

An Analysis of the Effect of Real Gross Domestic Product on Unemployment in Nigeria: (An ARDL- Approach)

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Abstract

This study examined the effect of real Gross Domestic Product (GDP) on unemployment in Nigeria. Unemployment is a major problem in Nigeria, even with the recent growth rate of 7% the country is recording, unemployment is still on the increase. The study considers the period 1977 to 2011 to analyse the long run and short run relationship between real gross domestic product and unemployment in Nigeria, with unemployment as a dependent variable. Besides the main variables for this study, other control variables particularly inflation was included in the model. The study has used Autoregressive Distributed Lag (ARDL) Model to test for ARDL-bound co-integration test, the long run and the Error Correction Model (ECM). The co-integration bound test results showed that the variables are co-integrated at 5% level. The results revealed a positive relationship between unemployment and real GDP in Nigeria both in the short run and in the long run. The study concludes that real GDP growth causes unemployment in Nigeria and suggests that Nigeria as a country should reduce the over reliance on petroleum sector as a source of revenue and give more emphasis on other sectors, especially agricultural sector in order to provide more job opportunities to the Nigerian citizens. Also, the government should use the huge revenue it derives from the oil sector to develop other sectors like iron and steel sector, agriculture and so on. The government should also provide environment that will attract capital and investment, the government does not necessary create jobs but does aid the private sector in making job creation possible and imminent.

Keywords: Real GDP, Unemployment, ARDL

1. Introduction

One of the determinants of a country's standard of living is the amount of unemployment, it typically experiences. People who are looking for work but cannot find it are not contributing to the economy's production of goods and services. Although some degree of unemployment is inevitable in a complex economy with thousands of firms and millions of workers, when a country keeps its workers as fully employed as possible, it achieves a higher level of GDP than it would if it lefts many of its workers standing idle. Losing a job can be the most distressing economic event in a person's life. Most people rely on labor earnings to maintain their standard of living and also, many people get from their work not only income, but also a sense of personal accomplishment. A job loss means lower living standard in the present, anxiety about the future and reduced self-esteem.

However, there has been a relationship between real GDP and unemployment. Real Gross Domestic Product (real GDP) is a macroeconomic measure of the value of economic output adjusted for price changes. Economists always realize an inverse relationship between unemployment and real GDP. But according to Gabrisch and Buscher (2006), "In the post communists' countries, the growth of GDP is characterized by productivity progress; however, the component of market demand is very low to decrease the rate of unemployment to barest minimum level. Whenever economists looked at real GDP and unemployment, they realize an inverse relationship between them. When real GDP is on the higher side, unemployment will be low and the inverse is true as well. Problem is said to arise when the variables coexist in an economy. In Nigeria, unemployment is increasing at a faster rate, real GDP is growing at 7%, CBN report (2012). In addition, According to information from the National Bureau of Statistics (NBS); unemployment rate in 2011 is 29.3 percent. This implies that unemployment has multiplied since most recent five years. Unemployment in Yobe state is 60.6 for percent, Kano state is 67 for percent and this is clear from the amount of youths in the wandering the roads without employment. There is a serious issue when a nation is developing at seven for percent but could not give employments to its natives. It is like a broken record; a nation that produces oil yet imports refined fuel, a nation that is in the tomato belt but imports tomatoes.

If real GDP rate is below its natural rate it is intended to promote employment because this rise in total income will generate inflationary pressures. On the other hand, if the real GDP is beyond its natural level, policy makers will choose not to intensively promote the creation of new jobs in order to secure a sustainable growth rate which will not generate inflation, Dumitrescu (2009). This is because the relationship between real GDP and unemployment is pertinent or rather very important for policy makers in securing a sustainable increase in living standards. The slope of unemployment in Okun's law is around -0.5 and potential real GDP growth is around 5.7 percentage points and the variables are negatively correlated as predicted by the theory. In Nigeria previous

studies have not put emphasis on the relationship between real GDP and unemployment. This study have used ARDL model and micro fit software to obtain high degree of freedom as the sample size for the study is small, for example see Narayan (2005). This has made the work unique and distinct from previous studies.

