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Predictive Impact of Educational Expenditure and Unemployment Rate on Economic Growth in Nigeria

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Abstract:

This paper examines the impact of Educational Expenditure and Unemployment rate on Economic Growth in Nigeria using a yearly data from 1970 to 2017 from the website of CBN and NBS. From the empirical results, it shows that the distributions of the dataset are positively skewness to the right and the distribution of the variables is exhibit high kurtosis which evidence of leptokurtic. The Jarque-Bera statistic shows very high values with it probability values indicating that the distribution on Gross Domestic Product (GDP), Educational Expenditure (EE) and Unemployment Rate (UR) are not normally distribution. Test for stationarity shows that EE and UR were stationary at first difference while GDP was stationary at second difference. An Autoregressive model was employed to predict the pattern of GDP, EE and UR for the next ten (10) years. Model specification was obtained and from the result of the AC and PAC statistic an AR model was selected and also include the difference in the data set for each data set at first for Educational expenditure and Unemployment rate while second order for GDP, that is, ARIMA(1,1,0) model for EE and UR and ARIMA(1,2,0) model for GDP. From the forecasting model, the results of the forecasting values for Educational Expenditure, Unemployment rate and Gross Domestic Product (GDP) from the period of 2018 to 2030 were obtained from individual estimate of the ARIMA models which shows a random walk for some period before reaching a steady state.

Keywords:

Predictive Impact, Education Expenditure, Unemployment, Economic Growth and Development

1. Introduction

In many countries of the world today, especially Asian countries like china, United Kingdom and United State, Education is positively at the higher increase due to the systematic increase to their educational system most especially in term of their reform and policy toward education. Allocating structured for their educational expenditure

every year has been on a geometric increase which now boot the economic in that part of the world. However, in many Africa countries like Nigeria, education is in s state of decay. Nigeria Leader is confronting increasing difficulty in allocating significant amount to the educational sector. The paralysis that has been unfolding to widespread of poor economic growth is one characterized basically by educational expenditure by the public sector. There have been some stylized facts of a positive relationship between GDP and education.

Therefore, in this paper, we study the trend of educational expenditure, Unemployment rate and Economic Growth in Nigeria from the period of forty eight year (48) and make a forecast for ten (10) years ahead in order to make recommendation from the result obtained.

2. Theoretical Framework

2.1. Endogenous Growth Theory

This theory stressed the importance of human capital for innovation and technical progress. The endogenous growth theory believes that economic growth is primarily the result of endogenous rather than exogenous variables. The theory also stressed that human capital and technological innovation are the products of education; therefore education causes growth in the economy. Endogenous growth theory advocates the stimulation of economic growth and development through improvement in human capital using policies aim at increasing expenditures on education. The theory also posits that improvement in the rate of investment, the size of the capital stock and the stock of human capital are pivotal to economic growth through productivity.

2.2. Human Capital Theory

Human capital theory is a modern extension of [1] explanation of wage differential by the so-called net advantage between different employments. The cost of learning on the job are very important components of advantage and have led economists such as Gary S. Becker and Jacob Mincer to claim that others things being equal, personal incomes vary according to the amount of investment in human capital; that is, the education and training undertaken by individual or group of workers.

2.3. Review of Related Studies

Investigating the impact of government capital expenditures on economic growth in Nigeria during 1970 and 2012. A multiple regression model based on a modified endogenous growth framework was utilized to capture the interrelationships among capital expenditures on agriculture, education, health economic infrastructure and economic growth. Drawing on error correction and cointegration specifications, an OLS technique was used to analyze annual time series [2].

Investigated the long run relationship between education and economic growth in Nepal between 1995 and 2013 through application of Johansen Cointegration technique and OLS. The results from OLS show that secondary and higher education contributes significantly to the Real GDP Per Capita in Nepal. The elementary education also positively influences economic growth but the results are statistically less significant [3].

