{04}: exchange rate has no significant impact on per capita income in Nigeria is accepted at a 5 percent level of significance given that the p-value of 0.1126 is greater than the 5 percent level of significance. This implies that the exchange has a negative and insignificant impact on the per capita income in Nigeria. Finally,

the hypothesis that stated **H$_{05}$:** interest rate has no significant impact on per capita income in Nigeria is accepted at a 5 percent level of significance given that the p-value of 0.3115 is greater than the 5 percent level of significance. This implies that the interest rate has a negative but insignificant impact on the per capita income in Nigeria.

Post-Estimation Checks (DOLS Diagnostic Test)
The results from the DOLS diagnostic checks captured in Table 7 are crucial for validating the robustness and reliability of the regression model that investigates the impact of macroeconomic indicators on per capita income in Nigeria. These post-estimation tests assess various assumptions underlying the DOLS regression analysis, ensuring that the model's inferences are statistically sound.

Table 7: Results of DOLS Diagnostic Checks

Tests		Outcomes	
		Coefficient	Probability
Breusch-Godfrey-Serial-Correlation Test	F-stat.	0.311415	0.7382
Heteroscedasticity-Breusch-Pagan-Godfrey Test	F-stat.	2.481500	0.4860
Normality Test	Jarque-Bera	0.310032	0.8564
Linearity Test	F-stat	2.430300	0.1430

Source: Author's Computation Using EViews-12 (2024)

Table 7 is the Breusch-Godfrey Serial Correlation LM Test checks for autocorrelation in the residuals of the regression model. Autocorrelation occurs when residuals are not independent of each other, which can lead to inefficient estimators and biased standard errors. The outcome of this test, with an F-statistic of 0.311415 and a probability of 0.7382, suggests that there is no significant serial correlation in the model. A high p-value indicates that the study fails to reject the null hypothesis of no serial correlation, thus confirming that the residuals of the model are independent across time, which is a desirable property in time series analysis. Also, the Heteroscedasticity Breusch-Pagan-Godfrey Test is used to detect the presence of heteroscedasticity, a condition where the variance of the errors is not constant across all levels of the independent variables. Heteroscedasticity can render the standard errors inaccurate, leading to unreliable hypothesis tests. The test yields an F-statistic of 2.481500 with a probability of 0.4860, indicating that there is no significant evidence of heteroscedasticity within the model. This means that the variance of the error terms is constant, allowing for confidence in the estimated standard errors and the statistical tests that rely on them.

The Normality Test, specifically the Jarque-Bera test, is employed to determine whether the residuals of the model are normally distributed. The normality of residuals is an important assumption, as it underpins the validity of various statistical tests, including the t-tests on the estimated coefficients and the F-test on the overall model. The Jarque-Bera statistic is 0.310032 with a probability of 0.8564, which indicates that the residuals are normally distributed. With a high p-value, the null hypothesis that the residuals are normal cannot be rejected, satisfying another critical assumption of the classical linear regression model.

Finally, the Linearity Test checks if the relationship between the independent variables and the dependent variable is correctly specified as linear. A non-linear relationship may indicate that the model is specified, which can lead to biased estimates. The F-statistic for the linearity test is 2.430300 with a probability of 0.1430 This result implies that there is no significant evidence against the linearity assumption of the model. Hence, the linear specification of the relationship between the macroeconomic indicators and per capita income appears to be appropriate.

Discussion of Findings

The paper focused on the impact of selected macroeconomic variables on per capita income in Nigeria. Based on the specific objectives of the research, broad money supply was found to have a positive and significant impact on per capita income in Nigeria and this implies that increase in broad money supply will lead to substantial increase in per capita income in Nigeria and this finding agreed with the work of Gatawa *et al.,* (2017) who concluded that there is a positive impact of broad money supply on per capita income. In contrast, the coefficient of inflation rate in Nigeria was found to be negative and has insignificant impact on per capita income in Nigeria which implies that inflation rate has little or no impact on per capita income in Nigeria meaning that inflation rate is not an important macroeconomic indicator in improving the level of per capita income in Nigeria, and this result agreed with the study of Khalid *et al.,* (2015) who posits that a change in inflation cannot necessarily bring a change in the per capita income.

However, unemployment rate showed a negative and significant impact on per capita income in Nigeria, which suggested that an increase in the unemployment rate is associated with a decrease in per capita income and this is because unemployment reduces the production and output in the economy which are main determinants of per capita income in Nigeria. This finding disagreed with the work of Jabaru and Jimoh (2020), that the unemployment rate has an insignificant impact on per capita income but agreed with Okun's law that an increase in the unemployment rate causes a reduction in per capita income. Also, the paper revealed that the exchange rate has a negative and insignificant impact on per capita income in Nigeria and this finding is consistent with the work of Muhammad *et al.* (2023) who concluded that the exchange rate has a negative but insignificant impact on per capita income in Nigeria. Finally, interest rates showed a negative and insignificant impact on per capita income in Nigeria, which suggests that an increase in the interest rate is not associated with a decrease or increase in per capita income in Nigeria.

Conclusion and Recommendations

In conclusion, the investigation revealed through the analysis of the DOLS results on the impact of selected macroeconomic variables on per capita income in Nigeria that broad money supply has a positive and significant impact on per capita income in Nigeria and this made broad money supply an important variable among the macroeconomic variables in improving the level of per capita income in Nigeria. On the other hand, the high unemployment rate hinders per capita income in Nigeria, while the inflation rate, interest rate and exchange rate have no impact on per capita income in Nigeria. Therefore, the following recommendations were raised from the research findings.

i. The Federal Government through the Central Bank of Nigeria should manage the volume of broad money supply to maintain its positive impact on per capita income in Nigeria and in such a way to increase the investment in the real productive sectors in Nigeria for improved per capita income in Nigeria.

ii. The Central Bank of Nigeria should manage the rate of inflation through price legislation especially the prices of inputs and industrial goods to ensure that there is a positive impact on per capita income in Nigeria.

iii. The Nigerian government should through the Federal Ministry of Labour and Productivity create policies and initiatives targeted at reducing the rate of unemployment through increase industrial activities and incentive for investors in the real sectors of the economy which will lead to a positive impact on per capita income in Nigeria.

iv. The fiscal authorities in Nigeria should drive fiscal policy frameworks that create conducive environment for investors to stimulate borrowing and aggregate demand, which can make monetary policy targets of interest rate in the economy to be significant and effective in impacting macroeconomic variables, including income per capita in Nigeria.

v. Finally, the data collected for exchange rate in Nigeria reflects the period of mix exchange rate regime. Policy interventions by the government before now often favoured currency controls or pegging, which may have minimized the exchange rate effect on per capita income in Nigeria. It is therefore, recommended that government or future study by researchers interested in this research area should focus on the analysis of time series data of exchange rate collected during full exchange rate deregulation regime to further test for its significance on per capita income.

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