Impact Of Population Growth and Poverty on Health in Nigeria

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DOI 10.56201/ijebm.vol.11.no4.2025.pg33.45

Abstract
The study examined the impact of population growth and poverty on health in Nigeria from 1981 to 2023. To achieve the objectives, annual time series data on Human Development Index (HDI), Population Growth Rate and Poverty were collected from secondary sources. The dependent variable was health which was proxy by life expectancy at birth. The independent variable – population growth (was disaggregated into rural and urban population growth rate) and poverty rate. The E-views 12 Statistical Software was employed to analyze the data empirically. The Unit root test was adopted to test the stationarity of variables. The Unit root test shows that Life expectancy at birth (LEB), Urban population growth rate (UPGR), and poverty rate (PVT) variables evaluated are all stationary after first difference I(1) while Rural population growth rate (RPGR) was stationary at level I(0). The result indicated that that the coefficients of UPGR, RPGR are positively signed and statistically significant in the long-run and short-run. It therefore means, UPGR and RPGR positively affect life expectancy at birth in Nigeria. The study recommends amongst others that the Nigerian government should raise minimum wage, create more employment opportunities, invest in quality and universal education, expand health and medical care, and provide easy access to the political process to reduce the poverty rate in the country.

Key Words*: Population growth, Poverty, Life expectancy, ARDL, Nigeria*

INTRODUCTION

It has been projected that the world population will increase to about 8.1 billion people in the year 2050 (Todaro and Smith, 2015) and that a major proportion of that increase is expected to come from the Africa countries, Asia, Latin America, (developing countries). Given the above trajectory, the situation in developing countries has never been out of the projections in the past 100 years. The population of Ghana, South Africa, Benin, Nigeria just to mention but a few has been on the rise. Nigeria being the most populous country in Africa and a key player in west Africa with an estimated population of 202 million people, according to the World Bank Group (2020), has also witnessed improvement in the quality of life/standard of living, judging from her historical data. The large size of the population in Nigeria is seen by the domestic society as a source of wealth, with its cultural view that increase in number of children implies additional source of manpower to the ordinary man in the village. But the situation seems different in the metropolitan cities where increase in population increases poverty, unemployment and corruption.

In developed countries, increase in population creates enabling market for locally made goods; increased man-power needed of the military; increased labour force and political participation, which is contrary to the Nigerian situation where increase in population has amounted to increase in poverty; increase in crime rate; increase in environmental degradation and all forms of social vices.(Eniang 1977).

However, the impact of population growth and poverty on health in Nigeria can be measured with several proxies. For this study, Life expectancy at birth, Rural population growth rate, Urban population growth rate and poverty rate were used as measures of the dependent and the independent variables. This paper therefore, seeks to investigate the impact of population growth and poverty on health in Nigeria. It is Interesting to know that, no study has investigated the impact of population growth and poverty on health in Nigeria using the above measures and dimension at the same time. These issues give credence to this study.

The organization of the article goes thus; the abstract, the introductory part, the literature reviewed which includes conceptual clarifications, theoretical framework and empirical review. The methodology, which contains the model design, model specification and empirical result explanations. The paper is concluded with the conclusion and recommendations.

LITERATURE REVIEW

Conceptual Clarification

Population Growth

The "population growth rate" is the rate at which the number of individuals in a population increases in a given time period, expressed as a fraction of the initial population. Specifically, population growth rate refers to the change in population over a unit time period, often expressed as a percentage of the number of individuals in the population at the beginning of that period.

Population growth is the increase in the number of individuals in a population. Global human population growth amounts to around 83 million annually (World Population Prospects, 2017) or 1.1% per year. The global population has grown from 1 billion in 1800 to 7.8 billion (World Population, 2017). It is expected to keep growing, and estimates have put the total population at 8.6 billion by mid-2030, 9.8 billion by mid-2050 and 11.2 billion by 2100 (World Population Prospects, 2017). Many nations with rapid population growth have low standards of living, whereas many nations with low rates of population growth have high standards of living.

