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Diversification of revenue base and growth synthesis: Macrofinametric evidence from Nigeria

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Abstract
This study is as a result of the intractable and hydra head problems associated with a mono-economy; prone to depletion, international price shock and unfavourable quota arrangement and other economic mayhem. Most especially now that the COVID-19 pandemic is ravaging the world economy, which has made the oil price to remain volatile in the global market. This study used data obtained from the Central Bank of Nigeria Statistical Bulletin and National Bureau of Statistics for economic growth, proxied by the Gross Domestic Product, Revenues from Oil Export and Non-Oil Export 1981 to 2020. The study was subjected to various macrofinametric tools in order to have a solid foundation to make inference that will be trusted by policy makers and other relevant bodies. After the various analyses, it was observed that the revenue from oil and non-oil exports insignificantly relate to economic growth in Nigeria. It was also found that revenue from the oil export and non-oil export separately and jointly do not cause economic growth in Nigeria. This study also found that revenue from oil export and non-oil exports will have positive and significant relationship with economic growth in the long run. Again that own shock exerted the greatest influence in the cause of variation on the economy. The researcher therefore calls for a shift from the emphasis on single based (oil sector) to properly diversified revenue based economy in Nigeria. Emphasis should be withdrawn from oil and non-oil sectors structured economy; not only on the mantra of oil and non-oil based revenue, rather a broad based revenue base (multiple sources based).

Keywords: oil export, non-oil export, economic diversification, economic growth, Nigeria

Introduction

In public finance, income of an individual determines his expenditure; hence individual rightly says 'I can spend so much', because the expected income is his strength. Government traditionally estimates her expenditure before devising means of raising the income. For that, the government capacity to raise certain amount of income decides her economic performance in a fiscal year, all things been equal, thus the emphasis on 'we have to raise so much to attend to developmental projects and other fiscal needs of the government'. The revenue base of any country remains a veritable tool that propels her economic performance. As such each tier of government is constitutionally provided with fiscal responsibilities and internal sources for generating revenue to accomplish those responsibilities (Onoh, *2007*) [44]. *Emphasizing the place of revenue on economic* growth, Bhatia (2002), captured the theory of public revenue as a portion that deals with the alternative sources of state income. The theory discusses and analyses the comparative advantages and disadvantages of the various forms of revenue and the principles which should govern the choice between them. This theory did well to stress the need for diversification of the revenue base of a country to ease the accomplishment of the assigned responsibilities of the various tiers of the government (local, state and federal). This also calls for efficiency in revenue generation, which advocates for selection of the alternative, from all those available to economic agents, which will yield the greatest net (monetary) return to economic agents (individual, firms and government) (Nwachukwu, 2003) [36]. The above premise set the pace for discussion on diversification of the revenue base of a nation to stimulate rapid economic growth and development. Any nation that depends on a single revenue base is apparently exposed to economic mayhem of all sorts. For that Economic diversification and structural transformation of a nation remain sacrosanct. Economic diversification is generally seen as the shifting of an economy away from a single income based towards multiple sources based from a growing range of sectors and markets (UNFCCC, 2021) [50]. This entails the movement of factors of production within, as well across different sectors of the economy towards greater productivity uses. Structural transformation on its part involves a phenomenal shift from oil sector to non-oil sector, agricultural to non-agricultural sectors, or from manufacturing to services. It is necessary to diversify revenue base, because decline or huge loss in a particular sector could be set off by another sector of the same economy (Herrendorf et al, 2014) [25]. This suggested trend is recommended in global labour markets.

In Nigeria, for instance, relying on oil sector has virtually diminished the share of agriculture in total employment, also shrinking across all country income groups. Although the revenue accruable from oil sector has significantly contributed to the development of Nigeria and other exporting countries, most on a boom trend, yet the there is a mixed blessing inherent in the reliance of oil revenue. For that, there is need for optimum diversification of the revenue base of a nation through non-oil, such as agriculture, manufacturing, taxes and service sectors etc. Again, the share of employment in manufacturing seems to be decreasing globally and has reportedly down slightly from 16 percent in 1991 to 14 percent in 2018, a trend driven primarily by high-income countries, where advanced robotics and the adoption

of other labour-saving technologies has made the greatest headway (World Bank, 2019) [52]. Noticeable sectors around the world where most significant employment expansion has happened in recent decades are services, with construction, non-market (public) services and, most importantly, a host of market services leading the way (ILO, 2019) [30]. However, the propelling forces encouraging revenue diversification can be viewed from two dimensions: a diversified revenue structure will of course emanate directly from policy makers' choices to capture the advantages associated with diversification, or it can be a policy reaction to the political and economic constraints of a jurisdiction. In all, revenue base diversification is a conscious attempt or strategic policy action or deliberate efforts that broaden the tax base, provide more stability and flexibility in financial management, and thus achieve better fiscal performance (Bartle *et al*., 2003, Yan, 2008) [9].

On the relationship between diversification of revenue base and economic performance, a good number of scholarly articles are available to buttress the relevance of the topic. For instance Awe and Ajayi (2009) [6] are of the opinion that a country attains growth and development of the economy through diversification, thereby suggesting simultaneous development of various sectors of the sectors rather than the practice of monoculturalism. Awe *et al* (2009) [6] further opined that the diversification of the revenue base of a nation has the potentials of igniting growth of the economy. Suberu *et al*, (2015) [49], argued that there is need to break from the shackles of the problems associated with mono-economy mainly dominated by oil, which is prone to depletion, international price shock and unfavourable quota arrangement, thus suggested the diversification as best option. This opinion is germane mostly now that the COVID-19 pandemic is ravaging the world economy, which has made the oil price to remain volatile in the global market. Obi (2018) [39], not only advocated for a drift from oil based revenue to non-oil based revenue instead to move from primary sector revenue based (Agriculture and oil) to non-primary sector revenue based (manufacturing, building and construction, power, services, entertainment industry, tourism, software industries, hospitality, telecommunication, information technology, wholesale and retail trade etc. This if well-articulated will spur the economy into broad revenue base, as well help to absorb external shock and volatility associated with oil revenue or monolithic based economy (Akpan, *et al*, 2017; Obi, 2018) [4, 39]. In sum, economic diversification is an indispensable element of economic development, for that a country needs to drift to a more diverse production and trade structure. If neglected or not attended to, it can expose a nation to increased vulnerability to external shocks that can play down the attainment of longer term economic growth (National Board of Trade, 2010; Hallward *et al*; 2017; OECD/WTO, 2019).

