

## VAR MODELLING OF DYNAMICS OF POVERTY, UNEMPLOYMENT, LITERACY AND PER CAPITA INCOME IN NIGERIA

Adefemi Alamu Obalade, M.Sc.<sup>1</sup>

Ayooluwade Ebiwonjumi, M.Sc.<sup>2</sup>

Anthony Olugbenga Adaramola, Ph.D.<sup>3</sup>

<sup>1</sup> Assistant Lecturer at Ekiti State University, Ado Akiti, Faculty of Management Sciences, Department of Finance  
PMB 5363, Ekiti State, Nigeria  
E-mail: obaladeadefemi@yahoo.com  
ORCID: 0000-0001-6062-1632

<sup>2</sup> University of Ilorin, Faculty of Physical Sciences, Department of Statistics, PMB 1515, Kwara State, Nigeria  
E-mail: jumiayooluwade@yahoo.com  
ORCID: 0000-0002-1959-4377

<sup>3</sup> Senior Lecturer at Ekiti State University, Faculty of Management Sciences, Department of Finance  
PMB 5363, Ekiti State, Nigeria  
E-mail: dr.adaramolaao@gmail.com  
ORCID: 0000-0001-9572-4092

Received 24 March 2018, Accepted 20 April 2019

### Abstract

**Research background:** Poverty, unemployment, literacy and per capita income are intertwined. However, there seems to be a disconnect between literacy and good living in Nigeria.

**Purpose:** This study investigated the dynamic relationship between poverty, unemployment, literacy and per capita income in Nigeria by examining the impact, shocks and responses among these identified variables.

**Research methodology:** The secondary data on poverty, unemployment and literacy rates were extracted from the National Bureau of Statistics and per capita income was extracted from the World Bank Annual Report. A vector autoregressive (VAR) model of lag order (4) was adopted for the study.

**Results:** The results revealed that poverty rate is an increasing function of unemployment rate and literacy rate and a reducing function of per capita income. The results further showed that dynamics of poverty is affected by shocks in unemployment rate, literacy rate and per capita income.

**Novelty:** Therefore, the study concluded that literacy rate fails as a vital tool for poverty reduction and that the high rate of unemployment results in chronic poverty. The application of VAR to untangle the interrelationship among the variables, without doubt, adds to the literature on the uses of the VAR model.

**Keywords:** VAR, Poverty, Unemployment, Illiteracy, per capital income

**JEL classification:** C01, I24, I32, J21, P43

## **Introduction**

Poverty has no generally acceptable definition. It may be viewed from both economic and social perspectives which cannot be easily quantified. Poverty is one of the universal challenges that are threatening the life and properties of the citizens of developing nations including Nigeria. It has also been identified as the main cause of social evils in society. One who finds it difficult to meet the minimum level of economic welfare and lacks the fundamental means of satisfying basic needs is said to be in poverty (Adedokun, Adeyemo, 2008). M.A. Illiyasu, A. Hamidu (2006) identified the fundamental needs in life to include clothing, food, shelter, health, education and recreation. Thus, any individual who is unable to acquire these basic needs of life is living in poverty.

Nigeria was ranked high among the countries whose citizens are faced with poor housing, malnutrition, unemployment, diseases, lack of portable water, low literacy, gender and income inequality which are indicators of poverty (Oni, 2010). The resultant effect of poverty is insecurity which has led to loss of life and properties. The National Teachers' Institute (2008) defined poverty as the various economic situations where individuals are unable to cope with the condition of living in society in terms of feeding, shelter, clothing and education. The World Bank (2005) opined that literacy is cherished as the basis for economic progression and social mobility. It reduces poverty by enhancing the efficiency of the work force. The multiplier effect of such efficiency leads to economic growth. This economic growth is expected to transform into higher per capita income thereby reducing the poverty level. S.B. Thapa (2010) opined that the lack of necessary education could, in itself, be viewed as poverty. Investment in education is privately and socially profitable because of its potency against poverty (Thirlwall, 2006). Accordingly, poverty, illiteracy, unemployment and low per capital income, may be viewed as intertwined. In other words, wealth, literacy, employment and high per capital income may not be disconnected.

Nigeria as a nation is endowed with diverse human and material resources and yet poverty is increasing, employment is rising and per capital income is dwindling. In 2010 the literacy rate according to the National Bureau of Statistics was estimated to be 61.3% and currently it is estimated to be 74.7%. However, the National Bureau of Statistics-NBS (2015) established that the poverty and unemployment rates were 70 and 28% respectively which were widely spread with around 126 million Nigerians living below \$1 a day. Thus, based on these statistics, there seems to be a disconnect between literacy and good living in Nigeria. Hence the study presents an empirical investigation on the interrelationship between poverty, unemployment, literacy

and per capital income in Nigeria by examining the impact, shocks and responses among these identified variables. The following sections are literature reviews, research methods, analysis and a discussion of the results and a conclusion and recommendation.

