The Validity of Okun's Law: An Empirical Evidence for Nigeria

Divine Ndubuisi Obodoechi
Department of Economics
Faculty of the Social Sciences
University of Nigeria, Nsukka, Nigeria
E-mail: divine.obodoechi@unn.edu.ng

Charles Uchenna Onuoha
Department of Economics
Faculty of the Social Sciences
University of Nigeria, Nsukka, Nigeria
E-mail: uchennaonuohac@gmail.com

Abstract
This paper empirically investigates the relationship between economic growth and unemployment in Nigeria under the Okun's Law framework. The Auto Regressive Distributed Lag model approach, the ARDL Bounds Test and Cointegration Test were employed in this paper. Economic Growth was also regressed on unemployment, log of industrial output, log of net foreign assets, log of foreign direct investment and population growth so as to know the impact of these variables on output. The research findings indicated that high the Okun's specification does not hold in the Nigeria, the impact of economic growth on unemployment is negative and insignificant. We did however find that there is a positive impact of unemployment on economic growth, meaning that the phenomena of jobless growth may be in play in the economy. The Johansen Co-integration test failed to establish evidence of long run relationship between GDP, industrial output, unemployment, foreign direct investment net foreign assets and population growth. The ECM could not be employed because the variables were integrated of different orders. It was however found there exist a significant positive relationship between the aforementioned variables and GDP except for population growth. The government should consider the Industrial Sector as a priority sector in a bid for better economic growth and development. Population control measures should also be put in play to ensure that the population does not exceed the economic carrying capacity. The government should also play an important role in abating unemployment in the economy using direct and indirect schemes and strategies.

Keywords: ARDL, Okun's law, Foreign Direct Investment, Industrial Output, Population Growth.

I. Introduction
One of the ironies of our time is that although the Nigerian economy is potentially and currently rich, the unemployment situation in the country is still very critical. Records of available data on the unemployment situation reveal that unemployment (particularly urban) is growing in seriousness (ILO, 1981). There is also evidence of the socio-economic consequences of unemployment;
- There is a rising wave of crime particularly fraud and armed robbery.
- Migration to the urban centers has been on the increase.
- Increased occurrence of industrial disputes.
    - The problem of mass unemployment is not new any longer as it has been with us in varying degrees for some decades.
In fact, population explosion of participants in formal education and the economic recession of the early 1980's have raised the situation to a critical level, which can no longer be ignored without disastrous consequences.

The Commission on the Review of Higher Education popularly called "Longe Commission" (1992) reported that by 1984, the phenomenon of graduate unemployment had begun to emerge and was generally believed to be due to the lopsided production of high level manpower from the universities in specific disciplines, with an acute shortage of high level manpower in a number of other areas. According to the UNICEF/FOS (1997) report, the main engine of the Nigerian economy is petroleum, but agriculture is the biggest employer utilizing about 75% of the workforce. There are, according to the report, 9 dependents to 10 economically active people. The GNP per capita of Nigeria declined from US $ 6037 in 2015 to US $ 5867 in 2016 (World Bank Development Indicators, 2017).

The Nigerian economy is a developing economy and has its mainstay of economic performance in the energy sector. Crude oil exploration, development and exportation account for over 80% of the country's foreign exchange earnings. Unemployment has been ever-present with poverty indices increasing over the years. From 1981-2007, the real GDP of Nigeria

has grown at an average rate of 3.92% (Central Bank of Nigeria, 2012). GDP growth peaked in the 1970's and early 2000's. Unemployment reached an all-time low in 1996 at about 4% of the total labor force. From the huge increases in economic growth, one would expect unemployment to be almost nonexistent in Nigeria. Aganga (2010) and Ogunmade (2013) in their independent appraisal of the Nigerian economy note that there was a decade of strong real GDP of 6.5% economic growth between 2000 and 2010, and in the same period, unemployment rate continued to rise annually from 11.9% in 2005 to 19.7% in 2009, and over 37% in 2013%. The evidenced economic growth has howevernot lead to economic development. The level and rate of poverty is still very high, the industrial sector is yet to takeoff, technological development is still at a rudimental stage, income inequality is high, mortality rate and child mortality rate is ever increasing, and in summary, Nigeria's development index is still very low.

