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Testing the Validity of Okun's Law in Nigeria: An Autoregressive Distributed Lag Approach (1980-2013)

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Abstract: This study examined the relationship between unemployment and economic growth in Nigeria using an Autoregressive Distributed Lag Approach. Specifically it determined the validity of Okun's law in Nigeria. It equally examined if there is significant long run relationship between growth rate and unemployment rate in Nigeria within the period under study. The study employed ex-post facto research methodology using Nigeria's data obtained from CBN statistical bulletin between 1980 and 2013. The empirical analysis started with the conduct of unit root test to determine the stationarity status of the series employed using Augmented Dickey Fuller test and Philip Peron, the result of which indicates that RGDP was stationary at level while unemployment rate and inflation rate were stationary at first difference. This led to the use of Autoregressive Distributed Lag Approach from where it was found that Okun's law does not hold for Nigeria. The sign borne by unemployment as found from this result did not meet the apriori expectation. The result also indicates that in the short run, unemployment does not influence the economy. Though Okun's law does not hold in Nigeria, it was found that unemployment influences RGDP significantly in the long run. Therefore, the study recommended that government should adopt stringent policies which will help to create employment opportunities so that unemployment level will be reduced drastically in the long run. This can be achieved by creating friendly environment for business which will as well trigger off economic growth.

Key words: Unemployment · Economic growth · Okun's law · Policies

INTRODUCTION

One of the greatest challenges of the Sub-Saharan African economies today is the high rate of unemployment that has maintained a rising trend over the years. The problem of unemployment has been of great concern to the economists and policy makers in Nigeria since early 1980s. The effect of financial crisis on public and private sectors has led to renew attention on the phenomenon. It is a widely accepted view in economics that the growth rate of the Gross Domestic Product (GDP) of an economy increases employment and reduces unemployment. Unemployment is an important issue in developing economies as high unemployment means that labour resources are not being used efficiently. Hence, the goal of full employment is usually a major macroeconomic goal of any government because it maximizes output. Unemployment is seen as a great problem to global economic development. In recent years, both developed and developing countries have witnessed this problem, though the developed countries have been curtailing the rate of their unemployment. However, in developing countries, especially in Africa, unemployment has been on a continuously accelerating rise in the economy, culminating in reduction of household income and living standards and concomitant rise in the level and incidence of poverty [1].

The theoretical proposition relating output and unemployment has been proposed by Okun (1962) [2]. This relationship is among the most famous in macroeconomic theory and has been found to hold for several countries and regions mainly, in developed countries [3]. Okun's (1962) [2] postulates a negative relationship between movements of unemployment rate and real gross domestic product (GDP) by focusing on the empirical relationship between unemployment and GDP variations. He emphasized that as a result of changes in aggregate demand, industry changes their production pattern which leads to changes in demand for labour which alter the unemployment rates. Okun (1962) [2]

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summarized the relationship between growth and unemployment in a statistical relationship, which was later labeled Okun's law. It has been discussed and updated by much economic research. This law states that the relationship between growth and unemployment reduction (employment increase) is not one to one. Okun in 1962 postulated that there is only a weak relationship between growth and the reduction of unemployment. He postulated that a percent increase in the growth rate above the trend rate of growth (or the growth in potential output) would lead only to 0.3 percent in the reduction of unemployment. Reversing the causality, one percent increase in unemployment will mean roughly more than 3 percent loss in GDP growth. This relationship implies that the rate of GDP growth must be equal to its potential growth just to keep the unemployment rate constant. To reduce unemployment, therefore, the rate of GDP growth must be over and above the growth rate of potential output. Okun's law is important for both theoretical and empirical reasons. From a theoretical point of view, Okun's law, which is rooted in old and new Keynesianism, is, along with the Phillips curve, a key element to derive the aggregate supply curve; from an empirical perspective, "Okun's coefficient is a useful "rule of thumb" in forecasting and policy-making" Habees and Rumman (2012) [4], cited in (Villaverde and Maza, 2008) [5]. There are many types of unemployment in Nigeria: structural unemployment, cyclical unemployment, frictional unemployment and classical unemployment. Structural unemployment occurs due to globalization and technological advancement which replace the workers with the machinery that causes the layoffs in the economy. It is also caused by mismatch of skills of workers from the underlying jobs. Cyclical unemployment is also known as Keynesian unemployment; it occurs when the aggregate demand of the economy is not sufficient to give the jobs to everyone who wants to work, because aggregate supply of goods and services exceed from the aggregate demand that can discourage the production and consequently it reduces the workers. Frictional unemployment occurs when the skills of the workers are mismatched with the underlying jobs, it is like a structural unemployment but it is short run in nature while structural unemployment has long lasting effect. According to the classical economists, unemployment, tagged "Classical unemployment" arises when government set the wage rates above the equilibrium prices that cause labour to rush for the jobs in the labour market which exceeds from the existing vacancies.

Unemployment problem in Nigeria has different dimensions. There are underemployment cases in which people receive incomes that are inadequate to support their basic needs, in terms of food, clothing and shelter. There are also cases of disguised unemployment where people take up jobs that are below their educational attainment and experience. The worst case of all is that of people seeking for job opportunities but who cannot find any either in the public or the private sector. Some people are willing and ready to set up enterprises themselves and engage in one type of economic activity or the other but are constrained by the prevailing poor macroeconomic environment. All these have contributed significantly to the high level of unemployment and poverty in Africa [6].

