

Impact of Selected Macroeconomic Variables on Human Capital Development in Nigeria

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Human capital is a key driver of economic growth and productivity and it has been argued that the management of macroeconomic variables like broad money supply, inflation rate, unemployment rate, economic growth rate and interest rate are effective tools in achieving high human capital development. Therefore, this study examined the impact of selected macroeconomic variables on human capital development in Nigeria (1990–2022). The study made use of ex-post facto research time series data and dynamic ordinary least squares techniques to examine the impact of selected macroeconomic variables on human capital development in Nigeria. Broad money supply has a positive and significant impact on human capital development in Nigeria and this made broad money supply an important variable among the macroeconomic variables in improving the level of human capital development in Nigeria. On the other hand, unemployment, inflation rate and interest rate hinder human capital development in Nigeria, because the increase in these three macroeconomic variables hurt human capital development in Nigeria. However, the coefficient for economic growth rate suggests a potential positive impact on human capital development in Nigeria. Therefore, the study recommends that the government through the Central Bank of Nigeria should manage the volume of the broad money supply to maintain its positive impact on human capital development in Nigeria and in such a way to increase the investment in education and health services in Nigeria for human capital development in Nigeria. Finally, the government through the Central Bank of Nigeria, Federal Ministry of Labour and Productivity and Federal Ministry of Finance should manage the rate of unemployment, inflation, economic growth and interest rate to improve their impact on human capital development in Nigeria and ensure that they have a positive impact on human capital development in Nigeria.

Background to the Study

The imperative of human capital towards the development of a country cannot be over emphasized. This is because of its importance to the wealth of a nation, as the productive capacity of a country is related to the level of its human capital (Awujola, 2014). Human capital development is a deliberate and continuous process of acquiring requisite knowledge, skills and experiences that are relevant to producing economic value for driving sustainable national development (Ogini & Agari, 2023). According to the endogenous growth theory, human capital development encompasses investment in education, health and infrastructure which are key to fostering economic growth and development in a country. This aligns with the Keynesian macroeconomic framework which axiomatically links any increase in government expenditure to increase in economic growth (Danladi *et. al*, 2015).

Also, human capital development refers to the process of improving and investing in the knowledge, skills, abilities, and health of individuals and it plays a crucial role in the economic, social, and environmental progress of countries around the world. Human capital is a key driver of economic growth and productivity. When individuals are well-educated, skilled, and healthy, they can contribute more effectively to the economy. A highly skilled workforce can innovate, adapt to new technologies, and drive advancements in various industries, leading to increased economic output and competitiveness on the global stage. Human capital development is essential for the growth, prosperity, and sustainability of nations worldwide. It does not only benefit individuals by improving their quality of life and opportunities but also contributes to broader economic, social, and environmental progress on a global scale (Shuaibu & Oladayo, 2016).

Human capital development is measured by Human Development Index (HDI) framework of the United Nation. The HDI provides a measure of human capital development in three dimensions: income, health and education. It is scored on a scale of 0 to 1, with 1 as the highest score and according to United Nations Development Programme (2016), countries can only score higher HDI when they have a longer life expectancy at birth, higher education period, and higher income per capita. Also, Razmi *et al.*, (2012) explained that increased social service expenditures will improve labor productivity and increase the supply of workforce, and, thereby, increase productivity and economic growth and also, that increased social service expenditures will improve the human development index for any Country.

Similarly, Dauda and Iwegbu (2022) argued that the management of macroeconomic variables like broad money supply, inflation rate, unemployment rate, economic growth rate and interest rate are effective in achieving high human capital development and they argued that due to the relevance of macroeconomic variables on high human capital development, the Nigeria government at various times had engaged in various policies that target the human capital development, such as the exchange rate flexibility, fiscal policy reform, financial sector reform, along with privatization and public enterprise

reforms especially in the health and education sectors in Nigeria. Also, in an attempt to resolve the problem of human capital development, the government introduced the National Economic Empowerment Development Strategy (NEEDS) program in 2004, which underscored the crucial role of private sector development in wealth creation, employment generation, poverty reduction, and value reorientation.