The impact of education expenditure on economic growth as a means of achieving the desired socio-economic change needed in Nigeria. The study uses time series data

from 1981 to 2012. The Johansen's co-integration analysis and ordinary least square (OLS) econometric techniques were used to analyze the relationship between gross domestic product (GDP) and recurrent education expenditure. Findings indicate that though a positive relationship subsists between education expenditure and economic growth [4].

Impact of government expenditure on economic growth in Nigeria. They investigate the effects of public expenditure in education on economic growth in Nigeria over a period from 1977 to 2012. The objective of their study was to determine the effect of public expenditure on economic growth in Nigeria using Error Correction Model (ECM). Their results indicate that Total Expenditure Education is highly and statistically significant and have positive relationship on economic growth in Nigeria in the long run. The result has an important implication in terms of policy and budget implementation in Nigerian [5].

The aim of this paper is to predictive the impact of educational expenditure and unemployment rate on Nigeria Economic Growth.

3. Methodology

3.1. Data for the Study

The data were sourced from the Central Bank of Nigeria (CBN) of the Department of Statistics and National Bureau of statistics from the period of 1960 to 2017 [6,7,8,9].

3.2. Analysis Procedure

3.2.1. Stationary Test (Augmented Dickey Fuller Test)

Stationarity test of the major assumptions in observing the series of any financial time series modelling. This assumption can be checked using the unit root, an Augmented Dickey–Fuller test (ADF**)** is a test for a unit root in a time series sample [10].

Let

$$y_t = \phi_1 y_{t-1} \tag{1}$$

$$y_t - y_{t-1} = \phi_1 y_t - y_{t-1}$$

$$\Delta y_t = (\phi_i - 1) y_{t-1}$$

$$\Rightarrow \phi_1 - 1 = 0 \text{ or } \phi_1 = 1$$

Null hypothesis is $H_0 : \phi_1 = 1$

and alternative hypothesis is : $H_1 : \phi_1 < 1$

$$\text{The Test Statistic (t-ratio):} = \frac{\phi_1^n - 1}{std(\phi_1)} = \frac{\sum_{t=1}^{T} P_{t-1} e_t}{\sigma^2 \sqrt{\sum_{t=1}^{T} P_{t-1}^2}} \tag{2}$$

where

$$\phi_1 = \frac{\sum_{t=1}^{T} p_{t-1} p_t}{\sum_{t=1}^{T} p_{t-1}^2}$$

and

$$\hat{\sigma}^2 = \frac{\sum_{t=1}^{T} (p_t - \hat{\phi}_1 p_{t-1})^2}{T-1}$$

$P_0 = 0$, T is the sample size and ϕ_1 for each Insurance stock.

The null hypothesis is rejected if the calculated value of t is greater than t critical value ([11])

3.2.2 . Jarque-Bera Test for Normality

Jarque-Bera test is the commonly used diagnostic statistic to test for normality of the residuals. The test statistic is computed as:

$$JB = \frac{N-k}{6}\left[S^2 + \frac{(K-3)^2}{4}\right], \tag{3}$$

is approximately χ_2^2. S is the skewness and K is the kurtosis ([11])

$$K = \frac{\mu_4}{\mu_2^2} - 3 = \frac{\mu_4}{\sigma^4} - 3$$

if K < 0, platykurtic, K > 0, excess kurtosis, leptokurtic and K= 0, mesokurtic. We reject the null hypothesis of normality if the Jarque-Bera statistic exceeds the corresponding critical value.

3.2.3. The Autoregressive Model AR (P) Model

The AR (1) model

$$Y_t = \phi Y_{t-1} + u_t \tag{4}$$

where we do not include a constant the AR(1) and $|\phi| < 1$ and u_t is a Gaussian (white noise) error term.

