



CRUDE OIL PRICE FLUCTUATION AND UNEMPLOYMENT NEXUS IN NIGERIA: EVIDENCE FROM VECM TECHNIQUE



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ABSTRACT

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The main objective of this paper is to examine the impact of crude oil fluctuation on the rate of unemployment in Nigeria using data for the period of 1991 to 2018 and employed VECM to realize the objective. The outcome from the VECM estimation revealed that population and economic growths were positive and significantly associated with unemployment while crude oil price and electricity consumption have significant negative sign with unemployment in the long-run but in the short-run only population growth was significant and positively signed with unemployment. From the granger causality, one-way causality runs from population growth to unemployment; economic growth to unemployment; crude oil price to unemployment; population growth to economic growth; crude oil price to population growth; crude oil price to economic growth; electricity consumption to economic growth. Variance decomposition indicate that population growth responded highly to shock in unemployment whereas impulse response function revealed that unemployment responded positively to shocks in economic growth and crude oil price while negatively to population growth and electricity consumption. Therefore, among the recommendations include population checking measures should be a long-term one, making strategies that provide and encourages greater continued economic growth, redirecting excess crude oil accounts earnings into areas of education, employment encouraging plans, improving healthcare services and infrastructure development plan. Lastly, supervising the activities of Power Holding Company of Nigeria (PHCN) in order to ensure constant supply of electricity to the industrial and domestic sectors would help in providing solution to the increasing rate of unemployment in Nigeria.

Contribution/ Originality: This study contributes to the existing literature through a novel attempt in providing a quantitative analysis of the impact of crude oil price fluctuation on unemployment in the case of Nigeria using VECM approach and Granger causality test.

1. INTRODUCTION

Crude oil price volatility has presumed an essential part in nation's drive through recession and has been the key reason for the government's fall. Instability in oil prices is constantly influenced by shocks in the supply and demand of crude oil developing from geopolitical mechanisms, economic disaster and developments. In history, price of crude oil has experienced all of these mechanisms, which has later resulted in instability in crude oil price that has cause nations to collapse and final government's fall (Majumdar, 2016). Adelman (2000) stated that crude

oil price has remained highly unstable than the price of all other commodities and the variations in the price is caused mainly by the dispute in the Middle Eastern region together with the OPEC fixation in several occasions. But [Osije \(1983\)](#) is of the view that crude oil price is basically regulated via the forces of demand and supply and is then ventured into price volatility. Increasing variations in the price of crude oil influenced the global economy in numerous different and important ways. For instance, increasing price of crude oil rises the cost of production of goods and services, transportations cost and heating cost. Therefore, governments, practitioners and consumers are seriously worried about the likely negative economic influence of variation in the price of crude oil, for example in the areas of business cycles, macroeconomics and inflation ([Hamilton & Herrera, 2004](#); [Hooker, 2002](#); [Lee, Lee, & Ratti, 2001](#); [Mork, 1994](#); [Rafiq, Salim, & Bloch, 2009](#)). Theoretically and via investigation of empirical basis has shown that volatilities in the international crude oil price have mixed implication on different nations and the significance depends on how seriously the nation is exposed to oil revenue. As one of the main exporters of crude oil, Nigeria extremely depend on earnings from crude oil exports and it accounted for about 90 percent of the country's earnings with about 70 percent of the annual government spending ([Akalpler & Nuhu, 2018](#)). Therefore, it is important to measure the potential influence of such variation on the increasing rate of unemployment in Nigeria.

According to the international labour organization (ILO), unemployment is among the key issues to communal stability in many nations and Nigeria is not exempted, placing the universal rate at 5.0 percent which correspond to 172.5 million people being unemployed and it is expected to reach 174 million people by 2020 due to labour force expansion ([ILO, 2019](#)). When associated with neighboring nations like Cameroon with 3.3 percent, Chad with 2.3 percent, Benin republic with 2.1 percent and Niger republic with 0.3 percent unemployment rates, the Nigeria's rate of unemployment stands at 27.1 percent and is the most serious one ([Tradingeconomics, 2020](#)). Over the years, Nigerian government has claimed solid progress in real economic growth determining at 6 percent or better said at 6.06 percent in 2006 to 2.21 percent in 2019 ([World Bank, 2020](#)). Despite the fact that the country has witnessed solid economic growth in terms of GDP of about 6.06 percent in the previous years, the rate of unemployment lingers increasing every year from 12.8 percent in 2006 to 27.1 percent in the second quarter of 2020 ([NBS, 2020](#)). One of the essential issues of development confronting Nigerian economy at the moment is the issue of unemployment and studies have shown that the rate of unemployment has been increasing since in the 80s, nevertheless the accessible information from several national, international institutions and the present clear indication of unemployment signifies that in the history of Nigeria there was no time where the rate of unemployment is high like now and one cannot completely said that government at all levels have not done everything possible whatsoever on one occasion or the other to lessen the rate of unemployment in the country ([Kayode, Arome, & Anyio, 2014](#)).

As a reminder, the paper is structured into four sections after this section. Section two handled the review of related literatures; section three is restricted for data and methodology of the study; section four offers the results and discussion of the empirical findings and lastly section conclude the paper by providing the conclusion and policy recommendations.

2. LITERATURE REVIEW

By considering an emerging market as a case study, [Doğrul and Soytaş \(2010\)](#) studied the causality connection between crude oil price, interest rate and unemployment using data for the periods spanning 2000:01 to 2009:08. After applying Toda and Yamamoto long-run causality, the outcome revealed that crude oil price and the rate of interest advances the predictions of unemployment in the long-run period. According to [Ebele \(2015\)](#) using times series data for 1970-2014 periods and applied Engel and Granger cointegration test together with granger causality technique to study the influence of crude oil price volatility on the economic growth of Nigeria, he reports that volatility in crude oil price has a contrary effect on the economic growth of the country even though crude oil

