POTENTIAL-REAL GDP RELATIONSHIP AND GROWTH PROCESS OF NIGERIAN ECONOMY: AN EMPIRIICAL RE-EVALUATION OF OKUN'S LAW

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Abstract

The study provides an empirical evaluation of the relationship between output and unemployment using the "first difference" and output-gab versions of the regression equations that were first estimated by Okun. The study particularly adopts vector autoregressive (VAR) mechanism to estimate this relationship; and finds out that the Okun's coefficient is not significant in Nigerian economy. But however, the trade-off between output-gab and unemployment gab is positive, meaning that a decrease in the gap between natural rate of unemployment and current rate of unemployment leads to a decrease in the difference between potential GDP and real GDP.

Keywords: Output Gap; Growth; VAR

Introduction

Potential output is seen as the aggregate output produced in an economy, when all factors especially human resources are gainfully employed or fully utilized. It is the maximum level of

durably sustainable production, without tension in the economy, and more precisely without acceleration of inflation (Dominique, Gian & Fabio, 2003). Conversely, real output is the national output produced when some units of factors still remained virtually unemployed. Thus, the gap between the potential GDP and real GDP spreads out the variations in unemployment which are in turn inversely related to changes in output. This relationship was first recognized and empirically estimated by Okun (1962), which is now commonly called Okun's Hypothesis. This hypothesis is based on the premise that 1 percentage point increase in employment lead to 3 percentage points fall in output.

However, Samuelson and Nordhaus, (1995) have debunked the claims of Okun when they carried out a study on the relationship between output and unemployment, and discovered that the variations between the two components is 2 to1 percent, but their study still justifies the inverse relationship between output gab and unemployment. In view of this, it means that Okun's hypothesis remains significantly valid in the context of output gab-unemployment relationship. The inverse relationship between output gab and unemployment is an essential tool often employed when analyzing any macro economy model because aggregate supply curve is derived by combining Okun's hypothesis and the Phillip's curve to make inferences which are very important to policy makers. This is particularly so, since they are interested in knowing the level of national output that is required to reduced unemployment by 1 percentage point. Therefore, in the process of growth, the movement between output gab and unemployment gives an indication for better policy making and implementation of monetary/ fiscal policies to adjust the economy appropriately.

The study is a fresh attempt carried out to estimate Okun's coefficient for Nigerian economy and to test the validity of Okun's Hypothesis with the aim of making recommendations to macroeconomic policy makers. To achieve these, the study is structured into 6 sections: section (1) deals with introduction; section (2) gives the literature review; section (3) discusses methodology and data; while analysis of results, conclusion and recommendations are presented in sections (4), (5), and (6) respectively.

1.1 Brief review of literature

Sheehan and Zahn (1980) investigated the variability of Okun's coefficient and found out that the changes in labour productivity and in weekly average hours are the two significant factors

causing this variability. Prachowny (1993) revaluated the estimates of Okun‘s law for U. S. economy and discovered that one percentage point decline in unemployment rate is accompanied by 2/3 percentage rise in output. He further revealed that ineffect of changes in weekly work hours had independent influence on output gap. Weber (1997) posited Okun‘s law as a relationship between output gap and unemployment in a business cycle. Nourzad and Almaghrbi (1996) observed that exclusion of expectations in the Okun‘s model undervalue the relationship between output growth and fall in unemployment. Attfield and Silverstone (1998) estimated the long run relationship between output and unemployment gaps using the cointegration methodology and discoved that the approximate value of Okun‘s coefficient was -2.25 for the U. S. economy.

Freeman (2000) classified Okun‘s law “a rule of thumb” which provides rough guideline to policy makers with regards to the relationship between output changes and unemployment changes. Söegner and Stiassny (2002)empirically tested Okun‘s law and found an inverse trade-off between the unemployment rate and the real output (GDP). Apergis and Rezitis (2003) estimated Okun‘s coefficient for some regional areas of Greece for the period 1960-1997. Their analysis revealed no differences in the region except for Epirus and North Aegean Islands. Further, it was noted that Okun‘s coefficient underwent substantial changes in 1981. For the later period unemployment became less responsive to output changes in all the regional areas. *Aoki and Yoshikawa* (2003) found that the magnitude of the relationship between unemployment and GDP is larger than Okun‘s original estimates if the average GDP rises. Stockhammer (2004) analyzed alternative regimes of profit-led demand and wage-led demand leading to growth by closing the model with Okun‘s law. He discovered that under profit led regime short run and long run equilibrium rates of unemployment were stable. None the less, under wage led demand regime there was no possibility of long run equilibrium rate of unemployment.

