



## **Selected Macroeconomic Variables and Human Capital Development in Nigeria**

<sup>1</sup>Ogini, Promise, Ph.D & <sup>2</sup>Agari, Evi Prosper

<sup>1</sup>Department of Banking and Finance,  
Faculty of Management Sciences  
Chukwuemeka Odumegwu Ojukwu University, Anambra State, Nigeria  
[promiseoginik@gmail.com](mailto:promiseoginik@gmail.com)

<sup>2</sup>Ph.D Scholar, Department of Business Administration,  
Faculty of Management Sciences  
Chukwuemeka Odumegwu Ojukwu University, Anambra State, Nigeria  
[agarijevili@yahoo.com](mailto:agarijevili@yahoo.com)

### **ABSTRACT**

Human development refers to the process of acquiring and increasing the number of persons who have the skill, education, experience which are critical for the economic and political development of a country. The main objective of the study is to examine the effect of selected macroeconomic variables on human capital development in Nigeria. Specifically the study determined the effect of gross domestic product on human capital development, examine the effect of unemployment rate on human capital development, analyze the effect of foreign direct investment on human capital development, determine the effect of inflation rate on human capital development, assess the effect of broad money supply on human capital development and investigate the effect of interest rate on human capital development in Nigeria. The study employed econometric techniques, including Descriptive Statistics, Augmented Dicker Fuller for Unit Root and the Autoregressive Distributive Lag (ARDL). 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. The study therefore concludes that selected macroeconomic variables have been effective short run and long run policy instruments that largely influenced human capital development in Nigeria. Amongst the recommendations is that federal government through the monetary authorities should regulate the monetary policy rate downwardly to encourage foreign and private investment to improve human capital development in Nigeria. Continuous fluctuations in interest rate may decrease the confidence of investors due to uncertainty about return on investment. Thus, government should control the interest rates charged by financial institutions to encourage investments and improve human capital development. Monetary authorities in Nigeria should reduce interest rate to attract low interest rates that can encourage credit and boost productivity across the sectors which will improve human capital development in Nigeria. Government should take serious steps to control the inflation rate by reducing imports and increasing exports, reducing government expenditures, give priority to agriculture sector, take serious consideration to food prices, increase and utilize energy resources with low production cost and remove security threats.

**Keywords:** Selected Macroeconomic Variables, Human capita Development, Nigeria

## **INTRODUCTION**

Human capital development can be seen as a deliberate and continuous process of acquiring requisite knowledge, skills and experiences that are applied to produce economic value for driving sustainable national development. Among the generally agreed causal factors responsible for the impressive performance of the economy of most developed and newly industrializing countries is an impressive commitment to human capital development (Fashina, 2016).

Human capital is considered as the most valuable asset and needs to be mobilized (Ebikila, Agada, Lucky & Matthew, 2018). Human capital as an economic term encompasses health, education and other human capacities that can raise productivity (Nwoko, Ihemeji & Anumudu 2016). Capital and natural resources are passive factors of production while human resources are active factors of production. Human capital constitutes the most valuable resource of a country; in its absence there will be the non performance of physical capital (tools, machinery, and equipment) which will impede economic growth (Adegbemi, 2018)

Human capital development is an important factor used in converting all resources to benefit mankind. Human Capital Development is strategic to the socio-economic development of a nation and includes education, health, labour, employment and women affairs. Foreign portfolio investing in human capital development is therefore critical as it is targeted at ensuring that the nation's human resource endowment is knowledgeable, skilled, productive and healthy to enable the optimal exploitation and utilization of other resources to engender growth and development in Nigeria.

Macroeconomic variables are indicators or main signposts signaling the current trends in the economy. Government and policy makers have embarked on various macroeconomic policies to address the problem of human capital development in Nigeria. Some of the policies involved the use of monetary and fiscal policy, export promotion strategy, imports substitution strategy, national economic empowerment development strategy (NEEDS). The fundamental objectives of the policies include price stability, maintenance of balance of payments equilibrium, promotion of employment, growth and sustainable development. These objectives are necessary for the attainment of internal and external balance of value of money and promotion of human capital development in Nigeria (Nwoko, Ihemeji & Anumudu 2016).

The main causes of unsustainable human capital development include high inflation, rising foreign debt, currency exchange rate volatility, consume more and save less, poor governance and policy implications, trade imbalance, spend more earn less, energy and water shortages and political instability (Paul & Akindele, 2016). Against this backdrop, this study examined the effect of selected macroeconomic variables on human capital development in Nigeria. Specifically, the study determined the effect of gross domestic product on human capital development, examine the effect of unemployment rate on human capital development, analyze the effect of foreign direct investment on human capital development, determine the effect of inflation rate on human capital development, assess the effect of broad money supply on human capital development and assess the effect of interest rate on human capital development in Nigeria from 1986 to 2018

## **REVIEW OF RELATED LITERATURE**

### **Conceptual Review**

#### **Macro-economic Variables**

Macroeconomic focuses on the behavior of the entire economy-the "big picture" which can be regional, national or international (Abdul, 2016). Abdulsalam, (2018) argues that macroeconomic environment is the overall aspects and working of national economy, such as income, output, and interrelationship among diverse economic sector. Conducive macroeconomic environment promotes human capital development of the country. Macroeconomic variables are defined as those variables that are independent from the income levels. They are factors that greatly influence the human capital development (Adegbemi, 2018). They deal with the performance, structure, behavior, and decision-making of an economy as a whole, rather than individual markets. These variables affect human capital development, output, national

income, unemployment, consumption, inflation, savings, investment, international trade, international finance, public debt, and grant (Muhammad, & Sahibzada, 2017).