Dependence on single based revenue, mostly in Nigeria and African countries, even around the world has been thorny one; the rain of revenue from a single source for instance oil is more or less a mixed blessing. Despite the fact that revenue from oil contributes significantly to the revenue streams like Nigeria (Central Bank of Nigeria, 2019) [52], it induces volatility in the revenue, poses constraint in the administration of such monolithic economy, thereby making planning, budgeting and budget implementation of such economy problematic (Ejoh *et al*, 2016) [13]. It also makes macroeconomic variables to become volatile; exposing them to shocks (Odionye, *et al*, 2019) [40]. Revenue volatility is a foremost concern for state and local government administrators because stability is a sine qua non for the effective operation of all facets of a government. Volatile revenue streams can affect the continuity of public service delivery and cause other long run inefficiencies. Stable revenues make it easier for governments to maintain a stable level of public services (Yan, 2008) [53]. Mono economy, most time makes the developing nations to fall prey and become vulnerable to the developed nations of the world. Apart from that, it makes a monolithic economy to be vulnerable and volatile, leading to misalignment of an economy with inherent adverse effects such exchange rate crisis, price instability, depletion of external reserves, recession, unemployment, inability to meet financial obligation, etc. All these economic vagaries have necessitated for the advocacy of diversification in the revenue base of nations, hence this study; examining the relationship between revenue diversification and the performance of the economy.

The remaining sections of this study is decomposed into; section 2, which takes care of the review of related literature, section 3 handles the materials and methods, while section 4 is about the analysis and results whereas section 5 houses conclusion and recommendation.

Literature Review

Diversification of Revenue Base: A Paradigm Shift

Though diversification of the economy of both developing and developed nations have remain a hard nut to crack in the face of challenging development in the global economy, its benefits can never be overemphasized. Economic diversification is of course the bedrock of economic development; its inadequacies expose developing nations to external shocks; making them to be vulnerable to developed nations. These in long run impede the prospects for long term economic growth (Sauive, 2019; Roy, 2019; World Bank, 2019) [47, 52]. Revenue diversification, a paradigm shift is traceable to Great Depression of 1930s when property values and property tax revenues experienced significant decline. In a panic response, the state government devised new revenue sources, such as sales and income taxes, to reduce or replace their reliance on property tax revenues and finance of public expenditures (Ulbrich, 1991; Fisher, 1997; Howe & Reeb, 1997) [18, 28].

In Nigeria, before the oil boom in the late 1970s, revenue from non-oil export (cocoa, groundnut, rubber, palm kernel and palm oil) accounted for 96.4% (Ekpo & Umoh, 2014; Jide, 2017) [15, 33] and has dramatically dropped, altering the structure of the economy due to dependence on oil based revenue (Ojo, 1994; Obadan, 2000) [42, 38]. Oil sector has in fact remain the mainstay of Nigeria economy accounting over 90% of the total export, 80% of the total government revenue and as well contributed to over 70% of the Nigerian GDP (Agbaeze, Udeh, & Onwuka, 2015) [2]. This has undoubtedly turned Nigerian economy to a monolithic as well volatile economy (Obi, 2018) [39]. Close to the transition of power from Dr Goodluck Jonathan to General Mohammed Buhari (Rtd) in 2015, the revenue profile of the Federal Government of Nigeria indicated that revenue from oil sector was 80% of foreign exchange earnings, whereas non-oil based revenue accounted about 20.1% (Onodujo *et al*, 2015). This attribute associated with a particular nation's economy renders it monolithic, hence vulnerable to the oscillations of the oil prices in the international market with inherent repercussions (WTO,

2019). This is unlike what is obtainable in the USA that has drifted from oil based revenue to non-oil revenue based like shale oil production and other alternative to fossil fuel energy such as solar, wind and bio-energy. This has unavoidably plummeted oil price in the international market (Onodujo *et al*, 2015). This has exposed nations whose revenue base is solely dependent on oil sector to suffer untold volatility and quagmire in their economy.

This dwindling in the global oil prices with negative repercussion of volatile economic growth of the exporting countries and the mismanagement of the such revenue from oil has change the policy directions and philosophy to resource based growth strategy driven by the production and exporting of non-oil product (Suberu, et al, 2015) [49]. Central Bank of Nigeria in 2016, in confirmation of the volatile oil induced economy, reported that crude oil price dropped in global market with its associated adverse effect to Nigeria economy (Achugo, *et al*, 2017). Of course, this is not good for a monolithic economy, hence a need for paradigm shift to economic diversification. If an economy is diversified from oil based revenue to non-oil revenue based, it will definitely stimulate such economy, thus enhancing the revenue generated to an overwhelming size (Riti, *et al*, 2016) [46]. Economic diversification which is a drift towards a more varied structure of domestic production and trade with the aim of increased production, creation of jobs and provision of the base for sustained poverty-reducing growth. This is targeted at reducing the vulnerability to adverse terms of trade shocks and stabilisization of export revenues, as well as stimulating output diversification (IMF, 2014; Lan & Shepherd, 2018; Sauvé, 2019) [31, 48]. Economic diversification literally emphasizes on the movement from traditional revenue base of an economy to alternative revenue based. For instance, the shift from oil based revenue or primary sectors to non-oil revenue or may be to non-primary sectors of the economy (Suberu, et al, 2015; Obi. 2018) [49, 39]. accelerating the expansion of the revenue base of such economy. It brings about numerous benefits like expansion of the export base of the country; enhance export earnings, generate appropriate employment opportunities, development and growth of potentials in untapped or underutilized sectors of the economy (Owan *et al* (2020) [45]. Export diversification can be viewed from two perspectives; a total drift from the old system, and maximizing the new system into diverse purposes for economic growth and development. These do not happen in a vacuum, it is driven by factors such as competitive exchange rate; trade and industrial policies; a dynamic growth framework; macroeconomic stability; institutional variables (including good governance); an expansionary but disciplined fiscal blueprint; as well as the absence of conflict and corruption. More so, sectors like agriculture, education, manufacturing, hospitality, tourism and mining and the knowledge economy hold the key to Nigeria's diversification (Iniodu, 1995; Suberu *et al*., 2015) [32, 49]. Economic diversification remains a frantic attempt where countries boost the varieties of economic outputs produced annually, through different production channels (Eko *et al*, 2013) [14]. It involves the government finances correlation between two or more taxes. In a bid to reduce revenue fluctuation, a desirable tax structure should include taxes that are not perfectly correlated. That means when one tax shrinks for some reasons such as an economic downturn, the total loss of government revenue is minimized because other revenue sources have not experienced the same changes (White, 1983) [51]. Economic diversification is relevant for poorer developing countries to create jobs and foster economic development (Freire, 2019) [19].