Graph of Unemployment and Real GDP

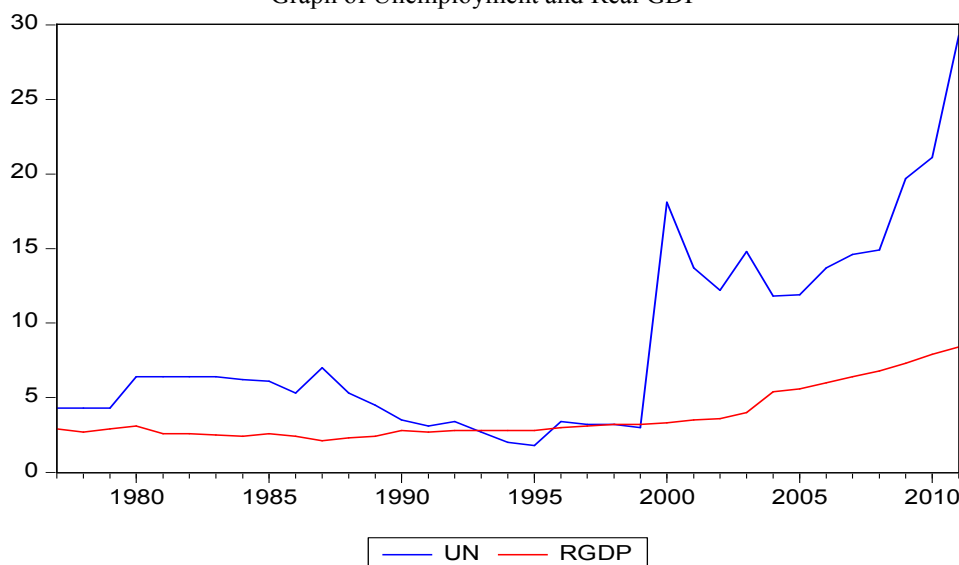


Figure 1 above is a trend of real GDP and unemployment in Nigeria. The graph confirms the assertion mentioned above that both real GDP and unemployment in Nigeria are increasing at the same time. The coexistence of the two started around year 2000. The real GDP growth is 7% in recent years, but still unemployment persistently failed to keep pace with the expansion of the real GDP. This might be due to some institutional problem such as corruption, lack of good governance among others. According to Worldwide Governance Indicators (WGI), the average government effectiveness in Nigeria between 1996 and 2011 is 14.4, World Bank report, (2013). Similarly the average percentage for political stability and absence of violence, control of corruption and Rule of law are 7.15%, 10.54% and 10.57% respectively.

This study starts with short demonstration of how unemployment related to real GDP in Nigeria. The second part of the study provides the theoretical and empirical relation between unemployment and real GDP. Part three discusses the data and methodology, results and discussion also in this part and the last part of the study is the conclusion.

2. Literature Review

The relationship between economic growth and the unemployment rate in the short run may be a loose one. One reason that unemployment may not fall appreciably when economic growth first picks up after a recession's end, is that some firms may have underutilized employees on their payrolls. This is because laying off workers when product demand declines and rehiring them when product demand improves has costs, Levine (2013). As long as different sectors in the economy can contribute more than was lost from unemployment, the rate of unemployment rises as real GDP rise. More so, as labour force growth is more rapid than employment growth, this will also increase the level of unemployment and vice-versa, Gregory (2009), and Levine (2013). The slope of unemployment in Okun's law is around -0.5 and potential real GDP growth is around 5.7 percentage points and the variables are negatively correlated as predicted by the theory. In the middle of the 1990s, the economy of the United State enjoyed the benefits of both worlds. From 1992 and through to 2000, the unemployment rate of civilian, fell from as high as 7.8% to as low as 3.8%.