Despite the social and economic consequences related with high unemployment rates, some additional issues remain unresolved. For instance;
- Which factors are responsible for the existence of unemployment?
- Does the size of unemployment follow an autonomous route independent from other macroeconomic variables?

The relation between unemployment and growth has been a central issue for economists and policymakers over the past 50 years. On the basis of empirical evidence, in the early 1960's, the economist Arthur Okun developed a theory later known as Okun's law.

The classical school of thought holds the view that the relationship between employment and output is a one-way relationship that goes from the input of labor to output. The classical growth theory, as reflected in the aggregate production function (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 labor, capital, land, technology, etc. The premise of the classical model therefore is that the growth rate of employment (unemployment) 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 perspective, the supply of labor 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 (Falokun, 1999).

The Keynesian theory explains the determination of output or productivity and employment/ unemployment in terms of aggregate demand. This approach sees demand for labor as a derived demand. Productivity (Output) growth (a la Verdoorn's Law), should increase the demand for labor thereby reducing unemployment. The Keynesian framework, as examined by Hussain and Nadol (1997), postulates that increases in employment (decreasing unemployment), capital stock and technological change are largely endogenous. Thus, the growth of employment (reduction of unemployment) is demand determined and that the fundamental determinants of long run growth of output also influence the growth of employment. This is in line with the Okun postulation. Thus the Keynesian school and Okun were getting at the same conclusion albeit through different viewpoints, Keynes from the aspect of aggregate demand and endogenous changes, Okun's from the aspect of labor force participation rate, changes in the number of hours worked per person, changes in labor productivity and the ability of monetary policy to effect changes in exchange and output. The Keynesian prescription for reducing unemployment is for a sustained increase in aggregate total demand through direct increases in government expenditure or for adoption of policies that encourage more private investment. The Keynesians argued that, as long as there is unemployment and excess capacity in the economy, the supply of goods and services will respond automatically to this higher demand. They postulate that a new equilibrium will consistently be established with higher income levels and lower levels of unemployment.

Okun answers the questions about the nature of unemployment by referring to the empirical investigation of the relationship between output and unemployment. Given that both variables, that is, economic growth and unemployment rate are affected to a greater or lesser extent by business cycle, we would expect a long-run relationship between these variables to exist. Within the context of this assertion, high rates of output growth will lead to a reduction of unemployment. Specifically, Okun's Law or rule of thumb states that a 1 percentage point fall in unemployment is linked to a 3 percentage increase in the output of the nation. Okun's Law suggests that an increase in transitory output is accompanied by a decrease in transitory unemployment. Okun's law suggests the existence of a specific empirical relationship between economic growth and the change in the rate of unemployment. Several studies in different countries on the convergence of the Okun's Law Coefficient (OLC) have gone underway since the Okun postulations came to light. The Okun's law relationship has important implications for macro policy as the size of the OLC is an important indicator of the degree of interdependence of output and labor movements around their long-run oscillation paths and is regarded as a benchmark for policy-makers to measure the cost of higher unemployment and how to reduce increased trends in unemployment.

Thinking of the Nigerian economy in this manner implicitly assumes that the components of output and unemployment are uncorrelated except for a negative correlation between the two transitory components. This law if it proves to hold true in Nigeria with regards to the relationship between output and unemployment will give policy makers an insight into how unemployment can be managed in the economy by controlling the growth rates of the GDP. This knowledge will help Nigerian policy makers manage the business cycle more effectively.

This paper seeks to test the validity of the Okun's Law in Nigeria. The specific objectives are:
- To ascertain whether the Okun's Law or rule of thumb holds in Nigeria.
- To ascertain the impact of unemployment on output growth in Nigeria.
- To determine if there exists a long run and (or) short run relationship between output growth and unemployment in Nigeria.
- To determine direction of causality between unemployment rate and output growth.