Furthermore, the Nigerian Vision 20:20:20 was formulated within the context of a global financial and economic crisis that is targeted at ensuring a robust economic growth trajectory, which ushers the economy onto a growth path that is sustainable, inclusive, and socio-economically driven. Key elements of the macroeconomic strategies and policy thrusts include attaining double-digit growth rates and establishing a robust economy that has a growth-oriented price level, interest rate, exchange rate, and other real monetary aggregates that could enhance economic diversification, stimulate the real sector, and enhance its global competitiveness among others. Therefore, the federal government of Nigeria, led by former President Mohammed Buhari, recognized the need for macroeconomic stability, which will engender human capital development. Thus, the government rolled out the Economic Recovery and Growth Plan (ERGP), a medium-term plan for 2017–2020, that builds on the strategic implementation plan, which is a short-term intervention plan. The ERGP's principle focuses on addressing factors that negatively impact growth.

Despite these macroeconomic policies in Nigeria, statistics shows that Nigeria is rated low or considered to have low level of human development at a HDI score of 0.453 which is lower than Sub-Saharan Africa average of 0.463 and 0.682 for the world average and the country also ranks 150 among 181 listed countries in the global HDI and 28th in Africa (United Nations Development Programme (UNDP), 2023). Therefore, this paper seeks to examine the impact of selected macroeconomic variables on human capital development in Nigeria from 1990 to 2022. Specifically, the paper seeks to examine the impact of broad money supply on human capital development in Nigeria; investigate the impact of inflation rate on human capital development in Nigeria; assess the impact of unemployment rate on human capital development in Nigeria; determine the impact of economic growth rate on human capital development in Nigeria and investigate the impact of interest rate on human capital development in Nigeria.

The hypotheses of this paper are stated as follows.

- H₀₁:** Broad money supply has no significant impact on human capital development in Nigeria.
- H₀₂:** Inflation rate has no significant impact on human capital development in Nigeria.
- H₀₃:** Unemployment rate has no significant impact on human capital development in Nigeria.
- H₀₄:** Economic growth rate has no significant impact on human capital development in Nigeria.
- H₀₅:** Interest rate has no significant impact on human capital development in Nigeria.

Materials and Methods

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. Abdulsalam, (2018) infers that macroeconomic environment is the overall aspects and working of national economy, such as income, output, and interrelationship among diverse economic sectors. Adegbemi (2018) posits that macroeconomic variables deal with the performance, structure, behavior, 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 of broad money supply, inflation rate, unemployment rate, economic growth rate. interest rate etc. Broad money (M3) measures the total volume of money supply in the economy. It is defined as narrow money plus savings and time deposits with banks including foreign denominated deposits. M2 is an economic index that is used to predict inflation. According to Dare & Okeya (2017, M3 comes to include short-term repurchase agreements, large liquid assets, and institutional money-market funds. While, Almalki & Batayneh (2015) opined that inflation is conventionally defined as a persistent rise in the general level of prices of goods and services in an economy over a while. When the general price level rises, each unit of currency buys fewer goods and services, thus eroding the purchasing power of money.

In defining unemployment, Fajana (2010), refers to it as a situation where people who are willing and capable of working are unable to find suitable paid employment. It is one of the macro-economic problems which every responsible government is expected to monitor and regulate. Jhingan (2003) viewed economic growth as an increase in a country's per capita income or output accompanied by an expansion in its labour force, consumption, capital, and volume of trade. Ojo *et al.*, (2022) sees economic growth as the process of augmenting the productive forces or expanding productive capacity which is accomplished through effective mobilization, assemblage, and management of human, material, and financial resources. Finally, Akani *et al.*, (2016) considered interest rate as rental payments for the use of credit by borrowers and return for parting with liquidity by lenders. Like other prices, interest rates perform a rationing function by allocating a limited supply of credit among the many competing demands on it.

On the other hand, human capital development according to UNDP (2016), is the process of expanding options for a human, which prioritizes long and healthy life, education and enjoyment of a good standard of living. It can then be deduced that human capital development is the process of acquiring and increasing the stock of knowledge, skill-based ability and experience in people useful to increase productivity in an economy. While, the human development index is a contemporary measurement index of the

United Nation which was developed to emphasize that people and their capabilities should be prioritized as criteria for assessing the development of a country and for comparing development among countries rather than economic growth alone (UNDP, 2021).

It is a summary measurement of basic achievement in key dimensions of human development in a country which includes knowledge and skills (education) assessed by expected years of schooling and mean years of schooling, long and healthy life measured by life expectancy at birth and standard of living dimension assessed by gross national income per capita. The HDI aside from being an improvement over gross domestic product in measuring economic and social well-being of a country, is also useful in examining national policy choices, such as how two countries with the same level of gross national income per capita can end up with different results of human development outcomes.