In most of times, exactly since the middle of the 1990s, the level of unemployment was and at the rate below many estimates of the natural rate, and this has led to many economists believed that increase in the real GDP was responsible for this, Cashell (2004). The experimental dissection on real GDP and unemployment in Romania have indicated that an ascent of one percentage purpose of unemployment is connected with a decay of harshly half percentage purpose of true GDP growth, Dumitrescu, (2010). Why you put the entire authors at the end of sentence not at the beginning? Is it the format of the journal? Many articles and journals have found that increase in real gross domestic product causes unemployment level to decrease, this means that real GDP growth significantly reduces the high level of unemployment in an economy. For example, Wajid (2013), have found that economic growth has a significant adverse effect on unemployment based on the study she conducted in Pakistan. Additionally, Hany (2012), also has found a negative relationship between output growth and unemployment in Egypt.

In the meantime, a study by Mossa (2008), has estimated Okun's value of coefficient in Arabic speaking

countries, which include Algeria, Egypt, Morocco and Tunisia. He found that the coefficient values in these countries are -0.011, -0.001, -0.00009, and 0.001 respectively. The coefficient of Okun's Law states that a 2% increase in output corresponds to a 1% decline in the rate of cyclical unemployment; a 0.5% increase in labor force participation; a 0.5% increase in hours worked per employee; and a 1% increase in output per hours worked. Gordon (1984), revealed a short run and long run negative relationship between real GDP and unemployment in the United States, with long run coefficient being greater than the Okun's coefficient in the long run. Sinclair (2009), has found an overall fluctuations as a result of permanent in the United States' unemployment and output movement. In the post communists' countries, the growth of GDP is characterized by productivity progress; however, the component of market demand is very low to decrease the rate of unemployment to barest minimum level, Gabrisch and Buscher (2006).

3. Methodology

This study have made use of the econometric processes and procedures in trying to estimate the long run and short run relationship between the variables, Real Gross Domestic Product and unemployment in Nigeria, from 1977 to 2011. Data on the real GDP were collected from the World Bank, while the data on unemployment were collected from National Bureau of Statistics (NBS). The study will use Autoregressive Distributed Lag (ARDL) Model and Cointegration Analysis to test for time series data with variables that are integrated either of order zero I(0) or order one I(1), Pesaran et al. (2001). The model is used to test for cointegration, the long run and short run relationship between real GDP and unemployment, by using micro fit software to be able get a high degree of freedom.

Cointegration test

The co-integration relationship verifies the long run relationship among the variables of interest using F-statistics. The ARDL co-integration test should be performed by transforming the model into unrestricted error correction model (UECM). In the following co-integration model, Real Gross Domestic Product and inflation are considered as independent variables while unemployment is a dependent variable:

$$\Delta \ln UN_t = \alpha_0 + \sum_{i=1}^m \partial_i \Delta \ln UN_{t-i} + \sum_{i=0}^m \varphi_i \Delta \ln RGDP_{t-i} + \sum_{i=0}^m \theta_i \Delta \ln IN_{t-i} + \beta_1 \ln UN_{t-1} + \beta_2 \ln RGDP_{t-1} + \beta_3 \ln IN_{t-1} + \mu_t$$

Where, $\ln UN$ is log of unemployment, $\ln RGDP$ is log of real gross domestic product and $\ln IN$ is log of inflation, α_0 is constant, $\beta_1, \beta_2, \beta_3$ are the parameters.

The null hypothesis (H_0) is that: $H_0: \beta_1 = \beta_2 = \beta_3 = 0$; there is no cointegration; the alternative hypothesis (H_1) is that: $H_1: \beta_1 \neq \beta_2 \neq \beta_3 \neq 0$; cointegration exists. This study has a small sample of thirty five (35), therefore the F-statistics should be compared to the critical bounds suggested by Narayan (2005). If $F_{\text{statistic}} > F_{\text{critical upper bound}}$ of the Narayan table, we reject null, which means cointegration exist; if $F_{\text{statistic}} < F_{\text{critical lower bound}}$, there is no cointegration, and if the $F_{\text{statistic}}$ fall in-between the bounds, it is inconclusive. The maximum lags for this small sample size according to Narayan (2005), is two (2).