## **1. Literature Review**

The connection between education and employment was established previously by Jensen and Verner (1996) in their duration models that the chance of getting employed increases with the length of education. In addition, studies have also linked high literacy with high wages and income (Jensen, Holm, 2000) and unemployment with poverty (Marichen, Ignatius, 2015). Empirically, M. Ravallion (2006) examined the effects of per capital income as a measure of economic growth on poverty in India and China in 1980–2000. The study revealed that economic growth reduced poverty in the two countries and income inequality reduced the effectiveness of poverty reduction. It was further emphasized that poverty reduction needed the combination of economic growth and income inequality reduction. R.A. Hakim, N.A.A. Razak and R. Ismail (2010) examined the causal relationship of social capital and poverty in Malaysia using the logit model. The result showed that social capital played a significant role in poverty reduction. It was further revealed that social capital, human capital, physical capital, age and gender of the head of the household, size of the household also play a significant role in poverty alleviation. Thus, institutional and human capital development helps in reducing poverty.

H.M. Sabir, Z. Hussain and A. Saboor (2006) carried out a study to examine the status of poverty in Pakistan. The study used 300 samples of randomly selected small farmers and the analysis was done using a descriptive analytics technique. The result revealed that education as a factor reduced poverty. The result further revealed that the old age of the head of household, large size of the household, small output and low price, inadequate infrastructure and high dependency ratio were the determinants of high poverty in Pakistan. Also, it was discovered that gender inequality used in assessing education facilities enhances poverty level and hinders economic growth thus limit per capita income. Also, M. Ali and M. Nishat (2010) examined the effect of foreign inflows on poverty through education, health and other human development indicators. An autoregressive distributed lag (ARDL) approach to co-integration on time series data (1972–2008) was adopted for the study and the result revealed a positive relationship between poverty, infant mortality, female enrolment and foreign inflows. Further, A.R. Chaudhary, I. Iqbal and S.Y.M. Gillani (2009) investigated the causality between higher education and economic growth in Pakistan between 1972 and 2005. The results of a co-integration approach

revealed a long run relationship among education, labour, per capita and real gross domestic product. Causality results showed the unidirectional causality from real per capita income to higher education. Similarly, M.S. Awan, N. Malik, H. Sarwar and M. Waqas (2011) evaluated the effect of different levels of education, experience and gender of the employed individuals as the determinants of poverty using data from the Household Integrated Economic Survey (HIES) for the years 1998–1999 and 2001–2002. The estimated parameters of the model were obtained using logistic regression and it was discovered that experience and educational achievement are negatively related with poverty incidence in both years. The result further revealed that as individual educational level increases, the probability of the person being out of poverty also increased. Moreover, M. Afzal, H. Rehman, M.S. Farooq and K. Sarwar (2011) examined the causal relationship between education and economic growth in the case of Pakistan for the period of 1971–1972 to 2008–2009. A co-integration and granger causality approach were adopted for the study and the results revealed a long run equilibrium relationship between education, labour force, physical capital and economic growth. The results of causality established a bi-directional causality between education and economic growth that could enhance the level of per capita income of the labour force.

In Nigeria, T.G. Apata, O.M. Apata, O.A. Igbalajobi and S.M.O. Awoniyi (2010) examined the determinants of rural poverty in the South-West. The sample of 500 subsistence farmers selected for the study were analysed using the probit model to establish factors that influence the probability of households escaping chronic poverty. In the study, it was found that access to micro-credit, education, participation in agricultural workshops or seminars, livestock asset and access to extension services significantly influence the probability of households escaping chronic poverty. On the other hand, female headed households and distance to a market increases the probability of prevailing chronic poverty while gender disparities in property rights in favour of women empowerment through legal rights to property act and serve as a key to chronic poverty ameliorating factors among farming communities. Similarly, H. Ibrahim and H.S. Umar (2008) assessed the determinants of poverty as well the poverty coping strategies among farming households in Nasarawa State, Nigeria. The study employed a simple random sampling technique to select 150 farming households. The study revealed that the incidence of poverty among the sampled households was high. It was also shown that the major determinants of poverty were household size, number of income sources of the head of the household, number of household members employed outside agriculture and the number of literate adult males and females in the household. Further, S.A. Muhammad, N.D. Oye and I. Inuwa (2011) examined the impact of unemployment on the Nigerian Gross Domestic

Product for a period of nine years (2000–2008) using the regression analysis. The findings showed that an inverse relationship exists between unemployment and gross domestic product which in turn reduced the workforce per capita income. Additionally, A.S. Bakare (2010) examined the determinants of urban unemployment in Nigeria. The variables used include level of unemployment, demand for labour, labour supply, population, inflation, capacity utilization, gross capital formation and nominal wage rate. The parsimonious error correction mechanism obtained from the result revealed that the rising nominal wages and the accelerated growth of population which affected the supply side through a high and rapid increase in the labour force relative to the absorptive capacity of the economy appear to be the main determinant of high unemployment in Nigeria. Thus, unemployment increases as a result of the inability to develop and utilize the nation's manpower resources effectively. H.S. Ahmad and M.Z. Imam (2013) examined the causal relation between poverty and education in Nigeria (1970–2009) using the Autoregressive Distributed Lag technique. The results of the study revealed a causal relationship between poverty and education during the period under study. Specifically, in the short-run, it was observed that an improvement in educational attainment does not reduce poverty. Thus an improvement in the standard of education provided in Nigeria is needed so that education can play its role of improving welfare and reducing poverty.