Empirical Review

One of the studies of interest was carried out by Ogini and Agari (2023), and their paper examined selected macroeconomic variables and human capital development in Nigeria from 1981 to 2018 using the Autoregressive Distributive Lag (ARDL) economic tool and the result of the study indicate that selected macroeconomic variables have (69% long run and 77% short run) significant effects on human capital development in Nigeria. They recommended that Monetary authorities in Nigeria should reduce interest rate to low-levels that can encourage credit and boost productivity across the sectors which will improve human capital development in Nigeria.

In their study, Damanik *et al.*, (2022) examined the impact of government expenditure on health, education, and infrastructure on the human development index (HDI) in Simalungun Regency. The study covered the period from 2003 to 2020 and the paper employed descriptive analysis and multiple linear regression analysis using the ordinary least squares model. The findings revealed a positive association between government expenditure in the health sector and the HDI in Simalungun Regency. Based on these results, the authors recommended an increase in government spending on the health sector in order to bolster human capital development.

In another study, Aigbedion (2021) examined econometric modeling of human capital development expenditures in Nigeria from 1990 to 2018 using the ARDL economic tool. The findings of the study are that government education capital expenditures in Nigeria, government health capital expenditure in Nigeria, government education recurrent expenditures in Nigeria, and government health recurrent expenditures in Nigeria have positive and significant impacts on human capital development in Nigeria.

While, Adejumo *et al.*, (2021) investigated the dynamic relationships between school enrollment rates and employment rates (measured by unemployment rates) in Nigeria

from 1970 to 2017. The study used the percentage of unemployed workers in the total labour force (UMP) as the dependent variable, real GDP (GDP) as a proxy for economic growth, Primary educational enrolment (PRY), Secondary educational enrolment (SEC), Tertiary educational enrolment (TER), Trade Openness (OPEN), Population growth (POPG), and Government expenditure (GOV) as independent variables. The researchers employed Autoregressive estimates and an unrestricted VAR approach to analyse the data. The findings provide support for the effectiveness of the government's Universal Basic Education (UBE) programme in partially addressing unemployment in Nigeria.

Also, Nurjannah *et al.*, (2021) analysed from 2009 to 2018, the impact of government spending on the education and health sectors, economic growth, and poverty levels on the Human Development Index (HDI) in South Sulawesi Province, Indonesia. The dependent variable was the gross domestic product, and the independent variables were the government expenditures on education, health, economic growth, and poverty. The data were processed using the OLS (Ordinary Least Squares) model with multiple linear regression analysis. The results showed that government spending in the education and health sectors, economic growth, and poverty levels affected the Human Development Index (HDI) in South Sulawesi Province, Indonesia. They recommended that the government, in this case, the central party in a country, be expected to be able to support good policies. As in budget expenditures, they must be accompanied by transparency to avoid criminal acts in this case, corruption and optimise the budget issued.

In a study conducted by Keji (2021), the relationship between human capital and economic growth in Nigeria was examined using vector autoregressive and Johansen techniques. The analysis revealed that the estimated coefficients of human capital have a statistically significant long-term impact on economic growth in Nigeria. Additionally, diagnostic tests were employed to assess the reliability of the techniques used in the study. Notably, the results of the normality test, VEC residual serial correlation LM tests, and VEC residual heteroskedasticity tests provide further support for the validity and justification of the estimated findings obtained in this research.

Ogege (2019) conducted an empirical analysis on the impact of inflation, interest rates, and exchange rates on economic development from 1981 to 2017. The study examined the relationship between various dependent variables, including the life expectancy index, education index, consumption per capita, human development index, and physical quality of life index, and independent variables such as the inflation rate, interest rate, and exchange rate. The research employed descriptive, correlational, and regression analyses to investigate these relationships. The findings of the study suggest that there is a significant association between macroeconomic variables and economic development indicators in Nigeria. Furthermore, the impact of economic attributes on performance indicators varies, indicating that different components of economic attributes affect performance indicators in different ways.

In another study, Ahmad *et al.*, (2019) investigated the influence of education, health, and economic dimensions on the human development index (HDI), and its subsequent impact on poverty. The study utilized panel data from the year 2010 to 2018. The variables considered in the analysis were poverty, health, and HDI. The authors employed a structural equation model based on the Partial Least squares (PLS) approach to analyse the data. The findings of the study indicate that the HDI has a significant negative effect on poverty. Among the three dimensions examined, the educational dimension was found to have the most prominent influence on both the HDI and poverty levels in Southeast Sulawesi. The authors suggest that, in order to alleviate poverty, the government should prioritise policies that focus on improving the quality of education through relevant programmes.