Long run equation

$$\ln UN_t = \alpha_t + \sum_{i=1}^m \partial_{1i} \ln UN_{t-i} + \sum_{i=0}^m \varphi_{1i} \ln RGDP_{t-i} + V_t$$

To calculate the long run coefficient, we use the Wald Coefficient test; $\beta_i = \sum_{i=0}^m \beta_i / 1 - \sum_{i=1}^m \partial_i$;

Error Correction Model (short run model):

$$\Delta \ln UN_t = \alpha_2 + \sum_{i=1}^m \partial_{2i} \ln UN_{t-i} + \sum_{i=0}^m \varphi_{2i} \ln RGDP_{t-i} + \sum_{i=0}^m \theta_{1i} \ln IN_{t-i} + \lambda ECM_{t-1} + \epsilon_t$$

Where: λ is the coefficient of ECM_{t-1}

ECM is the error correction term. It represents the potential effects of departures from the long run equilibrium (Baharumshah et. al, 2009). λ is the adjustment coefficient. The ECM coefficient should be negative, less than one and significant in order to conform the co-integration relationship.

Unit Root Test:

A unit root test tests whether a time series variable is non-stationary using an autoregressive model. A well-known test that is valid in large sample is the Augmented Dickey-Fuller (ADF) test. The essence of unit root in ARDL is to confirm the integration level of the variables as the approach is valid for variables that are stationary either at level [I(0)] or at first difference [I(1)]. If the variable in the regression model are not stationary, then it can be proved that the standard assumptions for asymptotic analysis will not be valid.

4. Results and Discussion

Table 1 below shows the stationary properties of the variables, unemployment, real GDP and inflation. Except for inflation, both unemployment and real GDP are non-stationary series at level, but only become stationary after first-differencing. This applies to all the versions of the stationarity test including Augmented Dickey-Fuller (ADF) and Philips Perron (PP) tests. These differences in the stationary level of the variables indicate that the use of Johansen Juselius and Engel-Granger based co-integration test cannot be feasible. Based on this we employed the Autoregressive Distributive lag (ARDL) approach in estimating the co-integrating relationship among our variables.

Level Variables	ADF		PP	
	Intercept	Trend with Intercept	Intercept	Trend with Intercept
LUN	0.3138 (0.9756)	-1.0213 (0.9275)	-1.0139 (0.9958)	-0.6300 (0.9704)
LRGDP	3.5333 (1.0000)	0.4294 (0.9986)	3.5616 (1.0000)	0.8503 (0.9997)
LIN	-3.4773** (0.015)	-3.5506* (0.0502)	-2.9454* (0.0506)	-2.9187 (0.1695)
First Difference	Intercept	Trend with Intercept	Intercept	Trend with Intercept
LUN	-6.3903*** (0.0)	-6.8345*** (0.0)	-6.3947*** (0.0)	-6.8345*** (0.0)
LRGDP	-3.6078** (0.004)	-5.7204*** (0.0)	-4.0236*** (0.003)	-5.7239*** (0.0)
LIN	-5.8805*** (0.0)	-5.8105*** (0.0002)	-9.4224*** (0.0)	-10.1789*** (0.0)

Note: ***, **, * indicate significant level at 1%, 5% and 10% respectively. Values in parenthesis are probability values.

Table 2 below contains a result for the ARDL – co-integration bound test. The results revealed that the variables are cointegrated at 5% level. It is indicated by the value of the F – Statistics of 5.3793 being greater than the values of both the lower bound, **I(0)** and the upper bound, **I(1)** of the Narayan (2005) table which are 4.183 and 5.333 respectively. The value of the F-statistic is lower than both the lower and upper bounds of the Narayan table at 1% critical value. Since the variables are cointegrated, the estimate of their long run relationships can be obtained. The results of the estimates are shown in Table 3.