Analysis of employment data for the past years shows that the rate of new entrants into the labour market has not been uniform. The rate was on the increase from 2007 to 2009, but declined significantly from 2009 to 2010 and increased again from 2010 to 2011. "Within the five-year period, there has been an average of about 1.8 million new entrants into the active labour market per year". Nigeria's unemployment rate increased to 23.9 percent in 2011 compared with 21.1 percent in 2010 and 19.7 percent in 2009, as revealed by the National Bureau of Statistics (NBS). The "Nigerian unemployment report 2011" prepared by the NBS shows that the rate is higher in the rural areas (25.6 percent) than in the urban areas (17.1 percent). The rise in the unemployment rate was largely attributed to the increased number of school graduates with no matching job opportunities, a freeze on employment in many public and private sector institutions as well as the slow disbursement of the capital budget by the Federal Government.

The result of the survey by International Labour Organisation (ILO) in Nigeria shows that persons aged 0 to14 years constituted 39.6 percent, those aged between 15 and 64 (the economically active population), constituted 56.3 percent, while those aged 65 years and above constituted 4.2 percent. Before now, not a few economic watchers have queried the recorded Gross Domestic Product, GDP, growth rates in Nigeria, which over time are contrary to the growing rate of unemployment. For instance, GDP report for third-quarter of last year showed that the Nigerian economy, when measured by the real GDP on an aggregate basis, grew by 7.4 percent in the third-quarter of 2011 as against 7.9 percent in the corresponding quarter of 2010. Amid this high rate of unemployment, the economic watchers have noticed that there is an increasing trend of disinterest by the emerging younger generation in highly

labour-intensive works such as agriculture and factory work in preference for white collar jobs, resulting in many preferring to remain in the labour market rather than take up such jobs. Based on the stated problem above, there is need to answer the following questions in the course of this research work.

- Does Okun's law on unemployment hold on Nigeria's economy?
- To what extent has unemployment impacted on economic growth in Nigeria?

The objective of this study is to examine the impact of unemployment on the Nigeria's economic growth from 1980-2013. Specifically, the study intends to test the validity of Okun's law for Nigeria and to examine if there is significant long run relationship between GDP and unemployment rate in Nigeria within the period under study.

Review of Related Literature

Theoretical Review: The relationship between productivity and employment/unemployment is a complex issue. Increased labour productivity connotes that the same volume of output can be produced with less labour. By implication, this tends to contract employment (an increase in unemployment rate). The theoretical perspectives on this relationship vary from one school of thought to another.

Classical View: The classical economists hold the view that the relationship between employment and output is a one-way relationship that goes from the input of labour to output. The classical growth theory, as reflected in aggregate production (mostly a variant of Cobb-Douglas function) derived essentially from the technical relations that make the level of output a function of production inputs such as labour, capital, land, technology, etc. In the classical model's steady state (conditions where the growth rate of capital stock and output are equal), the approach shows that the rate of growth of labour force and technical progress ultimately determine the growth rate of output. And as pointed out by Moazzami and Dadgostar (2009) and Herwartz and Niebuhr (2011) [7], [8], this model fails to explain the ultimate determinant of labour force and technical progress. The premise of the classical model therefore is that the growth rate of employment is exogenous to the growth rate of output. This, however, does not preclude the classical economists' belief in the attainment of full employment equilibrium. In this framework, the supply of labour is positively related to the level of real wage, while the demand exhibits a negative relationship with real wage, but a positive relationship with productivity (Beaton, 2010; Caraiani, 2010) [9], [10]. As pointed out by these authors, if there is some `involuntary' unemployment at or below the current real wage, the real wage would fail to induce employers to take more labour until all involuntary unemployment is eliminated. However, if increases in labour productivity translate to increased wages and such increases induce the substitution of capital for labour the effect on unemployment will be positive (Elshamy, 2013; Gordon, 2010a) [11], [12]. The policy implications of this have been viewed as misleading particularly, to developing countries (Gordon 2010b; Busetta and Corso 2012) [13], [14]. Evidence from the economic recession of the 1980s in Africa and Latin America clearly show that real wages declined very sharply. This period of lower real wages coincided with high level of unemployment than the available jobs (Levine, 2013) [15]. Also as argued by Amassoma and Nwosa, (2013) [16], the policy implication of the neoclassical approach to primary commodities-producing countries is that, given the existence of says Law, whatever that was produced is automatically sold irrespective of the characteristics of the goods produced and the demand for them. Recent developments in the world market for primary commodities have proved this to be wrong.

Keynesian Theory: In contrast, Keynesian theory explains the determination of output or productivity and employment/unemployment in terms of aggregate demand. This approach sees demand for labour as a derived demand. Productivity growth should increase the demand for labour thereby reducing unemployment. The Keynesian framework, as examined by Tillmann, (2010) Bakas and Papapetrou, (2012) and Bankole and Fatai, (2013) [17], [18], [19], postulates that increases in employment, capital stock and technological change are largely endogenous. Thus, the growth of employment is demand determined and that the fundamental determinants of long term growth of output also influence the growth of employment.

