

# Poverty, Unemployment and Food Insecurity: Empirical Evidence from Nigeria

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## Authors' contributions

The study was carried out in collaboration between both authors. Author OBE designed the study, performed the statistical analysis and wrote the first draft of the manuscript while author ST supervised the entire study. However, both authors read and approved the final manuscript.

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## ABSTRACT

The high incidence of poverty in Nigeria coupled with the alarming rate of unemployment has raised concerns among experts as to their likely relationship with food insecurity. This study examined the nexus between poverty, unemployment and food insecurity using the Johansen cointegration test and the vector error correction model. The result from the Johansen cointegration test suggests a long-run relationship between food insecurity, poverty and unemployment. Findings from the vector error correction analysis showed a positive but insignificant relationship between poverty and food insecurity such that a percentage change in poverty in the current period is associated with a 0.09 per cent increase in food insecurity on average, ceteris paribus. Besides, a positive and significant relationship subsists between unemployment and food insecurity where an increase in unemployment exacerbated the latter. Clearly, a 1 per cent deviation in the previous period unemployment level is associated with a 1.2 per cent degeneration of the food insecurity position in the short run. In the same vein, a 1 per cent change in unemployment in the current period causes a 1.5 per cent aggravation of food insecurity. Following the findings, this study recommends a multi sector-specific approach to solving the issue of poverty in Nigeria targeting agriculture and its employment generating capacity, creating the enabling environment through infrastructure development and improving the ease of doing business for the private sector to strive and enhance its employment generating capacities. The study concludes with a call for the implementation of a

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holistic food security policy targeting improvement in crop yield, internal security problems and the proper funding of agriculture to be effective.

*Keywords: Poverty; unemployment; food insecurity; johansen cointegration; vector error correction model.*

## 1. INTRODUCTION

Nigeria is currently plagued with an avalanche of insecurity issues ranging from insurgency, terrorism, farmer's/herdsmen clashes, militancy, kidnapping, civil conflicts and other social vices. Just recently, the country was declared food-insecure as the number of undernourished people rose astronomically to 25.6 million in 2018 (Food and Agricultural Organization, 2019). It has been documented that poverty and unemployment have implications for food security. Poverty and unemployment are twin economic problems that are endemic in Nigeria. They both represent deprivation. In its 2019 report, the National Bureau of Statistics observed that about 83 million Nigerians representing 40 per cent of the total population lived below the poverty line of \$1.05 per day [1]. Further, the unemployment rate leapfrogged from 17.6 million people in 2017 to 20.9 million in 2018 representing 18.8 per cent and 23.1 per cent of the population respectively.

According to Degefa [2], Poverty is evident in several ways including inadequate access to amenities, lack of access to good shelter, unemployment and lack of access to basic needs. Individuals who live are those who are persistently food insecure and habitually threatened by hunger. Poverty, therefore, speaks to both lacks of income and food. The more one lives in poverty, the more food-insecure one becomes. Unemployment, on the other hand, defines the inability to earn an income due to job unavailability. Inability to earn a living wage affects consumption, which ultimately causes food insecurity.

### 1.1 Poverty and Unemployment Trends in Nigeria

Poverty represents lack, deprivation and inadequate access to basic needs [3], for instance, inadequate access to food, housing, education, employment and health [4] etc. This study defines poverty along the lines of income and food. According to the National Bureau of Statistics, anyone living below the established

poverty line of Naira 137,430 or \$381.71 per annum is classified as income poor [1]. In the same vein, Food and Agricultural Organization (FAO) and the World Health Organization (WHO) have each recommended the minimum basic daily food calorie requirement to maintain balanced health. World Health Organization [5] prescribed calorie intake of between 2500 and 3400 per person while Food and Agricultural Organization [6] approved 2100 daily intake. Anyone unable to achieve this daily intake is food poor. Poverty could deprive one of the means to both achieve the income and food required to sustain a living. Unemployment too could have the same effect. Consequently, World Bank [7] identified the lack of adequate income as a dimension of poverty. This lack of access to income could arise because of unemployment.

As shown in Table 1 below, poverty is endemic in rural Nigeria where about 63.6 of the total population are domiciled. The proportion of the rural population living in extreme poverty is 74.1 per cent of the total population as compared to 25.9 per cent for the urban dwellers. 65.5 per cent of the rural population is food poor as against 34.6 per cent for the urban population.

**Table 1. Rural-Urban Poverty rate (%)**

Areas	Total population	Food poor	Extreme poor
Rural	63.8	65.5	74.1
Urban	36.2	34.6	25.9
National	100	100	100

Source: NBS, 2017

In Nigeria, Poverty is educationally biased against those without any form of schooling as it is more pronounced among those with no level of education at all as compared to those with some degree of education. As shown in table 2, 66.17 per cent male with education lives in poverty as against 34.72 per cent females with no level of education at all. However, those with some level of tertiary education have a low level of poverty as shown in Table 2 below. 18.13 per cent of

**Table 2. Poverty by Household's Education level & Sex (%)**

State	No Education		Post-Secondary Education	
	Male	Female	Male	Female
National	66.17	34.72	18.13	5.66
Urban	43.14	24.66	8.86	3.42
Rural	70.82	39.17	31.2	10.15

Source: National Bureau of Statistics, 2018. [8]

males with tertiary education live in poverty at the National level compared to 5.66 females who live in poverty. A disaggregated analysis shows that this figure is higher for rural areas when compared to urban centres.

For instance, as shown, 8.86 per cent of urban males with tertiary education lived in poverty in 2018 against 3.42 per cent urban females who live in poverty; this is as compared to the outrageous 31.2 rural males and 10.15 per cent rural females respectively.