Poverty Rate

Poverty has no clear cut or universal accepted definition. Poverty is a state where an individual is not able to cater adequately for his or her basic needs of food, clothing and shelter (Kpelai, 2013). However, Eboh & Uma (2010), view poverty as “a lack of command over basic consumption needs”, which means that there is an inadequate level of consumption giving rise to insufficient food, clothing or shelter, and moreover, the lack of certain capacities such as being able to participate with dignity in society. Genyi (2007), agrees that: Poverty has various manifestations including lack of income and productive resources sufficient to ensure sustainable livelihoods, hunger and malnutrition, ill-health, limited or lack of access to education and other basic services, increase morbidity from illness, homelessness and inadequate housing, unsafe environment, social discrimination and exclusion. It is also characterized by a lack of participation in decision and in civil, social and cultural life.

Life Expectancy

Life expectancy which is one of the three dimensions of human development index is a measure of the length of life expected to be lived by an individual at birth. Improvement of Life expectancy to at least 70 years by 2020 is one of Nigeria’s health policy targets. Life expectancy is frequently utilized and analyzed in the composition of demographic data for the countries of the world, for the attainment of mortality experiences and for more reliable international comparisons Julien

(2009), noted that life expectancy has important implications for the individuals and aggregate human behavior. They noted that it has crucial effects on fertility behavior, economic growth and development, human capital investment, intergeneration transfers and incentives for pension benefits. Granstein and Kanganovich (2004), noted from the social planner's perspective that life expectancy has implication for public finance.

Life expectancy is very crucial to the developing worlds who are earnestly striving for achieving socio-economic progress through investing significantly in social sectors like health, education, sanitation, environmental management and sustainability, and social safety nets (Kabir, 2008). In Nigeria, as in other developing countries, variations in morbidity and mortality have been associated with a wide variety of measures of socio-economic status including per capita GDP, fertility rate, adult illiteracy rate, per capita calorie intake, health care expenditure, access to portable drinking water, urban inhabitants, unemployment rate and the nominal exchange rate.

Studies have shown that there is a significant tendency for mortality to be lower in countries with a more even distribution of income. Rodger (1979), asserted that Nigeria is said to be highly non-egalitarian in income distribution. Per capita income of developing countries has improved significantly and translated into higher level of health care expenditure. For instance, there has been remarkable improvement in the incidence of income and non-income poverty overtime that have impacted positively on life expectancy. However, in many of the countries in Sub-Saharan Africa and Nigeria in particular, although income and health expenditure is increasing, life expectancy has been unsteady. An analysis of three docile averages show that between 1996 and 2004, in Nigeria, life expectancy averaged 46.5years and between 2005 and 2010, it improved marginally to an average 49.3 years. Bello-Imam (2004), compared the Nigerian data with the sub-region and concluded that maternal mortality rate per 100,000 live births in Nigeria averages 1,100 as against 900 Sub-Saharan African average; malaria mortality rate per 100,000 Population of 156 as against 104 Sub-Saharan African average; tuberculosis mortality rate among HIV negative people per 100,000 Population of 63 as against 51 Sub-Saharan African (SSA) average. Again a thirteen-year average (1999-2011) data on life expectancy, under five infant mortality rate, per capita income and unemployment rate for Nigeria, Ghana, Kenya, China, India shows that Nigeria performed poorly on all these indicators.

Theoretical Literature

Optimum Theory of Population by Edwin Cannan in 1924

The optimum theory of population was propounded by Edwin Cannan in his book Wealth published in 1924 and popularized by Robbins, Dalton and Carr-Saunders. Unlike the Malthusian theory, the optimum theory does not establish relationship between population growth and food supply. Rather, it is concerned with the relation between the size of population and production of wealth (Nipun, 2011; & Ayesha, 2014).

The Malthusian theory is a general theory which studies the population problem of a country in keeping with its economic conditions. Thus the optimum theory is more realistic than the Malthusian theory of population. Like the Malthusian theory, the optimum theory of population has some assumptions such as;

i. The natural resources of a country are given at a point of time but they change over time.
ii. There is no change in techniques of production.
iii. The stock of capital remains constant.
iv. The habits and tastes of the people do not change.

v. The ratio of working population to total population remains constant even with the growth of population.
vi. Working hours of labor do not change.
vii. Modes of business organization are constant

Given above assumptions, the optimum population is that ideal size of population which provides the maximum income per head. Any rise or diminution in the size of the population above or below the optimum level will diminish income per head.