2. Review of Relevant Literature
Arthur Melvin Okun was the first economist who developed an economic model where he postulated a connected between the variations in the unemployment rate to the changes in the output of an economy estimated by changes in the GNP by running an econometric analysis using quarterly data from 1947: II to 1960: IV in the United States of America. The correlation between these two important economic variables is famously known as Okun's law. It has since then been used as a benchmark by policy makers to measure the cost of higher unemployment and benefits of lower unemployment in an economy given the inverse relationship with the output of the nation in question. Discuss these two approaches in addition to newer additions to the body of his law.

In 1962 Arthur Okun documented that U.S. unemployment tended to fall by 1 percentage point for every 3-percentage point rise in gross national product (i.e., output); observers subsequently dubbed this empirical regularity "Okun's law". Okun originally stated that the economy experienced a 1 percentage point increase in unemployment for every 3 percentage point decrease GDP. In order to understand why the relationship between changes in output and changes in unemployment is not one-to-one, it's important to keep in mind that changes in output are also associated with changes in the labor force participation rate, changes in the number of hours worked per person, and changes in labor productivity. The percentage increase by which GNP changes when unemployment falls by 1% is the Okun coefficient.

Okun's law reinforces the notion that a country's output depends on labor. It is also a way to measure the effectiveness of monetary policy. Although the law only applies in the United States, the concept applies in all economies (that is, when more people have jobs, the economy is stimulated). Accordingly, a 1% change in employment may result in a different degree of increased output in other countries.

It is important for us to enlighten our reader that since Okun's time, the relationship between changes in output and changes in unemployment has been estimated to be about 2 to 1 rather than the 3 to 1 that Okun originally proposed. (NB. This ratio is also sensitive to both geography and time period.) In addition, it has been noted that the relationship between changes in output and changes in unemployment is not perfect, and Okun's Law should generally be taken as a rule of thumb as opposed to as an absolute governing principle since it is mainly a result found in the data rather than a conclusion derived from a theoretical prediction. Notable economists have criticized this law on the basis that the majority of the change in output is actually due to changes in factors other than unemployment, such as capacity utilization and hours worked, holding these other factors constant reduces the association between unemployment and GDP to around 0.7% for every 1% change in the unemployment rate. It is however our view in this work that we will follow the Okun assumptions and postulation with a view to testing for truths associated with the law instead of criticizing the foundations of the law. Departing from this will make us fail the Occam Razor approach of using the most simplistic version of any theory of model. For example, an increase in labor is required for an increase in production, however labor can come in a variety of forms, such as increased hours worked or through technological advances. Capturing these variables in a model would risk making a simple relationship complicated and because of that Arthur Okun focused on unemployment, as he believed that unemployment covers hours worked and technological advances indirectly.

Some authors have tested the Okun assertion before in Nigeria. (Udude & Nnachi, 2017) using an Autoregressive Distributed Lag Model investigated the existence of the assertion of Okun's Law in Nigeria from 1980 -2013. They found out that Okun's Law does not hold in Nigeria. The coefficient does not even conform to apriori expectation. Conversely, (Oluyomi, Stephen, & Adeyemi, 2016) found in their work that the Okun's Law holds in Nigeria. There exists long run and an inverse relationship between GDP and Unemployment. The Okun coefficient in their work is 1.75 signifying that unemployment changes really do impact negatively on output, although not to the tune specified by Okun.

The Law has also been tested by other authors in their countries with varying degrees of OLC, some countries conform to limits of the law while others do not.

(Hek & Dare, 2015) tested the validity of Okun's law in Curacao. They used the Hodrick Prescott filter and Cubic/Quartic equations to calculate potential output and natural unemployment in Curaçao. They used Okun's difference method and obtained that Okun's coefficient in the long run is -2.3%, while Okun's coefficient is -1.9% in the short run. Statistically significant short- and long-run relationships were found between output and unemployment in Curaçao.

(Dritsaki & Dritsakis, 2009) tested the Okun proposed relationship for four Mediterranean countries and obtained the following relationship; -0.024 for Italy, -0.017 for Spain, - 0.016 for Portugal and -0.007 for Greece. They believe that the

coefficient for Italy is higher than that of Greece because Italy is more industrialized than Greece. Summarily, all three countries have the postulated negative relationship.