**Table 3. Unemployment Rate in Nigeria, 1990 – 2018**

Year	Unemployment rate (%)
1990	3.4
2000	13.1
2001	13.6
2002	12.6
2003	14.8
2004	13.4
2005	11.9
2006	12.3
2007	12.7
2008	14.9
2009	19.7
2010	21.1
2013	10
2015	10.4
2017	18.8
2018	23.1

Source: National Bureau of Statistics, Social Statistics, 2018 [8]

On the other hand, Unemployment is a waste of resources as it represents the idle and utilized human resources. According to the National Bureau of Statistics, 2019, it defines those who are willing and able to work, are available and actively seeking employment but cannot find one. Available data shown in Table 3 revealed that unemployment in Nigeria increased steadily from 3.4 per cent in 1990 to 12.6 per cent in 2002. It skyrocketed to 21.1 per cent in 2010 but dropped by 11 per cent to 10 per cent in 2013 before hitting the rooftop and peaked at 23.1 per cent in 2018.

A disaggregated analysis of this unemployment figure revealed that unemployment is age, gender and residence sensitive. For example, unemployment is more prevalent among females compared to their male counterpart. As presented in Table 4, in 2018, 26.6 per cent of female were unemployed as compared to 20.3 per cent of unemployed males. In terms of residence, unemployment is higher in the rural areas recording 23.9 per cent as against the urban proportion of 21.2 per cent in 2018.

**Table 4. Unemployment Rate, 2018**

Age	Million	Rate (%)
15-34	13,145,708	29.7
35-44	3,462,179	16.1
45-54	2,565,920	16.5
55-64	1,753,841	19.1
<b>Gender</b>		
Male	10,120,801	20.3
Female	10,806,847	26.6
<b>Residence</b>		
Urban	5,609,454	21.2
Rural	15,318,194	23.9

Source: National Bureau of Statistics, 2018. [8]

When disaggregated in terms of age, unemployment is highest among the age bracket of 15-34 years with over 13 million people in the category, representing approximately 30 per cent of the population unemployed alone in 2018. This is closely followed by those in the age-grade of 45 to 54 years where over a 2.5million people representing 16.5 per cent of the population in 2018 were unemployed.

## 1.2 Dimensions of Food Insecurity in Nigeria

Food and Agricultural Organization [9] identified four dimensions of food security to include food availability, food accessibility, food utilization and food stability. The absence of these four dimensions of food security defines food insecurity, which can be either temporal or permanent. Temporal food insecurity explains a

short-term situation arising for instance from income and savings gap, fragile conditions, food inflation and food stock decline [10] while permanent food insecurity describes a long-term situation that could arise due to prolonged unemployment.

In Nigeria, due to the long neglect, Agriculture remains highly subsistence, rudimentary and mainly rain-dependent. The country has been unable to produce sufficient food to feed its teeming population, thereby resorting to food imports to cushion the food gaps. As shown in Table 5 below, the food import bill, which was reasonable at Naira377 million from 1999 to 2001, rose astronomically to Naira1028.2billion from 2007 to 2009 peaking at Naira6406.962 billion in 2015 to 2017 period.

In the same vein, the number of undernourished people continued to increase rising from 11.4 million people between 1999 and 2001 to 11.5 million during 2001 to 2003, dropping to 9 million during the period 2007 to 2009 before escalating to 25.6 million people in the period 2016 to 2018. Several reasons have been advanced for food insecurity in Nigeria including the high dependence on imported goods [11], Insecurity occasioned by Boko-haram insurgency, farmers/herdsmen incessant clashes [12] and Population growth [13] amongst others.

### 1.3 Problem Statement

Poverty is endemic in Nigeria where evidence suggests that about 40 per cent of the population live below the poverty income line of less than \$1.05 per day [1]. Further, unemployment is alarming with about 23.1 per cent of the population declared unemployed in 2018 [1] and it is replete with worrisome dimension especially that of youth and graduate unemployment. This twin problem of poverty and unemployment represents a different form of deprivation that has serious implications for food security if prolonged.

Nigeria is currently food-insecure [14]. It cannot produce sufficient food to feed its teeming population as Agriculture have been neglected in favour of oil, underfunded and remains rudimentary and rain-dependent. Huge foreign exchange is budgeted annually on imports of food to augment the deficit in local production. In addition to this neglect of agriculture is the current problem of internal insecurity posing threat to farmers and their crops.

This study, therefore, is an attempt to examine the links between poverty, unemployment and the growing food insecurity in Nigeria during the period 1980 to 2018 using empirical technique rooted in vector error correction modelling.

**Table 5. Food Insecurity Indicators**

Year	Number of people undernourished (million)	Prevalence of under-nourishment (per cent)	Food Imports (Nbillions)
1999-2001	11.4	9.3	377.3294
2000-2002	11.3	9	418.1072
2001-2003	11.5	9	506.125
2002-2004	11	8.3	524.6633
2003-2005	10.1	7.4	573.6548
2004-2006	9.1	6.5	586.4942
2005-2007	8.7	6.1	677.6713
2006-2008	8.7	6	795.8004
2007-2009	9	6	1028.2084
2008-2010	9.5	6.1	1451.5393
2009-2011	9.9	6.2	4025.5882
2010-2012	10.6	6.5	4872.7277
2011-2013	11.7	7	5891.5213
2012-2014	13.4	7.8	4847.7922
2013-2015	15.2	8.6	4025.5882
2014-2016	17.4	9.6	5742.322
2015-2017	21.4	11.5	6406.962
2016-2018	25.6	13.4	6755.765

Source: Food and Agricultural Organization's Statistics, various years.  
Central Bank of Nigeria, Statistical Bulletin, various years

## 1.4 Theoretical and Empirical Literature

This study is anchored on the theory of Relative Deprivation. The theory is associated with Robert Merton [15] and Walter Runciman [16]. According to the proponents, Relative Deprivation is the concrete inability to have access to required resources necessary to sustain a good quality of life such as food, clothing or other substantial possessions essential within a given economy. Longley [17] sees it as a feeling of being inferior rather than better off when compared with those within the same cycle of relationship with the individual. Runciman [16] describes four necessary conditions that explained relative deprivation. This include when an individual does not have any means of sustenance when an individual properly knows those that possess the means of sustenance that the individual lacks, when the individual desires to have the means of subsistence and when the individual is certain that they have every opportunity to acquire the means of sustenance.