reserves and profits have positive impact on the economy of Nigeria. Using the same country of Nigeria as a case study, [Adamu \(2015\)](#) employed OLS technique in determining whether significant changes exist between crude oil earning made by the country both in the past and in the period of decline in crude oil prices. The result discovered that crude oil benefits was meaningfully affected by the decrease in the international crude oil prices and therefore, it is projected that returns gathered by the oil sector of the economy should be put to a proper use in achieving economic development in the country. Again, using the same Nigeria, [Kayode et al. \(2014\)](#) investigates the motives that are accountable for the rising level of unemployment, its societal, economic and political consequences. The investigation discovered that poverty widespread, agitation of youth, rising rate of social immoralities, activities of unlawful nature were rampant due to unemployment and if not tackled then laziness, pessimism and rebellion may become the possible outcome and they recommend among other things that vital interference should be made in the important sectors of the economy such as agriculture, industry and power for the purpose of creating chances of employment. [Khodeir \(2016\)](#) investigate the negative association between generation of electricity via renewable means and the rate of unemployment in Egypt for the period covering 1989-2013 and employed ARDL procedure for the purpose of determining the influence in both the short run and the long run period. The outcome revealed that the hypothesis was realized only in the long-run periods. [Bekmez and Ağpak \(2016\)](#) examined the connection existing among non-hydro renewable energy and employment for the case of 80 nations and resolved that one-way causality exist running from employment to the consumption of non-hydro renewable energy for the case of low to middle income nations but no causal relationship was detected for the case of high income nations and the outcome support the fact that consumption of renewable energy is positively signed with unemployment. [Apergis and Salim \(2015\)](#) also considered the case of 80 nations for the period of 1990 to 2013 to explore the influence of consumption of energy from renewable source on unemployment using panel methodology that include unconventional unit root, cointegration and the nonlinear granger causality tests. The overall result revealed that consumption of renewable energy has a significant positive sign with unemployment in a disaggregated data across precise areas which include Latin America and Asia. [Maijama'a, Musa, Yakubu, and Mohammed \(2019\)](#) studied the influence of population growth on the rate of unemployment in Nigeria for the period covering 1991-2017. The time series data for the study was analyzed using dynamic ordinary least squares and the outcome revealed that population growth and the rate of exchange have positive sign with unemployment whereas foreign direct investment, per capita economic growth and consumer price index have significant negative influence on the rate of unemployment in the long run period. [Mohseni and Jouzaryan \(2016\)](#) scrutinized the part played by the rate of inflation and unemployment on economic growth in the case of Iran using time series data covering 1991-2012 period. The scrutinization was done using ARDL approach and the outcome revealed that there exist a significant negative influence of the rate of inflation and unemployment on the economic growth of the country in the long run period. [Imoisi, Amba, and Okon \(2017\)](#) examined the influence of unemployment on the economic growth of Nigeria using data covering 1980-2016 periods and engaged ordinary least squares in the achievement of the objective. The outcome indicates that total population, labour force and unemployment have significant influence on the country's economic growth whereas minimum wage rate appears to insert insignificant influence on the country's economic growth. [Adekola, Allen, Olawole-Isaac, Akanbi, and Adewumi \(2016\)](#) study was based on providing evidence that the rate of unemployment is largely associated with demographic change in Nigeria or that other essential factors are accountable for this social issue using a comparative study by engaging the densely populated nations of China, Nigeria and USA and the outcome revealed that population growth is not the only factor responsible for the increasing population but the opposite is the case for Nigeria as both unemployment and population are increasing. [Ademola and Badiru \(2016\)](#) inspects the influence of inflation and unemployment on economic growth of Nigeria for the period spanning 1981-2014. The time series data was analyzed for the realization of the main objective with the help of cointegration and ordinary least squares. The outcome indicate that inflation and unemployment have significant sign with economic growth. [Orumie \(2016\)](#) inspects the influence of unemployment and population

growth on the economic growth using model of multiple regression analysis and the outcome of the analysis revealed that since 70s population growth and the rate of unemployment have been growing amidst decreasing economic growth and also unemployment and growth of population supported the growth of the national economy. Anuolam and Anuforo (2014) studied the association between economic growth, poverty and unemployment for the period of 1980-2010 in Nigeria using three stage least square method and the outcome from the model indicate that the influence of poverty on economic growth and agricultural production is negative but positive with the rate of unemployment. Also, the economic growth is having negative influence on index of poverty with unemployment having positive influence index of poverty and economic growth. Chukwuma (2014) examines the menace of unemployment in Nigeria by employing data for the period of 2000-2011 and the time series data was analyzed using analysis of simple regression and chi-square test. The outcome revealed that rate of unemployment is increasing and does not relied on the gender, age group or level of education. Musa, Majjama'a, Shaibu, and Muhammad (2019) investigate the impact of crude oil price and exchange rate on economic growth in Nigeria by employing ARDL approach to analyze the time series data spanning 1982-2018 periods. The outcome indicates that crude oil price and exchange rate have positive and significant impact on economic growth in the long run and short run periods. The finding suggested that crude oil price and exchange rate could affect economic growth in the two periods. Musa, Majjama'a, and Muhammed (2020) studied the impact of oil price on exchange rate using time series data for the period of 1983 to 2017 in Nigeria. Using ARDL approach to analyze the data, the result revealed that oil price has negative and significant impact on exchange rate in both the short run and long run. Whereas oil revenue and gross domestic products have significant positive impact on exchange rate. The finding suggested that oil price could affect exchange rate in both short run and long run. In the case of Morocco, Fatiha and Karim (2019) scrutinized the determining factors for energy demands for the 1990-2016 periods and utilized Error Correction (ECM) model to provide empirical results for the analysis. The outcomes indicate that economic growth, foreign direct investment and access to electricity are the real determining factors for energy demands for the period under study in the country. Balcilar, Ozdemir, Ozdemi, and Shahbaz (2018) investigates the existing relationship between energy consumption, economic growth and CO₂ emissions and the outcome revealed that it is required that nations such as Italy, USA, Japan and Canada need to surrender those economic activities in order to lessen CO₂ emissions by prohibiting the consumption of energy from non-renewable source while for Germany, US, Canada, Japan and UK the result indicate that environmental kuznet curve does not hold as the environmental quality is not affected by economic growth in UK and Germany. By exploring the connection between energy demand and its determinants particular global crude oil price, population, urbanization and economic growth for period spanning 2000-2016 periods using the case of the Association of Southeast Asian Nations (ASEAN), Hassan (2018) shows that access to energy, economic growth and urbanization have significant influence on the demand of energy at the aggregated level whereas the outcome is not the same at the dis-aggregated level.