Furthermore, J.N. Ejikeme (2014) investigated the relationship between unemployment, poverty and the insecurity of lives and properties in Nigeria. The primary objective of the study was to ascertain whether the increased wave of violence in Nigeria was as a result of unemployment and poverty. The study stressed that unemployment and poverty are a universal phenomenon, not necessarily a peculiar characteristic of any particular segment of society. The study revealed that unemployment and poverty have a direct link to security challenges in Nigeria. Thus, the need for a radical reform in the areas of skill acquisition centres, agricultural development schemes for the creation of employment opportunities and holistic restructuring of peace building mechanisms to curb these social ills and the repositioning of a drifting nation to a more purposeful track. O.D. Adekoya (2018) examined the relationship between the elements of human capital development and poverty alleviation in Nigeria, from 1995–2017. It investigates the causal relationship between the human capital development explicitly measured on health and education and its impact on poverty alleviation measured by per capita income over the period of the time stated. The study uses the Granger causality test to determine whether the elements of education and health care have any effect(s) on per capita income. The result indicates that there is no causality either uni-directional or bi-directional between government expenditure on education and health, infant mortality, gross enrolment ratio and

per capita income but cases of uni-directional causality existed for literacy rate, life expectancy, and per capita income. Therefore, it can be suggested that the government should ensure that it invests more in education and health as they are essential factors that can help in alleviating poverty. However, the dynamic relationship between poverty, unemployment, literacy and per capita income were examined in this study. While previous studies in Nigeria have attempted to check the effect of one or more of these variables on the other(s), they have not unravelled the interrelationship among them.

## **2. Research Method**

### **2.1. Data**

For the vector autoregressive investigation of the dynamic of poverty in relation to the unemployment, literacy and per capital income in Nigeria, the study employed time series data over a fifteen year period from 1991 to 2015. The Vector Autoregressive model enables interaction among all the variables in the system. Data on poverty, unemployment and literacy, expressed in percentages, were extracted from the National Bureau of Statistics (2017) and per capita income was extracted from the World Bank Annual Report (2017). Poverty was measured as the proportion of individuals whose average expenditure per day was less than a dollar (MDG Handbook, 2012). The unemployment rate was measured as the ratio of the active labour force that were willing to work and looking for job but without a job to total active labour force in the population expressed in percentages. Literacy is the proportion of individuals in the population that attained secondary education and the per capita income was computed as the ratio of total gross domestic product to total labour force expressed in percentages. The necessary VAR models and diagnostics techniques required for taking decisions and arriving at an acceptable conclusion is specified below.

### **2.2. Model Specification**

The Vector Autoregressive (VAR) model is a widely used econometrics technique for modelling a multivariate time series. The VAR model and simultaneous equation model (SEM) look the same, but in specifying the VAR model, few and weak restrictions are imposed (Sims, 1980 and Chowdhury, 1986). VAR has provided a vital tool for analysing dynamics among time series processes because of its attractive features. W.D. Mcmillin (1991) and M. Lu (2001) opined that VAR models are made of sets of relationship that contain both the lagged values and the current values of all system variables. VAR models have been used empirically in many

investigations such as: T. Park (1990) used VAR models to forecast the U.S cattle market, D.A. Bessler (1984) used VAR models to study Brazilian agricultural prices, industrial prices and money supply and M.S. Kaylen (1988) used VAR and other forms of the model to forecast the U.S Hog market. In addition, K.L. Haden and L.W. VanTassell (1988) applied VAR to study the dynamic relationships in the dairy sector of U.S., D. Holtz-Eakin, W. Newey and H.S. Rosen (1988) applied the VAR model to panel data, T.A. McCarty and S.J. Schmidt (1997) used the VAR model to study government expenditures while M. Lu (2001) applied a VAR model for the dynamics of the U.S population between 1910 and 1990. Also in Nigeria, O.O. Salawu and O.E. Olubusoye (2006) compared VAR and other estimation techniques on macroeconomic models; M.O. Adenomon, B.A. Oyejola and C.A. Adenomon (2012) applied the VAR approach to the relationship between savings and investment and M.O. Adenomon, V.E.T. Ojehomon and B.A. Oyejola (2013) used VAR to model the dynamic relationship between rainfall and temperature time series data. Moreover, this study represents an application of VAR in the investigation of the dynamic relationship among the poverty, unemployment, literacy and per capita income in Nigeria. The structural analysis forecast, variance decomposition and the impulse response functions among the economic variables were also thoroughly examined. This without doubt adds to the literature on the uses of the VAR model.

Thus, to determine the interaction between poverty and unemployment, literacy and per capital income, the following VAR model was considered:

$$Y_t = C + A_1 Y_{t-1} + A_2 Y_{t-2} + \dots + A_p Y_{t-p} + U_t \quad t = 0, \pm 1, \pm 2 \quad (1)$$

where:

$Y_t = [\text{POVR}_t, \text{UNER}_t, \text{LITR}_t, \text{PCIN}_t]'$  is a  $(k \times 1)$  random vector,

$A_i$  = fixed  $(k \times k)$  coefficient matrices,

$C = k \times 1$  vector of constants permitting the possibility of a non-zero mean  $E(Y_t)$ ,

$U_t = [U_{1t} \dots U_{kt}]'$  a  $k$ -dimensional white noise,

i.e.  $E(U_t) = 0$ ,  $E(U_t U_s') = \Sigma_u$  and  $E(U_t U_s') = 0$ ;  $s \neq t$ .