Silvapulle, Moosa and Silvapulle (2004) observed that there had been an asymmetric relationship between output and unemployment. They used a dynamic model which permitted asymmetry in the relationship between unemployment and output to explain the Okun‘s coefficient. Perman and Tavera (2007) tested for the presence of convergence of the Okun’s Law coefficient (OLC) among several alternative groups of European economies. They used a testing procedure suggested by Evans in order to investigate the convergence or non – convergence of the OLC in several groups of European countries by examining how the cross –country variance of the OLC evolves over time in these groups. A hypothesis of medium – term convergence of the OLC

is rejected for most of the European country groups examined. Villaverde and Maza (2008) analyzed Okun‘s law for Spanish regions using data for the period 1980-2004. The results verified the existence of Okun‘s law for most of the regions and for the economy as a whole. However, the magnitude of Okun‘s coefficient differed for various regions due to regional productivity differentials.

Geidenhuys and Marinkov (2007) tried to give answer to the question if unemployment responds to changes in output in South Africa. For this reason, they estimated the relationship between economic activity and unemployment rate. The results indicated the presence of an Okun's law relationship in South Africa over the period 1970 -2005 with more evidence in favour of asymmetries during recessions.

Noor, Nor and Judhiana (2007) examined whether there exist an Okun – type relationship between output and unemployment in the Malaysian economy. The empirical results show that there was an inverse relationship between output and unemployment.

Malley and Molana (2008) demonstrated that labour productivity is affected by imperfections of goods and labour markets. Their estimates of threshold unemployment, which separates "high-effort" and "low-effort" states, are positive for G7 countries except Germany which tended to be persistently in the former state. Ho-Chuan Huang and Shu-Chin Lin (2008), motivated by a simple theoretical model, proposed the Bayesian approach for estimating Okun's coefficients using U.S. quarterly data from 1948: Q1 to 2006: Q1. The results showed that there is overwhelming evidence in favor of smooth –time – varying Okun's law which is positively related to productivity trend. Also their results indicated that the commonly – used Okun's law coefficient can lead to inappropriate results.

Turturean (2008) based on the inflation rate and unemployment rate registered in Romania for the period 1993 – 2004, examined how to show Okun's Law. Results consisted of two distinct models explaining the dependency between the GDP's growth rate and unemployment rate's growth and vice versa. This shows that in the case of Romania there was no two – way relationship using the same model, the direct and mutual dependencies between growths of unemployment rate and the growth rate of GDP's as shown in the original formulation of Okun's Law. Pierdzioch, Ruike and Stadtmann (2009) used data covering the period 1989-2007 for G7 countries test relevance of Okun‘s law to professional economist‘s forecasts of output growth and unemployment. Their results confirmed the consistency between Okun‘s law and professional

economists' forecasts of changes in unemployment rate and the real output growth rate. They also found a direct relationship between magnitude of unemployment and the size of the output gap. In a nut-shell, literature reveals that Okun's law has been revisited in several countries where the disparity between real output and unemployment is alarming. Therefore, it is imperative to test for the empirical validity of this law in Nigeria where this disparity is even more alarming.

2.1 Model specification and description of variables

The study employs the regression equations that were first estimated by (Okun 1970). He suggested two classes of specifications: the "gab" model and "first- difference" model; which are expressed as follows

1) $G - G_{(-1)} = \lambda_0 + \lambda_1[UE - UE_{(-1)}] + \mu$ …… [First difference model]

2) $\underline{G} - G = P_0 + P_1 [\underline{U}E - UE] + \varepsilon$ ……. [gab model]

Where: G is the real output rate

$G_{(-1)}$ is the lag of real output growth

UE is the unemployment rate

$UE_{(-1)}$ is the lag of unemployment rate

$\underline{G}$ is the potential output growth rate

UE is the natural rate of employment

λ_0, λ_1, P_0, P_1 are the regression parameters

μ, ε are the error terms.

Note:

Potential real GDP = natural employment rate X actual real GDP

actual employment rate

Actual employment rate (in %) = [100% - current unemployment rate]

Natural employment rate (in %) = [100% - natural unemployment rate]

Unemployment rate = unemployed people

total workforce population

Natural rate of unemployment = total workforce-employed population X 100

Total workforce 1

Workforce = employed population of unemployed population.