Conversely, Akinsokeji and Akinlo (2019) investigated the relationship that exists between human capital and economic growth in Nigeria from 1986 to 2015 using the Ordinary Least Square technique, in which the dependent variable is real GDP while the Independent variable is physical capital, which is proxied by gross capital formation; Human capital is the total labour force; Trade openness is the sum of export and import as a percentage of GDP; real interest rates; and manufacturing is the manufacturing value added. Consequently, the result showed that trade openness and physical capital have a negative impact on economic growth. Manufacturing and interest rates, on the other hand, are positive and have significantly impacted economic growth. Further, they recommended that the government improve the quality of the workforce through the restructuring of the educational system, organising a series of seminars, training, and retraining the workforce to reverse the inverse effect of human capital on economic growth, and adopting appropriate technology and complementary resources that will make the input and effort of the labour force show.

In their study, Akaakohol and Ijirshar (2018) examined the relationship between human capital development and economic growth in Nigeria over the period of 1981–2015. The study focused on the impact of government expenditure on education, government expenditure on health, gross fixed capital formation, and the labour force as independent variables, while the dependent variable was GDP per capita. To analyse the data, the researchers employed various statistical tests, including the Augmented Dickey-Fuller test, Johansen co-integration test, error correction test, and impulse response/variance decomposition. The findings of the study revealed a positive and significant long-term relationship between human capital development and economic growth in Nigeria. Based on these results, the study recommended that the Nigerian government continue to invest in education and health while also promoting private investment in these sectors.

Also, Arisman (2018) conducted a study to examine the factors influencing the human development index (HDI) in ASEAN member countries. The study utilized country-level data for variables such as population, inflation rate, unemployment rate, and GDP per capita growth. The analysis employed panel data regression with a fixed effect model.

The findings indicated that the growth rate of per capita income significantly affects the HDI in ASEAN member countries. However, the variables of inflation rate and unemployment rate were found to have no significant impact on the HDI. Based on these results, the study recommended that governments in ASEAN member countries priorities and allocate more resources to the health and education sectors.

In another study, Adeyemi and Ogunsola (2016) examined the impact of human capital development on economic growth in Nigeria from 1980 to 2013 and the paper employed ARDL. The study revealed that there is a positive long-run relationship among secondary school enrolment, public expenditure on education, life expectancy rate, gross capital formation and economic growth but it is statistically insignificant. The results also showed that there is a negative long-run relationship between primary and tertiary school enrollment, public expenditure on health, and economic growth. So therefore, they recommended that the government should make a greater financial commitment to education than the health sector.

Amassoma and Ikechukwu (2016) conducted a reappraisal of the nexus between investment in Human capital development and economic growth to ascertain if truly an investment in human capital can induce economic growth in Nigeria from 1970 to 2012 using human capital development (proxy by total primary and secondary enrolment), per capita income as the dependent variable, and public expenditure, gross fixed capital formation, inflation, exchange rate, and labour force participation using a two-stage least squares and Pairwise Granger causal methodologies. The variables used in the study were tested for stationarity using the Augmented Dickey-Fuller (ADF) and Philip Perron (PP) tests, and it was discovered that the amount the government spends on human capital development from enrollment and making schools easily accessible to pupils and students tends to foster economic growth in Nigeria. Finally, they recommended that the government should spend more on education.

Theoretical Framework

This study adopted the human capital theory and the human capital theory was initially formulated by Theodore Shultz, Gary Becker, and Jacob Mincer, all affiliated with the University of Chicago and the inception of the human capital theory was formally introduced in 1960 by Theodore Schultz. The theorists believed that human capital accumulation encompasses investments made in education, on-the-job training, health, migration, and other variables that enhance an individual's productive capacities and income. The advocates of human capital theory assert that human capital holds equal or greater significance compared to physical capital. These advocates recognised that allocating resources to education constitutes a valuable investment in the development of human capital and the allocation of resources for human capital development is affected by macroeconomic variables in the economy. Also, according to Ojo *et al.*, (2022), the augmentation of workers' marginal productivity in high-skill occupations results in the emergence of tasks that require logical and analytical reasoning, as well as the provision of specialised and technical knowledge. These theorists argue that the presence of high-

quality human capital is crucial for national productivity and economic growth with an effectiveness of the macroeconomic variables. Therefore, the theory established that there is a functional relationship between macroeconomic variables and human capital development in developing countries like Nigeria.