F-Statistic	1% Critical Value		5% Critical Value		10% Critical Value	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
5.3793**	6.140	7.607	4.183	5.333	3.393	4.410

K = 2, N = 35

Critical value Based on Narayan, (2005) table- The Unrestricted Intercept with no Trend

Table 3 presents the values of the estimated long-run coefficients with unemployment as a dependent variable. The coefficient of the rate of inflation is -0.87062, meaning that in the long run unemployment is negatively related to inflation rate in Nigeria. It further shows that a 1% increase in inflation leads to 0.870 % decrease in unemployment and it is significant at 1% level. This finding is in conformity with the Philips curve theory which stated that unemployment is negatively related to inflation. On the other hand, the coefficient of the real GDP shows a significant positive relationship with unemployment. A change in real GDP by 1% will explosively trigger a change in unemployment rate by 1.1351. This finding, although contrary to the *A priori* expectation, as the increase in real GDP ought to have reduced the unemployment rate in the country, but is possible as noted by Levine (2013). The study stated that “when economic output increases, in the long run, firms typically don’t hire new workers but have their current workers work for longer hours.” It could also be explained by the fact that, industries experiencing increasing returns to scale would require a minimum labor force as the increase would have a multiplicative effect on their cost of production, thus, will cause both real GDP and unemployment to rise.

Variables	Coefficients	Standard Error	T – Ratio [prob.]
LIN	-0.87062***	0.22873	-3.8063[0.001]
LRGDP	1.1351***	0.27922	4.0652[0.000]
INPT	-25.8425***	7.6215	-3.3907[0.002]

Note: LUN = Dependent Variable: Lag lengths are 1, 2, 0 selected based on SBC

Table 4 shows the result of the short run and error correction model. The results revealed that unemployment is negatively related to inflation at 5% significant level as indicated by the probability value of **0.049**. This is similar to the estimates of the long-run values. The real GDP, in the short-run on the other hand, is positively related to unemployment at 1% level of significant. This situation is possible, as according to Gregory Del Jones, (2006) that “As long as a different sector of the economy contributes to GDP by more than what was lost from unemployment, real GDP will rise as unemployment rises, if only marginally, (World Economic Forum, 2013). On the other hand, the error correction model is negative, significant at 1% and less than unity (-0.5272). This means that the degree of adjustment to equilibrium is about 53% annually.

The positive relationship between Real GDP and Unemployment in Nigeria as revealed by the results both in the short run and long run has been justified by the then Central Bank governor, L. Sanusi, in 2012 “There is a serious problem when a country is growing at seven per cent and yet could not provide jobs for its citizens (CBN report 2012). It is like a broken record;”The reason for this positive relationship between real GDP and unemployment is that there is over reliance on the oil sector in Nigeria neglecting other vital sectors like the manufacturing, iron & steel and agriculture. The oil sector cannot provides the required employment opportunities, whereas the agricultural sector if given more consideration can provide about sixty percent of job opportunities in Nigeria to the Nigerians, Seun (2013).

Variables	Coefficients	Standard Error	T – Ratio [prob.]
Δ LUN	0.2480	0.09313	2.6629 [0.013]
Δ LIN	-0.1758**	0.08546	-2.0582 [0.049]
Δ LRGDP	0.5984***	0.2053	2.9144 [0.007]
Δ INPT	-13.6248	5.2601	-2.5902 [0.015]
ECM _{t-1}	-0.5272***	0.1340	-3.9343 [0.001]

Note: LUN = Dependent Variable; Lag length $s : 1, 2, 0$ selected based on SBC.

Table 5 contains Diagnostic test results. The results revealed that there is no existence of Serial correlation, Functional form, and Heteroscedasticity in the error term. The Durbin Watson Statistic is slightly greater than two (2.2610), this indicates no serial correlation in the model. Moreover, the model does not have functional form misspecification which means that, it has accounted for some important nonlinearity. There is also non-existence of heteroscedasticity which validate the statistical test of significance. The existence of heteroscedasticity, is a problem in the application of regression analysis as it invalidates statistical significance.