Of course, no magic finger to diversification; there are numerous routes to achieve successful diversification. The basic issue is to lay a solid foundation despite the stage of development of such country. It could be in the form of exporting new business services, exploiting agglomeration externalities and building a low-cost business platform (Gelb, 2010; Hoekman & Shepherd, 2015; Roy, 2019). In her technical assistance approach, World Bank Group advocacy on economic diversification suggests that there are three key areas of economic incentives that intersect to affect the framework for diversification. These are business regulation, governing credit markets, the hiring and firing of workers, quality standards, the procedures and licenses required to starting a business, contract enforcement and insolvency; forming an essential part of the incentive framework to encourage investment in new activities (Aghion *et al*, 2006; Farole & Winkler, 2012; Andrews & Cingano, 2014) [3, 17]. If for instance, discriminatory regulations encourage less productive firms to survive and expand at the expense of more productive ones, diversification efforts will definitely fail (Bartelsman *et al.*, 2010; Hseih and Klenow, 2009; Bartelsman *et al.*, 2010 Baker *et al.*, 2015) [8, 29, 8, 7].

Theoretical Framework

This study is heavily anchored on the portfolio theory that sees diversification as way of ameliorating risk or variability, provided that different stocks in an investment portfolio do not move in exactly the same direction or the price changes of different stocks are less than perfectly correlated (Brealey & Myers, 1991) [11]. Drawing from portfolio theory; a theoretical framework that demonstrates the impact of revenue diversification on revenue stability conditional on the nature of its economic base. Assuming the local or state government economic base is unstable, the volatility of overall revenue will be minimized through tax diversification. However, if local or state government economy is relatively stable over time, it may be a sound policy to employ one or two large and stable revenue sources rather than a mix of many unstable small taxes, which increases the instability of the overall revenue. In such cases, a less diversified tax structure is preferred to a diversified one by bringing in stable revenue flows (Yan 2008; Onodugo, *et al*, 2015) [53, 43]. In a more precise approach, the Regional business cycle theorists as heavily debated; as the regions or local or state government become more economically diversified, the economy of the region or local or state government becomes less responsive to fluctuations in extra regional or federal government activity. This theory made enormous emphasis that much regional policy deliberations resolve around the development of strategies designed to induce greater economic diversification. From the above premise, three relevant hypotheses: under a stable economic base, revenue diversification can increase revenue instability; under an unstable economic base, revenue diversification can reduce revenue instability; the revenue-stabilizing effect of diversification can be enhanced as an economic base becomes more unstable (Hackbart *et al*, 1975) [23].

Empirical Review

The dominance of single revenue base of an economy has made most developing nation fall prey to price volatility as well

become vulnerable to revenue base diversified nations of the world. This has led to a phenomenal drift from a single revenue based to the diversified revenue based aimed at enhancing economic growth of nations. Several scholars have made applauded efforts to unravel the relationship between diversification of the revenue base and the economic growth. Most of the empirical literature reviewed supported the paradigm shift from monolithic economy to revenue based diversified economy. Starting from Awe and Ajayi (2009) [6] that employed co-integration analysis with more attention on ECM to evaluate the relationship between diversification of Nigerian Revenue base and economic growth, with emphasis on non-oil revenues from agriculture, solid mineral and manufacturing sectors. The result of the finding revealed that diversification of the revenue base of a nation can alter the growth of a nation towards positive direction in the future. It was disclosed that dynamic relationship exists between revenue from non-oil sector and economic growth.

Using descriptive method of analysis, Suberu et al (2015) [49], investigated diversification of the Nigerian Economy towards a Sustainable Growth and Economic Development. The study looked at likely avenues to diversify the productive base of the Nigerian economy. It was disclosed after the empirical analysis that from the peculiar attributes of Nigeria and previous fortunes since the discovery of oil, for Nigeria to break loose from the problems inherent in a mono-economy, especially one largely dominated by oil, which is subject to depletion, international price shocks and unfavorable quota arrangement, there is need for diversification. Agricultural sector is recommended as alternative for diversifying the Nigerian economy.

Ejolo *et al*, (2016) used survey design with regression model to examine the relationship between revenue diversification and government spending in Cross River, Nigeria. After the empirical analysis, it was revealed that diversification of public revenue reduces revenue fluctuation. However, the study is of the opinion that in order to minimize revenue volatility, government should objectively defines a set of economic activities like tax base and creates a tax portfolio with multiple revenue sources and low elasticity.

Applying Vector Autoregressive (VAR) techniques, Obi (2018) [39] examined revenue generation and economic growth in Nigeria with emphasis on a shift from primary sectors to non-primary sectors. The study made use of annual time series data spanning from 1981 to 2016. It was found that no causal relationship existed between non-primary sectors revenue and the economy within the period of the study. This signpost that the non-primary sectors insignificantly influenced the Nigerian economy. The study, however suggested the non-primary sector as an alternative source of revenue in Nigeria, hence should be harnessed. Yan (2018) investigated the impact of revenue diversification on economic base revenue stability. The study heavily drew from the portfolio theory and regional science literature to elucidate on the effect of revenue diversification on revenue volatility of sub national government and how it changes with respect to its economic base stability. The study made use of economic model to examine a series of factors that could affect revenue stability using socioeconomic and fiscal data of 156 Georgia country governments and 47 state governments within the period of 1986 to 2004. The study found that revenue diversification affected revenue stability conditionally on the instability of a jurisdiction's economic base. With a country level analysis, the study further revealed that revenue diversification significantly enhances the revenue instability of a country that has a stable economic base and the revenue stabilizing effect of diversification is increased as an economic base becomes more unstable. The study went ahead to suggest that the degree of revenue diversification should be gauged by the condition of its corresponding economic base in order to achieve the goal of revenue stability.

Nwosa *et al* (2019) [37] employed ARDL technique to unravel if relationship exists between export diversification and economic growth in Nigeria. The results of the study revealed that export diversification insignificantly impact economic growth in Nigeria, suggesting that oil based revenue is still dominant in the Nigerian economy. The study went further to recommend a formidable economic policy that ensures diversification of the entire non-oil sector of the economy.

Owon *et al*, (2020) ascertained the impact of diversifying the economic base on economic growth in Nigeria. The variables used in the study are GDP growth rate as a proxy for economic growth, where non-oil revenue GDP stood for GDP diversifications, export diversification is proxied by non-oil export, then investment and exchange rate. The study used OLS to estimate the model specified and came out that non-oil GDP exerted positive and significant impact on economic growth. Furthermore, export and investment insignificantly impacted on economic growth in Nigeria. The study went ahead suggesting the encouragement of increased productivity in the real sector as well as adopts stable and favourable exchange rate policies by the government in order to expedite economic growth in Nigeria.