Okun's Law: The extension of the Keynesian model dominated development theorizing in the 1950s and beyond. Such extensions could be found in Okun's Law and the Harrod-Domar model. For instance, Arthur Okun developed the relationship between the actual and potential output and between the actual and benchmark unemployment in an equation called the "Okun's Law" [20]: thus:

$$\frac{Q^* - Q}{Q} = \alpha (U - U^*) \quad (1)$$

where Q* is potential output, Q is actual output, U is the unemployment rate, U* is the benchmark unemployment rate and "is Okun's coefficient. The implication of Okun's coefficient is that a 1 percentage rise in unemployment causes the economy to lose "percent of its output. Okun's Law clearly gives a direct relationship between output and unemployment and indirectly between productivity and unemployment. In a similar vein, the neo-Keynesians in their efforts to provide reasons as to why employment growth lags behind growth of industrial output came out with a typical variant of the Harrod-Domar unemployment equation thus.

The import of this equation is that the rate of output growth (Y) minus the rate of growth in labour productivity (Y/N) approximately equals the rate of growth of employment (N). The implication is that the gap between growth rate of output and the growth of labour productivity accounts for the rate of labour absorption. As had been argued hypothetically by Knotek, (2007) [21], if output is growing by 8 percent per year while employment is expanding by only 3 percent, the difference is due to the rise in labour productivity and vice versa. By implication, rapid economic growth could generate lagging employment creation.

This tends to support Mankiw, (2010) [22], argument that if the reduction in labour demand resulting from productivity increases is more than compensated by overall increases in output, then both productivity and employment can increase together. This is particularly so when higher productivity leads to increased profit and higher rate of investment, which in turn results in higher rate of growth. In conclusion, the neo-classical approach posits that the rate of growth of employment (unemployment) is exogenous to the rate of growth of output (productivity). In contrast, the Keynesian argument is premised on the fact that it is the strength of demand that determines the amount of resources utilized. As such, employment is demand determined and the rate of output growth is itself an important determinant of the rate of growth of employment. Thus, output, productivity and employment are determined endogenously. This approach therefore suggests the possibility of a bi-causal relationship.

The Theory of Real Business Cycles: This theory contents that the growth of productivity of input which revolutionizes technology is the main sources of employment and unemployment that is, if the growth of output increases more than the growth of inputs, which makes the total factor productivity or the Solow's residual to receive increasing attention. For instance, if total factor productivity is not growing then firms and economies become inefficient. This therefore, follows that reallocation of labour and capital cannot be achieved and that labour and capital will be used in less profitable opportunities. Hence, the rate of unemployment will rise according to (Gordon, 2011) [23]. As a matter of fact, many factors are likely to be responsible for the slowdown in the total factor productivity (TFP). Hence, technology may not be an improving factor of the production of goods and services while workers skills are not being enhanced. Once there is no invention in a firm and nation at large and there is continuous increase in the prices of imported goods. This in turn pinpoints tendency for the TFP to be stagnant, such that, the co-movements in other important variables are likely to be equally slowdown, hence leading to fall in productivity growth.

Theory of Effective Demand: This theory was developed by Andrei, Vasile and Adrian, (2009) [24], where they considered unemployment as an involuntary phenomenon. Keynes thought that unemployment was basically cyclical, generated by the deficiency of aggregate demand in his opinion, capitalists hire workers and invest such labour to produce – output when the expectations about the economy and profits are favourable or optimistic. To him, if expectations about the future are supported by the economic reality, investments will be increasing such that employment will continue to rise until the equilibrium condition is reached. This equilibrium is however obtained by the intersection of aggregate demand and supply – the point of effective demand will and may be less than the full employment equilibrium; such that if expectation about the future of the economy is not favourable, the capitalists will reduce investment thereby making unemployment to rise. Hence, equilibrium is achieved where unemployment exists. This unemployment is due to the deficiency of aggregate demand particularly investment expenditure.

Empirical Literature: The relationship between economic growth (real output) and rate of unemployment has generated large volume of empirical studies since the pioneer work of Okun (1962) [2]. The Okun's law was formulated for the United States by Arthur Okun in 196 [2] and has since established itself as one of the most enduring stylized facts in macroeconomics and is now a basic rule of thumb. Okun (1962) [2] found that "in post-war period, on the average, each extra percentage point in the unemployment rate above 1% has been

associated with about 3% decrement in real GDP". The Okun's law has established its prominence in the macroeconomic framework of analysis for over four decades. Basically, it asserts that a negative relationship ensues between unemployment rate and real gross domestic product (real GDP). Several empirical studies have gone underway to establish the relationship proposed by the Okun's law.

Employing post war data for 16 OECD countries, Lee (2000) [20] evaluate the robustness of the Okun relationship. Though the Okun's law was statistically valid for most of the countries, the quantitative as opposed to qualitative estimates were far from uniform. The estimates were found to be sensitive to the choice of models. The study found mixed evidence of asymmetric behaviour but strong evidence of structural breaks occurring around the 1970s, after which time most countries began to experience a smaller output loss associated with higher unemployment.

Kitov (2011) [25], had it that Arthur Okun (1962) [2] formalized the hitherto observed inverse relationship between unemployment rate and real output growth into a statistical relationship. Employing US GDP data, Okun observed and explicated that for every percentage point that unemployment rate falls (increases) in excess of the natural unemployment rate, real output rises (falls) by approximately 3% per year. Though the negative relationship between unemployment rate gap and the growth of real output has remained quite stable, the absolute value of the Okun's coefficient seem to vary from country to country. As observed by Teck (2012) [26] estimates of Okuncoefficient tends to be sensitive to the model specification and the method of estimation.