Macroeconomic variables are indicators or main signposts signaling the current trends in the economy. Some of the macroeconomic variables which are affects human capital development in Nigeria include Gross Domestic Product (GDP), unemployment, inflation and exchange rates, economic output, unemployment, inflation, savings and investment, public debt and grant (Adekunle, Alalade, & Okulenu,(2016).

### **Human Capital Development**

Human development refers to the process of acquiring and increasing the number of persons who have the skill, education, experience which are critical for the economic and political development of a country. Human capital development is thus associated with investment in man and his development as a creative and productive resource (God'stime & Uchechi, 2014). Schultz (1961) categorized and developed human resources into six ways: facilities and services: - these involve all expenditure that affects the life expectancy, strength and stamina, vigor and vitality of the people; On – the job training which includes old type apprenticeship organized by firms; Formally organized education at elementary, secondary school and higher level; Study programmes for adults that are not in agriculture; It involves migration of individual and families to adjust changing job opportunity (factor mobility); and finally, transfer or importation of technical assistance, expertise and consultants.

God's time and Uchechi, (2014) described human capital as an important factor used in converting all resources to benefit mankind. Human capital development is strategic to economic development of a nation and includes education, health, labour, employment and woman affairs. Investing in human capital development is therefore critical as it is targeted at ensuring that the nation's human resources endowment is knowledgeable, skilled, productive and healthy to enable the optimal exploitation of other resources to produce growth and development. In a nutshell, investment in human capital development means expenditure on health, education, and social services in general but in a narrow sense, it is capable of measuring all expenditure on social services. For this study, the two basic objectives of human capital development will be the centre of focus which is Education and Health. There are important ends in themselves. Health is central to well-being and education is essential for a satisfying and rewarding life: both are fundamental to the broader notion of expanding human capability and that it has the heart of the meaning of development (Ifeoma, Emmanuel, Jonathan & Chizoba, 2013).

### **Theoretical Framework**

This study is anchored on Solow's Theory. Robert Solow and Swan introduced the Solow's model in 1956. Their model is also known as Solow-Swan model or simply Solow model. In Solow's model, other things being equal, states that saving, investment and population growth rates are important determinants of human capital development. Higher saving, investment rates lead to accumulation of more capital per worker and hence more output per worker. On the other hand, high population growth has a negative effect on human capital development simply because a higher fraction of saving in economies with high population growth has to go to keep the capital-labour ratio constant. In the absence of technological change and innovation, an increase in capital per worker would not be matched by a proportional increase in output per worker because of diminishing returns.

### **Empirical Review**

Victoria (2019) examined the effects of human capital investment on unemployment Volatility in Nigeria from 1981-2015 with a primary focal objective on the composition of human capital investment in Nigeria. The Error correction result revealed that Government current investment in human capital in terms of spending on education needs to increase in quantum for its significance to be meaningful. Hence,

the government needs to put more effort in human capital investment in order to reduce unemployment rate in Nigeria.

Olufunmilayo, Henry, Oluwatoyin and Romanus (2019) examined how electricity consumption and human capital can be used to reduce unemployment in Nigeria. The study obtained secondary data and analyzed the data with the Johansen co-integration technique. The study found out that electricity consumption negatively impact unemployment, so also is government education expenditure. The result showed that a 1% increase in electric power consumption will lead to about 0.22% decline in the level of unemployment and 1% increase in education expenditure will bring about 0.17% decrease in the rate of unemployment.

Abdulsalam, (2018) examined the “socio-economic effects of youth’s unemployment in Yola South Local Government Area of Adamawa State”. It is a common fact that youth unemployment is becoming a threat to the economic development in Nigeria. The study examines the effects of youth unemployment in Nigeria on the economic development and its resultant consequences. The study aimed to identify whether high rate of poverty and crime are recorded as a result of unemployment. The study employed the primary data where information was collected from various individuals in Yola South Local Government Area of Adamawa State whom are mostly youth. Responses from 500 questionnaires analyzed using simple percentage and chi-square was used to test the hypotheses. The result from the study reveals that youths are involved in drugs abuse, criminal activities.

Salim, Safia, and Issa, (2017) examined the impact of unemployment on economic growth in Tanzania and causal relationship between unemployment and economic growth in Tanzania. The study utilized co-integration and Dynamic Ordinary Least Square (DOLS) Approach to test the relationship between unemployment and economic growth and granger causality test to examine the causal relationship between variable. The unit root tests showed that all variables were integrated after taking first difference, the Johansen co-integration result showed that the variables were co-integrated. The DOLS estimate showed that unemployment rate has positive impact on economic growth in Tanzania but insignificant influence over the study period. In addition, granger causality test revealed that, there is a unidirectional causal relationship between unemployment and economic growth with direction from economic growth to unemployment.