Materials and methods

Sources of Data

This study made use of data obtained from the Central Bank of Nigeria (CBN) Statistical Bulletin and National Bureau of Statistics (NBS). Economic growth was proxied by the Gross Domestic Product (GDP) as the dependent variable and the independent variables are Revenues from Oil Export (OILEXP) and Non-Oil Export (NOILEXP). The annual data points spanning from 1981 to 2020, form the 40 observations for this study.

Estimation and Modeling Techniques

Descriptive Statistics is used in this study to know the distributive features of the data. The following residual diagnostic and stability tests were made; Serial correlation, Heteroscedasticity, inverse root of characteristic polynomial, Ramsey Reset test, Recursive Estimates of the CUSUM (Cumulative Sum Control) Test. To check the presence of multicolinearity in the model, correlation matrix and the Variance Inflation Factor (VIF) were used. Augmented Dicker Fuller (ADF) unit root test was employed to check the stationarity of the variables. The least squares, Error Correction Mechanism (ECM) and fully modified least squares regression were used to test the contemporaneous and long run relationships hypotheses. To ascertain the full causaility implications of the variables in the model, Johansen cointegration, Hansen cointegration procedure, pairwise Granger causality, VEC Causality/Block Exogeneity Wald tests, error correction modeling, impulse responses and variance decomposition were employed.

Analysis and Results

Trend Analysis of Data

This section commenced with trend analysis of data. The time series plot of the data is shown in figure I below. The figures below revealed that both revenues from oil and non-oil export trended upward with periods of peak and trough as well exhibited undulating movement except GDP that trended seemingly smooth upwards indicating the expected non-stationarity of the variables.

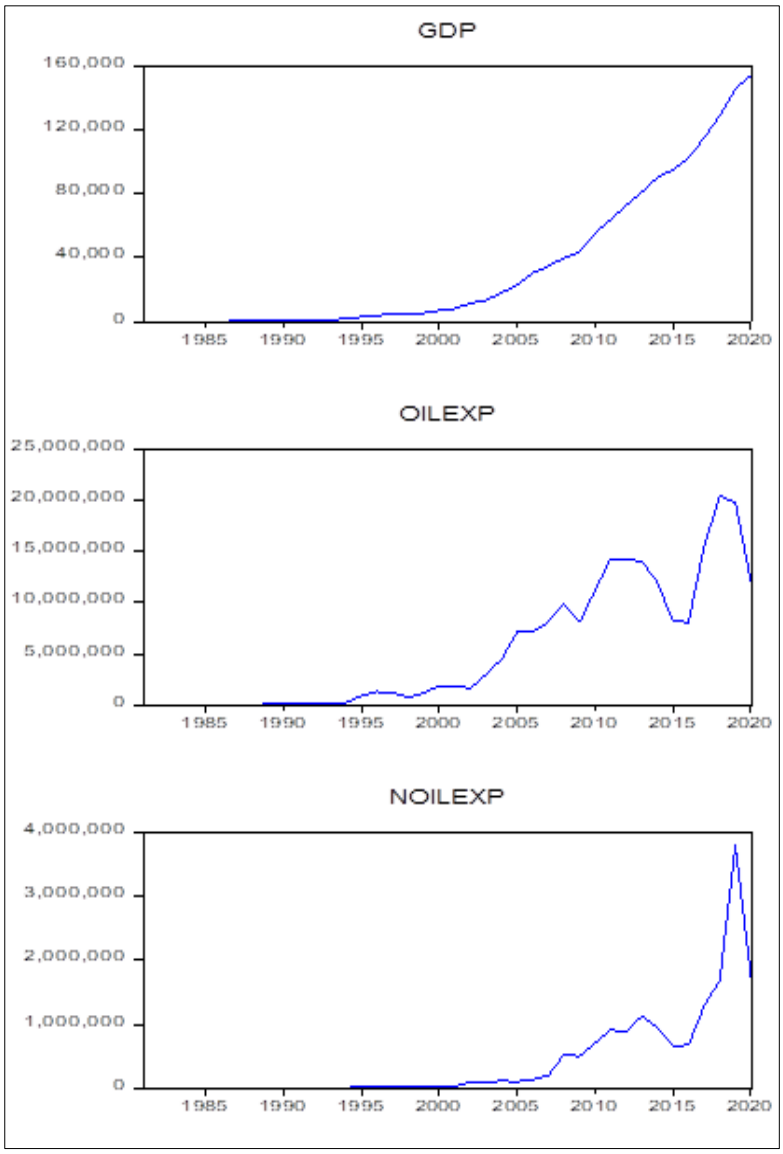

Fig 1: Trend Analysis of GDP, OILEXP and NOILEXP

Description of Variables

Table 1 below describes the distributional features of all the data. From the table 1, it is revealed that variability or dispersion of GDP, OILEXP and NOILEXP are 45875.59, 6155106 and 732907.3 respectively, indicating high standard deviation. This is supported by the high difference between the values of the minimum and maximum. OILEXP showed Kurtosis lower than normal suggesting platykurtic distributions while GDP and NOILEXP recorded Kurtosis greater than 3, which is excess from the normal, an indication of a leptokurtic distribution. GDP, OILEXP and NOILEXP have respective skewness coefficients of 1.265728, 0.938197 and 2.835103 suggesting positive skewed distribution. All the variables recorded p-values of Jarque-Bera that are significant at 5%, evidence of abnormal distribution.

Table 1: Descriptive Statistics for GDP, OILEXP and NOILEXP

	GDP	OILEXP	NOILEXP
Mean	34087.79	5231814.	409768.1
Median	7648.622	1744696.	31616.75
Maximum	154252.3	20475872	3788036.
Minimum	139.3105	7201.200	203.2000
Std. Dev.	45875.59	6155106.	732907.3
Skewness	1.265728	0.938197	2.835103
Kurtosis	3.351861	2.683148	12.54813
Jarque-Bera	10.88680	6.035419	205.5300
Probability	0.004325	0.048913	0.000000
Sum	1363512.	2.09E+08	16390722
Sum Sq. Dev.	8.21E+10	1.48E+15	2.09E+13
Observations	40	40	40

Global Utility Examination and Determination

It is pertinent in macroeconomic analysis to examine the global utility or usefulness of the specified models. This gives a researcher confidence to draw inference that can be referred for policy making. To do this, the researcher used correlation matrix and Ordinary Least Square (OLS) and others in subsequent sections of this study.

Multicolinearity Test

Table 2 below revealed the correlation matrix of the variables employed. As seen the correlations between GDP, OILEXP and NOILEXP range from 0.849772 to 0.908323, showing that the variables are not linearly correlated. For that the researcher has enough evidence to affirm absence of multicollinearity in the model.