In Mosikari (2013) [27], Okun's law is identified as one of the most enduring facts in macroeconomics. Employing new developments in trend/cycle decomposition to test Okun's law for ten industrial economies, the study found that the original Okun estimate for the United States (i.e. 3 points of real GDP growth for each 1% reduction in unemployment rate) was an average of 2 points of real GDP growth rate for the countries under observation. Further, the study showed that the pooled estimates for Europe were smaller than the estimates for the remaining elements in the sample. In order to ascertain the growth necessary to reduce unemployment or even eradicate it, a stability test of the Okun's law provides information on whether with an indirect check or external shock result in an unstable unemployment-GDP relationship. In a more recent study Mosikari (2013) [27], conducted panel Tests of Okun's Law for Ten Industrial Countries.

Single country studies on the Okun relationship are replete in the literature. Some single country studies are those of [28], [29], [30], [31], [32], [33], [34], [35], [36], [37], [20], [38], [39] They provide empirical evidences that validate the relationship proposed by the Okun's law. However, the estimates of the coefficient tend to vary among countries over time. As regards structural changes that may account for a structural break in the Okun's relationship, Lee (2000) [20] adduced this to corporate restructuring, changes caused by rising female labour force participation; productivity and wage slowdown. The issue of asymmetry in the output-unemployment relationship examined by Okun in 1962 [2] has been a subject of recent considerations. By asymmetry we mean that that the response of unemployment to output growth is different when the economy is expanding from that when the economy is contracting. This is as contrary to the conventional specification, which encompasses symmetry in the sense that expansions and contractions in output have the same absolute.

Ibragimov *et al.* [40] posited that forgone output is the major cost of unemployment and if the loss is very high it could lead to recession. Oberst and Oelgemöller (2013) [41], found long term relationship between unemployment and capacity utilization is not stable. Factors such as increasing labour resource utilization weakened the estimations of Okun's law. The empirical results of Hutengs (2013) [42] show that changes in output will lead to changes in efficiency of production. It identified other determinants of output as the amount of time worked and exploitation of facility space. Hutengs thus concluded that the Okun's law is but a partial measure of the relationship and GDP.

There are some studies that identified the shortcomings of Okun's law they include Lal *et al.* [43], Kangasharju, [44] and Lee [20]. For instance, Lal *et al.* [43] argue that Okun's law does not generally capture the shape of the time series of output; showing several instances in which the direction of GDP growth is inconsistent with the model's predictions. They conclude that that GDP growth depends on the level and rate of change of labour resource utilization. It is pertinent, however, to note that the stability of the relationship establishes its usefulness as a forecasting tool. Moreover, there is a dearth of studies in Africa testing the existence and stability of the Okun relationship, thus making this present study apt.

Lal *et al.* [43] test the validity of Okun's law in some selected Asian countries using time series annual data during the period 1980-2006. The study employs Tingi and Lingii, [47] cointegration technique to establish the

long-run relationship between the variables of interest and error correction mechanism for short-run dynamics. After the empirical analysis, the results of the study indicate non-applicability of Okun's law in some Asian countries.

Kitov and Kitov [45] estimates Okun's coefficient for Baltic States using cointegration and error correction model framework. The study also utilizes Hodrick-Prescott filter which allows the trend to change smoothly and gradually in the course of real business cycles analysis. The results of the study do not provide evidence in support of strong relationship between unemployment and output. The study, therefore, suggests data reliability issues and labour market features as reasons for such results.

Lang and De Peretti [46] verify the validity of Okun's law for the Spanish regions over the period 1980 - 2004. The study provides evidence in support of a negative relationship between unemployment and output for most of the regions and for the whole country. The study, however, further reveals different estimates of Okun's coefficients across the regions which could be attributed to regional disparities in productivity.

Lang and De Peretti [46], test the robustness of Okun's law in Mexico utilizing quarterly data between the 1st quarter of 1985 and 4th quarter of 2006. Using three structural time series models (Kalman Filter), the study estimates Okun's coefficient to fluctuate in the range 2.3 - 2.5. The study also finds robust evidence of bilateral causality between output and unemployment.

In recent study by the World Bank (Lang and De Peretti [46], staff suggested that the link between growth and unemployment in Jordan is affected by the types of jobs that are created mainly (manual jobs), by the incentives employers have to choose between foreign and local workers and by the choices that nationals make between accepting a local job and staying voluntarily unemployed in search of a better job overseas or in the public sector. They explained that despite Jordan achieved strong GDP growth and created many new jobs. However, unemployment (among nationals) did not decline but fluctuated around a fairly high level of 14%, the bulk of new jobs created have been taken by foreign workers. This is because; domestic workers have relatively high reservation wages, based on expectations of obtaining public sector or foreign jobs and of income support from families. More than 50% of the unemployed indicate that they are unwilling to take available jobs at prevailing wages.