Methodology

Sources 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 human development index was sourced from the World Bank (Online Databank) 1990-2022, 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:

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

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. The equation (1) was modified and specified to follow the study objectives and hypotheses of the study.

$$hdi = f(bms, ifn, uem, ecg, irs) \quad (2)$$

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

$$hdi_t = \beta_0 + \beta_1 bms + \beta_2 ifn + \beta_3 uem + \beta_4 ecg + \beta_5 irs + \mu_t \quad (3)$$

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 human capital development in Nigeria using Dynamic Ordinary Least Squares (DOLS), equation (3) will be formulated as:

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

Equation 4 presents the Dynamic Ordinary Least Square (DOLS) which shows the current and lagged relationship between selected macroeconomic variables and human capital development in Nigeria

Variable Description, Measurements and Apriori Expectation

Table 1: Description of the Variables Used for the Model

| Variable | Description/Measure | Type | Source | Apriori Expectation |
|----------|---------------------------------|-------------|-----------|---------------------|
| HDI | Human Development in Nigeria | Dependent | WDI, 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 | $B_3 > 0$ |
| ECG | Economic Growth 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, economic growth rate and interest rate will lead to decrease/increase in human capital development 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.

Descriptive Analysis and Summary Statistic of the Variables

Table 2: Descriptive Summary

| | HDI | BMS | IFN | UEM | ECG | IRS |
|--------------|----------|----------|----------|----------|-----------|----------|
| Mean | 0.478061 | 11403.01 | 17.97242 | 4.824879 | 4.276667 | 18.19273 |
| Median | 0.483000 | 3797.910 | 12.90000 | 4.015000 | 4.230000 | 17.95000 |
| Maximum | 0.538000 | 43342.30 | 72.80000 | 9.788000 | 15.33000 | 29.80000 |
| Minimum | 0.413000 | 47.42000 | 5.400000 | 3.700000 | -2.040000 | 11.50000 |
| Std. Dev. | 0.044876 | 13620.38 | 16.13075 | 1.884382 | 3.961364 | 3.735045 |
| Skewness | 0.068792 | 0.993877 | 2.205488 | 1.781183 | 0.472666 | 0.846873 |
| Kurtosis | 1.381695 | 2.658856 | 6.836874 | 4.458855 | 3.385760 | 4.766244 |
| Jarque-Bera | 3.627033 | 5.592873 | 46.99517 | 20.37572 | 1.433387 | 8.234038 |
| Probability | 0.163080 | 0.061027 | 0.000000 | 0.000038 | 0.488364 | 0.016293 |
| Sum | 15.77600 | 376299.3 | 593.0900 | 159.2210 | 141.1300 | 600.3600 |
| Sum Sq. Dev. | 0.064444 | 5.940000 | 8326.431 | 113.6287 | 502.1569 | 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 human development index in Nigeria between 1990-2022 is 0.478061, the maximum is 11403.01 and the minimum is 0.413000. 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 inflation rate is 17.97242, the maximum is 72.80000 and the minimum is 5.400000. The average rate for unemployment rate is 4.824879, the maximum is 9.788000 and the minimum is 3.700000. The average rate for economic growth rate is 4.276667, the maximum is 15.33000 and the minimum is -2.040000. The average rate for interest rate in Nigeria is 18.19273 the maximum is 29.80000 and the minimum is 11.50000. Human development index, economic growth rate, and interest rate have a skewness close to zero, which suggests their distributions are relatively symmetrical. They also have a kurtosis close to 3, which suggests they have tails that are similar to a normal distribution while BMS and UEM have a positive skew, which means their distributions are stretched out to the right. BMS also has a kurtosis slightly above 3, which means it has slightly fatter tails than a normal distribution. UEM has a kurtosis closer to a normal distribution.

While inflation rate has the highest skewness and kurtosis, at 2.2 and 6.84 respectively. This suggests a distribution that is skewed to the right with fatter tails than a normal distribution. For broad money supply, inflation rate, unemployment rate, and interest rate, the Jarque-Bera test statistic rejects the null hypothesis of normality at the 5% significance level. This means that we can be fairly certain that these variables are not normally distributed. For human development index and economic growth rate, the Jarque-Bera test statistic does not reject the null hypothesis of normality at the 5% significance level. There is not enough evidence to say that these variables are not normally distributed.