Given the stock of natural resources, the technique of production and the stock of capital in a country, there is a definite size of population corresponding to the highest per capita income. Other things being equal, any deviation from this optimum-sized population will lead to a reduction in per capita income (Nipun, 2011; & Ayesha, 2014).

Empirical Review

Moges (2013) examined the relationship among economic growth, inequality and poverty in developing countries. Utilizing a new and nationally representative dataset on household survey, the study found that economic growth and income inequality have significant impact on poverty reduction. The study suggested the need for developing countries to pursue both economic growth and income distribution policy objectives to bring about reduction in poverty because a one-sided approach would have limited effectiveness for sustainable poverty alleviation.

Nurudeen and Ibrahim (2014) examined the relationship among poverty, inequality and economic growth in Nigeria for the period 2000 to 2012. The study used both the Auto-regressive Distributed Lag (ARDL) and the granger causality techniques. The ARDL co-integration estimate showed no evidence of a long run relationship among the variables while the causality estimate showed unidirectional causation from economic growth to poverty rate in Nigeria.

Fosu (2015) examined the relationship among economic growth, inequality and poverty in Sub-Saharan Africa (SSA). The study used recent World Bank data and observed that recent progress on poverty reduction has been considerable, in contrast to the 1980s and 1990s period. Specifically, the study noted that income growth was the main driver of poverty reduction in SSA. However, the study acknowledged that from a global perspective, the low levels of growth inhibited the effectiveness of growth and inequality improvements in reducing poverty in many African countries.

Akanbi (2016) examined the link among economic growth, poverty and inequality for a group of nine South African provinces over the period 1995 to 2012. In the study, poverty was proxy by income poverty and non-income poverty while inequality was proxy by income inequality, education inequality and land inequality. Evidences from the study showed the existence of along-run relationship among growth, poverty and inequality. The causality estimate showed a unidirectional causation from income inequality to economic growth while no causation was observed from economic growth to income inequality. More so, unidirectional causation was observed from income poverty to income inequality while a unidirectional causation was equally observed from income inequality to non-income poverty.

Duada (2017) appraised the paradoxical link between rising poverty rate in the midst of high growth in Nigeria. The study noted that the rationale for the paradox Includes jobless growth, lack of pro-poor growth agenda, and failure of poverty alleviation initiatives/programs to address

structural transformation issues required for employment generation, sustainable growth, and closing the income gap in the economy.

Nakabashi (2018) examined the effects of poverty on economic development across the Brazilian States from 1980 to 2015. Many studies assess the effects of economic growth and economic development on poverty incidence, but there is almost no one trying to measure the impact of poverty prevalence on economic development. The results of this paper indicate that poverty incidence is essential in the economic development of the Brazilian States. Poorer Brazilian States have lower income per worker even when controlling for investment in physical capital, human capital stock, and the effective depreciation of capital. The results point to the variables measuring extreme poverty as having more influence on the economic development of the Brazilian States in relation to the variables quantifying poverty.

Nwosa and Ehinomen (2020) examined the relationship among income inequality, poverty and economic growth in Nigeria over the period 1981 to 2018. Specifically, the study examined: (i) the impact of income inequality and poverty on economic growth, (ii) the role of poverty in the link between inequality and economic growth, and (iii) the interactive effect of income inequality and poverty on economic growth. Using the autoregressive distributed lag technique; the study observed that inequality had positive and significant impact on economic growth while poverty had an insignificant impact on economic growth. More so, it was observed that poverty is insignificant in the relationship between income inequality and economic growth while income inequality played a significant role in the relationship between poverty and economic growth.

METHODOLOGY

Model Design

The method that is used in this study is the quasi-experimental design called correlational research design.

