OGBUAGU MATTHEW IKECHUKWU
Department of Economics and Development Studies, Faculty of Humanities and Social Sciences,
Federal University Oye-Ekiti, Ekiti State, Nigeria.
Email: ogbuagumatthew@gmail.com / matthew.ogbuagu@fuoye.edu.ng
GSM: 08036103412

&

EKPENYONG UDOM IMOH
Department of Economics and Development Studies, Faculty of Humanities and Social Sciences,
Federal University Oye-Ekiti, Ekiti State, Nigeria.
Email: imohtranspose@yahoo.com / imoh.ekpenyong@fuoye.edu.ng
GSM: 08038751465
EXPECTATIONS AND MACROECONOMIC VARIABLES IN NIGERIA:
AN ANALYSIS OF THE PHILLIP’S CURVE (1970-2013)

Abstract

Relationship between inflation and unemployment has attracted the attention of many scholars over the years. In Nigeria, most scholars believe that the Phillip’s curve does not hold because of structural rigidities and distortions, weak institutions etc. The main aim of this research is to model expectations. The specific objectives were to evaluate the short and long run impact of unemployment on inflation in Nigeria, to pin-down the direction of causality between inflation and unemployment, to examine the long run relationship between inflation and unemployment and finally, the rate of adjustment from the short run disequilibrium to the long run equilibrium. The Ordinary Least Square Method (OLS) and Generalized Least Square (GLS) were adopted to analyze the time series data from 1970 to 2013. The theoretical framework for analysis was the Phillip’s curve model. Koyck’s Transformation was used to factor in expectations into the Phillip’s curve model. The regression result supports the Phillip’s curve in the short run, which shows a negative relationship between inflation and unemployment. The Granger Causality test shows that there is no causality between inflation and unemployment in Nigeria. Also, the Johansen Cointegration test shows a negative relationship between inflation and unemployment in the long run. The Generalized Least Square technique was used to analysis the ECM; and the result shows that it will take approximately two years for the disequilibrium in the short run to be cleared. This paper recommended that a good blend of monetary and fiscal policies should be adopted by technocrats and policy makers. Also, economists and policy makers should reconsider the classical dichotomy thesis in the light of a significant and robust long run inflation-unemployment tradeoffs among others.

Keywords: Inflation, Unemployment, OLS, GLS, Phillip’s curve, Koyck’s Transformation, Nigeria.
1.0 BACKGROUND

Over the past decades, it has remained an interesting debate among economists whether it is possible to achieve low inflation and low unemployment rates in a particular economy at the same time. This is a major challenge for the developing countries. In this regard, in 1960, the concept of Phillips curve emerged, named after A. W. Phillips who is the pioneer of the Phillips curve in the United Kingdom. This curve suggests negative relationship between the rates of inflation and unemployment. The Phillips curve has three assumptions.

Firstly, in the short run there is tradeoff between inflation and unemployment. Secondly, aggregate supply shock can break the concept of Phillips curve because it can trigger off higher rate of inflation and unemployment which is also known as stagflation. Thirdly, in the long run there is no significant tradeoff between inflation and unemployment (Sagar et al, 2012; Ahuja, 2010). Therefore, economists should focus on identifying their relationship. Scholars have discovered in most studies that there is short run tradeoff between inflation and unemployment in different countries in different time periods.

Though, achieving low inflation and low unemployment rate are major economic goals, it is difficult to achieve both economic goals (low inflation and low unemployment) simultaneously. Inflation is the function of monetary policy while unemployment is the function of fiscal policy. The aim of monetary policy is to control the level of inflation or to maintain the sustainable inflation in the economy by sacrificing employment. In contrast the goal of fiscal policy is to make low unemployment in the economy at any rate of inflation. Therefore, coordination among the policies is very important in order to maintain optimal level of tradeoff between inflation and unemployment which is known as Natural Rate of Unemployment or some time it is also called NAIRU (Non Accelerating Inflation Rate of Unemployment). But it has also been discovered that supply shocks (oil prices) or changes in the way workers and firms form expectations regarding future inflation caused the breakdown of the Phillips curve (Neugart, 2003).