As it relates to this study, poverty is a deprivation as it is capable of denying an individual the basic food, shelter and other necessities of life. Further, unemployment is also a deprivation which when it results, denies the unemployed income to meet up with purchase, consumption and the satisfaction of basic needs. The totality of these two deprivations (poverty and unemployment) worsens food insecurity.

The available empirical literature has attempted to establish a clear link between poverty and food insecurity Amartya [18], Carmen, [19] and between unemployment and food insecurity, FAO [20], Akash & Travis [21]. However, the relationship between poverty, unemployment and food insecurity has been scantily investigated. The objective of this paper, therefore, is to examine the links and effect of poverty and unemployment on food insecurity in Nigeria.

Consequently, Tacoli, Bukhari and Susannah [22] examined the relationship between urban poverty, food security and climate change and found that the basic source of urban food insecurity is income poverty. The urban population in their study relied principally on consumption as a decline in income was followed by increases in food prices, which could have substantial consequences on the population. Climate change in their analysis was observed to amplify the environmental and socio-economic

drivers of food insecurity, as its impact was extremely affected by poverty and inequality. They concluded by suggesting a major focus on food production and a reduction in consumption to improve access to food in urban areas.

Wight et al. [23] examined the nexus between poverty and household food insecurity among children using the supplementary poverty measure and the official measure of poverty. They found evidence of a robust and statistically significant relationship between poverty and household food insecurity among children where the incidence of food insecurity increases as the income-to-needs ratio decreases. Their conclusion showed that the possibility of poor households experiencing low food security is the same whether the supplemental poverty measure or official poverty measure are used.

Nwosa [24] investigated the effect of government expenditure on unemployment and poverty rates in Nigeria during the period 1981 to 2011. Using the Ordinary Least square technique, the study found a positive and significant relationship between government expenditure and the unemployment rate. Further, government expenditure was observed to have a negative relationship with the poverty rate. Based on his findings, he recommended policies geared towards addressing the rising unemployment and high poverty rates to achieve the objective of sustainable economic growth. In the same Akinmulegun [25] studied the nexus between unemployment and poverty in Nigeria using descriptive statistics, including charts, percentages and ratios and observed that unemployment is a major driver of poverty in Nigeria during the period under study. He, therefore, recommended the need for a fundamental shift in the macroeconomic policies targeted towards employment generation.

Etana and Tolossa [26] using the binary logistic regression, investigated the effect of unemployment and food insecurity in Urban Ethiopia employing primary data obtained from 410 randomly selected households in Addis Ababa. They found that 55.9 per cent of the respondents were unemployed and about 12.4 per cent of the households were food secure. The incidence of food insecurity was higher among households controlled by unemployed persons. They observed education and economic factors as the strongest factor by which unemployment resulted in food insecurity. They recommended the need to increase employment

prospects through developing human capital to take advantage of the labour market and improve the economic status of households.

Maitra and Rao [27] examined the nexus between Poverty and Food security focusing on a cross-section sample of urban slum dwellers in Kolkata within the background of a simultaneous ordered probit model. Their results indicated that households living in poverty are likely to be food insecure. In this respect, they called for poverty alleviation measures aimed at eliminating food insecurity. In addition, they argued for a multi-dimensional involvement in eliminating food insecurity.

Overall, no specific literature attempted to establish the relationship between the three variables of importance in this study. Again there was no specific study on the Nigerian economy. This study, therefore, is a contribution to empirical literature in this regard.

### 1.5 Scope and Justification of Work Done

The objective of this paper is to examine the links between poverty, unemployment and food insecurity in Nigeria during the period 1980 to 2018 using secondary data. This timeframe was to allow sufficient time to understand the trends among the variables important to the study.

The study reviewed the theory of deprivation as its baseline theory. Although some existing work has attempted to establish the link between poverty and food insecurity vis-a-vis unemployment and food insecurity, not much work existed to document the linkage between poverty, unemployment and food insecurity, especially in Nigeria. This study, therefore, is an attempt to fill this current gap in the literature.

## 2. METHODOLOGY

The study used secondary data obtained from the Central Bank of Nigeria (CBN) statistical bulletin, the National Bureau of Statistics (NBS) and the World Bank. In the model specified, food insecurity is a function of poverty and unemployment expressed in the equation below.

$$finsec = f(pov, unem) \quad (i)$$

Linear estimation of equation (i) by adding an intercept and a stochastic error term results in the following transformation;

$$finsec = \beta_0 + \beta_1pov + \beta_2unem + \epsilon \quad (ii) \\ \beta_1 \& \beta_2 > 0$$

Where **finsec** is the food insecurity variable whose measurement is a function of several multiple indicators, the determination of which is explained in subsection 2.1, **pov** represents poverty while **unem** explains the unemployment variable. Apriori, the relationship between food insecurity, unemployment and poverty is likely to be positive. The high incidence of poverty and high unemployment is likely to worsen the food insecurity situation.

### 2.1 Measure and Derivation of Food Insecurity Index

The concept of food insecurity is difficult to measure. To date, there is no universally acceptable singular measure of food insecurity. Several one-dimensional measures have been used in the literature. For instance, Oguntegbe et al. (2018) used the food production index, Onime [13] used value-added in agriculture, forestry and fishing, Ahmad & Ali (2016) measured food insecurity using food availability; while Okunola, Nathaniel & Festus (2018) utilized agriculture's contribution to GDP. Others such as Weezel (2018), Cafiero (2013) and Smith & Wiesmann (2007) used dietary energy supply and food energy deficiency respectively. However, it has been documented that none of these one-dimensional indexes is sufficient to explain all features of food insecurity. Thus, Sen [28], FAO [29], OECD [30] and Napoli [31] amongst others have advocated for the adoption of a multidimensional and comprehensive index that will capture all aspects of food insecurity. Such a multidimensional index must incorporate all the four dimensions of food security including food availability, access, utilization and food stability.