Therefore, in line with the above reviewed literatures where the exact study on the relationship between fluctuations in crude oil price and unemployment is lacking in the case of economy like Nigeria, this study would bridge this gap in the literature by applying VECM technique and Granger causality test on the data over 1991-2018 periods.

3. DATA AND METHODOLOGY

Data on the interest series were extracted from the World Development Indicators (WDI) of World Bank and Organization of Petroleum Exporting countries (OPEC). The data measurement, definition and extracted sources are offered in Table 1 and the Bar graphical trends illustration of the series are given in Figure 1.

Table-1. Variables Description.

Series	Definition	Source
UN _t	Unemployment, total (% of total labor force) (modeled ILO estimate)	WB (2020)
PG _t	Population growth (annual %)	WB (2020)
EG _t	GDP per capita (constant 2010 US\$)	WB (2020)
OP _t	Crude oil price in US dollar per barrel	OPEC (2020)
EC _t	Access to electricity (% of population)	WB (2020)

Note: WB: World Bank, GDP: Gross Domestic Product and OPEC: Organization of Petroleum Exporting Countries.

The study modifies the model adopted by Banda, Ngirande, and Hogwe (2016) that rate of unemployment is a function of economic growth, deficit budget, real effective rate of exchange and productivity of labor and the model specified is given in Equation 1.

$$UR_t = f(GDP_t, BUG_t, REER_t, LP_t) \tag{1}$$

Where t is the time trend; GDP_t represent economic growth; BUG_t stands for the budget deficit; REER_t is the real effective exchange rate and LP_t represent labour productivity.

In our model modification from Equation 1, we enhance the model by adding some important variables and removing some irrelevant variables in the analysis. The Equation 2 is shown with series modified to fit the investigation, where unemployment is set as a function of economic growth; population growth; crude oil price; electricity consumption and it is presented as follows:

$$UN_t = f(EG_t, PG_t, OP_t, EC_t) \tag{2}$$

Where the time trend is denoted by t; EG_t represent economic growth; PG_t stands for the population growth; OP_t is the crude oil price and EC_t electricity consumption.

The Equation 2 is the functional form of the model where the error term is not captured, but Equation 3 provided the complete econometrics form of the model where the error term is expected to be normally distributed with zero mean and constant variance. Therefore, the Equation 3 gives the econometrics model as:

$$\ln UN_t = \chi_0 + \chi_1 \ln EG_t + \chi_2 \ln PG_t + \chi_3 \ln OP_t + \chi_4 EC_t + \varepsilon_t \tag{3}$$

Here ln stands for the natural log sign; χ_0 is the constant term; χ_1, \dots, χ_4 are the coefficients of slope parameters; EG_t is the economic growth; PG_t is the population growth; OP_t is the crude oil price; EC_t is the electricity consumption; ε_t is the stochastic error term.

The Vector Error Correction Model (VECM) is structured with aid of Vector Autoregressive model (VAR) system of Equation as given in the matrix form in Equation 4.

$$\begin{bmatrix} \Delta \ln UN_t \\ \Delta \ln PG_t \\ \Delta \ln OP_t \\ \Delta \ln EG_t \\ \Delta \ln EC_t \end{bmatrix} = \begin{bmatrix} \chi_0 \\ \delta_0 \\ \lambda_0 \\ \pi_0 \\ \varphi_0 \end{bmatrix} + \sum_{j=1}^k \begin{bmatrix} \chi_{1t-j} & \chi_{2t-j} & \chi_{3t-j} & \chi_{4t-j} & \chi_{5t-j} \\ \delta_{1t-j} & \delta_{2t-j} & \delta_{3t-j} & \delta_{4t-j} & \delta_{5t-j} \\ \lambda_{1t-j} & \lambda_{2t-j} & \lambda_{3t-j} & \lambda_{4t-j} & \lambda_{5t-j} \\ \pi_{1t-j} & \pi_{2t-j} & \pi_{3t-j} & \pi_{4t-j} & \pi_{5t-j} \\ \varphi_{1t-j} & \varphi_{2t-j} & \varphi_{3t-j} & \varphi_{4t-j} & \varphi_{5t-j} \end{bmatrix} \times \begin{bmatrix} \Delta \ln UN_t \\ \Delta \ln PG_t \\ \Delta \ln OP_t \\ \Delta \ln EG_t \\ \Delta \ln EC_t \end{bmatrix} + \begin{bmatrix} \psi_{UN_t} \\ \psi_{PG_t} \\ \psi_{OP_t} \\ \psi_{EG_t} \\ \psi_{EC_t} \end{bmatrix} \tag{4}$$

Where Δ is short run sign; \sum is the summation sign; t is the time trends; $\chi_0, \delta_0, \lambda_0, \pi_0$ and φ_0 are the constant terms; $\chi_j^{th}, \delta_j^{th}, \lambda_j^{th}, \pi_j^{th}$ and φ_j^{th} are the coefficients of slope parameters; ψ_t^{th} are the error terms.

To determine the direction of causality among the variables of the study, we employed the technique of Granger causality propounded by Granger (1969) and the modelling structure is given in a VAR system of Equation as shown in Equation 5:

$$\begin{aligned}
 \ln UN_t &= \alpha_0 + \sum_{j=1}^k \phi_{1j} \ln UN_{t-j} + \sum_{j=1}^k \phi_{2j} \ln PG_{t-j} + \sum_{j=1}^k \phi_{3j} \ln OP_{t-j} + \sum_{j=1}^k \phi_{4j} \ln EG_{t-j} + \sum_{j=1}^k \phi_{5j} \ln EC_{t-j} + \mu_{1t} \\
 \ln PG_t &= \alpha_1 + \sum_{j=1}^k \beta_{1j} \ln UN_{t-j} + \sum_{j=1}^k \beta_{2j} \ln PG_{t-j} + \sum_{j=1}^k \beta_{3j} \ln OP_{t-j} + \sum_{j=1}^k \beta_{4j} \ln EG_{t-j} + \sum_{j=1}^k \beta_{5j} \ln EC_{t-j} + \mu_{2t} \\
 \ln OP_t &= \alpha_2 + \sum_{j=1}^k \gamma_{1j} \ln UN_{t-j} + \sum_{j=1}^k \gamma_{2j} \ln PG_{t-j} + \sum_{j=1}^k \gamma_{3j} \ln OP_{t-j} + \sum_{j=1}^k \gamma_{4j} \ln EG_{t-j} + \sum_{j=1}^k \gamma_{5j} \ln EC_{t-j} + \mu_{3t} \\
 \ln EG_t &= \alpha_3 + \sum_{j=1}^k \delta_{1j} \ln UN_{t-j} + \sum_{j=1}^k \delta_{2j} \ln PG_{t-j} + \sum_{j=1}^k \delta_{3j} \ln OP_{t-j} + \sum_{j=1}^k \delta_{4j} \ln EG_{t-j} + \sum_{j=1}^k \delta_{5j} \ln EC_{t-j} + \mu_{4t} \\
 \ln EC_t &= \alpha_4 + \sum_{j=1}^k \vartheta_{1j} \ln UN_{t-j} + \sum_{j=1}^k \vartheta_{2j} \ln PG_{t-j} + \sum_{j=1}^k \vartheta_{3j} \ln OP_{t-j} + \sum_{j=1}^k \vartheta_{4j} \ln EG_{t-j} + \sum_{j=1}^k \vartheta_{5j} \ln EC_{t-j} + \mu_{5t}
 \end{aligned}
 \tag{5}$$

Where \sum is the summation sign; t is the time trends; $\alpha_0, \dots, \alpha_4$ are the constant parameters;

$\phi_j^{th}, \beta_j^{th}, \gamma_j^{th}, \delta_j^{th}$ and ϑ_j^{th} are the coefficients of slope parameters; $\mu_{1t}, \dots, \mu_{5t}$ are the error terms.

4. EMPIRICAL FINDINGS AND DISCUSSION

The graphical trends illustrations of the explained and the explanatory variables are depicted in Figure 2 for the sample period of 1991 to 2018 in Nigeria.

4.1. Descriptive Analysis Outcome

Description of the data on all the variables employed in this study are offered in Table 2 and the areas of the description include the mean which shows the average values in the distributions; median which indicate the middle values in the distributions; maximum and minimum values which offers the highest and lowest values in the distributions; the standard deviation that measures the amount of variation in the series; the skewness which measures how skewed the series is whether skewed positively or skewed negatively; the kurtosis values which measures how series are distributed whether leptokurtic, platykurtic or mesokurtic distributions and lastly the normality test through Jarque-Bera coefficients and their probability values which indicate whether the series is normally distributed or not.

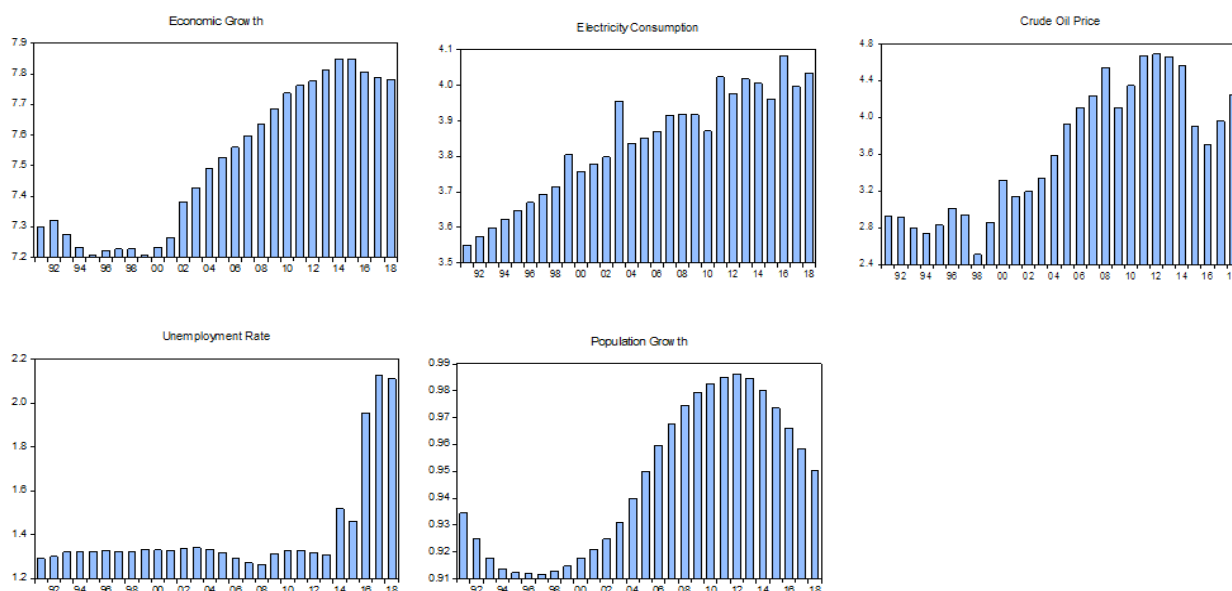


Figure-1. Graphical illustrations of the variables.

Source: World Bank and OPEC, 2020.

Table-2. Descriptive statistics.

Descriptors	UN _t	PG _t	EG _t	OP _t	EC _t
Mean	4.228	2.576	1873.555	47.803	46.930
Median	3.764	2.572	1824.594	38.405	47.496
Maximum	8.389	2.680	2563.900	109.450	59.300
Minimum	3.539	2.488	1348.681	12.280	34.792
Std. Dev.	1.324	0.072	454.919	32.222	7.133
Skewness	2.540	0.142	0.213	0.674	-0.117
Kurtosis	7.806	1.420	1.428	2.103	1.849
Jarque-Bera	57.075	3.005	3.095	3.059	1.609
Probability	0.000	0.222	0.212	0.216	0.447
Observations	28	28	28	28	28

Source: World Bank and OPEC, 2020.

4.2. Correlation Analysis Outcome

The investigation also employed correlation analysis to determine the direction of correlation amount the variables and to know whether the problem of multicollinearity exist or not among the independent variables (Pordan, 2013). The outcome shown in Table 3 indicates that there is positive correlation between population growth and unemployment; between economic growth and unemployment which implies that population increase and rising economic growth due to corruption and mismanagement of public funds could cause increase in the rate of unemployment whereas negative correlation exists between crude oil price and unemployment; between electricity consumption and unemployment which signifies that decrease in the rate of unemployment could only be achieve by the proper implementation of increasing crude oil returns and stable power supply in the country. Moreover, all the correlation coefficients for all the series are within the benchmark of 0.80 and this is the strong indication for the absence of multicollinearity among our variables.