Ahuja (1986) reiterated Friedsman’s natural rate hypothesis that though there is a trade-off between inflation and unemployment in the short run, the economy is stable in the long run at the natural rate of unemployment and therefore the long run Phillip’s curve is a vertical straight line. He further argued that misguided Keynesian expansionary fiscal and monetary policies based on the wrong assumption that a Phillip’s curve exist in the long run only result in increasing rate of inflation. This relationship can be further explained by the IS-LM framework. The IS curve captures the fiscal
policy, while the LM curve captures the monetary policy. An increase in aggregate demand (fall in unemployment) will cause price to increase (inflation). Also, an increase in money supply will increase aggregate demand (fall in unemployment) and an increase in price (inflation). So a good blend of the fiscal and monetary instruments cannot be over-emphasized.

As it had been seen in most studies, there is short run Phillip’s Curve tradeoff between inflation and unemployment. Also, long run relationship exist between these variables usually a neutral, negative or positive one. The relationship between inflation and unemployment rate has got a great fame in the literature. Studies like Rogerson (1988); Cooley and Hansen (1989), Mortensen and Pissarides (1994), Shi (1997), Berentsen, Lagos and Wright (2005), Lehmann (2006), Beyer and Farmer (2007), Kumar (2008), Berentsen, Menzio and Wright (2008) have found a positive relationship between inflation and unemployment in the long run. On the other hand, Karanassou, Sala and Snower (2003), Karanassou and Sala (2010), Franz (2005), Schreiber and Wolters (2007) had found an inverse relationship between inflation and unemployment in the long run.

In the case of Nigeria, the unemployment rate was 4.80% in 1970; it increased to 7.80% in 1980, galloped to 19.70% in 2009 and then remained at 23.60% in 2012 (NBS Survey, 2012). Besides unemployment, inflation is another macroeconomic problem which hurts both economic and social indicators in any country. Nigerian economy has also come across this macroeconomic problem. The inflation rate was at 9.90%, 7.2%, 6.9%, 11.6% and 10.8% in 1980, 1990, 2000, 2009 and 2012 respectively; with the highest at 72.8% in 1995 (CBN, 2012). The worse hit is the “Misery index” for Nigeria which ranged from 15.2%, 11.6% and 34.4% in 1980, 2000 and 2012 respectively (NBS Survey, 2012).

2.0 OBJECTIVES

The main objective of this research is to examine the effect of expectations on Inflation.

The specific objectives are:

- To evaluate the short run and long run impact of unemployment on inflation in Nigeria.
- To pin down the direction of causality between inflation and unemployment.
- To examine the long run relationship between inflation and unemployment.
- Finally, the rate of adjustment from the short disequilibrium to the long run equilibrium will be further ascertained within the course of this work.
The rest of the work are divided into section 3 literature review, section 4 methodology and model specification, section 5 data analysis and interpretation of results and section 6 summary, conclusion and recommendations.

3.0 LITERATURE REVIEW

Karanassou and Sala (2010) argued that there is a tradeoff between inflation and unemployment in the long run because of the fact that money and productivity growth leads to a decrease in unemployment, while supply shocks like oil prices leads to increase in unemployment. Wolfgang Franz (2010) concluded that it is very hard to assess the NAIRU if the joint relationship of inflation, wage increases and unemployment get worse because NAIRU is the point where inflation is constant at consistent rate of unemployment. Apel and Jansson (1999) argued that Phillips curve equation also helps in precision of estimating the potential output and the NAIRU. Haug et al (2011) adopted the classical theory to examine the relationship between inflation and unemployment in the long run, using quarterly US data from 1952-2010. Using the Band-Pass Filter Approach, they found strong evidence that a positive relationship exists; where inflation leads unemployment by some 3 to 3½ years in cycles that last from 8 to 25 or 50 years. Chicheke (2009) examined the relationship between inflation and unemployment in South Africa using the vector error correction modeling technique. The model regressed the monetary policy variables against inflation and unemployment growth over the period 1980-2008. The results obtained indicate that there is a long run relationship between inflation and unemployment.