A generalization of the AR (1) model is AR (p) model

AR (2) model, and will have the form:

$$Y_t = \phi_1 Y_{t-1} + \phi_2 Y_{t-2} + u_t \tag{5}$$

AR (p) model,

$$Y_t = \phi_1 Y_{t-1} + \phi_2 Y_{t-2} + \ldots \phi_p Y_{t-p} + u_t \tag{6}$$

or using the summation symbol:

$$Y_t = \sum_{i=1}^{p} \phi_i Y_{t-i} + u_t \tag{7}$$

3.2.4. Moving Average Models

The MA (1) model

$$Y_t = u_t + \theta u_{t-1} \tag{8}$$

The MA (q) model

$$Y_t = u_t + \theta_1 u_{t-1} + \theta_2 u_{t-2} + \ldots + \theta_q u_{t-q} \tag{9}$$

3.2.5. ARMA models

We can have combinations of the two processes to give a new series of models called ARMA (p, q) models. The general form of the ARMA (p, q) models is following:

$$Y_t = \phi_1 Y_{t-1} + \phi_2 Y_{t-2} + \ldots + \phi_p Y_{t-p} + u_t \ldots + \theta_1 u_{t-1} + \theta_2 u_{t-2} + \ldots + \theta_q u_{t-q} \tag{10}$$

which can be rewritten, using the summations as:

$$Y_t = \sum_{i=1}^{p} \phi_i Y_{t-i} + u_t + \sum_{i=1}^{q} \theta_j u_{t-j} \tag{11}$$

3.2.6. ARIMA Models

If a process Yt has an ARIMA (p, d, q) representation, the has an ARMA (p ,q) representation as presented by the equation below:

$$\Delta^d Y_t (1 - \phi_1 L - \phi_2 L^2 - \ldots - \phi_p L^p) = (1 - \theta_1 L - \theta_2 L^2 - \ldots - \theta_p L^q) u_t \tag{12}$$

4. Results and Discussion

4.1. Analysis of Data Variable

From the empirical results in table 1, it shows that the distributions of the dataset are positively skewness to the right and the distribution of the variables is exhibit high kurtosis which evidence of leptokurtic. The Jarque-Bera statistic shows very high values with it probability values indicating that the distribution on GDP, EE and UR are not normally distribution.

Table 1. *Descriptive Statistic on GDP, EE and UR.*

	GDP	EE	UR
Mean	11789.18	1.38E+09	7.897917
Std. Dev.	19579.66	1.43E+09	5.721125
Skewness	1.726006	1.207791	0.943082
Kurtosis	4.791226	3.092697	3.010917
Jarque-Bera	30.24976	11.68726	7.115466
Probability	0.000000	0.002898	0.028503
Sum	565880.5	6.64E+10	379.1000
Observations	48	48	48

4.1.1. Stationarity test

The stationarity of the three variables were investigated by observing the time plot of the series. The Figure 1, Figure 2 and Figure 3 below revealed the non stationarity of the three variables at level without transformation, that is, Educational Expenditure, Unemployment rate and Gross Domestic Product (GDP) respectively. However, a formal test of stationarity was also carried out using the Augmented Dickey- Fuller Test. The results obtained for three variables showed that the Augmented Dickey-Fuller test statistic were all less than their critical values at 1%, 5% and 10% as shown in Table 2. Hence, there is no unit root. The series were all stationary at different levels. The series plot is given in Appendix A for Educational Expenditure, Unemployment Rate and Gross Domestic Product.