Longe (2017) explored the phenomenon of graduate unemployment as well as its causal factors, consequences and remedies in Nigeria. Using quantitative research method, data were collected from 360 Abuja (Nigeria Federal Capital) based professionals through a self-administered questionnaire structured in line with the modified Likert scale. The study identified a combination of causal factors as responsible for the aggravated incidence of graduate unemployment in Nigeria. Findings also indicated that the socio-economic implications of graduate unemployment on the nation and affected individuals were gruesome. Aside from being a waste of human capital on the nation, those caught in the web were often susceptible to frustration and non-conforming behaviours.

## **METHODOLOGY**

### **Research Design**

An ex-post facto research design is adopted for this study because the data are time series data that were sourced from the Central Bank of Nigeria Statistical Bulletin, CBN Annual Reports and Statement of Accounts. National Bureau of Statistics. Independent variables are gross domestic product, unemployment rate, foreign direct investment, inflation rate, broad money supply and interest rate while human capita development is the dependent variable

**Model Specification**

The models for this study was adopted and modified in line with each objective of the study

**Examine the Effect of Selected Macroeconomic Variables on Human Capital Development in Nigeria**

The model which is adopted for objective five is the model of Olawale (2015) who studied the impact of macroeconomic variables on human capital development in Nigerian using the vector autoregressive approach:

**The Model is Stated Thus:**

$$HDI = f(UPR, FDI, IFR)$$

**Where:**

HCD= Human Capital Development Index

UPR= Unemployment rate

FDI= Foreign Direct Investment

IFR= Inflation Rate

**The Model were Modified as Follows:**

$$GDP = f(UPR, FDI, IFR, M_2, ITR)$$

**The Equation Form of the Model is:**

$$HDI = \beta_0 + \beta_1 UPR + \beta_2 FDI + \beta_3 IFR + \beta_4 M_2 + \beta_5 ITR + \mu - - - - - 6$$

**Where:**

HDI= Human Capital Development Index

GDP= Gross Domestic Product

UPR= Unemployment rate

FDI= Foreign Direct Investment

IFR= Inflation Rate

M<sub>2</sub>= Broad Money Supply

ITR = Interest Rate.

**Method of Analyses**

The data were analyzed with econometric techniques involving Econometric techniques, including Descriptive Statistics, Augmented Dicker tests for unit roots, The Autoregressive Distributive Lag (ARDL) approach which is capable of handling both stationary at level I(0) and first difference I(1). The Autoregressive Distributive Lag (ARDL). Bounds test for cointegration. The nature of the Autoregressive Distributive Lag (ARDL) long run relationship and speed of correction to equilibrium and the Autoregressive Distributive Lag (ARDL) short run relationship were used for the data analysis using E-view

**DATA PRESENTATION AND ANALYSIS**

**Descriptive Statistics**

These measures the individual characteristics of the variables used in this study. The result of the descriptive statistics is presented in Table 1

**Table 1: Descriptive Statistics for Selected Macroeconomic Variables on Human Capital Development in Nigeria**

	HDI	GDP	FDI	M2	UPR	ITR	IFR
Mean	0.453000	27207.28	1130.200	4873.760	5512.360	18.69000	13.00000
Median	0.475000	25466.23	615.4000	3217.910	5924.650	18.12000	12.00000
Maximum	0.500000	54612.26	3068.900	11525.53	10387.70	24.85000	23.80000
Minimum	0.350000	3134.140	132.4000	102.320	1744.200	15.14000	6.600000
Std. Dev.	0.053759	15464.72	1073.023	3881.098	3238.066	2.624322	4.811560
Skewness	-1.241875	0.403828	0.608589	0.777810	0.056149	1.213791	0.975012
Kurtosis	2.913926	1.972919	1.858316	2.026694	1.474176	4.244589	3.673977
Jarque-Bera	2.573511	0.711335	1.160402	1.403034	0.975312	3.100901	1.773683
Probability	0.276165	0.900706	0.559786	0.495833	0.614064	0.212152	0.411955
Sum	4.530000	272072.8	11302.00	48737.60	55123.60	186.9000	130.0000
Sum Sq. Dev.	0.026010	2.15E+09	10362406	1.36E+08	94365652	61.98360	208.3600
Observations	<b>32</b>	<b>32</b>	<b>32</b>	<b>32</b>	<b>32</b>	<b>32</b>	<b>32</b>

**Source: Authors computation from Eviews 9.0**

The descriptive statistics showed the mean and standard deviation. The mean is the average value of each variable over the years while the standard deviation shows the variability of the values. The descriptive statistics also showed the maximum and minimum values. The Jarque-Bera statistics is the test of normality of the time series variables.