Villavicencio et al (2013) adopting the backward-looking Phillip’s curve, they estimated the level of inflation that eroded price rigidity and investigated its time constancy. As a result, they employed smooth transition regression models with rolling regressions to account for varying threshold inflation levels. Investigating six advanced countries over the period 1970-2012, their results show that both the slope of the Phillip’s curve and the threshold trend inflation that eroded price rigidity were time varying. These characteristics could not be captured by a static linear or non linear model, illustrating the rich flexibility embedded in their proposed model. Karanassou et al (2007) analysed the relationship between US inflation and unemployment from the perspective of “Frictional Growth”, a phenomenon arising from the interplay between growth and frictions. They examined the interaction between money growth and various real growth and nominal frictions. Here, they showed that monetary policy has not only been persistent, but had permanent real effects, giving rise to long
run inflation-unemployment tradeoffs. Linzert (2005) examined the relationship between unemployment and wage inflation for 10 of the Euro area countries. He attributed the combination of low wage inflation and high unemployment to a rise in the natural rate of unemployment. Using a panel data approach, his paper modeled directly the specific structural determinants of the natural rate of unemployment that may account for a changing pattern in unemployment-inflation tradeoffs.

Herman (2010) took into consideration that there is no simple correlation between inflation and unemployment. In the light of the above, he analyzed data between 1989-2010 to establish whether or not Philip’s type of relationship exist. He established the fact that in the long run, one cannot identify a stable statistically significant relationship between inflation and unemployment. Anders et al (2000) using the two-stage Markov Switching VAR models of monthly unemployment and inflation for three countries: Sweden, UK and the US; they discovered that the MS VAR models provide better description of the data than single equation VARs and requires fewer lags to account for serial correlation. They also found that both the theoretical and empirical results suggest that an increase in central bank conservativeness can be associated with either a higher or lower variance in unemployment. Berensten et al (2009) investigating the long run relation between inflation and unemployment, discovered a positive relationship between these variables. They developed a framework where unemployment and money are both modeled using micro foundations based on search and bargaining theory. Sagar et al (2011) identified the relationship between inflation and unemployment in SAARC countries adopting the Phillip’s model. They used unbalanced panel data of 8 SAARC member countries (Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri-Lanka). They discovered that there exist a negative relationship between inflation and unemployment rate in SAARC countries.

In Nigeria, Oyejide (1972) examined the impact of deficit financing in propagating inflation processes in Nigeria and concluded the existence of direct relationship between inflation and the various measures of deficit financing for the period studied. However, Ajayi and Awosika (1980) found that inflation in Nigeria is explained more by external factors (such as international oil market fortunes) in contrast to internal influences. Yet, Adedeji and Fakiyesi (1980) estimated and tested the hypothesis that the main factor responsible for instability of prices and inflationary tendencies was the Nigerian government expenditure. And using quarterly data, Osakwe (1983) identified the money wage rate and money supply as the two must important determinants of prices during the
period. Again, using Cointegration and Error Correction Mechanism, Egwaikhide et al (1994) concluded that Nigerian inflation seems to find explanation in both monetary and structural factors and that both the official and the parallel market exchange rates exert upward pressure on the general price level. Furthermore, Ajakaiye and Ojowu (1994) using an input–output price model, simulated and analyzed empirically the impact of exchange rate depreciation under different make up regimes. The Phillips curve model performs well in explaining and forecasting inflation and it is best in its disaggregated form. However, Olubusoye and Oyaromade (2008) analyses the main sources of fluctuation in inflation in Nigeria using the framework of Error Correction Mechanism, it was found that lagged consumer price index (CPI), expected inflation, petroleum prices and real exchange rate significantly propagate the dynamics of inflationary process in Nigeria. They concluded that efforts of the monetary regulating authorities to stabilize the domestic prices would continuously be disrupted by volatility in the international price of crude oil.