Correlation Matrix Results

Table 3: Correlation Matrix Results

| Correlation Probability | HDI | BMS | IFN | UEM | ECG | IRS |
|-------------------------|---------------------|---------------------|---------------------|---------------------|--------------------|-------------------|
| HDI | 1.000000 ----- | | | | | |
| BMS | 0.894546 0.0000 | 1.000000 ----- | | | | |
| IFN | -0.404583 0.0195 | -0.260114 0.1438 | 1.000000 ----- | | | |
| UEM | 0.585405 0.0003 | 0.752498 0.0000 | -0.100987 0.5760 | 1.000000 ----- | | |
| ECG | -0.130928 0.4677 | -0.272076 0.1256 | -0.415752 0.0161 | -0.424293 0.0139 | 1.000000 ----- | |
| IRS | -0.646341 0.0000 | -0.628041 0.0001 | 0.306507 0.0828 | -0.376313 0.0309 | 0.314748 0.0744 | 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 HDI in Nigeria and BMS in Nigeria given the correlation co-efficient value of 0.894546 and the probability value of 0.0000 showed a significant relationship between HDI in Nigeria and BMS in Nigeria. On the other hand, the HDI and IFN in Nigeria has a strong and negative relationship as the correlation co-efficient value of -0.404583 and the probability value of 0.0195 showed a moderate negative correlation and significant relationship between HDI in Nigeria and IFN in Nigeria.

Similarly, there is existence of a weak negative correlation between ECG and IFN in Nigeria, given the correlation co-efficient value of -0.260114 and the probability value of 0.1438 showed an insignificant relationship between the ECG and IFN in Nigeria. In contrast, existence of a moderate and positive relationship between HDI in Nigeria and UEM in Nigeria exist given the correlation co-efficient value of 0.585405 and the probability value of 0.0003 showed a significant relationship between HDI in Nigeria and UEM in Nigeria and the correlation matrix showed that there exists a strong and positive relationship between BMS in Nigeria and UEM in Nigeria given the correlation co-efficient value of 0.752498 and the probability value of 0.0000 showed a significant relationship between BMS in Nigeria and UEM in Nigeria. Even IFN and UEM showed that there exists a weak negative correlation between IFN and UEM in Nigeria, given the correlation co-efficient value of -0.100987 and the probability value of 0.5760 showed a significant relationship between the IFN and UEM in Nigeria.

Also, from the correlation matrix showed that there exists a weak negative correlation between HDI and ECG in Nigeria, given the correlation co-efficient value of -0.130928 and the probability value of 0.4677 showed an insignificant relationship between the HDI and ECG in Nigeria. Similarly, there exists a weak negative correlation between BMS and ECG in Nigeria, given the correlation co-efficient value of -0.272076 and the probability value of 0.1256 showed an insignificant relationship between the BMS and ECG in Nigeria. Furthermore, the relationship of IFN and ECG is moderate negative correlation in Nigeria, given the correlation co-efficient value of -0.415752 and the probability value of 0.0161 showed an insignificant relationship between the IFN and ECG in Nigeria. Even UEM and ECG showed a moderate negative correlation in Nigeria, given the correlation co-efficient value of -0.424293 and the probability value of 0.0139 showed an insignificant relationship between the UEM and ECG in Nigeria.

Similarly the correlation matrix showed that there exists a strong negative correlation between HDI and IRS in Nigeria, given the correlation co-efficient value of -0.646341 and the probability value of 0.00000 showed a significant relationship between the HDI and IRS in Nigeria while there exists a strong negative correlation between BMS and IRS in Nigeria, given the correlation co-efficient value of -0.628041 and the probability value of 0.00001 showed a significant relationship between the BMS and IRS in Nigeria. Looking at IFN and IRS, a weak positive correlation exists between IFN and IRS in Nigeria, given the correlation co-efficient value of 0.306507 and the probability value of 0.0828 showed an insignificant relationship between the IFN and IRS in Nigeria. While there exists a weak negative correlation between UEM and IRS in Nigeria, given the correlation co-efficient value of -0.376313 and the probability value of 0.0309 showed a significant relationship between the UEM and IRS in Nigeria. Similarly, the correlation matrix showed that there exists a strong negative correlation between ECG and IRS in Nigeria, given the correlation co-efficient value of -0.314748 and the probability value of 0.00000 showed a significant relationship between the ECG 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 percent level of significance.