(Mercer-Blackman & Salazni, 2014) applied the Okun's law to Trinidad and Tobago and found that the relationship exists, but it is a very weak one. They agreed with previous authors that the Okun's relationship is seen more during the business cycle of recessions than expansions in absolute terms. They however note that unemployment figures have been underestimated in the country and might be a possible influence on their results.

(Rubcova, 2010) in his work in the Baltic states in testing the Okun type relationship found that little evidence of the relationship was detected. His results were not robust to estimation but a slightly negative relationship was observed in some of the states. He posits that "it is obvious that Okun's law is not a law, but rather a statistical regularity which has exceptions". The work goes further to explain the likely cause of the nonexistence of the relationship by saying that "rigid labor market structure and inelastic unemployment rate response to the shifts in the output could possibly result in little evidence in favor of the OL proposition".

(Lal, Sulaiman, Jalil, & Hussain, 2010) using an integration approach to test for evidence of Okun type relationship in Asian countries. The work employed Fully Modified Ordinary Least Square (FMOLS) to run its test. The results did not satisfy Okun's law assertion. Even though the coefficients were negative for the countries, they were also largely insignificant. They conclude that their results do not support the implications of Okun's Law in some developing countries because of asymmetric problems.

(Anderton, Aranki, Bonthuis, & Jarvis, 2014) in their analysis went a step further by disaggregating GDP into its different components of Consumption, Investment, Government Expenditure, Import and Exports so as to understand differing reactions of unemployment to movements of the various expenditure components in the Euro area. The data set was from (1996Q1-2013Q4). They argued that allowing the output component elasticities to vary adds considerably to the predictive capability of the Okun relationship. Their results have it that it seems that unemployment is most affected by changes in the consumption component of GDP, while movements in foreign trade (export and import) expenditure have a significantly lower impact on movements in unemployment.

(White & CHU, 2013) tested the Okun assertion in USA, Japan, and France. In France and Japan, the results show that the variables GDP and Unemployment have no effect on each other. However, Okun's Law of positive GDP change having a negative impact on unemployment holds for USA.

(Petkov, 2008) checked the UK data for the Okun postulations from 1973Q3 to 2003Q4. The results indicate that Okun's law is a valid empirical approximation. Their method exploits the Auto Regressive Distributed Lag (ARDL) approach, which is capable of dealing with fractionally integrated variables. They conclude that while there are some differences in the Okun's coefficient over time and in-between alternative specifications it seems clear that the Okun's Law continues to be a reasonably robust relationship in the United Kingdom and with their estimation method.

(Cevik, Dibooglu, & Barisik, 2013) examined the presence of asymmetry in Okun's law for nine transition economies by means of a Markov regime-switching model with a nonlinear estimation means of a Markov regime-switching model. Their empirical results showed a statistically significant Okun's law for transition economies and imply the Markov regime-switching model is more appropriate than a linear model in characterizing Okun's law. The unemployment rate displays statistically different behavior over the business cycle in transition economies. In general, job losses in downswing regimes exceed job gains in upswing regimes suggesting relatively poor job growth in recoveries and the results are robust across different specifications of Okun's law.

(Ayaz & Alkraidees, 2014) in their results show a long-run association between the unemployment rate and the GDP growth rate in both periods i.e. 2001: Q1-2007: Q4 and 2008: Q1-2013Q4, but no contemporaneous impact on the unemployment rate by the GDP growth rate.

(Bryson, 2016) in his study examines the appropriateness of Okun's Law for the Jamaican economy. Using the difference, output gap and auto- regressive distributive lags (ARDL) specifications, the study finds, at the aggregate level, a statistically significant relation between the unemployment rate and the output gap. The HP filter gap and production function gap specification supports Okun's rule of thumb in his work. More specifically, the HP filter specification shows that the unemployment rate will decline by 0.16 percentage points and 0.36 percentage points in response to a one percent increase in HP filter gap and production function gap, respectively.

3. Data and Methodology

The data consists of annual time series observations for the period 1981-2016. The variables of interest are: Unemployment, Gross domestic Product (GDP), Foreign Direct Investment (Inward Flows), Industrial Output Value Added (measured in constant USD), Net Foreign Assets, Population Growth Rate. The data were collected from the World Bank Development Indicators and the National Bureau of Statistics (NBS). To achieve robust estimates, reduce the effect of noise and ensure that the estimated parameters can be interpreted economically, except unemployment rate, was logged prior to estimation.