The variables of the study shown on Table 2 above indicate that Human capital development index (HDI) had a mean of 0.4530% with standard deviation of 0.053 with minimum and maximum values of 0.350% and 0.500% respectively

Real gross domestic product (RGDP) had a mean of 27.28% with standard deviation of 15.72 with minimum and maximum values of 313.14% and 546.26% respectively foreign direct investment (FDI) had a mean of 113.20% with standard deviation of 107.023 with minimum and maximum values of 132.40% and 306.90% respectively

Money Supply (M2) had a mean of 487.76% with standard deviation of 38.09 with minimum and maximum values of 102.32% and 1152.53% respectively

**Unit Root Test**

**Table 2: Summary Unit Root test for Stationarity**

Variables	At Level 1(0)	At First Difference 1(1)	At Second Difference 1(2)	Order of Integration	Probability
HDI		-4.668720		1(1)	0.0008
M <sub>2</sub>	-3.839292			1(0)	0.0070
GDP	-4.000361			1(0)	0.0000
FDI	-6.657659			1(0)	0.0000
IFR	-5.128101			1(0)	0.0003
UPR		-5.673721		1(1)	0.0008
ITR	-5.324361			1(0)	0.0021

**Source: Eviews 9.0**

The variables were tested for stationarity. The test aimed to understand the state at which the variables can be held stable for regression analyses. This test becomes pertinent because time series variables are often prone to non-stationarity which is capable of distorting the reliability of regression results. The variables used in the analysis were subjected to Augmented Dicker Fuller (ADF) Tests, to determine whether they are stationary series or non-stationary series. From the analyses of stationarity of the variables, it was seen that the variables have mixed stationarity of level and first differences. The Autoregressive Distributive Lag (ARDL) approach which is capable of handling both stationary at level I(0) and first difference I(1) were used for the data analysis. Thus, the most suitable tool of analyses is the ARDL test that accommodates both the short and long run trends in testing the relationship between the dependent and independent variables.

**Selected Macroeconomic Variables and Human Capital Development in Nigeria**

**ARDL (Bounds) Test for Cointegration**

**Table3. Result of the ARDL (Bounds) Test for Selected Macroeconomic Variables and Human Capital Development in Nigeria**

ARDL Bounds Test

Date: 12/21/22 Time: 17:23

Sample: 1986 2022

Included observations: 36

Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	6.48674	5

**Critical Value Bounds**

Significance	I0 Bound	I1 Bound
10%	2.26	3.35
5%	2.62	3.79
2.5%	2.96	4.18
1%	3.41	4.68

**Source: Eviews 9.0**

The bound test is shown in Table 3. The result compared the F-statistics with the critical bound values. The F-statistics is 6.48674. The results showed that the F-statistic is higher than the lower bounds at 2.62 and upper bounds at 3.79 of the critical values at 0.05 level of significance. This means that there is a cointegration or long run relationship between selected macroeconomic variables and human capital development in Nigeria

**Nature of ARDL Long Run Relationship and Speed of Correction to Equilibrium**

**Table 4: Model of the Long Run Relationship Between Selected Macroeconomic Variables and Human Capital Development in Nigeria**

ARDL Cointegrating And Long Run Form

Dependent Variable: HDI

Selected Model: ARDL

Date: 12/21/22 Time: 17:23

Sample: 1986 2022

Included observations: 36

Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(HDI(-1))	8.587973	0.208800	4.815958	0.0380
D(HDI(-2))	0.237865	0.116746	2.037455	0.0213
D(HDI(-3))	-0.160533	0.155162	-1.034616	0.3593
D(UPR)	0.000002	0.000001	1.316227	0.2041
D(UPR (-1))	-0.000002	0.000002	-0.862785	0.4369
D(UPR(-2))	0.000007	0.000004	2.039678	0.1110
D(FDI)	-0.000002	0.000001	-2.188334	0.0939
D(FDI(-1))	0.000001	0.000000	2.354086	0.0782
D(FDI(-2))	0.000001	0.000000	2.931361	0.0428
D(IFR)	0.000672	0.000408	1.648477	0.1746
D(IFR(-1))	0.001696	0.000463	3.663105	0.0215
D(IFR(-2))	-0.000610	0.000291	-2.094034	0.1044
D(M2)	0.000013	0.000004	2.986905	0.0405
D(M2(-1))	0.000003	0.000005	0.704552	0.5199
D(M2(-2))	-0.000002	0.000003	-0.771175	0.4836
D(ITR)	0.005315	0.002362	2.250231	0.0876
D(ITR(-1))	-0.003358	40.001743	2.926032	0.0047
CointEq(-1)	-6.904626	3.208291	-2.454298	0.0014

Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
UPR	-1.360017	0.000046	1.275025	0.4657
FDI	3.671075	0.000149	2.502412	0.0418
IFR	-0.007437	0.020454	-0.363584	0.7346
M2	6.252043	0.000095	3.448792	0.0018
ITR	-0.227895	0.458045	-0.497539	0.6449
C	4.841141	9.032941	s2.535943	0.0104

Source: Eviews 9.0

Haven found presence of long run relationship between selected macroeconomic variables and human capital development in Nigeria from result of the Bound Test, further analyses presented in Table 4 aimed at explaining the nature of the long run relationship. The results showed that the error correction term [CointEq(-1)] is rightly signed. The coefficient of the error term is -6.904626 with probability value of 0.0014. Since the p.value is less than 0.05, it connotes that the error term is statistically significance. This indicates the changes in human capital development trend will eventually return on a growing normal trend over time. The coefficient indicates about 69% of the deviations in human capital development in Nigeria due to selected macroeconomic variables can be corrected within a year. This implies that



increasing the rate of selected macroeconomic variables can be used as a significant policy adjustment to stabilize human capital development in Nigeria within the period under review

**Short Run Relationship**

**Table 5: Short Run Model of the Relationship Between Selected Macroeconomic Variables and Human Capital Development in Nigeria**