Table 4: Unit Root Test Result

| Variable | Augmented Dickey-Fuller (ADF) Test | | |
|----------|------------------------------------|--------------------|--------|
| | ADF | Critical Value@ 5% | Status |
| HDI | -4.364501 | -3.562882 | 1(1) |
| BMS | -7.026428 | -3.562882 | 1(1) |
| IFN | -4.636905 | -3.562882 | 1(1) |
| UEM | -5.977566 | -1.954414 | 1(1) |
| ECG | -9.266487 | -2.960411 | 1(1) |
| IRS | -6.399382 | -3.568379 | 1(1) |

Source: Researcher'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 which are the human development index in Nigeria (HDI), the broad money supply in Nigeria (BMS), the inflation rate in Nigeria (IFN), the unemployment rate in Nigeria (UEM), the economic growth rate in Nigeria (ECG) and the interest rate in Nigeria (IRS). Therefore, the paper went further to test for the long-run relationship by testing the co-integration using the Engle and Granger (Residual Based) 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 | -3.026285 | -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 variables of interest exhibits an Augmented Dickey-Fuller (ADF) test statistic of -3.026285. 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 understanding the relationship between macroeconomic variables and human capital development in Nigeria. It suggests a long-term equilibrium relationship exists 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 human capital development in Nigeria is not just short-lived but has long-lasting effects that will eventually lead to greater human capital development in Nigeria.

Presentation and Interpretation of Results

Dynamic OLS (DOLS) Regression Results

This section presented the long-run DOLS regression analysis involving the human development index, broad money supply, inflation rate, unemployment rate, economic growth rate and interest rate.

Table 6: Dynamic OLS (DOLS) Model Results

| Dependent Variable: HDI | | | | |
|-------------------------|-------------|------------|-------------|--------|
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| BMS | 2.640000 | 5.390000 | 4.909311 | 0.0008 |
| IFN | -0.000259 | 0.000296 | -0.874457 | 0.4046 |
| UEM | -0.009377 | 0.002777 | -3.377116 | 0.0082 |
| ECCG | 0.001472 | 0.001114 | 1.321270 | 0.2190 |
| IRS | -0.003432 | 0.002201 | -1.559682 | 0.1533 |
| C | 0.540222 | 0.040231 | 13.42800 | 0.0000 |
| R-squared | 0.987543 | | | |
| Adjusted R-squared | 0.959860 | | | |
| F-statistics | 30.00192 | | | |
| Prob(F-statistic) | 0.000000 | | | |
| Durbin-Watson stat | 2.126156 | | | |

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 2.640000, with a t-statistic of 5.390000, which indicates a significant positive impact on human capital development in Nigeria at the 5% level (Prob. 0.0008). This suggests that an increase in broad money supply tends to have a favourable impact on the human capital development in Nigeria, possibly through enhanced effective mobilization of funds for investment that will increase the health and education services for the benefit of the human capital development in Nigeria. On the other hand, the inflation rate in Nigeria has a considerably larger coefficient of -0.000259, accompanied by a t-statistic of -0.874457, signaling an insignificant negative relationship with human capital development in Nigeria at the 5% level (Prob. 0.4046). This low coefficient and the negative impact on human capital development in Nigeria underlines the fact the inflation rate has no significant impact on human capital development in Nigeria which was also confirmed by the probability at 5 percent level of significance.

Also, the unemployment rate presents an even more pronounced effect with a coefficient of -0.009377 and an impressive t-statistic of -3.377116, which is highly significant (Prob. 0.0082) and exerts a negative impact on human capital development in Nigeria. The result reveals that every 1% increase in the unemployment rate will decrease human capital development in Nigeria by 0.009377 units. This implies a high unemployment rate and underscores that a large number of the population and the productive labour force are excluded from industrial activities will less resources for health and education services

which are major components of human capital development in Nigeria. On the other hand, Nigeria's economic growth has a positive coefficient of 0.001472 with a t-statistic of 1.321270, which is insignificant at the 5% level (Prob. 0.2190), and demonstrates that an increase in economic growth is associated with little or no increase in human capital development in Nigeria. Finally, Nigeria's interest rate has a negative coefficient of -0.003432 with a t-statistic of -1.559682, which is insignificant at the 5% level (Prob. 0.1533). The insignificant result as shown by the high probability level shows that an increase in interest rate in Nigeria does not have an impact on human capital development in Nigeria.