The Covariance matrix  $\Sigma_u$  is assumed to be non-singular, implying its determinant exists.  $Y_t$  is a stable VAR(P) process if  $\det(I_K - A_1 \Phi^1 - \dots - A_p \Phi^p) \neq 0$ ,  $|\Phi| \leq 1$ .

The unrestricted vector autoregressive model in linear form is presented and given below:

$$\text{POVR}_t = \sum_i^h (\psi_i \text{POVR}_{t-i} + \beta_{1i} \text{UNER}_{t-i} + \beta_{2i} \text{LITR}_{t-i} + \beta_{3i} \text{PCIN}_{t-i} + \epsilon_{1t}) \quad (2)$$

$$\text{UNER}_t = \sum_i^h (\tau_i \text{UNER}_{t-i} + \mathfrak{U}_{1i} \text{LITR}_{t-i} + \mathfrak{U}_{2i} \text{PCIN}_{t-i} + \mathfrak{U}_{3i} \text{POVR}_{t-i} + \mathfrak{E}_{2t}) \quad (3)$$

$$\text{LITR}_t = \sum_i^h (\chi_i \text{LITR}_{t-i} + \gamma_{1i} \text{PCIN}_{t-i} + \gamma_{2i} \text{POVR}_{t-i} + \gamma_{3i} \text{UNER}_{t-i} + \mathfrak{E}_{3t}) \quad (4)$$

$$\text{PCIN}_t = \sum_i^h (\phi_i \text{PCIN}_{t-i} + \Upsilon_{1i} \text{POVR}_{t-i} + \Upsilon_{2i} \text{UNER}_{t-i} + \Upsilon_{3i} \text{LITR}_{t-i} + \mathfrak{E}_{4t}) \quad (5)$$

where:

$\text{POVR}_t$  – poverty rate,

$\text{UNER}_t$  – unemployment rate,

$\text{LITR}_t$  – literacy rate,

$\text{PCIN}_t$  – per capita income,

$\mathfrak{E}_{it}$  – stochastic error term,

the parameters to be estimated are:  $\psi_i$ ,  $\tau_i$ ,  $\chi_i$ ,  $\phi_i$ ,  $\beta_{ki}$ ,  $\mathfrak{U}_{ki}$ ,  $\gamma_{ki}$  and  $\Upsilon_{ki}$ .

### Lag Length Selection Model

The optimal lag length (p) is determined using the following criteria and p is chosen to be the order that minimizes the criterion given as follows:

$$\text{AIC}_{(p)} = \ln |\hat{Z}_{(p)}| + \frac{2}{T} \text{PK}^2 \quad (6a)$$

$$\text{SIC}_{(p)} = \ln |\hat{Z}_{(p)}| + \frac{2 \ln T}{T} \text{PK}^2 \quad (6b)$$

$$\text{HQIC}_{(p)} = \ln |\hat{Z}_{(p)}| + \frac{2 \ln \ln T}{T} \text{PK}^2 \quad (6c)$$

where:  $\hat{Z}$  – estimated covariance matrix and  $T$  – number of observations of the Akaike Information Criterion (AIC); the Schwarz Information Criterion (SIC); the Hannan and Quinn information Criterion (HQIC). Finally the lag length (p) that is associated with the minimum AIC, SIC and HQIC values from a set of AIC, SIC and HQIC values is selected as the appropriate lag length (p) for the model.

### 2.3. Forecast Error Variance Decompositions (FEVDs)

After identifying the innovation that drive the system, forecast error variance decomposition was used as a tool for further interpretation of the VAR model. Consider the FEVD model:

$$\beta_1 = T \Lambda T^{-1} \quad (7a)$$



$$\beta_1^j = T\Lambda^jT^{-1} \quad (7b)$$

where,  $\Lambda$  is a diagonal matrix with  $\lambda_1$  and  $\lambda_2$  the eigen values of the matrix  $\beta$ .  $T$  is a matrix with corresponding eigen vector  $x_1$  and  $x_2$ :

$$Y_t = \beta_1^t Y_0 + \beta_0 + \sum_{j=0}^{t-1} T\Lambda^jT^{-1}V_{t-j} \quad (8)$$

The response of element  $i$ , to a shock in element  $j$ ,  $k$  periods ago are given by:

$$\frac{\delta Y_{t,i}}{\delta V_{t-k,j}} = [\beta_1^k]_{ij} = [T\Lambda^kT^{-1}]_{ij} = a_{ij}\lambda_1^k + b_{ij}\lambda_2^k \quad (9)$$

where  $a_{ij}$  and  $b_{ij}$  are determined by the elements of  $T$  and  $T^{-1}$ .