Thus, following Napoli [31], the approach to the construction of the food insecurity index used as the dependent variable in this study proceeded through the steps below;

- i. Aggregation of indicators for each dimension of food insecurity, complete for the four dimensions, including availability, access, utilization and stability;
- ii. Standardization of the data to convert all the indicators used to a common scale using the Z-score. This step was executed through the use of IBMSPSS (version 25); and

- iii. Computation of the average of the total aggregated dimensions.

In the choice of the indicators to be included in the multidimensional index, OECD [30] recommended a mixture of statistical techniques, theoretical reliability and the accessibility of precise data. The table below shows the indicators from which data were derived to compute the food insecurity index used in this study using the steps enumerated above.

## 2.2 Method of Data Analysis

The analytical method in this study utilized an econometric technique to establish the relationship between poverty, unemployment and food insecurity. The econometric investigation started with a preliminary diagnostic test including plotting the line graph of the variables, which revealed an upward trend as shown in Appendix 1; depicting the time-variant nature of the variables in the model. The descriptive statistics as shown in Appendix 2 revealed that food insecurity averaged 1.6index, while poverty and unemployment averaged 52.4 per cent and 10.96 per cent respectively. With 39 observations, the variables in the model exhibited significant deviations from their means, including 0.34 times for the food insecurity variable, 10.94 and 5.34 times for poverty and unemployment correspondingly. The computed averages differ from median values suggesting

some degree of skewness. The probability test of the Jarque-Bera statistic suggests that the null hypothesis of normal distribution of poverty variable is rejected at the 5 per cent level of significance while that of food insecurity and unemployment cannot be rejected.

Lastly, the classical regression estimated and shown in Appendix 3 revealed an R-square of 42 per cent and a low Durbin Watson statistic of 0.74, an indication that the probability of a spurious regression cannot be rejected. The outcome of the diagnostic analysis is a precondition for carrying out unit root test, the outcome using both the Augmented Dickey-Fuller (ADF) and the Phillip-Perron (PP) test to determine the order of integration of the variables in the model is presented in Table 7;

As shown in Table 7, the unit root results using the Augmented Dickey-Fuller test showed that none of the variables was stationary at levels (no integration at I(0)). However, when the variables (finsec, pov and unem) were first differenced, there was evidence of stationarity with integration at order I(1). Similarly, the Phillip-Perron test confirmed the same result obtained under the Augmented Dickey-Fuller test. Since the variables in the model were integrated of the same order one, that is follows I(1) series only, the vector error correction model (VECM) can be specified and estimated.

**Table 6. Dimensions of food security & indicators for Nigeria**

Dimension	Indicators	Data source
Availability	Arable land (hectares/capita)	World Bank
	Cereal per yield (kg/hectare)	World Bank
	Food exports (% of merchandise exports)	World Bank
	Permanent cropland (% of land area)	World Bank
	Food production index (2005=100)	World Bank
Access	Consumer price index (2010=100)	Central Bank of Nigeria
	GDP per capita (Current US\$)	Central Bank of Nigeria
	Improved water source (% of rural population with access)	World Bank
Utilization	Rural population (% of the total population)	World Bank
	Mortality rate, under 5 per 1000	World Bank
	Prevalence of undernourishment (% of the population)	Food & Agricultural Organization (FAO)
Stability	Life Expectancy rate (%)	World Bank
	Food inflation, consumer prices (Annual %)	World Bank
	Food Imports (% of merchandise imports)	World Bank
	Unemployment rate (%)	National Bureau of Statistics (NBS)
	Net National Savings (% of GNI)	World Bank

Source: Adapted from Napoli (2011) and modified for Nigeria (2021).

**Table 7. Augmented Dickey-Fuller (ADF) and Phillip-Perron (PP) Unit Root Test – Intercept only**

Variable	ADF at level	ADF at first difference	ADF order of integration	PP at level	PP at first difference	PP order of Integration
finsec	0.778	6.167	I(1)	2.147	8.787	I(1)
pov	1.588	2.969	I(1)	1.588	2.969	I(1)
unem	2.188	5.013	I(1)	2.179	9.901	I(1)

Source: Authors Computation from Eviews10 (2021)

Note: All tests of significance were conducted at the 5% level

Before the estimation of the vector error correction model, Engle and Granger [32]) suggested testing for cointegration as a sufficient condition for the formulation of an error correction model (ECM). According to them, when variables are not stationary at levels but cointegrated, their dynamic relationships are specified correctly by an error correction model. The cointegration test to establish the long-run relationship between the variables in the model shall proceed using the Johansen method. The Johansen cointegration procedure associated with Johansen (1988) and Johansen and Juselius (1990) involves identifying the number of cointegrating vectors in a non-stationary series. The null hypothesis is that there is no cointegrating equation against the alternative that the null hypothesis is not true.

The appropriate lag length selection was carried out using four information criteria including final prediction error (FPE), Akaike (AIC), Schwarz (SC) and Hannan-Quinn (HQ) information criterion. The result obtained is presented in Appendix 4. Therefore, the appropriate lag length obtained and used in this study was three.

### 3. RESULTS AND DISCUSSION

The result obtained following the test of Johansen cointegration and the vector error

correction analysis is presented and discussed in this section.

#### 3.1 Result of Johansen Cointegration Test

In Table 8, the trace statistics indicated two (2) cointegrating equations at the 5 per cent level of significance as two of the trace statistics were greater than the critical values at 5 per cent. This result suggests a long-run relationship between the variables in the model thereby confirming the rejection of the null hypothesis of no cointegration amongst the variables.