Model Specification

The model specification for this study aligned with the work of Ali. *et al*. (2018) with further modification. Ali, *et al*. (2018) who analyzed the nexus between population, poverty and economic development in some selected developing countries between 2002 and 2015 model was:

LEB = *f(*RPGR, UPGR, PVT) 3.4

Where
LEB = Life expectancy at birth
RPGR = Rural population growth rate
UPGR = Urban population growth rate
PVT = poverty rate

For the purpose of estimation, it is necessary to re-write the model in the form of equation as;

$$LEB = \beta_0 + \beta_1 RPGR_t + \beta_2 UPGR + \beta_3 PVT_t + \mu_{1t} \quad 3.5$$

Where: LEB = Life Expectancy at birth
β_0 = Constant term
β_1, β_2, β_3 = the coefficient of rural population growth, urban population growth and poverty rate to be determined.
μ_{1t} = error or stochastic term.

$\beta_1, \beta_2, \beta_3 > 0$ = the apriori expectation.

Empirical Results and Discussions
Table 1

Philip Perron Unit Root test
Stationarity characteristics of the variables used in the study were tested. The study employed the Philip Perron (PP) Unit Root Test. The results are presented in Table 4.3 below.

Table 4.3 Philip Perron Unit Root test

Variables	Level	Critical Value	1st Diff.	Critical Value	Decision
LEB	-1.093970	-3.529758	-109.5065	-3.533083	I(1)
PVT	-2.809585	-3.529758	-7.903391	-3533083	I(1)
RPGR	-4.447963	-3.529758			I(0)
UPGR	-1.861027	-2.938987	-5.738266	-2.941145	I(1)

Source: *Author's Computation using E-views 12*

Table 1, shows the Philip Perron Test. Going by the preposition of Jenkin and Box (1970), the Variables that are not stationary at levels shall be made stationary after first difference. Life expectancy at birth, Urban population growth rate and poverty rate were stationary after first difference while Rural population growth rate was stationary at level..

Table 2: ARDL Bounds Test
Bound Test Co-integration Result for LEB Model

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
		Asymptotic: n=1000		
F-statistic	62.18794	10%	2.72	3.77
k	3	5%	3.23	4.35
		2.5%	3.69	4.89
		1%	4.29	5.61

Source: Computed from E-view

Table 2 shows that the upper bound critical value of 4.35 at 5 percent significant level is less than 61.18794 which is the calculated F-statistics. Going by this result, it therefore means that there is long run relationship amongst the variables in the gross national income per capita model.

Table 3 ARDL-ECM Short-run Results for LEB model

ECM Regression
Case 3: Unrestricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.849733	0.111008	16.66305	0.0000
D(LEB(-1))	0.905818	0.010701	84.64696	0.0000
D(PVT)	-0.000166	0.000243	-0.682650	0.5002
D(PVT(-1))	-0.000813	0.000239	-3.394741	0.0020
D(UPGR)	-0.088833	0.011537	-7.699891	0.0000
CointEq(-1)*	-0.024921	0.001504	-16.56758	0.0000

R-squared	0.997057	Mean dependent var	0.240816
Adjusted R-squared	0.996598	S.D. dependent var	0.223427
S.E. of regression	0.013032	Akaike info criterion	-5.698807
Sum squared resid	0.005435	Schwarz criterion	-5.440241
Log likelihood	114.2773	Hannan-Quinn criter.	-5.606812
F-statistic	2168.563	Durbin-Watson stat	0.904822
Prob(F-statistic)	0.000000		

Source: Computed from E-view

Table 3, shows that the calculated Adjusted-R square is 0.996598, indicating that the regressors in the model account for about approximately 100 percent of the total variation in LEB. Also, the entire regression result of the model is significant at 5 percent level as shown by the F-calculated of 2168.563 with a p-value of 0.000001 which is less than 0.05 Alpha ($P<0.05$). The error correction term (CoinEq(-1)) shows the speed of adjustment to restore equilibrium in the dynamic model. In particular, the ECM coefficients show how quickly or slowly the variables converge to equilibrium. The result of the error correction model indicates that it is well specified and the diagnostic statistics are good. The ECM variable has the correct apriori sign and statistically significant (p-value <0.05). The speed of adjustment of -0.024921 shows the level of convergence. In particular, about 2.5 percent of disequilibrium or deviation from long run of LEB in the previous period is corrected in the current year, since the data employed are annual.