Dependent Variable: D(HDI)  
 Method: Least Squares  
 Date: 12/21/22 Time: 17:23  
 Sample: 1986 2022  
 Included observations: 36

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(HDI(-1))	3.587973	0.208800	2.815958	0.0480
D(HDI(-2))	0.237865	0.116746	2.037455	0.0013
D(HDI(-3))	-0.160533	0.155162	-1.034616	0.3593
D(UPR)	-1.926306	1.26E-06	-1.316227	0.4021
D(UPR(-1))	-5.287406	3.98E-06	-1.478911	0.2546
D(UPR(-2))	-7.312206	3.59E-06	-0.039678	0.9110
D(FDI)	2.125106	9.67E-07	2.188334	0.0539
D(FDI(-1))	1.979306	5.49E-07	3.594777	0.0229
D(FDI(-2))	9.98E-07	3.41E-07	2.931361	0.0428
D(IFR)	0.030672	0.000408	1.648477	0.1746
D(IFR(-1))	0.701086	0.000281	0.863149	0.4181
D(IFR(-2))	-0.000610	0.000291	-2.094034	0.1044
D(M2)	1.27E-05	4.27E-06	2.986905	0.0405
D(M2(-1))	9.80E-07	3.38E-06	4.290203	0.0016
D(M2(-2))	-2.25E-06	2.92E-06	-0.771175	0.4836
D(ITR)	0.005315	0.002362	2.250231	0.0276
D(ITR(-1))	-0.003358	0.001743	-1.926032	0.1264
C	-0.458100	0.166954	-2.743860	0.0517
UPR(-1)	-1.65E-06	3.74E-06	-0.440333	0.6824
FDI(-1)	-7.07E-06	1.61E-06	-4.395027	0.0117
IFR(-1)	0.000704	0.000607	1.159215	0.3109
M2(-1)	4.03E-06	2.40E-06	1.680173	0.1682
ITR(-1)	0.021565	0.005330	4.045732	0.0155
HDI(-1)	0.094626	0.208291	0.454298	0.6732
R-squared	0.799090	Mean dependent var		-0.001071
Adjusted R-squared	0.773055	S.D. dependent var		0.026295
S.E. of regression	0.007136	Akaike info criterion		-7.279042
Sum squared resid	0.000204	Schwarz criterion		-6.137152
Log likelihood	125.9066	Hannan-Quinn criter.		-6.929955
F-statistic	12.76635	Durbin-Watson stat		1.819650
Prob(F-statistic)	0.007927			

Source: Eviews 9.0

The short run effect of selected macroeconomic variables and human capital development in Nigeria is explained in the result in Table 5. The analyses are interpreted based on the coefficient of the explanatory variables, and the coefficient of determination (R2). The statistical significance was confirmed using the t-statistics for the coefficient of regression, and F-statistics for the coefficient of determination.

**Human Capital Development Index (HDI):** The results showed that the coefficient of human capital development index in the first year is positive at 3.587973 and after one year is positive at 0.237865 with

t-Statistic of 2.815958 and 2.037455 with probability value of 0.0480 and 0.0013 which means that human capital development is an endogenous variable in the short run

**Unemployment Rate (UPR):** The coefficient of unemployment rate in the first year is negative at -1.926306 and after one year is negative at -5.287406 with t-Statistic of -1.316227 and -1.478911 and probability value of 0.4021 and 0.2546 showing that unemployment rate has negative and insignificant effect on human capital development in the short run

**Foreign Direct Investment (FDI):** The coefficient of foreign direct investment in the first year is positive at 2.125106 and after one year is positive at 1.979306 with t-Statistic of 2.188334 and 3.594777 with probability value of 0.0539 and 0.0229 this indicate that foreign direct investment has significant effect on human capital development in the short run

**Inflation Rate (IFR):** The coefficient of inflation rate (IFR) in the first year is positive at 0.030672 and after one year is positive at 0.701086 with t-Statistic of 1.648477 and 0.863149 and probability value of 0.1746 and 0.4181 showing that of inflation rate has positive and insignificant effect on human capital development in the short run

**Money Supply (M2):** The coefficient of money supply (M2) in the first year is positive at 1.27E-05 and after one year is positive at 9.80E-07 with t-Statistic of 2.986905 and 4.290203 with probability value of 0.0405 and 0.0016 indicating that money supply (M2) has positive and significant effect on human capital development in the short run

**Interest Rate (ITR):** The coefficient of interest rate (ITR) at level is positive at 0.005315 and after one year is negative at -0.003358 with t-Statistic of 2.250231 and -1.926032 and probability value of 0.0276 and 0.1264 which means that interest rate in the first year has positive and significant effect on human capital development in the short run but after one year has positive and insignificant effect on human capital development in the short run

#### **Diagnostic Statistics**

The reliability of the econometric models of estimation and data analysis were determined using: The diagnostics are tested to determine the reliability of the model estimations and empirical findings on this study. Following diagnostics including Multicollinearity, Normality, Serial Correlation, Heteroskedascity, and Regression Specification Error (RESET).