Umaru et al (2012) adopted Ordinary Least Square (OLS) technique to estimate the relationship between inflation and unemployment in Nigeria from 1977-2009 using the classical theory. The direction of causality between inflation and unemployment were ascertained using the Granger causality test; after which the Johansen Cointegration test were used to establish if the variables under consideration have long run relationship. They further tested for volatility in inflation and unemployment in Nigeria using the ARCH and GARCH models. It was discovered that there is a high volatility in inflation and unemployment in Nigeria.

Umoru et al (2013) using a VAR model, tested the validity of Philip’s curve in Nigeria between 1985-2012. In order to achieve his objectives, he adopted the Engle-Granger Test to establish the direction of causality between unemployment and inflation. They further adopted the difference models by Philip-Perron (PP) and the Augmented Dickey Fuller (ADF) to check for the level of integration of the variables. They were able to establish the existence of a long run relationship between unemployment and inflation using both trace test and maximum Eigen values.

The literature review shows that little or nothing has been done to model “expectations” especially in Nigeria. This research intends to fill the use of Koyck’s Transformation Model to model expectations into the Philip’s curve equation.

4.0 RESEARCH METHODOLOGY AND MODEL SPECIFICATION
This section makes use of quasi-experimental research design approach for the data analysis. Here, the researcher combined the theoretical consideration (a priori criterion) with the empirical observation and extracts maximum information from the available data. This enables the researcher to observe the effects of the explanatory variables on the dependent variables. The study therefore, makes use of secondary data mainly time series obtained from publications such as the World Bank Digest of Statistics, Central Bank of Nigeria Statistical Bulletin, International Financial Statistics, African Development Indicators, NBS Survey, Journals and Websites.

Though this research adopted the simple Phillips Curve Model, the Koyck’s Transformation would be employed to model expectations into the inflation-unemployment equations. Here, the impact of all the lagged values of inflation and unemployment will be captured within the model simultaneously. Koyck’s Transformation has been proved to be very relevant in modeling adaptive expectations (Cho, 2003). This corroborates the New Classical Theory that past levels of inflation and future inflation rates join forces to determine the current value of inflation (Fumitaka, 2007).

Applying the Kyock`s Transformation to the simple Phillips curve, the model is as follows:

\[ \text{INF}_t = f(\text{UNEM}_t, \text{UNEM}_{t-1}, \text{UNEM}_{t-2}, \ldots) \]  \hspace{1cm} \text{……………………………………………………. (1)}

\[ \text{INF}_t = \alpha + \beta_0 \text{UNEM}_t + \beta_0 \lambda \text{UNEM}_{t-1} + \ldots + \mu_t \]  \hspace{1cm} \text{…………………………(2)}

\[ \text{INF}_{t-1} = \alpha + \beta_0 \text{UNEM}_{t-1} + \beta_0 \lambda \text{UNEM}_{t-2} + \ldots + \mu_{t-1} \]  \hspace{1cm} \text{…………… (3)}

\[ \lambda \text{INF}_{t-1} = \lambda \alpha + \beta_0 \lambda \text{UNEM}_{t-1} + \ldots + \lambda \mu_{t-1} \]  \hspace{1cm} \text{……………… (4)}

\[ \text{INF}_t - \lambda \text{INF}_{t-1} = \alpha - \lambda \alpha + \beta_0 \text{UNEM}_t + \mu_t - \lambda \mu_{t-1} \]  \hspace{1cm} \text{…………………………………(5)}

\[ \text{INF}_t = \alpha (1-\lambda) + \beta_0 \text{UNEM}_t + \lambda \text{INF}_{t-1} + V_t \]  \hspace{1cm} \text{………………………………………………(6)}