The R-squared value of 0.987 indicates that the model explains a very high proportion of the variation in per capita income in Nigeria. The adjusted R-squared value of 0.95986 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 30.00192, 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 human capital development 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 human capital development in Nigeria as the current model. The Durbin-Watson statistic is 2.126156, 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 human capital development in Nigeria is rejected given that the value of 0.0008 is less than 5 percent level of significance. This implies that the broad money supply has a positive and significant impact on the human capital development in Nigeria. On the contrary, the hypothesis that stated H_{02} : inflation rate has no significant impact on human capital development in Nigeria is accepted given that the value of 0.4046 is greater than 5 percent level of significance. This implies that the inflation rate has a negative and insignificant impact on the human capital development in Nigeria. However, hypothesis that stated H_{03} : the unemployment rate has no significant impact on human capital development in Nigeria is rejected at a 5 percent level of significance given that the value of 0.0082 is less than 5 percent level of significance. This implies that the unemployment rate has a negative and significant impact on the human capital development in Nigeria.

On the other hand, the hypothesis that stated H_{04} : economic growth rate has no significant impact on human capital development in Nigeria is accepted at a 5 percent level of significance given that the p-value of 0.2190 is greater than the 5 percent level of

significance. This implies that the economic growth rate has a negative and insignificant impact on the human capital development in Nigeria. Finally, the hypothesis that stated H_{05} : interest rate has no significant impact on human capital development in Nigeria is accepted at a 5 percent level of significance given that the p-value of 0.1533 is greater than the 5 percent level of significance. This implies that the interest rate has a negative but insignificant impact on the human capital development 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. | 1.327700 | 0.2945 |
| Heteroscedasticity-Breusch-Pagan-Godfrey Test | F-stat. | 0.200274 | 0.9964 |
| Normality Test | Jarque-Bera | 3.026285 | 1.9521 |
| 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 1.327700 and a probability of 0.2945, 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 0.200274 with a probability of 0.9964, 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. 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 3.312109 with a probability of 0.190891, 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 misspecified, which can lead to biased estimates. The F-statistic for the linearity test is 0.613911 with a probability of 0.4448. 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 human capital development in Nigeria appears to be appropriate.

Discussion of Findings

The study focuses on the impact of selected macroeconomic variables on human capital development in Nigeria. The R-squared revealed that the selected macroeconomic variables model has a good fit in explaining the variation in human capital development in Nigeria. Based on the specific objectives with the findings of the study, broad money supply was found to have positive and significant impact on human capital development in Nigeria. In contrast, the coefficient of inflation rate in Nigeria was found to be negative but was statistically insignificant on human capital development in Nigeria and this is because when prices of social services like health and education services rise there will be reduction in human capital development in Nigeria.

Also, unemployment rate showed negative and significant impact on human capital development in Nigeria, which suggests that an increase in the unemployment rate is associated with a decrease in human capital development in Nigeria and this is because unemployment rate reduces the access to health and education services which are main determinants of human capital development in Nigeria. Furthermore, economic growth coefficient showed a positive and insignificant impact on human capital development in Nigeria, while the coefficient of interest rate is negative and has significant impact on human capital development in Nigeria.

Conclusion and Recommendations

In conclusion, the study revealed through the analysis of the Dynamic Ordinary Least Squares results on the impact of macroeconomic variables on human capital development in Nigeria that broad money supply has a positive and significant impact on human capital development in Nigeria and this made broad money supply an important variable among the macroeconomic variables in improving the level of human capital development in Nigeria. On the other hand, unemployment, inflation rate and interest rate adversely affect human capital development in Nigeria. This is because increase in these three macroeconomic variables have negative impact on human capital development in Nigeria. However, the coefficient for economic growth rate suggests a potential positive impact on human capital development in Nigeria and the result

revealed that the economic growth rate has little or no impact on the level of human capital development in Nigeria given the probability of the result. Therefore, the following recommendations were raised from the study's findings.

- i. Government through the Central Bank of Nigeria should manage the volume of broad money supply to maintain its positive impact on human capital development in Nigeria and in such a way to increase the investment in education and health services in Nigeria for human capital development in Nigeria.
- ii. The FGN should through the Federal Ministry of Labour and Productivity create policies and initiatives targeted at reducing the rate of unemployment which will lead to positive impact on human capital development.
- iii. Government through the Central Bank of Nigeria should manage the rate of inflation through price legislation especially the prices of health and education services to improve its impact on human capital development in Nigeria and ensure that there is a positive impact on human capital development in Nigeria.
- iv. The FGN through the Central Bank of Nigeria should manage the rate of interest through commercial banks and other banking institutions especially the interest rate of health and education services to improve its impact on human capital development in Nigeria and ensure that there is a positive impact on human capital development in Nigeria.
- v. Finally, government through the Federal Ministry of Finance should manage the rate of economic growth through real sectors to improve its impact on human capital development in Nigeria and ensure that economic growth has a positive impact on human capital development in Nigeria.

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