Tingi and Lingii [47] analyzed the validity of Okun's law for certain regional areas in Greece over the period 1960-1997. Using the Hodrick-Prescott and band-pass filtering techniques, the results indicate no much interregional differences for most regional areas. The results further indicate that Okun's relationship undergoes a structural change in 1981. After this break, unemployment becomes less reactive to output changes in all regional areas of study. Zanin and Marra [48], analyzes a vector error correction model of economic growth and unemployment in four major European countries, France, Germany, Italy and United Kingdom. The study finds the existence of positive long-run relationship between economic growth and unemployment; a finding which goes contrary to Okun's law. However, the short-run dynamics of the two variables of interest indicates agreement with Okun's law. The study further reveals that Okun'scoefficient is in agreement with previous estimates for the countries in the sample with the exception of United Kingdom.

In Nigeria, Zanin and Marra [48], conduct an empirical evaluation of the relationship between output and unemployment using the first difference and output-gap models of Okun's law. The study finds no evidence to support the validity of Okun's law in Nigeria.

It is observed by Bankole and Fatai [19] that Okun law is invalid for Nigeria; Amossoma and Nwosa [16] find that it is valid. Some studies had gathered results contrasting to Okun's Law and some of them are; Ting and Ling for Malaysia and Habees and Rumman [4] for Arabian countries and Jordan showed that there is no absolute relation between unemployment and growth; Lal and others [20], for some developing Asian countries, showed that Okun's Law is not applicable. Tillmann [17], states that the relation started to get weak from 90's.

There exist studies showing partial validity of Okun's Law. Some findings are as follows: the relation is unstable for USA and Canada (Beaton, 2010); partially valid for Germany (Oberst and Oelgemöller, 2013) [41]; valid with low rate for Central and East Europe (CEE) countries (Hutengs and Stadtmann, 2013); strong validity for young population and weak validity for old population in Euro zone (Hutengs and Stadtmann, 2012) [38]; there are different coefficient for different countries and coefficients are time varying, while the relation is valid in the opposite way for Euro zone countries (Zanin and Marra, 2012) [48]. Using the Italy example, Busetta and Corco (2012) [14] found results suggesting that there might be regional differences. In another study on

regional differences, Kangasharju and others (2012) [44], find similar results and pointed the decrease tendency of coefficients. In their study on relation of unemployment in crisis periods and growth, for USA and EU, Cazes, Verick and Hussami (2011) [3], (and Gordon, 2010a; 2010b; 2011) [10], [23] find that after global crisis, coefficients for USA, Canada and Spain showed sudden increases. In addition to this, these increases are quite sudden compared to crisis before 2000 and coefficients are lower for economies with high labor protection, like Germany.

MATERIALS AND METHODS

Research Design: Ex-post facto research design was adopted for this study. It is systematic and empirical inquiry in which the researcher does not have direct control of independent variables because their manifestations have already occurred or because they are inherently not manipulated (Zanin and Marra 2012) [48]. Thus, it will be adopted as a research design for this work. This kind of research will be based on analytical examination of dependent and independent variables.

This design will be used because the study intends to use what already exist and look backwards to explain why. More so, independent variables are studied in retrospect for seeking possible and plausible relations and the likely effects, the changes in independent variables produce on a dependent variable. Theoretical viewpoint supports the existence of positive relationship between real GDP growth and employment level. William Phillips proposed higher price level following increasing employment level. Increasing employment level tends to increase the GDP growth rate, thus, employment and GDP growth rates are positively related with each other and as such, unemployment and GDP growth rates will be negatively related to each other. Arthur Okun defined this negative relationship between GDP growth and unemployment rate and this is the only empirical hypothesis explaining the relationship between unemployment rate and GDP growth. The different versions of the hypothesis are discussed below:

Difference Model:

$$RGDPG_t - RGDPG_{t-1} = \alpha\ (UNR_t - UNR_{t-1})\ \varepsilon_t \quad (2)$$

"Gap" Model

$$RGDPG_t - RGDPG_t^* = \alpha_0 + \alpha_1\ (UNR_t - UNR_t^*)\ \varepsilon_t \quad (3)$$

where:

$RGDPG_t$ = Real Gross Domestic Product Growth (measured in natural logarithm) t $RGDPG_t^*$ = Potential output (measured in natural logarithm)

$RGDPG_{t-1}$ = One period lagged Real Gross Domestic Product Growth (measured in natural logarithm)

UNR_t = Unemployment rate (measured in percentage) t UNR

UNR_t^* = Natural/Normal rate of unemployment (measured in percentage)

UNR_{t-1} = One period lagged unemployment rate (measured in percentage)

ε_t = White noise error term t

A priori/Theoretical Expectation: $\alpha_0 > 0$, $\alpha_1 < 0$.

In taking a leaf from the above model, it was modified. Thus, the model is represented in a functional form. It is shown as below:

$$RGDPG_t = f\ (UNEG_t, INF_t) \quad (4)$$

$$RGDP_t = \alpha_0 + \alpha_1 UNEG_t + \alpha_2 INF_t + U_t \quad (5)$$

where; $RGDPG_t$ = Growth Rate Real Gross Domestic Product at a given period, $UNEG_t$ = Unemployment Rate at a given time and INF_t = Inflation Rate at a given time. U_t = Disturbance Term. α_0= Intercept, $\alpha_1 - \alpha_2$ = coefficient of the independent variables.

The apriori expectations of the variables hold that $UNEG_t$ = Unemployment Rate and INF_t = Inflation Rate at a given time should possess negative sign (-). This implies that increase in unemployment rate and inflation rate at a given time will bring about decrease in Growth Rate Real Gross Domestic Product at a given period ceteris paribus.