Furthermore, the result revealed that the LEB in the one lagged period was positively and statistically significant in explaining LEB in the country. The coefficient of LEB in the one period lag was 0.905818 with a p-value of 0.0001 which is less than 5%. This implies that a one unit increase in LEB in the previous year increases LEB by 90.6% in the current period. Also, the table shows that PVT coefficient was -0.000166 with a p-value greater than 0.05 alpha level. This implies that PVT was negative but insignificant in predicting changes in LEB. However, PVT in the one period lag significantly impacted LEB. The coefficient of PVT in the one lag period was -0.000813 with a p-value of 0.0020. The implication is that a one unit increase in PVT (-1) decreases life expectancy by the coefficient value.
In the same vein, the coefficient of UPGR was -0.88833 with a p-value of 0.0001 which is an indication that UPGR significantly predict the changes in LEB. For every 1 unit increase in UPGR, there is a corresponding decrease LEB by 89.0% within the period of study.

Long-run ARDL Model Estimation for Model 1 (LEB Model)
Table 4.5 ARDL Long-run Estimate for LEB

Levels Equation
Case 3: Unrestricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
PVT	0.034794	0.019207	1.811527	0.0804
RPGR	-10.57236	0.607099	-17.41455	0.0000
UPGR	-2.659047	0.192306	-13.82719	0.0000

Source: Computed from E-view

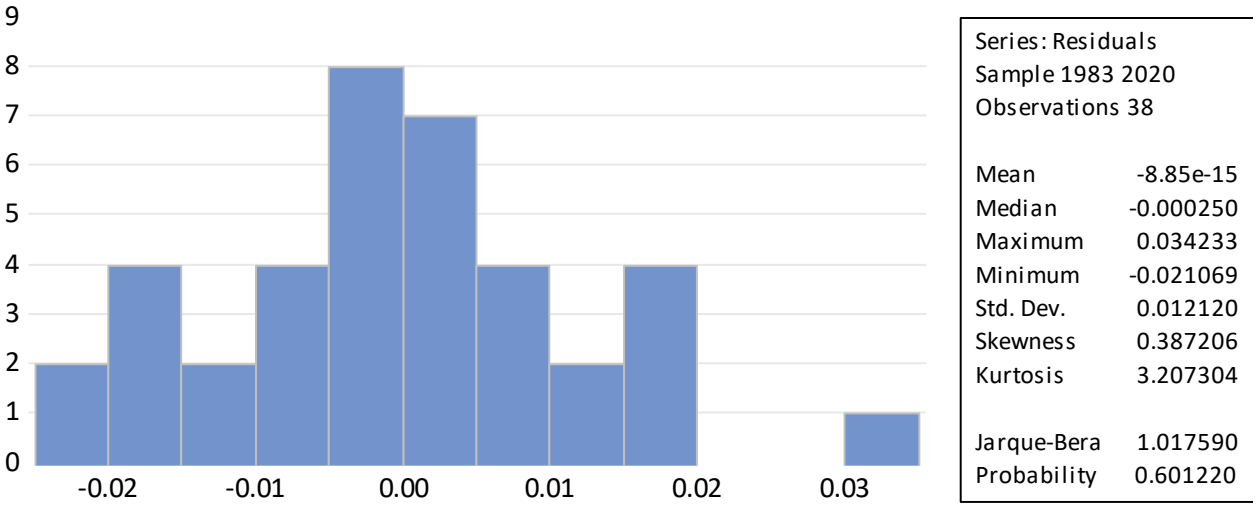
The result of the long-run estimation of model one in Table 4 RPGR and UPGR which are independent variables, were negatively significant in explaining the changes in LEB while PVT was insignificant in the study period. The result shows that PVT has a coefficient value of 0.034794 with a p-value of 0.0804 which is greater than 5% level of significant. RPGR has a coefficient of-10.57236 with a p-value of 0.0001 which is less than 0.05 alpha. This is an indication that RPGR significantly impact LEB.
In addition, UPGR was found to significantly impact on LEB since the p-value is less than 5%. A unit increase in UPGR result in a decrease of 2.659047 percent in LEB.