#### **Multicollinearity Test**

Multicollinearity is a type of disturbance in the data because the presence of multicollinearity in the data makes the estimators imprecisely estimated (Ranjit, 2006). Presence of high multicollinearity, causes the confidence intervals of the coefficients tend to become very wide and the statistics tend to be very small, making the hypothesis testing to be misguided. Presence of multicollinearity is tested using the Variance Inflation Factor (VIF). VIF shows how multicollinearity has increased the instability of the coefficient estimates (Freund & Littell 2000).

**The Decision Rule:** “if any of the VIFs exceeds 10 (or 5), it is an indication that the associated regression coefficients are poorly estimated because of multicollinearity” (Ranjit, 2006).

**Selected Macroeconomic Variables and Human Capital Development in Nigeria**

**Table 6: Test of Multicollinearity for Selected Macroeconomic Variables and Human Capital Development in Nigeria**

Variance Inflation Factors  
 Date: 12/21/22 Time: 13:57  
 Sample: 1986 2022  
 Included observations: 36

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
HDI(-1)	0.044827	11..5157	3.156265
HDI(-2)	0.036446	7.50587	1.223438
EXR	1.89E-15	1.757632	2.698651
EXR(-1)	1.66E-15	8.540541	1.488878
FDI	1.45E-12	10.42076	4.491855
FDI(-1)	7.59E-13	5.03866	3.940274
FDI(-2)	1.56E-12	3.36491	1.0820320
IFR	7.31E-07	9.443531	3.856771
IFR(-1)	3.10E-07	8.195435	1.787041
M2	5.80E-11	6..28373	2.137188
M2(-1)	6.03E-11	5.35143	4.169250
ITR	1.57E-05	12.928061	1.281038
ITR(-1)	7.82E-06	5.68620	3.120059
ITR(-2)	5.70E-06	8.75531	2.694671
C	0.025475	8.263931	2.42842

Source: Eviews 9.0

From the results of the Variance Inflation Factor (VIF), none of the variables have a centered Variance Inflation Factor above five (5). This indicates that there is no presence of multicollinearity in the models. The results from the model will not likely overstate the coefficients of the regression and coefficient of determination. Thus it can be said that the result of the coefficient are true to the relationship between selected macroeconomic variables and human capital development model.

**Normality Test**

The models are examined for normal distribution. The Jarque-Bera (JB) statistics is used to test for the normality of the models. The null hypothesis is that the models are normally distributed. The decision rule is to reject the null hypothesis if the p.value is less than 0.05 level of significance

**Table 7: Normality Test of the Models in the Study**

Models	Jarque-Bera statistic	P-value
HDI	2.573511	0.276165
RGDP	0.711335	0.900706
FDI	1.160402	0.559786
ITR	3.100901	0.212152
IFR	1.773683	0.411955
UPR	0.711861	0.825521

**Source:** Extract from Eviews results

The models are examined for normal distribution. The Jarque-Bera (JB) statistics is used to test for the normality of the models. The null hypothesis is that the models are normally distributed. The decision rule is to reject the null hypothesis if the p.value is less than 0.05 level of significance. The P.values of the JB for HDI, GDP, FDI, M2, ITR, IFR and UPR are 02.573511, 0.711335, 1.160402, 3.100901, 1.773683 and 0.711861 and the p.values are 0.276165, 0.900706, 0.559786, 0.212152 0.411955and 0.825521

respectively. Since the p.values are greater than 0.05, the study cannot reject the null hypothesis that the model is normally distributed.

**Selected Macroeconomic Variables and Human Capital Development in Nigeria**

**Table 8: Serial Correlation Test for Selected Macroeconomic Variables and Human Capital Development in Nigeria**

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	14.50123	Prob. F(2,11)	0.8853
Obs*R-squared	21.02549	Prob. Chi-Square(2)	0.4728

Source: Eviews 9.0

The results of the F-statistic are 14.50123 with probability value of 0.8853. Since the p.value is greater than 0.05, the study thus conclude that there is no serial correlation (of time series) in the model. This confirms that the nature of the relationship (negative or positive) as found in the estimation from the ARDL is correct and true of the model characteristics. As well, the significance values are correct as estimated. This implies that the result of the test of hypothesis from the Autoregressive Distributed Lag (ARDL) gives correct position of the effect of selected macroeconomic variables on human capital development in Nigeria

**Heteroskedasticity Test**

The study also tested for heteroskedasticity in linear regression analysis. Presence of heteroskedasticity implies that the coefficients estimated from the regression analyses will be a biased one. Presence of heteroskedasticity means that there is an unequal error variance in the model from the data observations. The null hypothesis is that the residuals are homoscedastic and the alternate hypotheses are that the residuals are heteroscedastic.

**The Decision Rule:**

The decision rule is to reject the null hypothesis if the p.value is less than 0.05 level of significance. From result in Table 9, the p.values of the models is greater than 0.05, revealed that the models do not have homoscedastic at 5% level of significance.