Diagnostic Test	LM Version	F Version
Serial Correlation	CHSQ(1)=1.2601[0.262]	F(1, 26)=1.0323[0.319]
Functional Form	CHSQ(1)=0.91638[0.762]	F(1, 26)=0.072401[0.790]
Normality	CHSQ(2)=36.5351[0.000]	Not applicable
Heteroscedasticity	CHSQ(1)=0.33471[0.563]	F(1, 31)=0.31764[0.577]
<i>R- Squared</i> 0.85527		
<i>DW-statistic</i> 2.2610		

5. Summary and Conclusion

For years, numerous of studies have confirmed the negative relationship between real GDP growth and the level of unemployment. However, Gabrisch and Buscher (2006) have argued that GDP growth characterized by productivity progress will hardly reduce the level of unemployment if the employment – relevant component of aggregate demand is too low.

This study has analyzed the relationship between real gross domestic product and unemployment in Nigeria, with inflation as a control variable, using Autoregressive Distributed Lag (ARDL) Model for the period 1977-2011. The empirical findings of this study show that real GDP growth is positively correlated with unemployment. This finding is contrary to *a priori* expectation that real GDP ought to have reduced the level of unemployment. Inflation is negatively related to unemployment and this has conformed to Philips curve hypothesis. The positive relationship between real GDP and unemployment in Nigeria, although, contrary to many studies, but supports the view of Gregory (2009), that if different sectors in the economy can contribute more than what was lost from unemployment; real GDP will rise as unemployment rises. With this we can clearly say that both real GDP increase and unemployment coexist in the Nigerian economy. Therefore, it is expected of the government to use the huge revenue it derives from the oil sector to develop other sectors like iron and steel sector, agriculture and so on that more and more job opportunities. The government should also provide environment that will attract capital and investment, the government does not necessarily create jobs but does aid the private sector in making job creation possible and imminent.

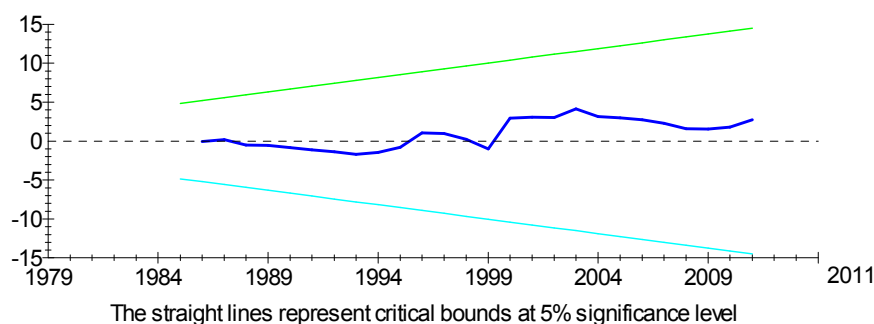
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Appendix 1 (CUSUM TEST)

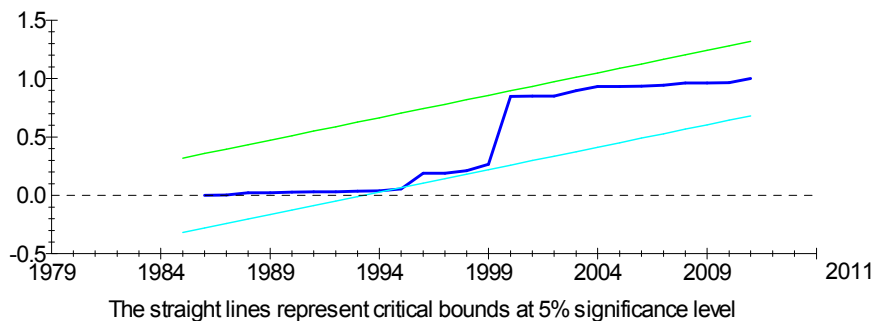
Figure 2

Plot of Cumulative Sum of Recursive Residuals



Appendix 2 (CUSUM Square TEST)
Figure 2

**Plot of Cumulative Sum of Squares
of Recursive Residuals**



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