Table 2: Correlation Matrix

Variables	GDP	OILEXP	NOILEXP
GDP	1.000000	0.908323	0.883338
OILEXP	0.908323	1.000000	0.849772
NOILEXP	0.883338	0.849772	1.000000

Stationarity Properties of the Variables

This procedure is important in macroeconomic time series analysis to know the appropriate technique to use in model estimation. It is also important to know the long run equilibrium links and causality between the variables. In this study, the researcher employed Augumented Dickey Fuller (ADF) unit root test as shown below in table 3. As seen from the table 3 below, the entire variables did not attain stationarity at level; (tau = -1.318810, prob = 06112, not significant) for GDP, (tau = -1.444453, prob = 0.5507, not significant) for OILEXP, and (tau = -0.950271, prob = 0.7612, not significant) for NOILEXP, suggesting non-rejection of the null hypotheses that all the variables have unit root at level. They all achieved statioarity at first difference or differenced once to be stationary; (tau = -3.334832, prob = 0.0201, significant) for GDP, (tau = -6.102372, prob = 0.0000, significant) for OILEXP, and (tau = -7.319598, prob = 0.0000, significant) for NOILEXP, indicating rejection of null hypotheses that the entire variable have unit root at first difference. Having confirmed that all the variables are integrated at order one or 1(1), the researcher then has sufficient evidence to proceed to co-integration test.

Table 3: ADF Unit Root Test at Level and First differenced Data

Variables	Maxlag	Level	1st Difference	Remarks
		ADF Statistics/P-value	ADF Statistics/ P-value	
LnGPD	9	-1.318810(0.6112)	-3.334832 (0.0201)	@1(1)
LnOILEXP	9	-1.444452(0.5507)	-6.102372 (0.0000)	@1(1)
LnNOILEXP	8	-0.950271(0.7612)	-7.319598 (0.0000)	@1(1)

Co-integration and Equilibrium Test

This is important to ascertain if there exist equilibrium relationships between the variables; GDP, NOILEXP and NOILEXP. Table 4 below showed the results of unrestricted rank tests (Trace and Maximum Eigenvalue). For trace, the observed number of co-integration are "None" and "At most 1" with trace statistics and p- values of 72.23433(0.0000) and 20.98438(0.0067) respectively, suggesting two co-integration equation at 5% level of significance among the variables. Also, with Maximum Eigenvalue, the observed number of co-integration are "None" and "At most 1" with Max-Eigen statistics and p- values of 51.24995 (0.0000) and 19.14041 (0.0078) respectively. This shows that long run relationship exists between the dependent variable economic growth proxied by GDP and independent variables; OILEXP and NOILEXP in Nigeria

Table 4: Johansen Cointegration Test

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.740418	72.23433	29.79707	0.0000
At most 1 *	0.395706	20.98438	15.49471	0.0067
At most 2	0.047367	1.843966	3.841466	0.1745
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.740418	51.24995	21.13162	0.0000
At most 1 *	0.395706	19.14041	14.26460	0.0078
At most 2	0.047367	1.843966	3.841466	0.1745

Again, the researcher went ahead to check the validity of the above test on table 4 with Hansen parameter instability co-integration procedure as shown in table 5 below. As revealed in the table below, the null hypothesis that the series are co-integrated cannot be rejected, hence sustained, because the observed Lc statistic with stochastic trends paraded a p-vlaue of 0.1775, which is greater than the critical p-value of 0.05. Therefore, the results of the Johansen co-integration test are sustained and affirmed by Hansen parameter instability co-integration procedure that GDP, OILEXP and NOILEXP are co-integrated.

Table 5: Cointegration Test-Hansen Parameter Instability

Null hypothesis: Series are cointegrated				
Cointegrating equation deterministics: C				
	Stochastic	Deterministic	Excluded	
Lc statistic	Trends (m)	Trends (k)	Trends (p2)	Prob.*
0.288147	2	0	0	0.1775
*Hansen (1992b) Lc(m2=2, k=0) p-values, where m2=m-p2 is the number of stochastic trends in the asymptotic distribution				

Contemporaneous Relationship between Economic Growth and Revenue from Oil and Non-oil export

In this study, it is expected (apriori expectation) that the revenue from oil and non-oil exports will have positive and significant relationship with the Nigerian economy, all things been equal. Least square is employed to estimate this relationship. Table 6a below revealed the output of Ordinary Least Square (OLS) estimated model for the relationship between oil and non-oil exports and GDP. From the table Durbin-Watson statistics is 0.778667, showing presence of autocorrelation, suggesting the model cannot be used for further analysis and policy formulation. The researcher therefore proceeded to Error Correction Mechanism Test.

Table 6a: Ordinary Least Square (OLS) Methods

Dependent Variable: LNGDP				
Method: Least Squares				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNOILEXP	0.355339	0.089047	3.990453	0.0003
LNNOILEXP	0.494002	0.082356	5.998388	0.0000
C	-1.360365	0.424777	-3.202539	0.0028
R-squared	0.981875	F-statistic (beta= 1002.186)		0.000000
Adjusted R-squared	0.980895	Durbin-Watson stat		0.778667

From the least squares (ECM) results in table 6b, it is obviously observed that both revenue from oil and non-oil exports posted probabilities greater than 5% or even 10% acceptance region of significance in finance. This suggests that revenue from oil and non-oil exports insignificantly relate to economic growth in Nigeria, demystifying the apriori xpection of this study. Of course the veracity is not in doubt in this study, since the Adjusted R-squared is 10.59%, suggesting that revenue from oil and non-oil exports only explain 10.59% of the total variation in the economy proxied by GDP. This result is reliable for further investigation because problem of autocorrelation is totally negated since Durbin-Watson (DW) stat parades 2.193996 in this study.

Having seen that the least square estimates could not sufficiently address the trepidations of this study; the researcher then proceeded to other techniques, starting from pairwise Granger Causality.

Table 6b: Error Correction Mechanism Test

Dependent Variable: D(LNGDP)				
Method: Least Squares				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNGDP(-1))	0.983708	0.142497	6.903371	0.0000
D(LNOILEXP(-1))	-0.046157	0.059581	-0.774705	0.4444
D(LNOILEXP(-2))	-0.042324	0.054648	-0.774488	0.4445
D(LNNOILEXP(-1))	-0.048072	0.047474	-1.012594	0.3191
D(LNNOILEXP(-2))	0.071168	0.045511	1.563758	0.1280
ECM(-1)	0.022173	0.072726	0.304877	0.7625
R-squared	0.230131	Durbin-Watson stat		2.193996
Adjusted R-squared	0.105959			

Causal Relationship between GDP, OILEXP and NOILEXP

In macroeconomic analysis, causality test is a common tool used to check if causality exists or otherwise, between any two or more variables. From the table 7 below, OILEXP granger causes GDP ($F\text{-}stat_{OILEXP}$ = 6.28123; $Prob_{OILEXP}$= 0.0049, significant at 5%). In the other way round, GDP does not granger cause OILEXP ($F\text{-}stat_{GDP}$ = 2.21856; $Prob_{GDP}$= 0.1247, not significant at 5%). That suggests a unidirectional causality between OILEXP and GDP. That means causality flows from OILEXP to GDP only, no feedback effect. Again, NOILEXP granger causes GDP ($F\text{-}stat_{NOILEXP}$ = 6.99266; $Prob_{NOILEXP}$ = 0.0030, significant at 5%), also, GDP does granger cause NOILEXP ($F\text{-}stat_{GDP}$ = 6.43271; $Prob_{GDP}$ = 0.0044, significant at 5%). These show bidirectional causality between NOILEXP and GDP, that means NOILEXP and GDP drive each other; there is a feedback effect.