In this paper we intend to investigate the validity of the Okun's Law in Nigeria. We will adopt the Auto Distributed Lag Model which is the closest form of the Dynamic Version Approach of the Okun's Law. Our first Model, an ARDL model, will be used to determine our first and third objectives of; the validity of the law, and the existence of a long run and/ short run relationship between output and unemployment rate in Nigeria. Our second model, an Ordinary Least Squares (OLS) model, will capture the impact of unemployment as well as other relevant variables on the output of the economy, as well as check existence of a long run relationship amongst the variables. An Error Correcting Model will be estimated on the second model to check for short run stability in the relationship of the variables involved. Finally, a Granger Causality Test will be used to check the direction of causation amongst unemployment and output in other to give meaning to our third objective.

Our models are as follows;

Model I:

- **Functional Form of the Model**

$$UNEMP = f(GDP) \text{ --(1a)}$$

- **The Deterministic/ Mathematical Form of the Model**

$$UNEMP_t = \beta_0 + \beta_1 GDP_t + \lambda_i GDP_{t-k} + \phi_i UNEMP_{t-k} \text{ ---(1b)}$$

- **The Econometric Form of the Model**

$$UNEMP_t = \beta_0 + \beta_1 GDP_t + \lambda_i GDP_{t-k} + \phi_i GDP_{t-k} + \mu_t \text{ ---(1c)}$$

Where:

β_0 = Intercept; λ_i = Coefficients of the Lag Variables of GDP_t; ϕ_i = Coefficients of the Lag Variables of $UNEMP_t$; k = 1, 2, 3, … (Successive Lags); i = 1, 2, 3 …. (Successive Lag Parameters); μ_t = Stochastic Error Term

MODEL 2:

- **Functional Form of the Model**

$$GDP = f(UNEMP, IO, NFA, FDI, POP\_GR) \text{ ---(2a)}$$

- **The Deterministic/ Mathematical Form of the Model**

$$GDP_t = \alpha_0 + \alpha_1 UNEMP_t + \alpha_2 IO + \alpha_3 NFA + \alpha_4 FDI + \alpha_5 POP\_GR \text{ -------------------------(2b)}$$

- **The Econometric Form of the Model**

$$GDP_t = \alpha_0 + \alpha_1 UNEMP_t + \alpha_2 IO + \alpha_3 NFA + \alpha_4 FDI + \alpha_5 POP\_GR + \mu_t \text{ -------------------(2c)}$$

- **The Error Correction Model**

$$\Delta GDP_{t-1} = \alpha_0 + \alpha_1 \Delta \sum UNEMP_{t-1} + \alpha_2 \Delta \sum IO_{t-1} + \alpha_3 \Delta \sum NFA_{t-1} + \alpha_4 \Delta \sum FDI_{t-1} + \alpha_5 \Delta \sum POP\_GR_{t-1} + \alpha_6 \mu_{t-1} + \varepsilon_t \text{ --(2d)}$$

Where:

α_0 = Intercept; $\alpha_{1, 2, 3, 4, 5}$ = Coefficient of Independent Variables; Δ = First Difference Operator; μ_{t-1} = Error Correction Term; ε_t = Error Term

To check for the long run relationship among unemployment and output, The Bounds Test is employed for the ARDL model specification and the Johansen Cointegration test for the OLS specification of the second model. The Error Correction Model will only be employed if there exists a long run relationship amongst the variables in question else testing the speed of short run equilibrium to long run equilibrium will be a moot action. A Granger Causality Test is undertaken to check direction of causation among the two variables.

4. Empirical Findings and Discussion

This empirical analysis started off with tests of stationarity on all the variables, using both the ADF unit root test and the Phillips Perron unit root test procedures. With the lag length selected automatically by Schwarz Information Criteria and including trend and intercept, the results of these tests are shown in Table I. The results indicate that Foreign Direct Investment, Industrial Output and Population Growth rate are integrated of order I (0) while Unemployment, GDP and Net Foreign Asset are integrated of order I (1). These results suggest that there may not be a long run stable relationship between these variables given their different orders of integration.