Sources of Data: The data for this research project will be obtained from the following sources:

- Central Bank of Nigeria Statistical Bulletin, Volume 24, 2013.
- CBN Annual Report and Statement of Accounts.

RESULT AND DISCUSSIONS

Unit Root Test: It is used to test for the stationarity of the time series data. Augmented Dickey fuller was used in the process. In considering the levels the data could be said

to be integrated of, Augmented Dickey Fuller (ADF) test statistics is compared with the critical values at 5% level of significance. A situation whereby the (ADF) test statistics is greater than the critical values with consideration on the absolute values, the data at the tested order will be said to be stationary. Augmented Dickey-Fuller test relies on rejecting a null hypothesis of unit root (the series are non-stationary) in favour of the alternative hypotheses of stationarity. The test results are presented below:

Augmented Dickey Fuller Unit Roottest

Table 1: Trend and Intercept (Series at Level)

Series	ADF Test Statistic	5% critical values	10% critical values	Remarks
RGDP	-6.209548	-3.552973	-3.209642	Stationary I(0)
UNEG	-3.048171	-3.552973	-3.209642	Not Stationary
INF	-3.021112	-3.552973	-3.209642	Not Stationary

Sources: Researcher's compilation from E-views 7

Augmented Dickey Fuller Unit Root Test

Table 2: Trend and Intercept (Series at 1st Difference)

Series	ADF Test Statistic	5% critical values	10% critical values	Remarks
RGDP	-17.73015	-3.557759	-3.212361	Stationary
UNEG	-7.792109	-3.557759	-3.212361	Stationary I(1)
INF	-5.471471	-3.557759	-3.212361	Stationary I(1)

Sources: Researcher's compilation from E-views 7

Considering the variables, RGDP, UNEG and INF, the series of RGDP was stationary at level I (0)while others (UNEG and INF) are not stationary at level. However, at first difference UNEG and INF became stationary 1(I). The results show that in the first instance a series is integrated of order zero I(0) while others are integrated of order one I(1), thus ARDL Model otherwise known as Bound test is employed.

Ardl Bounds Tests for Cointegration: In order to empirically analyze the long-run relationships and short run dynamic interactions among the variables of interest (Real Gross Domestic Product (RGDP), Unemployment Growth Rate (UNEG) and Inflation Rate (INF)) we apply the autoregressive distributed lag (ARDL) cointegration technique. The ARDL cointegration approach was developed by Zanin and Marra, (2012). and Zanin *et al*. (2001) [48]. It has three advantages in comparison with other previous and traditional cointegration methods. The first one is that the ARDL does not need that all the variables under study must be integrated of the same order and it can be applied when the under-lying variables are integrated of order one, order zero or fractionally integrated. The second advantage is that the ARDL test is relatively more efficient in the case of small and finite sample data sizes. The last and third advantage is that by applying the ARDL technique we obtain unbiased estimates of the long-run model (Harris and Sollis, 2003). The ARDL model used in this study is expressed as follows:

$$\Delta y_t = \beta_0 + \Sigma\, \beta_i \Delta y_{t-i} + \Sigma \gamma_j \Delta x_{1t-j} + \Sigma \delta_k \Delta x_{2t-k} + \theta_0 y_{t-1} + \theta_1 x_{1t-1} + \theta_2\, x_{2t-1} + e_t\,; \quad (9)$$

In the eviews equation format, it becomes:

D(RGDP) C D(RGDP(-1)) D(RGDP(-2)) D(UNEG(-1)) D(UNEG(-2)) D(INF(-1)) D(INF(-2)) RGDP(-1) UNEG(-1) INF(-1) (10)

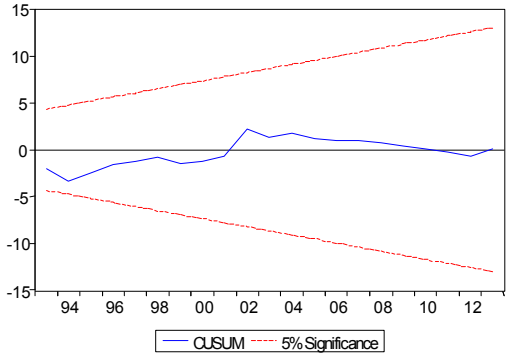
where all variables are as previously defined in chapter three, D is the first difference and lag length 2 is chosen due to the obtained lowest AIC and SIC values.

Diagnostic Tests: The validity of the regression for the underlying ARDL equation was tested against serial correlation (Breusch-Godfrey test) and stability of the model using cumulative sum of recursive residuals (CUSUM) so as to assess the parameter stability (Pesaran and Pesaran (1997).

Table 3: Breusch-godfrey Serial Correlation Lm Test:

F-statistic	0.732396	Prob. F(2, 19)	0.4938
Obs*R-squared	2.218863	Prob. Chi-Square(2)	0.3297

The Observed R-squared is 2.22 while its P-value is 0.33. The P-value is greater than the chosen level of significance [0.05], therefore we cannot reject the null hypothesis. This implies that this model does not have serial correlation. The model is tested to check if it is stable or not using CUSUM:



The blue line is within the two red lines. This implies that the model is stable.