The Johansen normalization equation displayed in table 9 below placed food insecurity (finsec) as the dependent variable. In the long run, poverty was observed to have a negative relationship with food insecurity while unemployment has a positive relationship with food insecurity on average, ceteris paribus.

The coefficients of the variables in the normalization equation are statistically significant at the 5 per cent level of significance. In sum, the null hypothesis of no cointegration among the variables in the model is rejected against the alternative of a cointegrating relationship in the model.

**Table 8. Johansen Unrestricted Cointegration Rank Test (Trace)**

**Trend assumption: Linear deterministic trend**

**Series: FINSEC POV UNEM**

**Lags interval (in first differences): 1 to 3**

Hypothesized	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
No. of CE(s)				
None *	0.611573	50.58683	29.79707	0.0001
At most 1 *	0.334163	17.48906	15.49471	0.0247
At most 2	0.088786	3.254215	3.841466	0.0712

\*\*MacKinnon-Haug-Michelis (1999) p-values, \* denotes rejection of the hypothesis at the 0.05 level

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

Source: Author's computation from Eviews (2021)



**Table 9. Johansen normalization equation**

<b>1 Cointegrating Equation(s):</b>		<b>Log likelihood</b>	<b>-171.2431</b>
<b>Normalized cointegrating coefficients (standard error in parentheses)</b>			
<b>FINSEC</b>	<b>POV</b>	<b>UNEM</b>	
1.000000	0.023107 (0.00439) (5.2876)	-0.089306 (0.00716) (12.4729)	
Adjustment coefficients (standard error in parentheses)			
D(FINSEC)	-0.287700 (0.15993)		
D(POV)	-34.09445 (9.99690)		
D(UNEM)	13.83405		

Source: Author's computation from Eviews (2021)

**Table 10. Estimated Error Correction Model**

Dependent Variable: D(FINSEC)				
Method: Least Squares				
Date: 05/10/21 Time: 03:55				
Sample (adjusted): 1984 2018				
Included observations: 35 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.019949	0.024730	-0.806680	0.4285
D(FINSEC(-1))	1.023606	0.353131	2.898662	0.0083
D(FINSEC(-2))	-0.028848	0.199318	-0.144732	0.8862
D(FINSEC(-3))	0.093226	0.144152	0.646721	0.5245
D(POV)	0.000867	0.002415	0.358907	0.7231
D(POV(-1))	0.001647	0.006772	0.243168	0.8101
D(POV(-2))	-0.010709	0.006541	-1.637133	0.1158
D(POV(-3))	0.005215	0.006872	0.758883	0.4560
D(UNEM)	0.012009	0.005186	2.315482	0.0303
D(UNEM(-1))	0.015395	0.006175	2.493205	0.0207
D(UNEM(-2))	-0.003626	0.005976	-0.606789	0.5502
D(UNEM(-3))	0.038834	0.008748	4.439144	0.0002
ECM(-1)	-1.498349	0.433780	-3.454167	0.0023
R-squared	0.685699	Mean dependent var		0.009759
Adjusted R-squared	0.514262	S.D. dependent var		0.153728
S.E. of regression	0.107141	Akaike info criterion		-1.350794
Sum squared resid	0.252541	Schwarz criterion		-0.773093
Log likelihood	36.63889	Hannan-Quinn criter.		-1.151372
F-statistic	3.999717	Durbin-Watson stat		1.682830
Prob(F-statistic)	0.002390			

Source: Author's computation in Eviews10 (2021)

Following the existence of cointegration among the variables in the food insecurity model, the vector error correction model (VECM) can be specified and estimated. Such VECM as

constructed facilitates the examination of both the long and short-run dynamics of the cointegrated series.

$$\Delta finsect = \beta_0 + \sum_{i=1}^d \beta_{1i} \Delta finst_{-1} + \sum_{i=1}^n \beta_{2i} \Delta povt_{-1} + \sum_{i=1}^n \beta_{3i} \Delta unemt_{-1} + \lambda ECM_{t-1} + U_t \quad (iii)$$

Where ECM, as used in equation (iii), is the error correction term and it represents the long-run model obtained from the residual of the long-run equation.

### 3.2 Result of Vector Error Correction Model

An assessment of the result of the Error Correction Model (ECM) presented below shows an overall good fit.

The R-square is fairly high, implying that about 69 per cent systematic variation in food insecurity is explained by the independent variables in the model during the short-run period. The model's best fit was further confirmed by the significant value of the F-statistic of 3.99 per cent, which passed the significance test at the 5 per cent level. The error correction term is well behaved and correctly signed as it appeared with the expected negative sign, passing the significance test at the 1 per cent level, indicating that any previous period deviation in long-run equilibrium is corrected in the current period at an adjustment speed of 1.51 per cent. Any short-run disequilibrium therefore can be speedily corrected for in the long run. The Durbin-Watson statistic close to two (precisely 1.68) shows the absence of autocorrelation. The result of the Breusch-Godfrey Serial Correlation LM Test as shown in appendix 5 further confirmed the absence of autocorrelation with F-statistics of 3.63, easily passing the significance test at the 5 per cent level.

In terms of the performance of the coefficients of the variables in the model, a positive but insignificant relationship was observed between poverty and food insecurity. A 1 per cent previous period deviation in poverty was associated with 0.16 per cent deterioration in the food insecurity situation on average *ceteris paribus* in the short run. Similarly, a percentage change in poverty in the current period is associated with a 0.09 per cent increase in food insecurity on a regular, all things being equal in the short run.