3.2 Sources of Data: the formulae above were used to compute data on potential real GDP rate and natural rate of unemployment while unemployment rate, real GDP growth rate are readily published data which were sourced from the publication of Nation Beraeu of Statistic to cover a period of thirty-one years ranging from 1981 to 2011.

3.1 Empirical results

3.1 Unit Root Test

Our empirical findings begin with the test for the stationary of thee specified variables. The Augumented Dickey Fuller (ADF) [1981] test was adopted to test the stationarity of potential real output growth rates and, natural-current employment rates. The results obtained are reported on table 4.1

Table 4.1 Test for the presence of Unit Root based on ADF Statistics

The Difference Version					The Output Version				
Variables series	ADF Stat	Machinnon Critica value			Variables series	ADF Stat	Machinnon Critica Value		
		1%	5%	10%			1%	5%	10%
$G - G_{(-1)}$	-6.88	-4.30	-3.57	-3.22	$\underline{G} - G$	-4.41	-4.30	-3.57	-3.22
$D[G - G_{(-1)}]$	-10.76	-4.31	-3.57	-3.22	$D(\underline{G} - G)$	-7.89	-4.31	-3.57	-3.22
$UE - UE_{(-1)}$	-2.95	-2.64	-1.95	-1.61	$\underline{UE} - UE$	-2.38	-4.30	-3.57	-3.22
$D[UE - UE_{(-1)}]$	-5.02	-4.31	-3.57	-3.22	$D(\underline{UE}-UE)$	-3.30	-2.64	-1.95	-1.61

Source: computed from E-view progamm

The results of the ADF statistics are conducted on the series of the specified variables including intercept and trend as they are reported on table 4.1. We discover that the null hypothesis that there is presence of a unit root is rejected both at levels and at first difference for the "difference version" of the model. This means that the series of the specified variables are stationary. However, the "out-gab" versions of the model show a different result, since, the series of the variables are found to be stationary at different levels. This out rightly led the researcher to estimate the two versions of the model using vector autoregressive (VAR) technique.

4.2 The Significance of Okun's Coeffcient

The study actually utilizes the VAR mechanism to estimate the Okun's coefficient in Nigerian economy. The results obtained are reported on table 4.2

Table 4.2 VAR Output for the two Versions of the Model

First Difference Version				Out-Gap Version			
Variable	Coefficient	Standard error	t-stat	Variable	Coefficient	Standard error	t-stat
$D[G - G_{(-1)}]$	-0.23	0.19	-1.21	$\underline{UE} - UE$	0.26	0.64	0.39
$UE– UE_{(-1)}$	0.31	0.24	1.30				

Source: computed from E-view program

Merely looking at the sign of the coefficients in the two versions- the first difference and the output-gab of the model reveals to us that the difference between the natural rate of unemployment and current rate of unemployment is positively related to the output- gab. This means that the gap between potential GDP and real GDP can be shrunk by reducing unemployment rate to the natural level. The closer the unemployment rate to the natural rate the smaller the gap between potential and real GDP's.

However, the coefficient estimated in the two versions are found to be insignificant at 5% level because the observed t-statistics 1.30 are o.39 are smaller than the critical t-value at 5% which is 2.05 using one-tale test. Thus, the Okun's coefficient is not significant in Nigerian economy. Therefore the Okun's law which states that a 1 percent point increase in unemployment could lead to 3 percent points fall in output is not valid in Nigeria.

4.1 Conclusion

The study provides a precise evaluation of the relationship between output and unemployment using both the "first difference" version and "output-gab" version of the original regression equations that were first estimated by Okun in 1962. The results obtained show that a consistent decrease in the gap between natural rate of unemployment and current rate of unemployment lead to a correspondent but not necessarily proportionate decrease in the between potential GDP and real GDP. However, the Okun's coefficient is found to be insignificant both at

the "first difference" and "output-gab" versions of the model. This simply means that the Okun's law is grossly invalid in Nigerian economy.

6.1 Recommendations

The study strictly recommends that the Nigerian government should urgently diversify her resource base; so as to decrease the ever increasing gab between natural unemployment and current unemployment.

Also, the government's debt policy should be tilted towards asset acquisition and capacity building both in the public and private sectors.

Finally, the government should provide enabling grounds for productive minority to operate freely through subsidies, flexible credit facilities and stable, sustainable electricity. If these machineries are put in place the Nigerian economy will spring up and move along the production possibility curve (frontier).

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