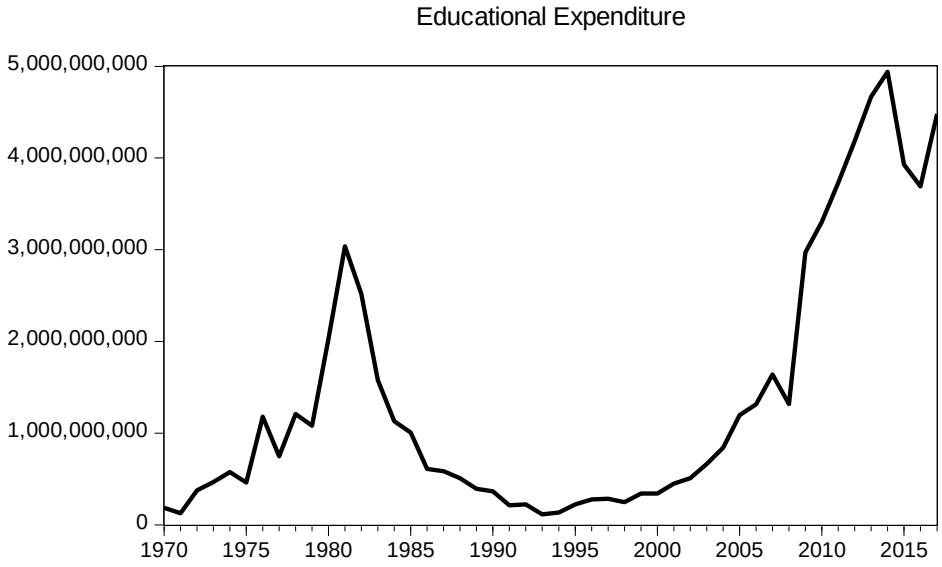

Figure 1. *Shows the time plot of Educational Expenditure from 1970 to 2017.*

Figure 2. *Shows the time plot of Unemployment Rate from 1970 to 2017.*

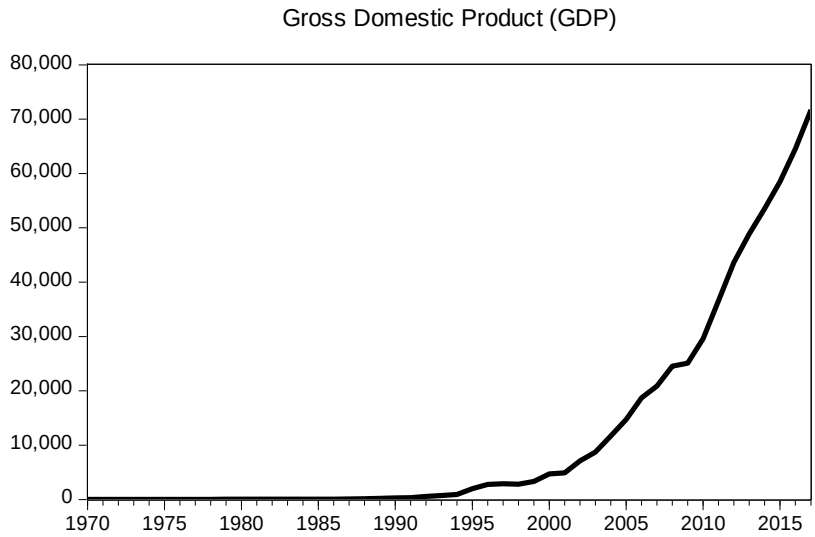

Figure 1. *Shows the trend of Gross Domestic Product (GDP) in Nigeria from the period of 1970 to 2017.*

Table 2. *ADF Statistic for GDP, EE and UR.*

	ADF Test Statistic	Comment
GDP	-6.377157	Stationary at second level
EE	-5.42794	Stationary at first level
UR	-7.839066	Stationary at first level

1% critical = -3.432219, 5% critical = -2.862251, 10% critical = -2.567193

4.1.2. Model Specification Using AC or PAC Statistic

Table 3 shows the model specification in order to estimate and forecast for Educational Expenditure, Unemployment rate and Gross Domestic Product using either the AR or MA or both model (ARMA) or ARIMA model. From the result of the AC and PAC statistic we will run AR model and include the difference in the data set for each data set at first for Educational expenditure and Unemployment rate while second order for GDP, that is, ARIMA(1,1,0) model for EE and UR and ARIMA(1,2,0) model for GDP.