**Selected Macroeconomic Variables and Human Capital Development in Nigeria**

**Table 9: Heteroskedasticity Test for Selected Macroeconomic Variables and Human Capital Development in Nigeria**

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	4.887341	Prob. F(15,13)	0.7310
Obs*R-squared	12.30493	Prob. Chi-Square(15)	0.5231
Scaled explained SS	2.835860	Prob. Chi-Square(15)	0.3497

Source: Eviews 9.0

The F-statistic of the Breusch-Pagan-Godfrey result is 4.887341 with probability value of 0.7310. Since the probability value is greater than 0.05, we cannot reject the null hypothesis that the residuals are homoscedastic. Thus we conclude that there is no heteroscedastic in the model. This confirms that the result obtained from the estimated model is not a biased value of the effect of selected macroeconomic variables on human capital development in Nigeria

**Regression Specification Error Test (RESET Test)**

This is to ensure that there is linear relationship in the regression model. The traditional OLS as well as the advanced ARDL regression employed in this study are based on the assumption of linear relationships. Thus, presence of nonlinear relationship will produce unreliable regression results. The Ramsey Reset test is employed to identify the existence of any significant nonlinear relationships in the developed linear regression model. The null hypothesis is that there is linear relationship in the regression model.

**The Decision Rule:**

The decision rule is to reject the null hypothesis if the p.value is less than 0.05 level of significance.

**Selected Macroeconomic Variables and Human Capital Development in Nigeria**

**Table 10: Regression Specification Error Test (RESET Test): for selected macroeconomic variables and human capital development in Nigeria**

Ramsey RESET Test

Equation: UNTITLED

Specification: HDI HDI(-1) HDI(-2) HDI(-3) UPR UPR(-1) UPR(-2) FDI FDI(-1) IFR IFR(-1) M2 M2(-1) ITR ITR(-1) ITR(-2) C

Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	3.122445	12	0.0042
F-statistic	2.31993	(1, 12)	0.9046

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	4.28E-06	1	4.28E-06
Restricted SSR	0.003432	13	0.000264
Unrestricted SSR	0.003428	12	0.000286

Source: Eviews 9.0

From Table 10 above showed that the F-statistics and the corresponding p.values of the Ramsey RESET Tests is 3.122445 and 0.0042, respectively. Since, the p. value is less than 0.05 level, we reject the null hypotheses of non-linear relationships in the models. This implies that the models are well specified and is good for the estimation of the model, selected macroeconomic variables and human capital development in Nigeria. The results from this study is thus expected to be reliable

**Hypotheses Testing**

The hypotheses testing are now carried out to determine the significance of selected macroeconomic variables on economic development in Nigeria. The hypotheses are tested separately for long run and short run effects. The short run effects are tested using the adjusted R<sup>2</sup> and corresponding F-statistics.

**Decision Rules:**

**For Long Run Effect:** If the bound values are less than the F-statistics value, reject the null hypothesis.

**For Short Run Effect:** At 5% level of significance, reject the null hypothesis, if the F-statistics p.value is less than 0.05.

**Stage One: Restatement of Hypothesis in Null and Alternate Form**

Ho<sub>1</sub>: Selected macroeconomic variables have no positive and significant effect on human capital development in Nigeria

Hi: Selected macroeconomic variables have positive and significant effect on human capital development in Nigeria

### Stage Two: Analysis of Results

Long Run Effect: F-statistics = 6.48674 (Lower and Upper Bounds = 2.62 and 3.79)

CointEq (-1) -6.904626; p.value = 0.0014

Short Run Effect: Adj R<sup>2</sup> = 0.773055; F-statistics = 12.76635; p.value 0.007927

The result compared the F-statistics with the critical bound values. The F-statistics is 6.48674. The results showed that the F-statistic is higher than the lower bounds at 2.62 and upper bounds at 3.79 of the critical values at 0.05 level of significance. This indicates that there is a cointegration or long run relationship between selected macroeconomic variables and human capital development in Nigeria

The results showed that the error correction term [CointEq(-1)] is rightly signed. The coefficient of the error term is -6.904626 with probability value of 0.0014. Since the p.value is less than 0.05, it connotes that the error term is statistically significance. This indicates the changes in human capital development trend will eventually return on a growing normal trend over time. The coefficient indicates about 69% of the deviations in human capital development in Nigeria due to selected macroeconomic variables can be corrected within a year. This implies that increasing selected macroeconomic variables can be used as a significant policy adjustment to stabilize human capital development in Nigeria within the period under review.

The hypothesis testing for short run effect showed that the computed F-statistics (12.76635) has a p.value of 0.007927 which is less than 0.05 for rejection of null hypothesis of short run effect. The study concludes that selected macroeconomic variables have a short run significant negative effect on human capital development in Nigeria. The adjusted coefficient of determination indicates 77% explanatory power.

**Decision:** Selected macroeconomic variables has (69% long run and 77% short run) significant negative effects on human capital development in Nigeria

### DISCUSSION OF FINDINGS

The discussion of findings was done in line with the objectives of the study

#### **Selected Macroeconomic Variables and Human Capital Development in Nigeria**

Selected macroeconomic variables have (69% long run and 77% short run) significant negative effects on human capital development in Nigeria.

The findings agree with the Solow-Swan model. Solow's model which states that human capital acquired knowledge and skills of workers through education, training, and experience. Quality human capital will enhance the ability of a country to produce goods and services. The findings of this study disagree with the work of Orumie (2017) that showed that selected macroeconomic variables and population growth have negative effect on human capital development in Nigeria

### CONCLUSION

The study revealed that selected macroeconomic variables have (69% long run and 77% short run) significant effects on human capital development in Nigeria.