Table 7: Pairwise Granger Causality Test Results

Null Hypothesis:	**Obs**	**F-Statistic**	**Prob.**
OILEXP does not Granger Cause GDP	38	6.28123	0.0049
GDP does not Granger Cause OILEXP		2.21856	0.1247
NOILEXP does not Granger Cause GDP	38	6.96926	0.0030
GDP does not Granger Cause NOILEXP		6.43271	0.0044

Residual Diagnostic and Stability Tests

In continuation of the global utility examination of the specified model, this study is exposed to more diagnostic and stability tests; Normality test, Serial correlation test, Heteroscedasticity test, inverse root of characteristic polynomial, Ramsey Reset test, Recursive Estimates of the CUSUM (Cumulative Sum Control) Test and Variance Inflation Factor (VIF)

Table 8: Breusch-Godfrey Serial Correlation LM Test

F-statistic	**0.955438**	**Prob. F(2,29)**	**0.3964**
Obs*R-squared	2.287299	Prob. Chi-Square(2)	0.3187

Table 9: Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	**0.837596**	**Prob. F(6,30)**	**0.5508**
Obs*R-squared	5.308872	Prob. Chi-Square(6)	0.5049
Scaled explained SS	6.425745	Prob. Chi-Square(6)	0.3772

Serial correlation test on table 8 above revealed that F-statistic coefficient is 0.955438 with p-value of 0.3964 and Obs*R-squared has coefficient of 2.287299 with p-value of 0.3187. The respective p-values are greater than the 5% level of significance. For that the researcher has sufficient evidence to say that there is an absence of serial correlation in the model used in this study. The result of Durbin-Watson in table 6 also confirmed this claim. Table 9 above is a diagnostic test for Heteroskedasticity, used to check if the model coefficients estimated with least squares are free from bias. Heteroskedasticity is assumed whenever the variance of errors or the model is not the same for all observations. Here, F-statistic coefficient is 0.837596 with p-value of 0.5508 and Obs*R-squared has coefficient of 5.308872 with p-value of0.5049. The respective p-values are than the 5% level of significance. The researcher therefore boldly states that there is no Heteroskedasticity in the model.

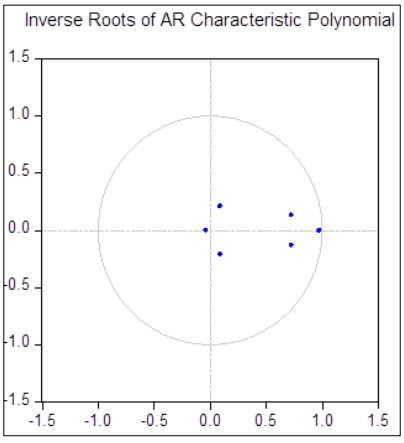

Fig 2: inverse root of characteristic polynomial

Figure 2 represents examination of the stability of the estimated VAR (1) model, the researcher plots the inverted roots in relation to unit circle. It is statistically known that the estimated VAR model is stable if all the inverted points are inside the unit circle (Ezirim et al, 2019) [16]. Therefore the output in Figure 2 indicated that the inverse roots of the characteristics AR polynomial fall or lie within the unit imaginery circle (modulus), suggesting that VAR (1) model is stable.

Table 10: Ramsey Reset test

	Value	df	Probability	
t-statistic	0.302327	34	0.7642	
F-statistic	0.091402	(1, 34)	0.7642	
Likelihood ratio	0.104702	1	0.7463	

Table 10 above is The Ramsey Reset test conducted to ascertain the stability of the regression model. The result showed the respective p-values for t-statistic, F-statistic and Likelihood ratio are 0.7642, 0.7642 and 0.7463; greater than 5% significance or benchmark. This revealed that the model is stable.

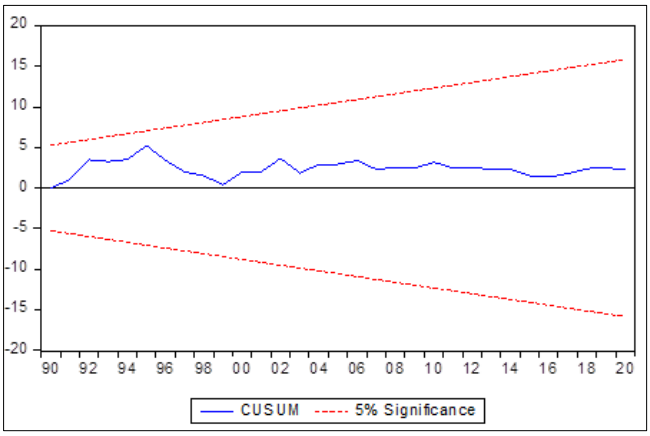

Fig 3: Recursive Estimates of the CUSUM (Cumulative Sum Control) Test

In continuation of the stability test, Recursive Estimates of the CUSUM in figure 3 above revealed that the blue line falls between the two red lines showing the 5% significance level boundaries. This confirmed that the model is stable.

Table 11: Variance Inflation Factor (VIF) Test

	Coefficient	Uncentered	Centered
Variable	Variance	VIF	VIF
LNGDP(-1)	0.001037	530.2145	36.62341
LNOILEXP	0.000522	660.0963	22.58945
LNNOILEXP	0.000704	546.1752	35.72107
C	0.012114	77.40338	NA

To further test multicollinearity among the explanatory variables, the Variance Inflation Factor (VIF) is employed. It is a statistical tool used to ascertain the presence of multicollinearity among the explanatory variables. Multicollinearity is a concern, when two or more independent variables interconnect in a study. Variance Inflation Factor of such explanatory variables is normally higher than the values of 4 (Garson, 2012) [20] or 10 (Gujarati & Porter, 2009) [22], depending on the benchmark adopted to attain the goal of a study.

The result of the VIFs on table 11 revealed that all the explanatory variables in this study are within the acceptable limits. This is also evidence affirming the absence of multicollinearity.