Table-3. Correlation analysis result.

Variables	lnUN _t	lnPG _t	lnOP _t	lnEG _t	lnEC _t
lnUN _t	1.000	0.042	-0.537	0.246	-0.278
lnPG _t	0.042	1.000	0.052	0.018	0.376
lnOP _t	-0.537	0.052	1.000	0.577	-0.071
lnEG _t	0.246	0.018	0.577	1.000	-0.164
lnEC _t	-0.278	0.376	-0.071	-0.164	1.000

Source: World Bank and OPEC, 2020.

4.3. Unit Root Test Outcomes

Kwiatkowski Philip Schmidt Shin unit root test outcomes are offered in Table 4. The outcomes demonstrate that the null hypothesis of series stationary could not be rejected for all the series both at level and after first differencing. The Failure to reject the null hypothesis suggests that the series have passed the unit root test and therefore, all the series including the explain and the explanatory series have the same order of integration as displayed in Table 4.

Table-4. Kwiatkowski philip schmidt shin unit root test outcome.

Kwiatkowski Philip Schmidt Shin			
Variables	Constant	Constant & Trend	Order
Level			
$\ln UN_t$	0.417 (0.739) ***	0.158 (0.216) ***	I (0)
$\ln PG_t$	0.499 (0.739) ***	0.102 (0.216) ***	I (0)
$\ln OP_t$	0.543 (0.739) ***	0.114 (0.216) ***	I (0)
$\ln EG_t$	0.597 (0.739) ***	0.109 (0.216) ***	I (0)
$\ln EC_t$	0.658 (0.739) ***	0.200 (0.216) ***	I (0)
First Difference			
$\Delta \ln UN_t$	0.376 (0.739) ***	0.116 (0.216) ***	I (1)
$\Delta \ln PG_t$	0.206 (0.739) ***	0.202 (0.216) ***	I (1)
$\Delta \ln OP_t$	0.120 (0.739) ***	0.117 (0.216) ***	I (1)
$\Delta \ln EG_t$	0.191 (0.739) ***	0.174 (0.216) ***	I (1)
$\Delta \ln EC_t$	0.327 (0.739) ***	0.426 (0.216)	I (1)

Note: ***, ** & * are the 1, 5 and 10% levels of significance; values in () are the critical values.

However, the unit root test result offered in Table 4 above did not tackled the problems of structural breaks in the series and breakpoint unit root test is employed to tackle the possible existence of such problem and the outcome is given Table 5. The outcome of the breakpoint test revealed that unemployment and population growth are stationary at level while crude oil price, economic growth and electricity consumption were not stationary at level but became stationary after first differencing. Therefore, unemployment and population growth are I (0) while economic growth, crude oil price and electricity consumption are I (0) variables.

Table-5. Breakpoint unit root test outcome.

Breakpoint Unit Root Test				
Variables	Constant	Break Date	Constant & Trend	Break Date
At Level				
$\ln UN_t$	-4.097 (5)	2015	-6.066 (3) ***	2014
$\ln PG_t$	-7.081 (3) ***	2001	-4.819 (5)	2010
$\ln OP_t$	-3.018 (0)	2003	-3.729 (1)	2010
$\ln EG_t$	-5.158 (0)	2001	-3.318 (1)	2011
$\ln EC_t$	-2.763 (4)	2011	-6.859 (0) ***	2001
At 1st Difference				
$\Delta \ln UN_t$	-2.346 (5)	2015	-5.473 (5) **	2013
$\Delta \ln PG_t$	-3.619 (6)	2012	-6.426 (1) ***	2007
$\Delta \ln OP_t$	-4.914 (1) **	2014	-6.152 (1) ***	2014
$\Delta \ln EG_t$	-3.310 (0)	2002	-5.475 (0) **	2002
$\Delta \ln EC_t$	-9.341 (0) ***	2011	-6.188 (3) ***	2010

Note: ***, ** & * are the 1, 5 and 10% levels of significance; values in () are the lag lengths.

4.4. Optimum Lag Selection Outcome

The result of VAR lag-order selection criterion are reported in Table 6 and the outcome shows that the selection of lag order was made on the basis of 2 lags maximum in order to avoid losing the degree of freedom and to allow for the model modification together with the achievement of realize well performed residuals. Also, the

outcome for the selection of optimum lag length emphasized that the criterion nominated lag 2. Therefore, lag 2 was selected as the best lag for the data set and the Johansen Juselius test for cointegration was achieved via 2 lags for the VAR.

Table-6. Lag Selection criteria outcome.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	162.537	NA	4.15e-13	-14.321	-14.073	-14.263
1	233.523	103.253	6.81e-15	-18.502	-17.014	-18.151
2	314.344	80.820*	6.49e-17*	-23.5767*	-20.849*	-22.934*

Note: * indicates the selected lag.

4.5. Johansen Test for Cointegration Outcome

Table 7 below shows the outcomes for the cointegration relationship among the series using Johansen (1991) test for cointegration. The tests of cointegration rank can then be confirmed via the trace and max-eigen value tests statistics and sometimes both the trace and max-eigen value tests might offered conflicting outcome. And if that happened, Alexander (2001) desires that trace test outcome should be chosen since it is stronger compared to max-eigen test statistics for cointegration. The outcome of the test in Table 7 revealed that there exists two cointegrating Equations from both the two tests and therefore the null hypothesis of no cointegration relationship is strongly rejected and the alternative hypothesis of cointegration relationship is highly accepted and the series are said to be cointegrated.

Table-7. Johansen cointegration test outcome.

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	P-Values
Trace Statistics				
$C \leq 0$	0.941***	131.201	69.818	0.000
$C \leq 1$	0.703**	57.422	47.856	0.004
$C \leq 2$	0.440	25.809	29.797	0.134
$C \leq 3$	0.328	10.713	15.494	0.229
$C \leq 4$	0.013	0.350	3.841	0.553
Max-Eigen statistics				
$C \leq 0$	0.941***	73.779	33.876	0.000
$C \leq 1$	0.703**	31.612	27.584	0.014
$C \leq 2$	0.440	15.095	21.131	0.282
$C \leq 3$	0.328	10.363	14.264	0.189
$C \leq 4$	0.013	0.350	3.841	0.553

Note: ***&** are the 1 and 5% levels of significance.