In terms of the unemployment variable, a positive and significant relationship exists between unemployment and food insecurity, easily passing the significance test at the 5 per cent level of significance. The previous period (one-lag) and current period coefficient of unemployment appeared with a positive sign as hypothesized. Specifically, a positive and significant relationship exists between unemployment and food insecurity. An increase in unemployment exacerbates food insecurity in the short run. Thus, a 1 per cent deviation in the previous period unemployment level is

associated with a 1.2 per cent degeneration of the food insecurity position on average *ceteris paribus* in the short run. In the same vein, a 1 per cent change in unemployment in the current period causes a 1.5 per cent intensifies in food insecurity in the short run.

Consequently, following the performance of the coefficient of the variables, evidence exist supporting the existence of a relationship between food insecurity, poverty and unemployment both in the short and long run. While the relationship was not significant for poverty, it was highly significant for unemployment at the 5 per cent level of significance. Thus, we conclude that the two variables (poverty and unemployment) to a reasonable extent explained food insecurity issues in both the short and the long-run period.

#### 3.2.1 Poverty and food insecurity

The vector error correction result of a 1 per cent rise in extreme poverty exacerbating food insecurity by 0.16 per cent confirms the earlier expectation of a positive relationship between poverty and food insecurity, though the relationship was found to be insignificant. This result is consistent only in part with the findings of Wight et al. [23] for the United States and Maitra & Rao [27] for Kolkata, India of a positive relationship between poverty and food insecurity but contradicts their confirmation of a significant link between the two variables. Therefore, any policy to address food insecurity in Nigeria must deal with the issue of poverty to achieve reasonable success.

#### 3.2.2 Unemployment and food insecurity

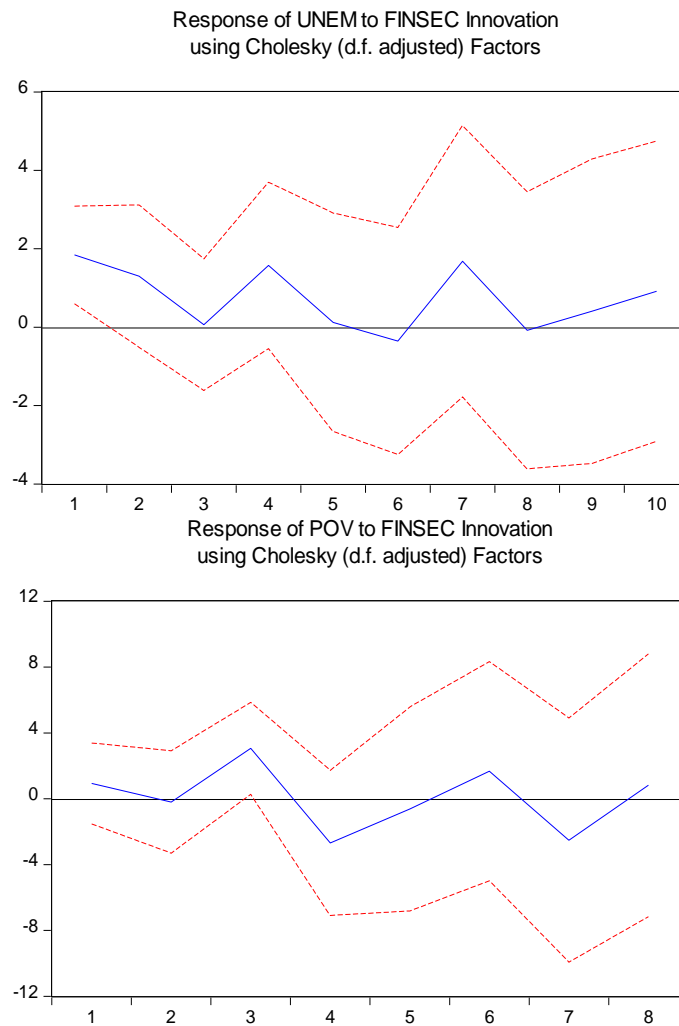
The result of the study indicates that a positive and significant relationship exists between unemployment and food insecurity. That is an increase in the unemployment rate is associated with an upsurge in the food insecurity situation. Thus, a 1 per cent change in unemployment position during the current period in Nigeria causes a 1.5 per cent increase in food insecurity in the short run. This finding supports earlier studies by Etana and Tolassa [26] on Ethiopia where they found that the incidence of food insecurity was higher among households controlled by unemployed persons. In light of this, any policy to address food insecurity in Nigeria must equally deal with the rising incidence of unemployment in the country to be successful.

### 3.3 Impulse Response Function

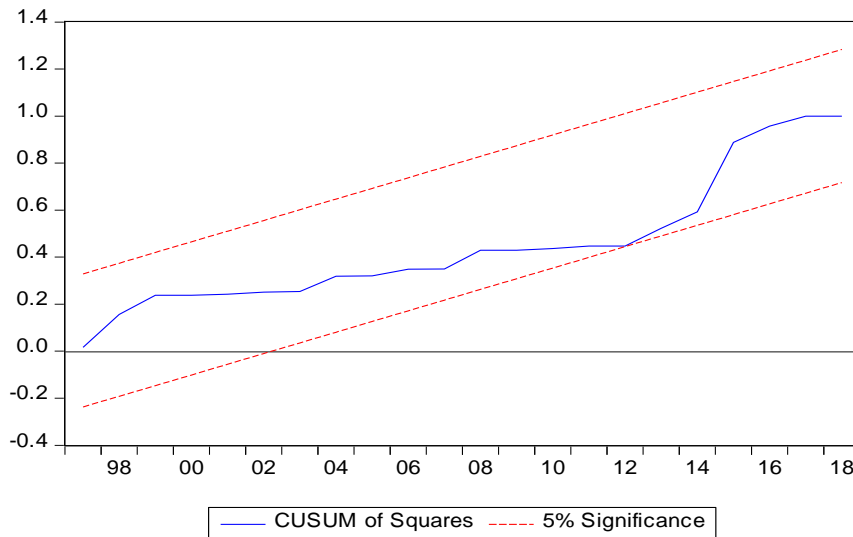
The impulse response function in Fig. 1 shows the response of unemployment and poverty to a one standard deviation shock on food insecurity. The blue line represents the impulse response function while the red lines depict the 95 per cent confidence interval. As shown, the unemployment function lied within the 95 per cent confidence interval throughout the period except for period five and six. A one standard deviation shock to unemployment initially decreased food insecurity up to period three. A further innovative shock caused an increase in unemployment in period four before it declined and slides into negative briefly and up to period six. In period seven, a noticeable increase was

observed but that quickly tipped off in period eight.