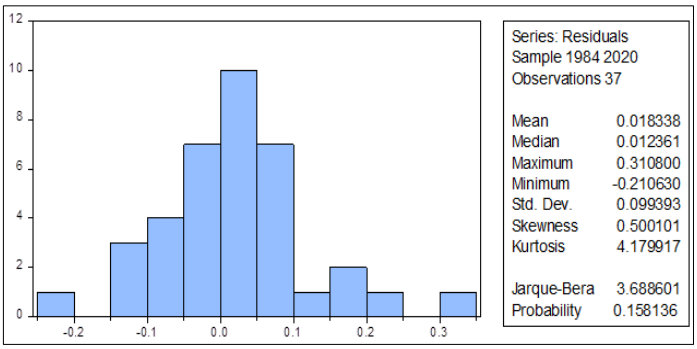

Fig 4: Normal Distribution Test

Histogram normality in Figure 4 showed that the coefficient of Jarque-Bera is 3.688601 with 0.158136; the p-value is more than 5% level of significance established in this study. This disclosed that the data set is normally distributed

Error Correction and Long run Test

It is already established that the variables in this study are cointegrated, hence, there is likelihood of adjustment from short run to long run equilibrium. That means errors encountered in the short run could be corrected or adjusted in the long run. To achieve the consistency, the researcher estimated the model with Vector Error Correction Estimates. Therefore, table 12 below revealed that error correction equation (CointEq1) has coefficient of -0.020444 and t-statistic of-2.20927. That means error correction parameter is negative and significant, satisfying the apriori expectation (condition), thus, significant. The speed of adjustment 2%, affirming the co-integration already established. That means short term errors can be corrected in the long run with annual speed of adjustment 2%. It also confirms that long run causality flows from OILEXP and NOILEXP to GDP.

Table 12: Vector Error Correction Estimates

Error Correction:	D(GDP)	D(OILEXP)	D(NOILEXP)
CointEq1	-0.020444	21.98916	-1.854391
	(0.00925)	(7.12028)	(1.36633)
	[-2.20927]	[3.08824]	[-1.35721]
R-squared	0.807053	0.540479	0.652162
Adj. R-squared	0.783665	0.484780	0.610000
F-statistic	34.50785	9.703488	15.46795

Short Run Causality Test

In order to ascertain the short run causality implications of the variables, the researcher employed VEC Granger Causality/ Block Exogeneity Wald Test. Table 13 showed that the p-values of Chi-square statistic for OILEXP and NOILEXP are insignificant at 5%, suggesting OILEXP and NOILEXP separately do not cause GDP in the short run. Also All (both) OILEXP and NOILEXP jointly do cause GDP with p-value of0.5295.

Table 13: VEC Granger and Causality/Block Erogeneity Wald Test

Dependent variable: LNGDP			
Excluded	Chi-sq	df	Prob.
LNOILEXP	0.579409	2	0.7485
LNNOILEXP	1.499185	2	0.4726
All	3.171971	4	0.5295

Long run Co-integrating and Further Hypotheses Testing

The previous result in this study observed that revenue from oil and non-oil exports insignificantly relate to economic growth in Nigeria. Again, OILEXP and NOILEXP separately do not cause GDP in the short run, it is then necessary to evaluate if the observed results in terms of magnitude, direction and sign implication in the contemporaneous relations will be same in the inter-temporal long run. To achieve that, the research employed the fully modified least squares (FMOLS) technique to examine the long run co-integration estimates of the variables. However, result of the estimates on table 14 revealed that OILEXP has coefficient or beta = 0.33, t =3.05, p-value = 0.0042, suggesting a positive and significant relationship with GDP, also NOILEXP has beta = 0.50, t = 5.04, p-value = 0.0000, indicating a positive and significant relationship with GDP. This output signposts that, OILEXP and NOILEXP will have positive and significant relationship with GDP in the long run. This shows that if the revenue base of the Nigeria is properly diversified, it will enhance the economic performance of Nigeria and other developing countries.

Table 14: Fully Modified Least Square (FMOLS) Results

Dependent Variable: LNGDP				
Long-run covariance estimate (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNOILEXP	0.333896	0.109377	3.052720	0.0042
LNNOILEXP	0.509961	0.101000	5.049114	0.0000
C	-1.173164	0.530516	-2.211365	0.0334

Impulse Response of GDP to its Own Shock and Shocks from OILEXP and NOILEXP & Variance Decomposition Analysis

It is observed in this study that, OILEXP and NOILEXP contemporaneously and inter-temporally do not jointly cause or relate with GDP in the short, thus it pertinent to determine the shocks or innovations of GDP from itself and from OILEXP and NOILEXP. In the same vein, determine the dynamic impacts or shocks of OILEXP and NOILEXP on GDP. This is done with impulse responses and variance decomposition as shown below.

Table 15: Response of GDP to Innovations from itself and from OILEXP and NOILEXP

Period	LNGDP	LNOILEXP	LNNOILEXP
1	0.099490	0.000000	0.000000
2	0.139037	-0.004015	-0.015221
3	0.164502	0.006583	-0.009733
4	0.182006	0.020901	-0.001044
5	0.193806	0.031632	0.006584