4.6. Outcome of Vector Error Correlation Model (VECM)

Series can either have short run or long run influence and this paper engaged the technique of vector error correction model (VECM) to realize these influences. The aim of technique of VECM is to permits us to differentiate between the long run and short run influence of series for the model of unemployment. By means of the outcomes found after the tests of cointegration, the VECM approach was quantified and the outcome of VECM are stated in Table 8 and 9. The outcome from Table 8 demonstrate the long run influence of independent series ($\ln PG_t$, $\ln OP_t$, $\ln EG_t$, and $\ln EC_t$) on unemployment in the case of Nigeria in the given Equation 8:

$$\ln UN_t = -19.823 + 9.933 \ln PG_{t-1} - 0.973 \ln OP_{t-1} + 1.777 EG_{t-1} - 0.195 \ln EC_{t-1} \quad (8)$$

from the Equation 8, PG_{t-1} and EG_{t-1} have a log run positive connection with unemployment in Nigeria and it is worth stating that population growth and economic growth have significant positive sign in explaining the rate of unemployment due their real t-statistic values been larger than 2. The outcome therefore, advocate that 1% rise in population growth is associated with an approximately 9.933% rise in the rate of unemployment thus growing population is connected with reduction in job creation in the long run period. This is in line with empirical outcome

of Maijama'a et al. (2019) for the same case study. Again, the outcome confirms that 1% increase in economic growth rises the rate of unemployment by approximately 1.777% and usually, economic growth increase is associated with decrease in the level unemployment but whenever economic growth is not attended with creation of jobs, then the growth is regarded as the phenomenon of jobless growth. Banda et al. (2016) and Mahadea (2003) produced the same outcome using the case study of South Africa and our results also confirmed the hypothesis of jobless growth which state that Nigerian economic growth is failing to provide employments.

Equation 8 also revealed that OP_{t-1} and EC_{t-1} have significant negative influence on the rate of unemployment in Nigeria. Accordingly, the outcomes specify that 1% increase in the price of crude oil from the international crude oil market decreases the rate of unemployment by 0.973% approximately. This implies that earnings from higher crude oil prices if properly implemented in the economy will go a long way in reducing the increasing rate of country's unemployment in the long-run period. Similarly, electricity consumption has significant negative impact on unemployment in Nigeria and precisely, increase in the rate of electricity supply by 1% is associated with 0.195% decrease in the rate of country's unemployment for the sample period of 1991-2018. This implies that constant uninterrupted power supply in the country will assist in reviving the industrial sector of the economy and consequently provide a lots of job opportunities to the teeming population.

Table-8. Long-run cointegration outcome.

Variables	Coefficients	Standard errors	t-statistics
Constant	-19.823	-----	-----
$\ln UN_{t-1}$	1.000	-----	-----
$\ln PG_{t-1}$	9.933***	1.532	6.482
$\ln OP_{t-1}$	-0.973***	0.092	-10.581
$\ln EG_{t-1}$	1.777***	0.230	7.712
$\ln EC_{t-1}$	-0.195**	0.128	1.525

Note: *** & ** indicate 1 and 10% levels of significant respectively.

Table 9 showed the outcome of VECM which specified the indication of error correction. The outcomes demonstrate that the ECT_{t-1} coefficient has satisfied the necessary econometrics conditions of been negative, less than one in value and significant as shown by its value of the t-statistics been greater than 2. Therefore, the speed of adjustment is -0.675% approximately and this implies that if deviation exists from the position of equilibrium, 67.5% of the deviation is corrected every year as the series moved towards reestablishing equilibrium while the remaining 32.5% is explained by other factors that influence unemployment in Nigeria apart from PG_t , OP_t , EG_t and EC_t respectively. The other factors may consist of demographic features, country's education level, and structure of monetary policy among other things. The outcome also shows that $\ln PG_{t-1}$ and $\ln PG_{t-2}$ are the only significant series as shown by their respective values of t-statistic which are above 2 in absolute terms. While $\ln OP_{t-1}$ and $\ln OP_{t-2}$; $\ln EG_{t-1}$ and $\ln EG_{t-2}$; $\ln EC_{t-2}$ and $\ln EC_{t-1}$ were not significant in explaining changes in the rate of unemployment in the short-run period since their respective values of t-statistic are less than 2 in absolute terms.

The error correction outcome also revealed that 1% unit increase in the previous one year population growth in the short-run period is associated with 49.327% decrease in the rate of unemployment while previous two year population growth have significant positive influence on the rate of unemployment in the short run period as 1% unit increase is associated with 39.749% rise in the rate of unemployment in the short-run period in the country for the sample period of 1991 to 2018. The R-square value of 0.677 or 68% implies that 68% variations in the rate of unemployment in Nigeria is jointly explained by population growth, crude oil price, economic growth and electricity consumption while the rest of the 32% is captured by other factors that are not included in this model and this factors may consist of country's monetary policy structure, etc.

Table-9. Error correction and short run outcomes.

Variables	Coefficients	Standard errors	t-statistics
ECT _{t-1}	-0.675**	0.292	2.308
$\Delta \ln UN_{t-1}$	0.347*	0.212	1.635
$\Delta \ln UN_{t-2}$	-0.168**	0.064	-2.613
$\Delta \ln PG_{t-1}$	-49.327**	17.363	-2.840
$\Delta \ln PG_{t-2}$	39.749**	15.324	2.593
$\Delta \ln OP_{t-1}$	0.295	0.208	1.416
$\Delta \ln OP_{t-2}$	0.169	0.149	1.134
$\Delta \ln EG_{t-1}$	0.185	0.812	0.228
$\Delta \ln EG_{t-2}$	-0.366	0.788	-0.465
$\Delta \ln EC_{t-1}$	-0.083	0.418	-0.198
$\Delta \ln EC_{t-2}$	-0.299	0.386	-0.776
Constant	0.130**	0.039	3.334
R ² & Adj. R ²	0.677 & 0.404		

Note: ** & * indicates 1% and 10% levels of significance.