If other variables of interest are included, the model will be of the form:

\[ \text{INF}_t = \alpha (1-\lambda) + \beta_0 \text{UNEM}_t + \beta_1 \text{Ms} + \beta_2 \text{INTR}_t + \beta_3 \text{ECGR}_t + \beta_4 \text{INVR}_t + \beta_5 \text{OILR}_t + \lambda \text{INF}_{t-1} + V_t \]  \hspace{1cm} \text{………………………………………………………………………..(7)}

Where: \text{INF}= Inflation Rate, \text{UNEM}= Unemployment Rate, \text{Ms}= Money Supply, \text{INTR}= Interest Rate, \text{OILR}= Crude Oil Revenue, \text{ECGR}= Economic Growth, \text{INVR}= Investment (Proxy National
Savings). \( \lambda \) simultaneously captures the impact of the lagged values of inflation and the lagged values of the explanatory variables.

Note that: \( 0 < \lambda < 1 \)

Where \( t \) is the time trend and \( V \) is the white noise (stochastic term) which is assumed according to Ordinary Least Square to be normally distributed with zero mean and constant variance.

The parameters for estimation from equation 7 are \( \beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \lambda \). In consonance with economic theory, it is expected that \( \beta_0 < 0, \beta_1 > 0, \beta_2 > 0, \beta_3 > 0, \beta_4 < 0, \beta_5 > 0, \lambda > 0 \).

4.1 ECONOMETRICS ISSUES

4.1.1 UNIT ROOT TEST

Generally, macroeconomic time series data are stochastically trended, which is a problem that can be solved by differencing. A number of tests can be used to verify the presence of unit roots in time series. This study adopts the Augmented Dickey Fuller (ADF) and Phillip Perron (PP) tests for the presence of unit roots in inflation rate, unemployment rate, national savings, money supply, crude oil revenue, gross domestic product growth rate. Theoretically, the following ADF specifications are possible:

\[
\Delta Y_t = \delta Y_t - 1 + \sum_{i=1}^{m} \beta_i \Delta Y_t + \mu t \quad \text{............... (8)}
\]

\[
\Delta Y_t = \alpha 0 + \delta Y_t - 1 + \sum_{i=1}^{m} \beta_i \Delta Y_t + \mu t \quad \text{............... (9)}
\]

\[
\Delta Y_t = \alpha 0 + \delta Y_t - 1 + \alpha 1 t + \sum_{i=1}^{m} \beta_i \Delta Y_t + \mu t \quad \text{............... (10)}
\]

Each of the models is applied depending on the properties of the series. Thus, if a series has no intercept and trend, model 8 is appropriate, while model 9 is more appropriate if the series has intercept without trend. Model 10 is applicable if the series has both time trends and intercept. Stationarity test is important to avoid spurious regression estimates.

4.1.2 COINTEGRATION TEST

In the context of time series literature, cointegration test is conducted with a view to detecting common stochastic trends in a set of variables. In other words, cointegration is important to establish
whether the variables under investigation have a long run relationship; especially when short run disequilibria have been established. In the light of this, the study adopts the cointegration approach developed by Johansen (1988) and expanded by Johansen and Juselius (1990).

### 4.1.3 ERROR CORRECTION MODELS (ECM)

After testing for unit roots and cointegration, and the short run dynamics is established, the ECM is used to ascertain the rate of adjustment to the long run equilibrium.

The Error Correction Model (ECM) is specified below:

\[
\text{INF}_t = \bar{\theta}_0 + \bar{\theta}_1\text{UNEM}_t + \bar{\theta}_2\text{Ms}_t + \bar{\theta}_3\text{INVR}_t + \bar{\theta}_4\text{OILR}_t + \bar{\theta}_5\text{INTR}_t + \bar{\theta}_6\text{ECGR}_t + \bar{\theta}_7\text{INF}_{t-1} + \bar{\theta}_8\text{ECT}_{t-1} + \mu_t, \quad \text{(11)}
\]

Where: \(\text{ECT}_{t-1}\) = Lagged value of the Error Correction Coefficient, \(\bar{\theta}_8\) = Measures the speed of adjustment.