Table I: Unit Root Test Results

Variable	ADF	Phillips-Perron	Result
GDP	I (1)	I (1)	I (1)
UNEMP	I (1)	I (1)	I (1)
FDI	I (0)	I (0)	I (0)
IO	I (0)	I (0)	I (0)
POP_GR	I (0)	I (1)	I (1)
NFA	I (1)	I (1)	I (1)

Since all the variables are integrated of order I (0) and I (1), the unit root needs of an ARDL models are satisfied, we can go ahead and estimate model 1. We estimated our model 1 using the ARDL specification. We included the linear trend in our estimation because the dependent variable unemployment had a graphical positive trend. From this estimation result, we ran the Bounds Test to check for Long Run relationship between output and unemployment. Our results are shown below.

Table 2. Regression Results

Model 1 ARDL Results		Model 2 OLS Results	
Table 2:		**Table 2:**	
Variable	Coefficient	Variable	Coefficient
Constant	24.3626**	Constant	-19.29636
LGDP	-2.3728***	UNEMP	0.028548
UNEMP(-1)	0.9537**	FDI	0.539531
@TREND	0.3685***	IO	2.296646
R-squared	0.961648	NFA	0.311557
Adjusted R-squared	0.957937	POP_GR	-2.712616
Akaike info criterion	4.119872	R-squared	0.987828
Durbin-Watson stat	2.165659	Adjusted R-squared	0.985800
Prob(F-statistic)	0.000000	Akaike info criterion	-1.047276
		Durbin-Watson stat	1.586782
		Prob(F-statistic)	0.000000
Residual Diagnostics			
Jarque-Bera Normality Test	3.2440	**Residual Diagnostics**	
Breusch Pagan-Godfrey Heteroscedasticity Test	0.022	Jarque-Bera Normality Test	0.1127
Breusch Godfrey Autocorrelation Test	0.444	Breusch Pagan-Godfrey Heteroscedasticity Test	0.793
Ramsey Reset Stability Test	1.513	Breusch Godfrey Autocorrelation Test	1.089
		Ramsey Reset Stability Test	1.038

From the results above, we can see both the regression results and the residual diagnostics which helps us to ensure that we fit the best model. For Model 1, there is only one lagged variable of UNEMP as recommended by the model selection criteria of Akaike and Schwarz Info Criterions. All the coefficients in the first model are statistical insignificant except for the first lagged variable of unemployment. This shows that the previous year's unemployment rate causes the current year unemployment rate to increase at a decreasing rate. The Okun coefficient is very much above the Okun's postulation, moreover, it is insignificant. There is an increasing trend in unemployment over the years, but this too is statistically insignificant. The model is BLUE and the residual diagnostics all conform to the appropriate levels. In the second model, all the coefficients are statistically significant, we have a very good fit as can be interpreted from the R-squared value. The impact of unemployment on output is both positive and statistically significant. A percentage point increase in the unemployment rate in Nigeria will lead to a 0.02 percentage change in the output of the economy. This does not conform to apriori expectations; however, the emerging concept of jobless growth can be used to explain this result.

From the second model, there is a significant relationship between output in the economy and industrial output, foreign direct investment, net foreign assets and population growth. We can see that as the population of the country increases, there is a decrease in the output of the economy, this suggests pressure on resources and the carrying capacity of the infrastructure of the country. On the other hand, increases in FDI and NFA increases the output of the economy at a decreasing rate. The major variable with increases output in the economy is the output of the industrial sector.

All the residual diagnostics also conform to the expected statistical levels of a regression model.
Both model's F-statistics is significant.

We will now show the result of the long run relationship tests of model 1 and model 2 using the ARDL Bounds Test and the Johansen Cointegration Test respectively.