4.7. Diagnostic Checks Outcome

This study performed diagnostic checks in order to validate the parameter. The results in Table 10 show that there is no serial correlation, no conditional heteroskedasticity and there is a normal distribution in the unemployment model as shown by the insignificance of the t-statistics probability values which implies the acceptance of the null hypotheses for all the tests. Therefore, our estimated model is free from serial correlation problem, heteroscedascity problem with errors been normally distributed and therefore our estimates are reliable for policy making in the country.

Table-10. VECM Diagnostic test results.

Tests	Null hypotheses	t-statistics	P-values
Serial correlation	No serial correlation	30.777	0.196
Heteroscedasticity	No heteroscedasticity	340.060	0.339
Normality	There is normality	4.233	0.936

4.8. Granger Causality Test Outcome

The existence of cointegration relationship among our variables necessitate the possible existence of causal relationship among the variables but the direction of the relationship is not known. The direction of the causality is tested using the granger causality test and the outcome of the test is reported in Table 11. The outcome shows that unidirectional causality runs from population growth to unemployment rate at 5% level of significant and this is an indication that growing population is responsible for the rising level of unemployment in the country. This in line with empirical finding of Majjama'a et al. (2019). Again, there is another unidirectional causality running from economic growth to unemployment at 10% level of significant and this implies that economic growth of Nigeria is regarded as the jobless growth because it fails to provide for job creation. This corroborate the finding of Banda et al. (2016) for South Africa. Similarly, one-way causality exists between crude oil price and unemployment at 1% level of significant and this means that earnings from higher crude oil price does not bringdown the rate of unemployment in the country for the period under study. Moreover, unidirectional causality exists running from population growth to economic growth, crude oil price to economic growth, crude oil price to population growth and electricity consumption to economic growth at different levels of significance and these are also possible signs that higher growth of population is correlated with higher economic growth, earnings from crude oil exports causes an increase in the country's level of economic growth, revenue generated from crude oil exports is accountable for the country's growing population and constant supply of electricity will creates more economic activities and

thereby causing higher economic growth for the country. The rest of the interpretations of the outcome is given in Table 11.

Table-11. Granger causality test outcome.

Null Hypothesis	Obs.	F-Statistic	P-values	Causality
$\ln PG_t$ does not granger cause $\ln UN_t$	26	3.579**	0.046	Unidirectional causality
$\ln UN_t$ does not granger cause $\ln PG_t$	26	0.032	0.968	
$\ln EG_t$ does not granger cause $\ln UN_t$	26	2.887*	0.078	Unidirectional causality
$\ln UN_t$ does not granger cause $\ln EG_t$	26	0.022	0.977	
$\ln OP_t$ does not granger cause $\ln UN_t$	26	7.062***	0.004	Unidirectional causality
$\ln UN_t$ does not granger cause $\ln OP_t$	26	0.428	0.657	
$\ln EC_t$ does not granger cause $\ln UN_t$	26	0.812	0.457	Independent causality
$\ln UN_t$ does not granger cause $\ln EC_t$	26	0.988	0.388	
$\ln EG_t$ does not granger cause $\ln PG_t$	26	0.948	0.403	Unidirectional causality
$\ln PG_t$ does not granger cause $\ln EG_t$	26	5.242**	0.014	
$\ln OP_t$ does not granger cause $\ln PG_t$	26	3.727**	0.041	Unidirectional causality
$\ln PG_t$ does not granger cause $\ln OP_t$	26	15.891	6.E-05	
$\ln EC_t$ does not granger cause $\ln EG_t$	26	0.456	0.639	Independent causality
$\ln EG_t$ does not granger cause $\ln EC_t$	26	0.375	0.691	
$\ln OP_t$ does not granger cause $\ln EG_t$	26	3.158*	0.063	Unidirectional causality
$\ln EG_t$ does not granger cause $\ln OP_t$	26	1.440	0.259	
$\ln EC_t$ does not granger cause $\ln EG_t$	26	6.732***	0.005	Unidirectional causality
$\ln EG_t$ does not granger cause $\ln EC_t$	26	1.840	0.183	
$\ln EC_t$ does not granger cause $\ln OP_t$	26	1.952	0.166	Independent causality
$\ln OP_t$ does not granger cause $\ln EC_t$	26	0.491	0.618	

Note: ***,**,* are the 1, 5 and 10% levels of significance respectively.

4.9. Outcome of Variance Decomposition Analysis

Table 12 presents the outcomes of variation decomposition analysis and the outcomes revealed that the percentage of the prediction error variance in the rate of unemployment is described by own innovations together with the innovations in population growth, crude oil price, economic growth and electricity consumption for the periods of 10 years. For the aim of determining the influence of population growth, crude oil price, economic growth and electricity consumption on the rate of unemployment for a moderately extended period, this study utilized analysis of variance decomposition for a maximum period of 10 years. The outcome of the analysis in Table 12 indicate that in the first years, all changes in the rate of unemployment is described by its own shocks. But in the fifth year, the rate of unemployment itself accounted for 54.377% of its variation, while $\ln PG_t$ explain 39.269% variations, $\ln OP_t$ explains 3.346%; $\ln EG_t$ explains 1.038% variations; $\ln EC_t$ explains 1.968% variations in the short-run period. However, in the long-run period of 10 years, the rate of unemployment explains 38.760% variations by its self and the remaining 61.24% is jointly explains by the other variables were $\ln PG_t$ accounted for 51.737% variations; $\ln OP_t$ explains 6.999% variations; $\ln EG_t$ explains 0.530% variations; $\ln EC_t$ explains 1.971% variations. The results of variance decomposition analysis therefore indicate that in both the short-run and long-run periods population growth and crude oil price accounted for the higher percentage of unemployment.

Table-12. Outcome of variance decomposition.