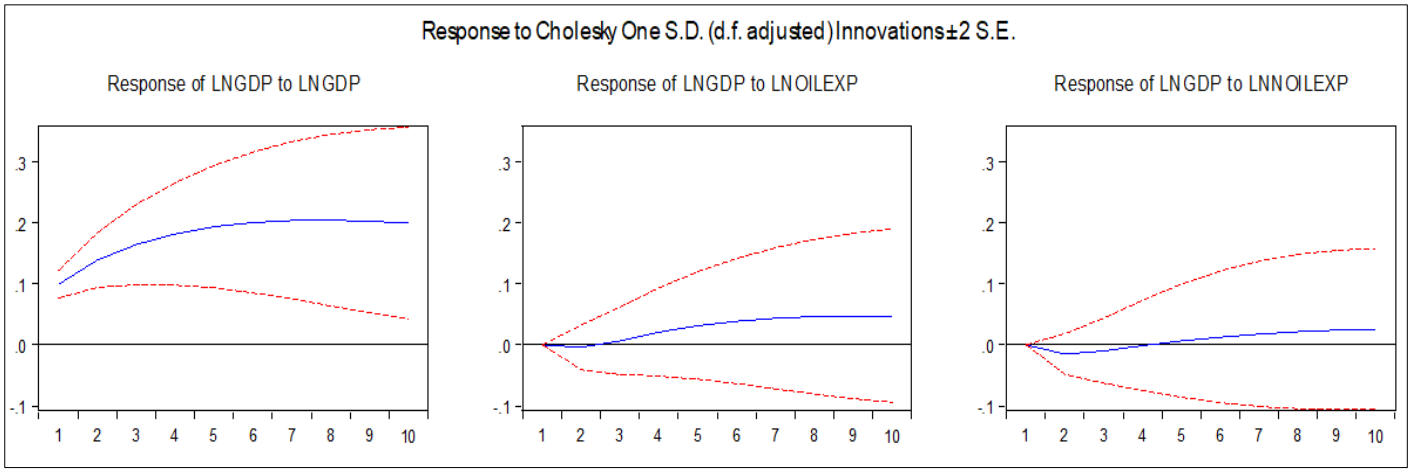

Fig 5: Response of GDP to Shocks

Table 16: Variance Decomposition

Period	S.E.	LNGDP	LNOILEXP	LNNOILEXP
1	0.099490	100.0000	0.000000	0.000000
2	0.171690	99.15934	0.054693	0.785972
3	0.238068	99.31915	0.104906	0.575942
4	0.300401	99.08707	0.550002	0.362933
5	0.358950	98.55037	1.161798	0.287836

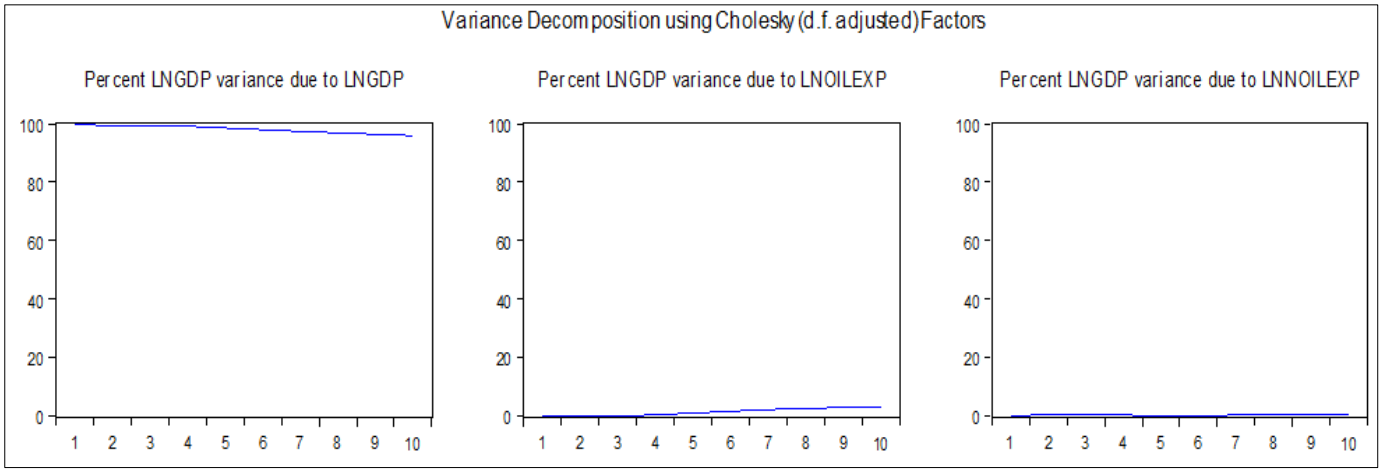

Fig 6: Variance of Decomposition of GDP

It is a known assertion and theory opines that an impulse response function determines or traces the effect of a one-time shock to one of the innovations on current and future values of the endogenous variables, whereas variance decomposition tries to separate the variation in an endogenous variable into the component shocks to the VAR. Variance decomposition gives information about the relative importance of each random innovation as it affect the variables in the VAR (HIS Global Inc, 2015; Ezirim *et al*, 2019) [26, 16]. From table 15 and figure 5, the impulse response function shows one time shock to the variables. It revealed that GDP responded positively to own shock from first period to the last period with magnitude of 0.099490, 0.139037, 0.164502, 0.182006 and 0.193806 for the first, second, third, fourth and fifth periods respectively. GDP responds to OILEXP was insignificant or the threshold at the first period, then negative in the second and rose slightly and gradually from third to the last period on a positive side of reaction. NOILEXP was also insignificant on the first period, then has negative and significant effect from second period to fourth period, then responded slightly positive from the fifth period to the last period. Variance decomposition on table 16 and figure 6 showed that own shock caused 100 percent variations in the first period and slightly reduced to 98% in the filth period and continued in the same trend. That suggests that own shock exerted the greatest influence in the cause of variation on GDP. The shock from OILEXP and NOILEXP were minimal ranging 1.16% to 0.7% in all the periods. These are sufficient evidence to affirm that own shock are critical source of volatility to a single based revenue economy, especially in Nigeria and other developing countries.

Conclusions and Recommendations

The essence of subjecting this study to the various macrofinametric tools especially diagnostic and stability is to have a solid foundation to make inference that will be trusted by policy makers and other relevant bodies. On that note, the researcher boldly announced the success and validation of all tests employed in this study. Therefore the results of all the macrofinametric techniques separately found as follows; that revenue from oil and non-oil exports insignificantly relate to economic growth in Nigeria. This result corroborated the findings of Nwosa *et al* (2019) [37] that export diversification insignificantly impact economic growth in Nigeria. It was also found that revenue from oil export and non-oil export separately and jointly do cause economic growth in Nigeria. This study also found that revenue from oil export and non-oil export have positive and significant relationship with economic growth in the long run, suggesting proper revenue base diversification to enhance the economic performance of Nigeria and other developing countries. It was observed that that non-oil revenue and economy growth proxied by GDP drive each other; there is a feedback effect. It was further revealed that Nigerian economy responded positively to own shock from first period to the last period. Again that own shock exerted the greatest influence in the cause of variation on the economy. The shocks from oil and non-oil export revenues were minimal. These are sufficient evidence to affirm that own shock are critical source of volatility to a single based revenue economy, especially in Nigeria and other developing countries. These findings therefore call for a shift from emphasis on single based (oil sector) to properly diversified revenue based economy in Nigeria. The Nigerian economy should be micro structured into various economic activities engaged by economic agents; every economic activity should be appreciated and stimulated. Emphasis should be withdrawn from oil and non-oil sectors structured economy; not only on the mantra of oil and non-oil based revenue. The Nigerian economy should be structured in line manufacturing, building and construction, power, services, entertainment industry, tourism, software industries, hospitality, telecommunication, information technology, wholesale and retail trade, financial services, mining etc. In fact, it should be a multi-sectoral economy (multiple sources based); broad revenue base, drifting to a more diverse production and trade structure. This if well-articulated will spur the Nigerian economy into broad revenue base, as well help to absorb external shock and volatility associated with oil revenue or monolithic based economy.

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