The bounds test is mainly based on the joint F-statistic which its asymptotic distribution is non-standard under the null hypothesis of no cointegration. The first step in the ARDL bounds approach is to estimate the equations by ordinary least squares (OLS).

The estimation of the equation test for the existence of a long-run relationship among the variables was conducted by employing an F-test for the joint significance of the coefficients of the lagged levels of the variables, i.e., : H_0: C(8) = C(9)= C(10) = 0 against the alternative one : H_1: C(8) ≠ C(9) ≠ C(10) ≠ 0 for C(8), C(9) and C(10)are RGDP(-1), UNEG(-1) and INF(-1) respectively. We denote the F-statistic of the test which normalize on *RGDP =f* (*UNEG, INF)*.

The F-statistic value is 4.14. We compare the F-statistic value with the two sets of critical values for a given significance level can be determined (Zanin *et al.,* 2012) [48]. The first level is calculated on the basis that RGDP included in the ARDL model is integrated of order zero, while the second and third variables are calculated on the basis that the variables are integrated of order one.

Using the Zanin Critical value at 5% level with restricted intercept and no trend, the lower boundary is 3.10while the upper bound is 3.87. The null hypothesis of no cointegration is rejected since the value of the F-statics statistic [4.14] exceeds the upper critical bounds value.

From these results, it is clear that there is a long run relationship amongst the variables when *RGDP* is the dependent variable because its F-statistic (4.14) is higher than the upper-bound critical value (3.87) at the 5% level. This implies that the null hypothesis of no cointegration among the variables is rejected. This means that all the three variables (RGDP, UNEG and INF) move together in the long run.

Table 4: Ardl Long-run Relationships Test

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.615532	3.054702	1.510960	0.1457
D(RGDP(-1))	0.026960	0.013299	2.027258	0.0555
D(RGDP(-2))	0.009908	0.009286	1.067077	0.2981
D(UNEG(-1))	0.102924	0.143072	0.719388	0.4798
D(UNEG(-2))	0.111680	0.125526	0.889692	0.3837
D(INF(-1))	0.122945	0.057323	2.144761	0.0438
D(INF(-2))	0.047548	0.064984	0.731691	0.4724
RGDP(-1)	-0.679366	0.194683	-3.489599	0.0022
UNEG(-1)	0.094784	0.142288	0.666147	0.5126
INF(-1)	-0.069807	0.067710	-1.030969	0.3143

R^2 = 0.621941, F-Statistics = 3.84, Prob(F-Statistics) = 0.005, DW = 2.24

Table 5: Wald Test

Test Statistic	Value	Df	Probability
F-statistic	4.144378	(3, 21)	0.0187
Chi-square	12.43313	3	0.0060

TABLE 6: Error Correction Model (ECM)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.219224	1.128703	-1.080199	0.2908
D(RGDP(-1))	0.005864	0.012527	0.468089	0.6439
D(RGDP(-2))	0.001112	0.010085	0.110224	0.9131
D(UNEG(-2))	0.052438	0.130101	0.403059	0.6905
D(INF(-1))	0.134098	0.056483	2.374144	0.0259
D(INF(-2))	-0.027999	0.058098	-0.481929	0.6342
ECT(-1)	-0.121054	0.056408	-2.146031	0.0422

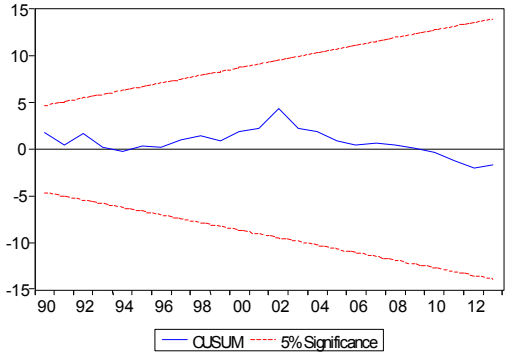
Table 7: Serial Correlation Test of Ecm:

Breusch-godfrey Serial Correlation Lm Test:			
F-statistic	2.194247	Prob. F(2, 22)	0.1352
Obs*R-squared	5.155403	Prob. Chi-Square(2)	0.0759

To capture the speed of the adjustment to the long run equilibrium, ECM is estimated.

The F-statistic is 2.19 while its P-value is 0.135. Since the P-value is greater than 0.05, we cannot reject the null hypothesis. This means that there is no serial correlation in the model.

Stability Test: In order to ascertain if the model is stable for analysis, CUSUM test is conducted.



It is observed from the graph that the blue line is within the red lines. Thus, it is an indication that the error correction model is stable. Having ascertained that ECM does not have serial correlation and stable, it is a good model. The model is desirable for estimation.

Test of Hypotheses

Hypothesis I:

H_0: Okun's law does not hold for Nigeria within the period under study.

In testing the above hypothesis.

Table 8: Wald Test Is Employed

Test Statistic	Value	Df	Probability
t-statistic	0.403059	24	0.6905
F-statistic	0.162456	(1, 24)	0.6905
Chi-square	0.162456	1	0.6869

Considering coefficient 4 i.e. C(4) which is the coefficient of unemployment rate, the t-statistic is 0.403 while its P-value is 0.6905. Since the P-value (0.6905) is greater than the chosen level of significance (0.05), the null hypothesis cannot be rejected. This means that Okun's law does not hold for Nigeria within the period under study.