When there is a change in one innovation (error) such that other contemporaneous values of the innovations are fixed, it must be noted that changes in errors in the same time period will be correlated if the variance covariance matrix is not diagonal. Error correlations are to ensure that movements in one innovation are associated with movements in the others such that more than expected an increase in the unemployment rate (a positive error), for instance, makes one think more likely that it will result in more poverty (a positive error). Thus, the need for a decision on how to handle this contemporaneous correlation.

## 2.4. Impulse Response Functions (IRF)

The Impulse Response Function is used to determine the extent of responsiveness of every endogenous variable to a shock in its own value and in every other variable over time. In this study, the impulse response analysis was employed to disclose the interaction between poverty rate, unemployment rate, literacy rate and the capita income within the VAR model. IRF is given as:

$$Y_t = \lambda + \beta_0\lambda_t + \beta_1\lambda_{t-1} + \beta_2\lambda_{t-2} \quad (10)$$

This equation expresses changes in  $Y_t$  given that a change had occurred in the residual. Plotting the IRF maps at the “cyclic” created in all variables given the ‘shock’ in one variable:

$$\frac{\delta Y_{1,t+k}}{\delta \lambda_{i,t-k}} = \frac{\delta Y_{1,t}}{\delta \lambda_{i,t-k}} = \beta_{ij}^k, \quad i, j = 1, 2, \dots, n, \quad s > 0.$$

### 3. Analysis and Discussion of the Results

#### 3.1. Lag Selection

It is better, to determine the optimal number of lags to be employed by the VAR approach before a further estimation. Table 1 shows the results of the vector autoregressive lag length required for this study. From the results, the vector autoregressive lag order of four (4) is selected due to the statistical significant of the Akaike information criterion, the Schwarz information criterion and Hannan-Quinn information criterion values of  $-15.03528$ ,  $-11.65301$  and  $-14.30124$  respectively at a 5% level of significance. It was on this basis that a vector autoregressive of lag order four (4) was put in this study.

Table 1. VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	67.99890	NA	2.65e-08	-6.095133	-5.896177	-6.051955
1	118.2890	76.63254*	1.05e-09	-9.360857	-8.366074	-9.144964
2	133.0934	16.91933	1.44e-09	-9.246992	-7.456382	-8.858384
3	157.2633	18.41512	1.20e-09	-10.02507	-7.438636	-9.463750
4	225.8704	26.13605	4.35e-11*	-15.03528*	-11.65301*	-14.30124*

\* Indicates the selected lag base on the information criterion.

Source: authors' computation (2018).

#### 3.2. Result of the VAR Estimation

Table 2 shows the result of the VAR model of the dynamics of poverty in Nigeria with the coefficient of parameters and [*t*-statistic]. It was discovered that poverty at lag one and two, unemployment at lag three and four, literacy at all lags and per capita income at lag three have a direct relationship with the current level of the poverty situation in Nigeria. Specifically, one per cent improvement in the poverty, unemployment, literacy and per capita income at the identified lags worsen the current level of poverty in Nigeria by 6.11, 19.47, 6.66, 10.43, 24.32, 92.42, 222.66, 176.72 and 155.58% respectively. However, poverty at lag three and four, unemployment at lag one and two, per capita income at lag one, two and four have an inverse relationship with the current level of poverty. This implies that poverty, unemployment, per capita income at these lags reduces the current poverty level by 21.69, 41.14, 5.01, 9.15, 324.60, 221.17 and 726.44% respectively. Per capital income except at lag three appear to have the expected reducing effect on poverty but this is not supported by unemployment, an indication

of unequal distribution of wealth or income in the economy. The adjusted R-Square revealed that 65.7, 84.2 49.5 and 88.8% variations in the current level of poverty, unemployment, literacy rate and per capita income respectively can be explained by their lags and the F-statistic values of 3.39, 7.68 and 10.86 > 3.22, the critical value at 5% level of significance revealed the significance and adequacy of the VAR model.