The study therefore concludes that selected macroeconomic variables have been effective short run policy instruments that largely influenced human capital development in Nigeria but have not been effective long run policy instruments that largely influence economic development in Nigeria.

### RECOMMENDATIONS

The recommendations of the study are as follows:

1. The study recommended that federal government through the monetary authorities should regulate the monetary policy rate downwardly to encourage foreign and private investment and improve human capital development in Nigeria
2. Continuous fluctuations in interest rate may decrease the confidence of investors due to uncertainty about return on investment. Thus, government should control the interest rates charged by financial

institutions to encourage investments and improve human capital development, Government should pursue policies and programmes aimed at sustenance of low interest rate regime. Such policies may include development of requisite infrastructure, maintenance of price stability and institutionalization of good governance practices to improve human capital development in Nigeria

3. Monetary authorities in Nigeria should reduce interest rate to attract low interest rates that can encourage credit and boost productivity across the sectors which will improve human capital development in Nigeria.
4. Government should take serious steps to control the inflation rate by reducing imports and increasing exports, reducing government expenditures, give priority to agriculture sector, take serious consideration to food prices, increase and utilize energy resources with low production cost and remove security threats
5. The main policy implication of this study is that government should embark on labour intensive technique of production as against capital intensive and also close the border to some extent which is the likely measure to reduce unemployment and improve human capital development in Nigeria.

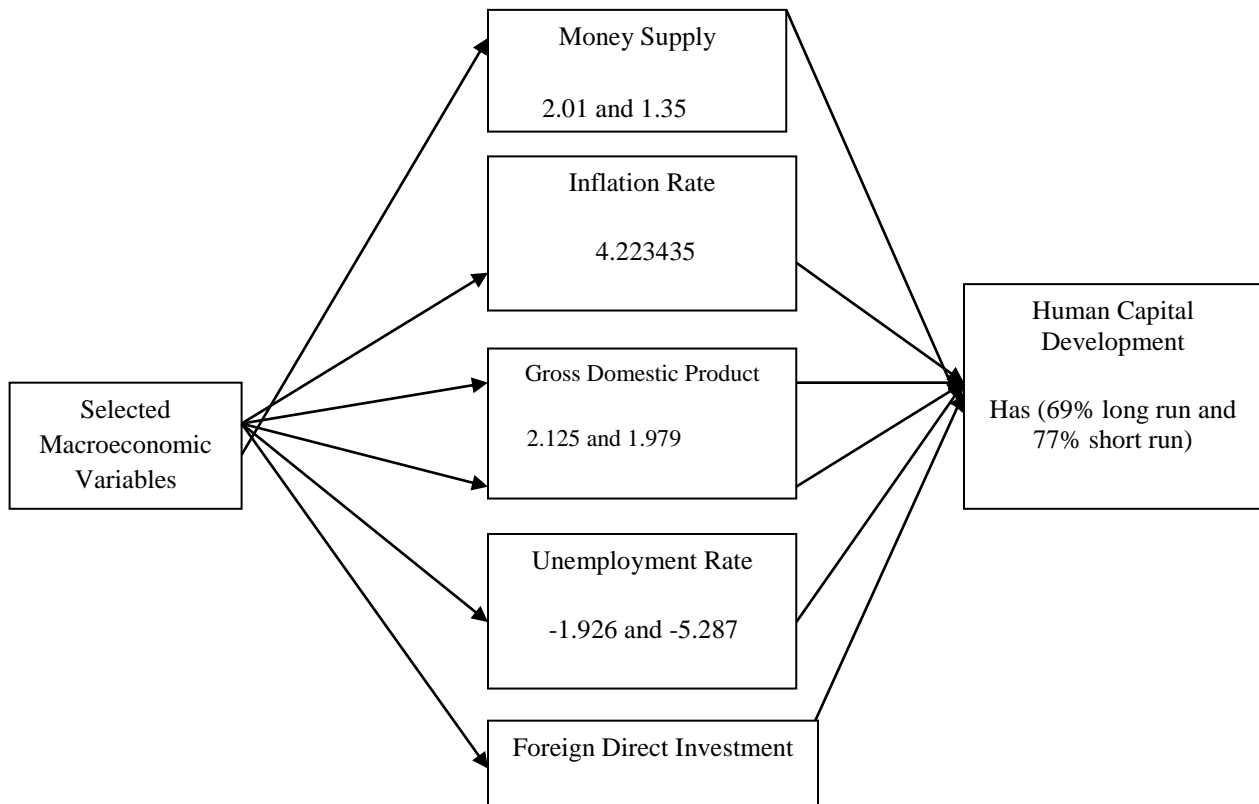
**Contribution to Knowledge**

The study developed distinct and novel models, for investigating the effect of selected macroeconomic variables on economic development in Nigeria. The specific models developed are:

**Selected Macroeconomic Variables and Human Capital Development in Nigeria:**  $HDI = \beta_0 + \beta_1 UPR + \beta_2 FDI + \beta_3 IFR + \beta_4 M_2 + \beta_5 ITR + \mu - - - - - 1$

The study incorporated human capital development index while the independent variables are gross domestic product, unemployment rate, foreign direct investment, inflation rate, broad money supply and interest rate

**Graphical Illustration of Contribution to Knowledge, Indicating the Variables**



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