Table 3. *Model Specification on AR, MA or ARMA or ARIMA models.*

	AC	PAC	Q-Stat	Prob
1	0.812	0.812	32.991	0.000
2	0.710	0.150	58.795	0.000
3	0.615	0.010	78.585	0.000
4	0.620	0.262	99.184	0.000
5	0.580	-0.006	117.63	0.000
6	0.511	-0.104	132.29	0.000
7	0.356	-0.285	139.59	0.000
8	0.289	0.017	144.51	0.000
9	0.287	0.172	149.51	0.000
10	0.227	-0.210	152.70	0.000

ARIMA (1, 1, 0) Parameter Estimate for Education Expenditure

Table 4 shows the ARIMA parameter estimation for educational expenditure. From the results is shows that previous allocation to educational expenditure is significant and positive with a coefficient value of AR (1) =1.0000 and p-value =0.0000 and the error given as SIGMASQ =7.19E-15 and p-values =0.0244 which is less that 5%

confident interval. Therefore, with this estimate we can then forecast for the period of 2018 to 2030 on educational expenditure in Nigeria.

Table 4. *ARIMA Estimation for Educational Expenditure.*

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG(EDU)	-2.22E-15	0.011503	-1.93E-13	1.0000
AR(1)	1.000000	4.33E-11	2.31E+10	0.0000
SIGMASQ	7.19E-15	3.08E-15	2.331380	0.0244
Mean dependent var	1.000000	S.D. dependent var		0.000000
S.E. of regression	8.76E-08	Akaike info criterion		-28.99015
Sum squared resid	3.38E-13	Schwarz criterion		-28.87206
Log likelihood	684.2685	Hannan-Quinn criter.		-28.94571
Durbin-Watson stat	0.999999			

ARIMA (1, 1, 0) Parameter Estimate for Unemployment Rate

Table 5 shows the ARIMA parameter estimation for unemployment rate. From the results is shows that previous unemployment rate is significant and positive with a coefficient value of AR (1) =1.04300 and p-value =0.0000 and the error given as SIGMASQ =2.49E-15 and p-values =0.0000 which is less that 5% confident interval. Therefore, with this estimate we can then forecast for the period of 2018 to 2030 on unemployment rate in Nigeria.

Table 5. *ARIMA Estimation for Unemployment Rate.*

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG(UR)	1.50E-15	0.009959	1.51E-13	1.0000
AR(1)	1.04300	1.15E-13	8.69E+12	0.0000
SIGMASQ	2.49E-15	5.48E-17	45.37423	0.0000
S.E. of regression	5.15E-08	Akaike info criterion		30.02938
Sum squared resid	1.17E-13	Schwarz criterion		29.91129
Log likelihood	708.6905	Hannan-Quinn criter.		29.98494
Durbin-Watson stat	1.000000			

4.1.3. ARIMA (1, 1, 0) Parameter Estimate for Gross Domestic Product

Table 6 shows the ARIMA parameter estimation for unemployment rate. From the results is shows that previous unemployment rate is significant and positive with a coefficient value of AR (1) =0.477165 and p-value =0.0000, AR (2) =0.522835 and p-value =0.0000 and the error given as SIGMASQ =1.58E-14 and p-values =0.3428 which the AR (1) and AR (2) are less that 5% confident interval. Therefore, with this estimate we can then forecast for the period of 2018 to 2030 on Gross Domestic Product in Nigeria.

Table 6. *ARIMA Estimation for Gross Domestic Product.*

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG(GDP,2)	-1.64E-14	0.040969	-4.01E-13	1.0000
AR(1)	0.477165	8.85E-09	53938837	0.0000
AR(2)	0.522835	5.68E-09	91985766	0.0000
SIGMASQ	1.58E-14	1.65E-14	0.959473	0.3428
Mean dependent var	1.000000	S.D. dependent var		0.000000
S.E. of regression	1.32E-07	Akaike info criterion		28.15233
Sum squared resid	7.27E-13	Schwarz criterion		27.99332
Log likelihood	651.5037	Hannan-Quinn criter.		28.09277
Durbin-Watson stat	0.999999			

4.1.4. Forecasting Values for Educational Expenditure, Unemployment Rate and Gross Domestic Product from the Period of 2018 to 2030 in Nigeria

Table 7 shows the results of the forecasting values for Educational Expenditure, Unemployment rate and Gross Domestic Product (GDP) from the period of 2018 to 2030 obtained from individual estimate of the ARIMA models. A Series plot of the forecasting values of the variables is shows in the figures below.