Explanation of LEB Model
Population Growth, Poverty and Health in Nigeria
Population growth was disaggregated into rural and urban population growth rate while health status is proxied by life expectancy at birth. The result of the analysis reveals that in the long-run, the coefficient of poverty rate (PVT) was insignificant in explaining the variations in the health (life expectancy at birth) in Nigeria for the period of study. This may be attributed to the fact PVT rate is not the only determinant of life. The result affirms the trend of life expectancy at birth which is constantly on the rise within the study period. On the other hand, rural population growth rate (RPGR) and urban population growth rate were found to be significant in explaining the changes in LEB. The coefficient of RPGR was -10.57236 with p-value of 0.0001 which is less than 5%. The implication is that for every 1 unit increase in RPGR, there is a corresponding change of 10.57% in LEB. This can be attributed to the fact that the many rural communities lack or inadequacy of the basic social amenities including good drinking water, hospitals, schools etc. which makes life more meaning.
In addition, the result shows that UPGR was negative and significant in predicting change in LEB. A one unit increase in UPGR result in 2.66% decrease in LEB. This is expected considering that facilities in the urban areas are over stretched due to influx of persons from the rural areas. In the short-run, LEB and PVT in the 1 lagged period, were significant in explaining the changes in LEB. Also UPGR has significant influence on LEB. A 1 unit increase in LEB in the one lagged period increases LEB by 90.6% approximately while a unit increase in PVT in the one lagged period decreases LEB by 0.008%. On the other hand, 1 unit change in UPGR causes a 2.5% decrease in LEB in the short-run within the study period. The hypothesis that population growth and poverty has not affected health status in Nigeria is rejected, the study concludes that population growth and poverty has affected health in Nigeria. The finding is at variance with the findings of Song (2013) and Sarker, Khan and Mannan (2016) who found that Population has a positive effect on

Economic Development (HDI) but supports the findings of Maestas, et al. (2016), and Mohd, et al. (2015). These scholars have found that Population reduces Economic Development (HDI).

Diagnostic Testing for LEB Model

The diagnostic test is conducted to determine if the series fulfill the assumption of normality of distribution, autocorrelation (Breusch-Godfrey Serial Correlation LM Test) and heteroscedasticity (Breusch-Pegan-Godfrey Test). The result of the diagnostic test is presented below.



Source: *Author's Computation using E-views 12*

Figure 4.7 Residual Diagnostic Test Analysis for Model 1 (LEB)

Normality test is essential to ascertain the distribution of the data set in the model. It could be seen in figure 4.7 that the null hypothesis that the variables are normally distributed cannot be rejected since the probability value of Jarque-Bera is greater than 0.05, at 0.601220. This means that the residuals are normally distributed and has not violated the assumption of normality. The histogram-normality test further showed that the model is largely skewed to the right given the skewness statistic value of 0.387206 and possessed a normal tail than the normal distribution given a kurtosis statistic value of 3.207304.

4.2.1.6 Serial Correlation LM Tests of Model 1

One of the assumptions of the ARDL model must not violate is no serial correlation of the residuals. If they become serially correlated, parameter estimates are still linearly unbiased and consistent, but they are no longer having minimum variance as expected. The Lagrange Multiplier (LM) version is applied in this study.

Table 4.7 Residual Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 2 lags

F-statistic	2.699219	Prob. F(2,15)	0.0997
Obs*R-squared	9.527385	Prob. Chi-Square(2)	0.0085

Source: *Author's Computation using E-views 12*

The null hypothesis of no serial correlation is rejected in the LM testing approach, if the probability value (p-value) is smaller than the level of significance which 0.05. From the result in Table 4.8 the null hypothesis cannot be rejected at 5% level of significance because the LM-Stat corresponding to 2 lags used in this study is 2.699219 and the p-value is 0.0997 (9.9%) which is more than 5%.

Table 4.8: The Heteroscedasticity Test Result for Model 1 (LEB)

Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

F-statistic	1.106800	Prob. F(8,29)	0.3873
Obs*R-squared	8.888454	Prob. Chi-Square(8)	0.3518
Scaled explained SS	5.713303	Prob. Chi-Square(8)	0.6793

Source: *Author's Computation using E-views 12*

The null hypothesis of no heteroscedasticity cannot be rejected if the p-value of the Breusch – Pagan statistic is greater than the specified 5% levels of significance. The result in Table 4.8 Shows p-value greater than 0.05 indicating our model is devoid of heteroscedasticity.