The impulse response function of poverty to food insecurity fluctuated between the upper 95 per cent confidence interval and the lower 95 per cent confidence interval throughout the period. As shown in the impulse response function, a one standard deviation shock to poverty initially decreased food insecurity up to period two before increasing steadily to period three and fell thereafter, sliding into a negative position in period four. It responded from a negative position with a noticeable increase up to period six before it again declined and went into another negative in period seven but only marginally recovered in period eight.



**Fig. 1. The impulse response of unemployment & poverty to food insecurity**  
 Source: Author's computation derived from Eviews10 (2021)



**Fig. 2. CUSUM of Square test for stability**

### 3.4 Model Stability Test

The study tested the stability of the model by conducting the cumulative sum of recursive (CUSUM) test. The result displayed in Fig. 2 shows the model is stable as it lies within the 5 per cent boundary. The implication, therefore, is that the model is stable and the results of the regression coefficients are suitable for policymaking.

## 4. CONCLUSION

Findings from this study revealed that a long-run relationship exists between food insecurity, poverty and unemployment. In the short run, a positive but insignificant relationship was observed between poverty and food insecurity such that a percentage change in poverty in the current period is associated with a 0.09 per cent increase in food insecurity on a regular, all things being equal in the short run. Furthermore, a positive and significant relationship exists between unemployment and food insecurity such that an increase in unemployment exacerbates food insecurity in the short run. Thus, a 1 per cent deviation in the previous period unemployment level is associated with a 1.2 per cent degeneration of the food insecurity position on average *ceteris paribus* in the short run. In the same vein, a 1 per cent change in unemployment in the current period causes a 1.5 per cent intensifies in food insecurity in the short run.

The findings suggest that dealing with poverty and unemployment in the country is only a necessary condition to resolving food insecurity

problems in the country, it is not sufficient. Sufficient conditions involve dealing with other economy-wide factors responsible for the worsening food insecurity position during the period studied. Based on the findings, this study recommends a multi sector-specific approach to deal with the issue of poverty in Nigeria. A major sector to easily focus on is the Agriculture sector which can employ over 70 per cent of the population. Revamping the sector will expand its employment generating potentials to reduce unemployment in the country. Furthermore, the government needs to improve the enabling environment through infrastructure development and enhancing the ease of doing business for the private sector to continue to strive, thereby improving their employment generating capacities. In respect of other economy-wide factors driving food insecurity (such as, for instance, clashes between farmers and herders, civil unrest, neglect and poor funding of the agricultural sector etc.), this study suggest the need to implement a holistic food security policy. Such policy must target improvement in crop yield, deal with internal security problems and address infrastructure and agriculture funding to be effective.

### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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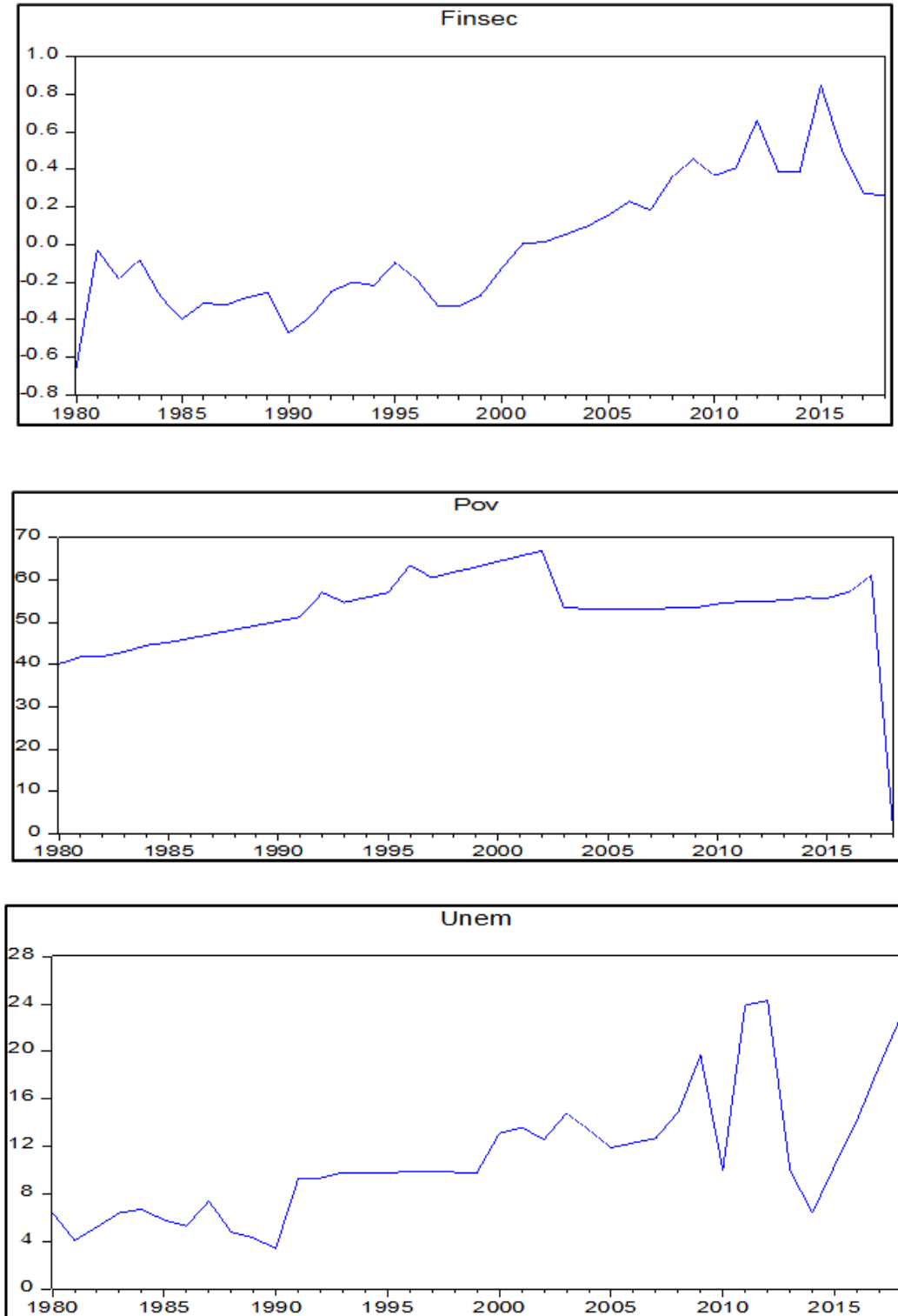
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## APPENDIX