### 5.0 RESULTS AND INTERPRETATION

**Table 1 UNIT ROOTS TEST**

<table>
<thead>
<tr>
<th>Variable(s)</th>
<th>Level of integration</th>
<th>t- statistic</th>
<th>Probab. Value(s)</th>
<th>Significant Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inflation</td>
<td>I (1)</td>
<td>-3.447422</td>
<td>0.0148</td>
<td>*</td>
</tr>
<tr>
<td>Rat_Unmt</td>
<td>I (1)</td>
<td>-4.0945</td>
<td>0.0026</td>
<td>*</td>
</tr>
<tr>
<td>NAT_SAVT</td>
<td>I (1)</td>
<td>-3.4228</td>
<td>0.0672</td>
<td>**</td>
</tr>
<tr>
<td>M2</td>
<td>I (1)</td>
<td>-3.7863</td>
<td>0.0004</td>
<td>*</td>
</tr>
<tr>
<td>GDPGR</td>
<td>I (1)</td>
<td>-6.73341</td>
<td>0.0000</td>
<td>*</td>
</tr>
<tr>
<td>OIL_REV</td>
<td>I (1)</td>
<td>-4.8483</td>
<td>0.0023</td>
<td>*</td>
</tr>
</tbody>
</table>

*Source: (By Author) 1% level of significance * 5% level of significance ** 10% level of significance ***

**Table 2 REGRESSION RESULT**

| Included observation: 40 after adjustment |

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std Error</th>
<th>t- statistic</th>
<th>Prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>DRAT-UNMT</td>
<td>-0.4174</td>
<td>0.013423</td>
<td>-31.09691</td>
<td>0.0000</td>
</tr>
<tr>
<td>DOIL-REV</td>
<td>-1.55E-06</td>
<td>5.10E-08</td>
<td>-30.31080</td>
<td>0.0000</td>
</tr>
<tr>
<td>DNAT_SAVT</td>
<td>-2.23E-06</td>
<td>1.79E-07</td>
<td>-12.48718</td>
<td>0.0000</td>
</tr>
<tr>
<td>DM2</td>
<td>2.33E-06</td>
<td>3.52E-07</td>
<td>6.605769</td>
<td>0.0000</td>
</tr>
<tr>
<td>TDINFLATIONT</td>
<td>-6.83E-05</td>
<td>0.00560</td>
<td>-0.012194</td>
<td>0.9903</td>
</tr>
<tr>
<td>DGDPGR</td>
<td>-0.003025</td>
<td>0.000686</td>
<td>-4.411103</td>
<td>0.0001</td>
</tr>
<tr>
<td>ECT</td>
<td>1.000456</td>
<td>0.005593</td>
<td>178.8869</td>
<td>0.0000</td>
</tr>
<tr>
<td>C</td>
<td>25.11621</td>
<td>0.194446</td>
<td>129.1680</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

*Source: Computed By Author*
The Equation is of the form:

\[ \text{INF}_t = 25.11621 - 0.417418 \text{RAT-UNMT} - 1.55 \times 10^{-6} \text{OIL-REV} - 2.23 \times 10^{-6} \text{DDNAT-SAVT} + 2.33 \times 10^{-6} \text{DDM2} - 6.83 \times 10^{-5} \text{TINFLATIONT} - 0.003025 \text{GDPGR} + 1.000456 \text{ECT} \]  
\[ \text{--------- (10)} \]

From (10) a percentage increase in unemployment rate reduces inflation by 0.42% holding other variables constant. This result is significant at 1%, 5% and 10% levels; since the probability value is at 0.0000 which is lower than 1%, 5% and 10%.

Also, an increase in money supply by 1 million naira holding other variables constant, inflation will increase by 0.000002%. This result is significant at 1%, 5% and 10% levels.