Stability Tests for GNI

The stability test tests to know if the estimated ECM model is stable and appropriate. The test is important because it helps to check if the model coefficient is stable and can be used for forecast or prediction. The test for stability was carried out using the cumulative sum (CUSUM) test. If the line of the cumulative sum of the model lie within the 5% critical bound it thus means that it is a stable model. From our observation, the model is very stable.

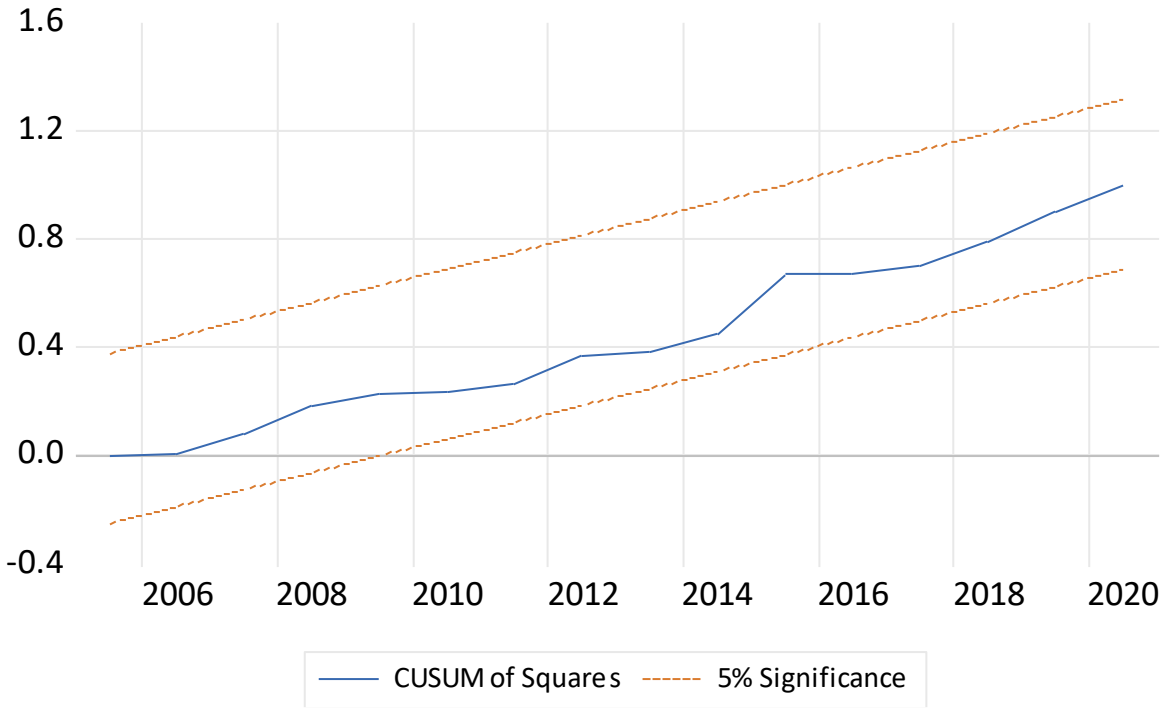


Figure 1 *Plot of Cumulative Sum of Square Recursive Residuals (CUSUMQ)*

Conclusions

Population growth in less developed countries like Nigeria is linked to many problems, including poverty, hunger, high infant mortality and inadequate social services and infrastructure (transportation, communication etc.) Population growth may intensify the rate of poverty which may in turn affect savings and investment. Poor savings and investment affects economic development while economic development in turn affects the population growth. This is an indication that population growth, poverty and economic development are linked. This study is to further explore the linkage in the Nigerian context. The study findings indicated that a long-run relationship exists among the variable, the independent variables also have significant impact on the dependent variable. It is therefore concluded that population growth, poverty rate has negative significant impact on life expectancy at birth in Nigeria within the study period.

Recommendations

The recommendations for this study include;

i. Governments should raise minimum wage, create more employment opportunities, invest in quality and universal education, expand health and medical care, and provide easy access to the political process to reduce the poverty rate in the country.
ii. Government should ensure that the human resources in the country are properly harnessed, developed and channeled into areas of the economy where they can be fully utilized in bringing about high rates of economic growth and development for the country.

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