### Appendix 1



**Fig. 1. Line graphic of variables in the model**  
Source: Author's computation using EViews10 (2021)

**Appendix 2. Descriptive Statistics**

Key Statistics	finsec	pov	unem
Mean	1.60E-08	52.39641	10.95564
Median	-0.080444	53.6	9.83
Maximum	0.845436	66.9	24.3
Minimum	-0.655407	0	3.4
Std. Dev.	0.344456	10.94394	5.345271
Skewness	0.445	-2.80111	0.955895
Kurtosis	2.455404	14.58235	3.487033
Jarque-Bera	1.769111	268.9956	6.324732
Probability	0.412898	0	0.042325
Sum	6.25E-07	2043.46	427.27
Sum Sq. Dev.	4.508693	4551.255	1085.733
Observations	39	39	39

Source: Author's computation using Eviews10 (2021)

**Appendix 3. Classical regression result**

Dependent Variable: FINSEC  
 Method: Least Squares  
 Date: 05/09/21 Time: 02:48  
 Sample: 1980 2018  
 Included observations: 39

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.585227	0.23358	-2.505469	0.0169
POV	0.002483	0.003997	0.621298	0.5383
UNEM	0.04154	0.008184	5.075831	0
R-squared	0.419624	Mean dependent		1.60E-08
Adjusted R-sq.	0.387381	S.D. dependent		0.344456
S.E. of regress	0.269606	Akaike info crit.		0.29009
Sum squared resi	2.616738	Schwarz criterion		0.418056
Log likelihood	-2.656758	Hannan-Quinn crit		0.336003
F-statistic	13.01437	Durbin-Watson stat		0.741239
Prob(F-statistic)	0.000056			

Source: Author's computation using Eviews10 (2021).

**Appendix 4. Lag length selection criteria**

VAR Lag Order Selection Criteria  
 Endogenous variables: FINSEC POV UNEM  
 Exogenous variables: C  
 Date: 05/09/21 Time: 15:50  
 Sample: 1980 2018  
 Included observations: 36

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-248.6184	NA	236.3257	13.97880	14.11076	14.02486
1	-208.978	70.47173	43.19351	12.27656	12.80440*	12.46079
2	-202.5785	10.31033	50.52377	12.42103	13.34475	12.74343
3	-181.129	30.98262*	26.06847*	11.72939*	13.04899	12.18997*

\* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Source: Author's computation using Eviews10 (2021)



**Appendix 5. Breusch-Godfrey Serial Correlation LM Test:**

F-statistic	3.634663	Prob. F(2,20)	0.0450
Obs*R-squared	9.330132	Prob. Chi-Square(2)	0.0094

Source: Author's computation using Eviews10 (2021)

**Appendix 6. Regression Data**

Obs	Pov (Poverty)	Unem (Unemployment)	Finsec (Food Insecurity Index)
1980	40.2	6.40	-0.65540688
1981	41.88	4.07	-0.02806938
1982	41.96	5.21	-0.18072375
1983	43.08	6.40	-0.08044375
1984	44.6	6.70	-0.28192688
1985	45.3	5.80	-0.3955875
1986	46.3	5.30	-0.30995188
1987	47.3	7.40	-0.3212025
1988	48.3	4.80	-0.28217375
1989	49.3	4.30	-0.25431
1990	50.3	3.40	-0.46970188
1991	51.3	9.32	-0.38341313
1992	57.1	9.35	-0.24812125
1993	54.76	9.81	-0.20001813
1994	55.9	9.79	-0.21709625
1995	57.1	9.82	-0.09468375
1996	63.5	9.84	-0.18456375
1997	60.6	9.83	-0.32559
1998	61.9	9.83	-0.32475125
1999	63.1	9.80	-0.27320063
2000	64.4	13.10	-0.12712688
2001	65.7	13.60	0.005264375
2002	66.9	12.60	0.014680625
2003	53.5	14.80	0.054725625
2004	53.3	13.40	0.097335625
2005	53.02	11.90	0.154639375
2006	53.12	12.30	0.22974625
2007	52.99	12.70	0.18352375
2008	53.6	14.90	0.359755
2009	53.5	19.70	0.454988125
2010	54.43	10.00	0.367970625
2011	54.9	23.90	0.4065275
2012	55.01	24.30	0.66003125
2013	55.21	10.00	0.384898125
2014	55.9	6.40	0.38866
2015	55.8	10.40	0.84543625
2016	57.2	14.20	0.49527625
2017	61.2	18.80	0.27
2018	0.00	23.10	0.26

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