Period	S.E.	$\ln UN_t$	$\ln PG_t$	$\ln OP_t$	$\ln EG_t$	$\ln EC_t$
Variance decomposition of $\ln UN_t$						
1	0.086	100.000	0.000	0.000	0.000	0.000
3	0.164	79.997	13.408	3.117	1.416	2.065
5	0.264	54.377	39.269	3.346	1.038	1.968
7	0.440	47.178	45.295	5.115	0.956	1.454
9	0.692	48.856	43.422	5.432	0.611	1.677
10	0.812	38.760	51.737	6.999	0.530	1.971

4.10. Outcome of Impulse Response Functions Analysis

The impulse response functions analysis reported in Figure 2 revealed the dynamic feedback of unemployment rate to single period standard deviation shock to the system innovations and again indicate the directions and persistence of the feedback to every shock for over a period of 10 years. The outcome of the analysis indicates that shocks in all the series are significant and were not persistent. A single period standard deviation shock to $\ln PG_t$ and $\ln EC_t$ marginally reduced the rate of unemployment throughout the entire periods of 10 years respectively. A one-year standard deviation shock to $\ln OP_t$ and $\ln EG_t$ escalates the rate of unemployment from around period 1 up to period 10. The outcome of these analysis indicates that increasing $\ln PG_t$ and $\ln EC_t$ suggest diminishing rate of unemployment while rising $\ln OP_t$ and growing $\ln EG_t$ are associated with increasing the rate of unemployment for the period under study.

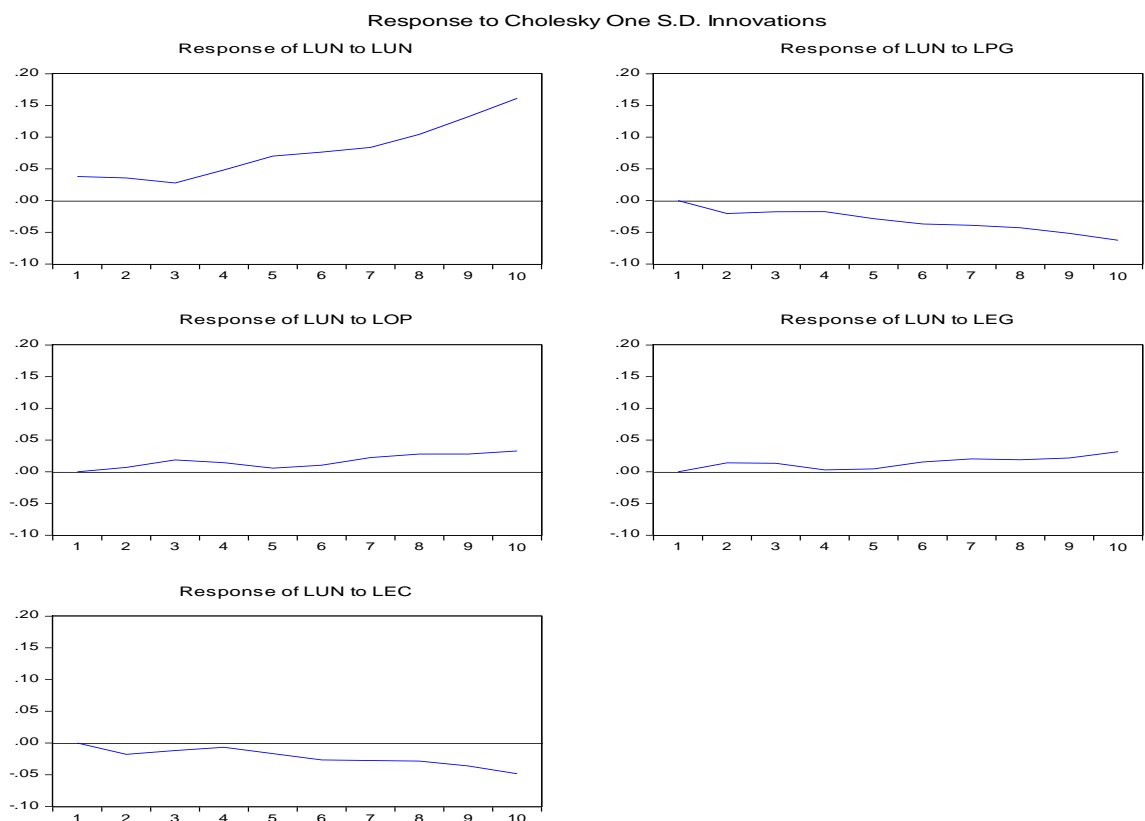


Figure-2. Impulse response functions graphs.

5. CONCLUSION AND POLICY RECOMMENDATION

The motivation of this study was based on the increasing rate of unemployment and the growth connection in developing nations. But very little attention has been drawn to the unemployment and crude oil price fluctuation relationship in the case of emerging nations most especially in the continent of Africa. The Nigerian economy is currently undergoing the issues of shortage of jobs and the country’s rate of unemployment has been rising for over the years and this is among the motives that led economists and policymakers in the country to formulate series of possible reasons that are accountable for the increasing rate of unemployment in the country and to find the possible ways to tackle the issue. The long-run result of VECM revealed that population growth and economic growth have positive impacts on the rate of unemployment in the country while crude oil price and electricity consumption have negative impact on the country’s rate of unemployment. Therefore, in light of the above-mentioned outcome, the outcome suggests that there are many policy recommendations that can be drawn from it in order to tackle the issues of high rate of unemployment and these recommendations are anticipated to significantly provide employment opportunities in Nigeria. Since population growth has significant positive impact on the rate of unemployment, the study recommends that population checking measures or controls should be a

long-term one in order to reduce the rising rate of unemployment through maintaining an optimum population. Economic growth also has positive influence on the rate of unemployment and this implies that economic growth of Nigeria is regarded as a “jobless growth”, the study recommend that since achievement of higher economic growth and the creation of employment opportunities still remains an issue to the Nigerian economy and in order to realize a remarkable economic growth that will support nation’s economy, increase the demand for labour and creates employment opportunities, the country’s policymakers should make strategies that provide and encourages greater continued economic growth. But crude oil price appears to be negatively signed with the rate of unemployment and based on this result the study recommend that the Nigerian government should redirect its excess crude oil accounts earnings into areas that directly or indirectly encouraged the provision of employment via education and employment encouraging plans, improving healthcare services, infrastructure development plan and even the actions that support fight against terrorism can also contribute in making good name for the country and thereby been the safe investment terminus for various foreign investors and thereby assisting in reducing the rate of unemployment in Nigeria. The electricity consumption has a negative and significant impact on the country’s rate of unemployment and the recommendations that can be drawn from this result is that policy makers should supervised the activities of Power Holding Company of Nigeria (PHCN) in order to ensure that constant supply of electricity to the industrial and domestic sectors is granted and by doing that would help in providing employment opportunities to the teeming population in Nigeria.

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