Table 2. Vector Autoregressive (VAR) Model Result

	POVR	UNER	LITR	PCIN
POVR(-1)	0.0612 [0.1766]	-1.1550 [-0.5457]	-0.0702 [-0.1646]	-0.0884 [-0.9054]
POVR(-2)	0.1947 [0.5574]	-0.1663 [-0.0779]	0.4236 [0.9839]	-0.0617 [-0.6261]
POVR(-3)	-0.2169 [-0.6213]	-0.2874 [-0.1347]	0.1033 [0.2401]	0.0799 [0.8127]
POVR(-4)	-0.4113 [-1.2528]	3.2351 [1.6122]	-0.2842 [-0.7024]	-0.0871 [-0.9404]
UNER(-1)	-0.0501 [-0.9091]	0.0584 [0.1731]	0.0404 [0.5944]	0.0079 [0.5105]
UNER(-2)	-0.0915 [-1.6130]	-0.1084 [-0.3128]	-0.0360 [-0.5152]	0.0099 [0.6227]
UNER(-3)	0.0666 [0.9831]	0.0406 [0.0980]	0.0177 [0.2116]	-0.0214 [-1.1179]
UNER(-4)	0.1043 [1.2472]	0.0803 [0.1571]	0.0809 [0.7843]	0.0106 [0.4473]
LITR(-1)	0.2432 [0.5652]	0.6321 [0.2404]	0.1041 [0.1963]	0.2649 [2.1835]
LITR(-2)	0.9242 [1.5531]	3.6309 [0.9984]	-0.0322 [-0.0440]	0.2361 [1.4072]
LITR(-3)	2.2266 [2.2177]	4.8346 [0.7879]	-0.8873 [-0.7171]	-0.0189 [-0.0669]
LITR(-4)	1.7672 [1.8786]	1.3181 [0.2293]	0.1763 [0.1521]	0.2347 [0.8851]
PCIN(-1)	-3.2460 [-1.6111]	-6.6098 [-0.5368]	1.4471 [0.5828]	1.0044 [1.7681]
PCIN(-2)	-2.2117 [-0.8417]	1.0143 [0.0632]	-1.4278 [-0.4409]	-0.9974 [-1.3464]
PCIN(-3)	1.5558 [0.8331]	0.8494 [0.0744]	1.2944 [0.5624]	0.6530 [1.2403]
PCIN(-4)	-7.2645 [-1.9490]	-6.3805 [-0.2801]	0.2243 [0.0488]	-1.3627 [-1.2968]
C	6.6366 [1.9648]	-24.7405 [-1.1985]	2.7620 [0.6635]	1.06391 [1.1171]
R-squared	0.9314	0.9685	0.8990	0.9775
Adj. R <sup>2</sup>	0.6570	0.8423	0.4948	0.8875
F-statistic	3.3942	7.6785	2.2243	10.8602

Source: authors' computation (2018).

### 3.3. Variance Decomposition of the Economic Variables

The proportion of forecast error variance in a variable that is explained by innovations in itself and the other variables can be measured by variance decomposition. The technique breaks down the variance of the forecast error for every variance following a shock to a given variable and in this way determines variables that bear the strong effect of the shocks. Table 3 shows that variation in all the variables resulted from their own shocks. The shocks resulting from poverty ranged from 100% in the first period through 26.15% in the fifth period and finally to 17.66% in the tenth period. Apart from poverty past values, unemployment rate, literacy rate and per capita income are also responsible for variation in poverty. Initially, unemployment has no impact until

the fifth period when its contribution rose from 55.98% to 61.16 in the eighth period and finally to 67.10%.

Table 3. Variance Decomposition of Poverty

Period	S.E.	POVR	UNER	LITR	PCIN
1	0.053984	100.00000	0.00000	0.00000	0.000000
2	0.076788	50.57718	32.27366	15.64373	1.505428
3	0.127059	25.27762	60.90615	11.96849	1.847739
4	0.136155	29.52478	57.48284	11.26662	1.725766
5	0.187841	26.14723	55.98434	15.05721	2.811226
6	0.295758	22.71768	64.21454	11.40369	1.664096
7	0.381331	16.19139	60.30390	22.50360	1.001108
8	0.387968	15.71522	61.15971	22.00599	1.119078
9	0.398639	15.87292	61.98874	21.00619	1.132142
10	0.495561	17.66092	67.09910	13.59816	1.641820

Source: authors' computation (2018).

Also, literacy and per capita income have no effect in the first period but rose to 15.06 and 2.81% respectively in the fifth period. The shocks in literacy further increased to 22.01% while shocks in per capita income declined to 1.12 in the eighth period. Finally, the shocks in literacy and per capita income stood at 13.60 and 1.64% respectively to shocks in poverty in the tenth period.

### 3.4. Impulse Response

Impulse response was estimated to quantify the responsiveness of variables to structural changes in the system. In this research the response of poverty to a shock in unemployment, literacy and per capita income were observed and depicted in the graph (Figure 1).

The impulse responses for all of the ten periods were given in Figure 1. The response of poverty to shock in unemployment was positive throughout the ten periods except in the 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, 6<sup>th</sup> and 7<sup>th</sup> periods. The result indicates that, an increase in poverty was a resultant effect of increase in the unemployment rate in Nigeria. On the other hand, the responses of poverty to shock in the literacy rate were only positive in the 2<sup>nd</sup>, 4<sup>th</sup>, 8<sup>th</sup>, 9<sup>th</sup> and 10<sup>th</sup> periods. This result implies that literacy worsens the poverty situation in Nigeria by 0.6, 0.08, 3.8, 5.7 and 8.7% respectively. Also, the responses of poverty to shock in per capita income were positive throughout the ten periods except in the 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> period. The response of poverty to shock in per capita income in the 6<sup>th</sup>, 7<sup>th</sup>, 8<sup>th</sup>, 9<sup>th</sup> and 10<sup>th</sup> period are 0.3, 1.1, 1.1, 4.5 and 3.5% respectively.