Table 3. Long Run Relationship Results

ARDL Bounds Test			Johansen Cointegration Test				
ARDL Bounds Test			Date: 12/31/18 Time: 15:35				
Date: 12/31/18 Time: 15:31			Sample (adjusted): 1983 2016				
Sample: 1982 2016			Included observations: 34 after adjustments				
Included observations: 35			Trend assumption: Linear deterministic trend (restricted)				
Null Hypothesis: No long-run relationships exist			Series: LGDP UNEMP LFDI LNFA POP_GR LIO_CON				
			Lags interval (in first differences): 1 to 1				
Test Statistic	Value	k					
F-statistic	0.052775	1	Unrestricted Cointegration Rank Test (Trace)				
			Hypothesized		Trace	0.05	
Critical Value Bounds			No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
Significance	I0 Bound	I1 Bound	None *	0.863724	144.4621	117.7082	0.0004
10%	5.59	6.26	At most 1	0.510446	76.69771	88.80380	0.2703
5%	6.56	7.3	At most 2	0.492563	52.41288	63.87610	0.3131
2.5%	7.46	8.27	At most 3	0.343824	29.34784	42.91525	0.5411
1%	8.74	9.63	At most 4	0.296722	15.02276	25.87211	0.5727
			At most 5	0.085925	3.054665	12.51798	0.8700

As we can see from the table above, there is no long run relationship in both the first and second models. This means that there is no long run relationship between output and unemployment in Nigeria. According to Christian Dreger (2015), "If one variable is I (1) and the other is I(0), Cointegration cannot exist, and consequently, you could not proceed with an ECM, according to the Granger representation theorem". Thus we cannot estimate the Error Correction Model as a result of the different orders of integration in the second model. Thus, there is no long run relationship between unemployment and output in Nigeria and the short run relationship is indeterminate.

We will now estimate the Granger Causality Test to check direction of the causation between output and unemployment in Nigeria.

Table 4. Granger Causality Test

Null Hypothesis:	Obs	F-Statistic	Prob.
GDP does not Granger Cause UNEMP	34	1.19538	0.3171
UNEMP does not Granger Cause LGDP		0.63113	0.5391

On the direction of causality between output and unemployment in Nigeria, we estimated the Granger causality model at lag 2. The results are as shown in Table 4. We find that there is no causality running between agricultural credit and agricultural productivity in Nigeria.

5. Conclusion and Recommendation
The findings of this study negate the existence of the Okun's Law assertions in Nigerian economy. The ARDL approach was disproved. In Nigeria, increasing economic growth rates does mean decreasing unemployment rates, however, the magnitude of the change is not as postulated by the Okun's law. The relationship statistically is insignificant. This could be as a result of capital-intensive led growth strategies. The phenomena of Jobless Growth have been seen to manifest in many developing countries and this could be the case here in Nigeria. This means that government has to be actively involved in unemployment reduction strategies and efforts as economic growth here has not been able to absorb the labour force up to the capacity utilization rate necessary for the growth. Since there is no long run relationship between economic growth (output) and

unemployment, unemployment policies need to be sustained even in the face of massive surges in the growth rates of the economy. It should be noted that changes in unemployment significantly impacts on the output in Nigeria, albeit minutely.

We found out that population growth has a negative relationship with output or GDP in the economy. This has very grave economic implications because if not controlled appropriately could lead to a massive downward spiral in the output of the country. The implication of this is that there is a massive pressure on the resources of the economy; the population is growing faster than the means of sustenance is growing. The Reverend Malthus theory may be in play here.

The industrial output plays a massive role in the output of the Nigerian economy; it is a critical sector in the quest for sustained growth. Net foreign assets and foreign direct investment also contributed the growth of GDP (output) over the years. A unit increase in the industrial output leads to about adouble fold increase in the output of the economy. This means that the economy has unimaginable growth potentials in its industrial sector, if only it were to be properly harnessed. Foreign direct investment and investments abroad should also be encouraged as a means of growth as well.

On the basis of the results of this paper, we recommend that;

- The government is actively involved in unemployment reduction strategies.
- There should be a proper population control measures in play.
- There should be a massive investment in the Industrial sector of the economy.
- Further studies are carried out to determine the relevant variables that cause and affect unemployment in the country.

In conclusion, we have seen that the Okun's rule of thumb does not hold in Nigeria, as a result of the findings of this work. There has been tremendous economic growth without a significant decrease in unemployment in Nigeria. The government therefore is advised to implement more viable and long lasting social programs and strategies, so as to control the unemployment situation in the economy.