HYPOTHESIS II:

H_0: There is nosignificant long run relationship between GDP and unemployment rate in Nigeria within the period under study.

RECALL

H_0: C(8) = C(9)= C(10) = 0 against the alternative one: H_1: C(8) ≠ C(9) ≠ C(10) ≠ 0 for C(8), C(9) and C(10)are RGDP(-1), UNEG(-1) and INF(-1) respectively. We denote the F-statistic of the test which normalize on *RGDP =f (UNEG, INF)*.

Table 9: Wald Test

Test Statistic	Value	Df	Probability
F-statistic	4.144378	(3, 21)	0.0187
Chi-square	12.43313	3	0.0060

The F-statistic value is 4.14. We compare the F-statistic value with the two sets of critical values for a given significance level can be determined (Zanin *et al.* 2012) [48]. Using the Zanin Critical value at 5% level with restricted intercept and no trend, the lower boundary is 3.10 while the upper bound is 3.87. The null hypothesis of no cointegration is rejected since the value of the F-statics statistic [4.14] exceeds the upper critical bounds value. Therefore, there is significant long run relationship between GDP and unemployment rate in Nigeria within the period under study.

Implication of the Results: Okun's law stipulates that one percent increase in unemployment will mean roughly more than 3 percent loss in RGDP growth.

According to Tingi and Lingii, (2011), Zanin and Marra, (2012) [47], [48], the relationship on RGDP and unemployment from the position of Okun (1962) [2] has been found to hold for several countries and regions mainly, in developed countries. However, the result as found from this study does not hold in Nigeria.

Using the Wald test in ECM, it was found that the T-statistic for unemployment [C(4)] is 0.403 while its P-value is 0.6905. This implies that unemployment does not significantly influence RGDP within the period under study. It contracts the finding from Okun 1962 [2]. The sign borne by unemployment as found from this result did not meet the apriori expectation.

Theoretically, increase in unemployment will bring about decrease in RGDP, ceteris paribus. However, all things cannot be equal. As found in Nigeria's economy, people who are gainfully and self-employed see themselves as under unemployed class. Though they classify themselves as unemployed, they indirectly contribute to the growth of the economy. Thus, the assertion that 1% increase in unemployment will bring about more than 3% decrease in RGDP does not hold in Nigeria. The result also indicated that in the short run, unemployment does not influence the economy.

Thus, there is no causality running from unemployment to RGDP in the short run. This is confirmed by the Wald test on ECM. However, the Wald test on the ARDL long run test indicated that unemployment and even inflation have significant impact in the long run. Thus, unemployment may not affect RGDP in the short run but will significantly affect RGDP in the long run. It is estimated from the ARDL long run test that 1% increase in inflation on the average, will bring about 0.1% decrease in RGDP. This confirms that in Nigeria that people who are gainfully employed but claim to be jobless as they are looking for white collar jobs contribute to the growth of the economy indirectly through their blue collar jobs which they engage themselves. Thus, their unobserved economic activities by them (aggregate demand) rising above aggregate supply causes inflation to rise. Thus, increase in the inflation rate has adverse effect on the economy.

In the ECM, it was found that the ECT is -0.12 and its P-value is 0.0422. The Error Correction Term (ECT) is fractional, negative and significant. Thus, the conditions for ECM are met. The speed of adjustment is 12%. This implies that the whole system of the model correct its previous disequilibrium by 12% annually. Thus, there is system correction of disequilibrium to long run equilibrium.

Conclusion and Recommendations: This study examined the relationship between unemployment and economic growth in Nigeria using an Autoregressive Distributed Lag Approach. Specifically it determined the validity of Okun's law in Nigeria. It equally examine if there is significant long run relationship between GDP and unemployment rate in Nigeria within the period under study. The study employed ex-post facto research design using Nigeria's data obtained from CBN (1980-2013). The empirical results were on Augumented Dickey-Fuller test and Philip Peron. In the second step, An Autoregressive Distributed Lag Approach was undertaken. The presence of long run equilibrium found led to the use of Error Correction Mechanism (ECM). It was found from this study that Okun's law does not hold for Nigeria. The sign borne by unemployment as found from this result did not meet the apriori expectation. As found in Nigeria's economy, people who are self-employed see themselves as under unemployed class. Though they classify themselves as unemployed, they indirectly contribute to the growth of the economy. The result also indicated that in the short run, unemployment does not influence the economy. Thus, there is no causality running from unemployment to RGDP in the short run. However, long run test indicated that unemployment and even inflation have significant impact in the long run. Based on the findings, the policy implications are in three directions.

- Though Okun's law does not hold in Nigeria, it was found that unemployment influences RGDP significantly in the long run. Therefore government should adopt stringent policies which will help to create employment opportunities so that unemployment level will be reduced drastically in the long run. This can be achieved by creating friendly environment for business which will as well trigger off economic growth. Such friendly environment includes infrastructure, expansionary fiscal policy etc.
- In the course to boost economic growth through macroeconomic policies, government should be mindful of the inflation rate as there is macroeconomic trade between the fight against unemployment and inflation. In the bid to reduce inflation level so as to embrace more economic growth, there is every tendency to increase the unemployment level. Therefore, stabilization policy should be watch word for government as this policy works to regulate the economy during boom and recession in the economy.

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