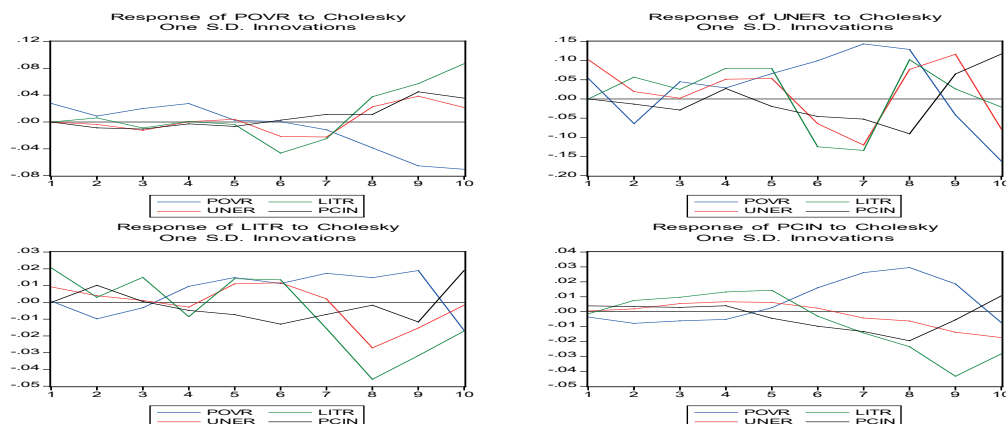


Figure 1. Graphical Illustration of Impulse Response of Poverty

Source: authors' computation (2018).

## Conclusion and Recommendation

The main aim of this research was to examine the dynamic relationship that exists between poverty rate, unemployment rate, literacy rate and per capita income in Nigeria for a period of twenty five years using a VAR model. Based on the findings, it was established that literacy failed to be a vital tool for poverty reduction against the belief that literacy increases the probability of being employed, creating a better means of a livelihood and earning more than uneducated individuals. This study is not consistent with H.M. Sabir, Z. Hussain and A. Saboor (2006) in Pakistan but it supports H.S. Ahmad and M.Z. Imam (2013) in Nigeria. The high rate of unemployment may be the reason for increasing the effect of education on poverty. The study also revealed that the high rate of unemployment worsens the poverty situation. The lags between poverty and unemployment imply that unemployment did not immediately transmit to poverty. This may be because many school leavers depend on their parents for some time (McDonald, 1993). This suggests that there is time lag between the time a student completes his/her education and the time the student becomes independent, and begins to feel the effect of unemployment. A. Barr, L. Miller, and P. Ubenda (2016) opined that unemployment has a number of socio-economic, political and moral consequences and this could lead to low productivity and chronic poverty. The findings of this research imply that the high rate of poverty in Nigeria reflects the high level of unemployment that has ravaged the country during the period under study. Moreover, the developmental policy of the government to effectively tackle

the menace of poverty or raise the level of per capita income will still require resolving the illiteracy and unemployment problem. In conclusion, the use of VAR in this study is novel to the subject area in Nigeria and it brings out the dynamic relationship among the variables under consideration. VAR may also be applied by future researchers using quarterly or monthly data as more and more data becomes available.

## References

---

- Adedokun, M.O., Adeyemo, W.C. (2008). Role of Community Education in poverty alleviation. *Journal of Educational Foundations and Management*, 6 (1), 125–141.
- Adekoya, O.D. (2018). Impact of Human Capital Development on Poverty Alleviation in Nigeria. *International Journal of Economics & Management Sciences*, 7 (4), 1–8
- Adenomon, M.O., Ojehomon, V.E.T., Oyejola, B.A. (2013). Modeling the Dynamic Relationship between Rainfall and Temperature Time Series Data in Niger State, Nigeria: A Vector Autoregressive Analysis Approach. *Journal of Mathematical Theory and Modeling*, 3 (4), 53–70.
- Adenomon, M.O., Oyejola, B.A., Adenomon, C.A. (2012). On the Relationship Between Savings and Investment in Nigeria: A Vector Autoregressive Analysis Approach. *Journal of The Nigerian Statistical Association*, 24, 45–58.
- Afzal, M., Rehman, H., Farooq, M.S., Sarwar, K. (2011). Education and economic growth in Pakistan: A cointegration and causality analysis. *International Journal of Educational Research*, 50, 321–335.
- Ahmad, H.S., Imam, M.Z. (2013). *A Study of Causality between Poverty and Education in Nigeria*. Paper presented at the 4<sup>th</sup> National Conference on Education in SRCOE, Kano from 10th–13th September, 1–14.
- Ali, M., Nishat, M. (2010). Do foreign inflows benefit Pakistani poor? *Paper presented at 25<sup>th</sup> annual general meeting and conference of Pakistan society of development economists*, Marriot, Islamabad, Pakistan, 16th to 18<sup>th</sup> March, 2010. *American Journal of Agricultural Economics*, 66 (1), 25–30.
- Apata, T.G., Apata, O.M., Igbalajobi, O.A., Awoniyi, S.M.O. (2010). Determinants of rural.
- Awan, M.S., Malik, N., Sarwar, H., Waqas, M. (2011). Impact of education on poverty reduction. *International Journal of Academic Research*, 3 (1), 659–664.