Acknowledgements

References

Aganga, O. (2010). Rising Unemployment Rate is Unacceptable– Goodluck Jonathan. *Business Facts and Figures Magazine* September, 2010, p. 15

Anderton, R., Aranki, T., Bonthuis, B., & Jarvis, V. (2014). Disaggregating Okun's Law Decomposing the Impact of the Expenditure Components of GDP On Euro Area Unemployment (No. 1747). Frankfurt, Germany. https://doi.org/10.2866/36377

Ayaz, A., &Alkraidees, A. (2014). Okun's Law: Can It Still Be a Best Rule of Thumb? (A Time-Series Analysis). California State Polytechnic University, Pomona.

Bryson, T. (2016). Okun's Law – Evidence from Jamaica. Retrieved March 19.

Central Bank of Nigeria .(2012). Central Bank of Nigeria Statistical Bulletin 2002. CBN Publication, pp 252 – 260.

Cevik, E. I., Dibooglu, S., & Barisik, S. (2013). Asymmetry in the Unemployment – Output Relationship Over the Business Cycle: Evidence from Transition Economies. Comparative Economic Studies, Online, 1–25. https://doi.org/10.1057/ces.2013.7

Dreger, C. (2015). How to construct an error-correction model when one variable is I(0) while the other is I(1)? German Institute for Economic Research.https://www.researchgate.net/post/How_to_construct_an_error correction_model_when_one_variable_is_I0_while_the_other_is_II

Dritsaki, C., & Dritsakis, N. (2009). Okun's Coefficient for Four Mediterranean Member Countries of EU: An Empirical Study. Thessaloniki Greece.

Falokun, G. O. (1999). Inter-Sectoral Indicators of Employment Potential in Nigeria, NISER Federal Office of Statistics Publications for 1989, 1992. Lagos.

Hek, A., & Dare, S. (2015). The Validity of Okun's law in Curacao, (2), 9–30. Review of the Federal Reserve Bank of Ranses City, Fourth Quarter, pp 23-44.

Hussain, M. N. and C. Nadol .(1997). Employment, Growth and the Demand Side: The Case of Some African Countries, *African Development Bank's Economic Research Papers*, No. 28, The African Development Bank.

International Labour Organisation (1981). Year Book of Labour Statistics. Geneva.

Lal, I., Sulaiman, Jalil, A., & Hussain, A. (2010). Test of Okun's Law in Some Asian Countries Co-Integration Approach. *European Journal of Scientific Research*, 40(1), 73–80. Retrieved from http://www.eurojournals.com/ejsr.htm

Mercer-Blackman, V., &Salazni, M. (2014). Unemployment and Growth Does Okun's Law Apply to Trinidad and Tobago? (Vol. No. IDB-PB).

Ogunmade, O. (2013) $600bn Stolen by Nigerian Elite since Independence. THIS DAY LIVE. Retrieved on 19/6/18www.thisdaylive.com/article/$600bn-stolen-by-nigerian-elite

Oluyomi, O., Stephen, O., &Adeyemi, O. (2016). Output and Unemployment Relationship: How Applicable Is the Okun 's Law to Nigeria? *The Social Sciences*, 11(8), 1422–1427. https://doi.org/10.3923/sscience.2016.1422.1427

Petkov, B. (2008). The Labour Market and Output in the UK – Does Okun's Law Still Stand? (S. Stattev, T. Manchev, N. Nenovsky, M. Nenova, & P. Anachkova, Eds.) (1st ed.). Sofia: Bulgarian National Bank Printing Center.

Rubcova, A. (2010). Okun's Law: Evidence from The Baltic States (Vol. 9). Riga.

Udude, C. C., &Nnachi, D. N. (2017). Testing the Validity of Okun's Law in Nigeria: An Autoregressive Distributed Lag Approach (1980-2013), 35(5), 754–766. https://doi.org/10.5829/idosi.wasj.2017.754.766

White, M. J., & Chu, L. Y. (2013). Does Okun's law still hold Today?Lingnan Journal of Banking, Finance and Economics, 4(January).

World Bank (2017) World Bank: Nigeria Statistics. Retrieved from www.data.worldbank.org/nigeria the 5th of November 2018.

Copyrights