Table 7. *Forecasting values on Educational Expenditure, Unemployment Rate and Gross Domestic Product in Nigeria from the Period of 2018 to 2030.*

Years	*Educational Expenditure*	*Unemployment Rate*	*Gross Domestic Product*
2018	2.3620	2.6941	817.84772
2019	6.3677	1.2130	288.6918
2020	3.9505	2.0926	639.099
2021	5.4092	1.5703	461.2172
2022	4.5290	1.8804	566.5641
2023	5.0611	1.6962	536.2553
2024	4.7396	1.8056	562.3022
2025	4.9330	1.7407	570.0719
2026	4.8163	1.7792	580.2420
2027	4.8867	1.7563	593.2005
2028	4.8442	1.7600	602.6542
2029	4.8698	1.7618	614.8564
2030	4.8547	1.7666	625.2794

5. Conclusion

From the descriptive statistic, shows the respective statistic of the three variables such as the mean, Standard Deviation (STD), skewness, kurtosis, Jarque-Bera (JB), Probability Value (P-Value) and sum. From the initial result of the data set GDP gives the following results of 11789.18, 1.726006, 4.791226, 30.24976 and 0.0000 which represent the mean, STD, skewness, kurtosis, JB and P-value respectively. The GDP results shows that the distribution of the is positively skewed with high kurtosis value of 4.791226 that is it is leptokurtic and the p-values is less that 1%, 5% which means that the distributions of GDP is not normally distributed. The EE gives 1.38E+09 of mean, 1.43E+09 of STD, 1.207791 of skewness, 3.092697 of kurtosis, 11.68726 of JB and 0.002808 of p-values meaning that the distribution is positively skewed with high kurtosis and the distribution of EE is not normally distributed also the result of UR gives the value of 7.897917 for mean, 5.721125 for STD, 0943082 for skewness, 3.010917 for kurtosis, 7.115466 for JB and 0.028503 for p-values, meaning that the descriptive statistic for UR is that the distribution is positive and leptokurtic and the distribution is not normally distributed since the p-value is less that 5% confident interval (CI).

A stationarity test was investigated by observing the time plot of the series. The revealed that the variables were not stationary at level. However, formal tests of stationarity were also carried out using the Augmented Dickey- Fuller Test. The results obtained for three variables showed that the Augmented Dickey- Fuller test statistic were all less than their critical values at 1%, 5% and 10% as shown in Table 2. Hence, there is no unit root after the differences were taken at first and second

difference for Educational Expenditure, Unemployment Rate and Gross Domestic Product.

A model specification were estimate in order to make forecast or prediction for Educational Expenditure, Unemployment rate and Gross Domestic Product using either the AR or MA or both model (ARMA) or ARIMA model. From the result of the AC and PAC statistic we run AR model and include the difference for each data set at first for Educational expenditure and Unemployment rate while second order for GDP, that is, ARIMA(1,1,0) model for EE and UR and ARIMA(1,2,0) model for GDP.

The results of the forecasting values for Educational Expenditure, Unemployment rate and Gross Domestic Product (GDP) from the period of 2018 to 2030 obtained from individual estimate of the ARIMA models which from their results, it was find that EE and UR will experience fluctuation for some period of year before it approaches steady state while the GDP also experience fluctuation for some period of year before experience a geometric increase.

Addition, the predictive values of the three variables were estimated using multiple regression to detect if there will be a significant relationship. But from the regression estimate, it shows that there is no significant relationship in the predictive values of the independent variables on the dependent variable and also shows that educational expenditure and unemployment rate will affect economic growth of Nigeria negatively.

Conflicts of Interest

The author declares that there is no conflict of interest regarding the publication of this article.

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