- Bakare A.S. (2010). The determinants of urban unemployment crisis in Nigeria: An econometric analysis. *Journal of Emerging Trends in Economics and Management Sciences (JETEMS)*, 2 (3), 184–192.
- Barr, A., Miller, L., Ubenda, P. (2016). Moral Consequences of Becoming unemployed. *Proceedings of the National Academy of Sciences*, 113 (17), 4676–4681.
- Bessler, D.A. (1984). Relative prices and money: A vector autoregression on Brazilian data. *American Journal of Agricultural Economics*, 66 (1), 25–30.
- Chaudhary, A.R., Asim, I., Gillani, S.Y.M. (2009). The nexus between higher education and Economic Growth: An empirical investigation for Pakistan. *Pakistan Journal of Commerce and Social Sciences*, 3.
- Chowdhury, A.R. (1986). Vector Autoregression as Alternative Macro-modeling Technique: *The Bangladesh Development Studies*, 14 (2), 21–32.
- Ejikeme, J.N. (2014). Unemployment and Poverty in Nigeria: a link to National Insecurity. *Global Journal of Politics and Law Research*, 2 (1), 19–35.
- Haden, K.L., VanTassell, L.W. (1988). Application of vector autoregression to dynamic relationships within the U.S diary sector North Central. *Journal of Agricultural Economics*, 10 (2), 209–216.
- Hakim, R.A., Razak, N.A.A., Ismail, R. (2010). Does social capital reduce poverty? A case study of rural households in Terengganu, Malaysia. *European Journal of Social Science*, 4 (14), 556–566.
- Holtz-Eakin, D., Newey, W., Rosen, H.S. (1998). Estimating vector autoregression with panel data. *Econometrica*, 56 (6), 1371–1395.
- Ibrahim, H., Umar, H.S. (2008). Determinants of poverty among farming households in Nasarawa State, *PAT*, 4 (1), 11–21.
- Illiyasu, M.A., Hamidu, A. (2006). Entrepreneurship Education and National Development of Primary Education in Nigeria. *Journal of Business Education*, 1 (1), 63–73.
- Jensen, P., Svarer, M. (2003). Short- and long-term unemployment: How do temporary layoffs affect this distinction? *Empirical Economics*, 28, 23–44.
- Jensen, T.P., Holm, A. (2000). “Danskernes læse-regne-færdigheder – i et internationalt lys” (Prose literacy and mathematical literacy of the Danes – an international perspective), AKF Forlaget. *Journal of Science and Technology Education Research*, 1 (4), 85–91.
- Kaylen, M.S. (1988). Vector Autoregression Forecasting Models: Recent Developments Applied to U.S Hog Market. *American Journal of Agricultural Economics*, 70 (3), 701–712.
- Lu, M. (2001). Vector Autoregression (VAR) as Approach to Dynamic analysis of Geographic Processes. *Geogr. Ann.*, 83 (2), 67–78.

- Marichen, V.W., Ignatius, S. (2015). The struggle against poverty, unemployment and social injustice in present-day South Africa: Exploring the involvement of the Dutch Reformed Church at congregational level. *STJ*, 1 (2), 731–759.
- McCarty, T.A., Schmidt, S.J. (1997). A Vector Autoregression Analysis of State Government Expenditure. *The American Economic Review*, 87 (2), 278–282.
- McDonald, M. (1993). Depending on Parents. *Family Matter*, 3. Retrieved from: <https://aifs.gov.au/publications/family-matters/issue-35/depending-parents>.
- Mcmillin, W.D. (1991). The velocity of M1 in the 1980s: Evidence from a multivariate time series. *Southern Economic Journal*, 57 (3), 634–648.
- Muhammad, S.A., Oye, N.D., Inuwa, I. (2011). Unemployment in Nigeria: Implication on the Gross Domestic Product (GDP) over the Years. *International Journal Economics Resources*, 2 (1), 66–71.
- National Bureau of Statistics (2010, 2013, 2015). Poverty Profile for Nigeria. *Annual Abstracts*. Federal Republic of Nigeria. *Paper Presented at the 4th National Conference on Education in SRCOE, Kano*.
- Nili, M., Nafisi, S.H. (2003). Relationship between Human Capital and Economic Growth. *Quarterly Journal of Economic Researches of Iran*, 17.
- Oni, D.A. (2010). *Role of Microfinance on Poverty Alleviation Programme Among Nigerian Youths*. Unpublished M.B.A Dissertations Obafemi Awolowo University Ile-Ife, Nigeria.
- Park, T. (1990). Forecasting evaluation for multivariate time series models: The US Cattle Market. *Western Journal of Agricultural Economics*, 15 (1), 133–143.
- Ravallion, M. (2006). *Inequality is bad for the poor*. World Bank Policy Research Working Paper No. 3677.
- Sabir, H.M., Hussain, Z., Saboor, A. (2006). Determinants of small farmers poverty in the Central Punjab (Pakistan). *Journal of Agriculture and Social Sciences*, 1 (2).
- Salawu, O.O., Olubusoye, O.E. (2006). A Comparison of Alternative Estimators of Macroeconomic Models. *Journal of the Nigerian Statistical Association*, 18, 23–34.
- Sims, C.A. (1980). Macroeconomics and Reality. *Econometrica*, 48 (1), 1–48.
- Thapa, S.B. (2010). The Educational Kuznets Curve: A case of Nepal. *Tribhuvan University Journal*, 27 (1–2).
- Thirlwall, A.P. (2006). *Growth and Development*, 8th ed. Palgrave Macmillan.
- World Bank (2005). *World development indicators*. Washington, DC.
- World Bank Report (2013). Human capital index. WEF\_2013\_Human\_Capital\_Report.pdf.