Furthermore, an increase in the lagged value of inflation and other explanatory values by 1% percent holding other variables constant; reduces inflation by 0.000004 percent. This is the Kyock’s coefficient, and is insignificant at 1%, 5% and 10%. Meaning the lagged values of both the explained and explanatory variables do not influence current inflation rate.

An increase in the gross domestic product growth rate by 1% reduces inflation by 0.003%; and is significant at 1%, 5% and 10% levels.

The R-Squared adjusted is 0.999163; meaning over 90% of the variation in the dependent variable is captured within the model. The overall goodness of fit of the model is justified significant as the prob (F-statistic) (0.00000)) is less than 1%, 5% and 10%. The DW is 2.54, showing absence of autocorrelation/first order serial correlation.

The short run impact of unemployment rate on inflation rate is negative at -0.42, while the long run impact is at 0.99993 which is approximately 1.0.

Table 3: PAIRWISE GRANGER CAUSALITY TESTS

<table>
<thead>
<tr>
<th>Null Hypothesis</th>
<th>Obs</th>
<th>F-statistic</th>
<th>Prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>M2 does not Granger Cause INFLATIONT</td>
<td>40</td>
<td>0.49792</td>
<td>0.612</td>
</tr>
<tr>
<td>INFLATIONT does not Granger Cause M2</td>
<td></td>
<td>0.11005</td>
<td>0.8961</td>
</tr>
<tr>
<td>RAT-UNMT Does not Granger Cause INFLATIONT</td>
<td>40</td>
<td>0.33320</td>
<td>0.7189</td>
</tr>
<tr>
<td>INFLATION Does not Granger Cause RAT-UNMT</td>
<td></td>
<td>0.86451</td>
<td>0.4301</td>
</tr>
<tr>
<td>GDPGR does not Granger Cause INFLATIONT</td>
<td>39</td>
<td>0.64522</td>
<td>0.5308</td>
</tr>
<tr>
<td>INFLATIONT does not Granger Cause GDPGR</td>
<td></td>
<td>0.40767</td>
<td>0.6684</td>
</tr>
</tbody>
</table>

Source: Computed By Author
The Granger Causality test shows that unemployment does not Granger Cause Inflation and Inflation do not Granger Cause unemployment in Nigeria. Also, the result shows that money supply does not Granger Cause Inflation and Inflation does not Granger cause money supply. GDP growth rate does not either cause inflation or does inflation cause economic growth.

Table 4: JOHANSEN COINTEGRATION TEST
Series: DINFLATIONT DM2 DNAT-SAVT DOIL-REV DRAT-UNMT DGDPGR
Unrestricted cointegration Rank Test (Trace)

<table>
<thead>
<tr>
<th>Hypothesized No. OF CE(S)</th>
<th>Eigenvalue</th>
<th>Trace Statistic</th>
<th>0.05 critical value</th>
<th>prob.**</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>0.9807</td>
<td>343.06</td>
<td>95.97</td>
<td>0.0000</td>
</tr>
<tr>
<td>At most1*</td>
<td>0.8720</td>
<td>193.08</td>
<td>69.82</td>
<td>0.0000</td>
</tr>
<tr>
<td>At most2*</td>
<td>0.6596</td>
<td>114.96</td>
<td>47.86</td>
<td>0.0000</td>
</tr>
<tr>
<td>At most3*</td>
<td>0.6180</td>
<td>74.01</td>
<td>29.80</td>
<td>0.0000</td>
</tr>
<tr>
<td>At Most4*</td>
<td>0.5189</td>
<td>37.44</td>
<td>15.50</td>
<td>0.0000</td>
</tr>
<tr>
<td>At Most5*</td>
<td>0.2240</td>
<td>9.64</td>
<td>3.84</td>
<td>0.0019</td>
</tr>
</tbody>
</table>

Source: By Author

Trace test indicates 6 cointegrating eqn(s) at 0.05 level *denotes rejection of the hypothesis at the 0.05 level**Mackinnon-Hang- Michelis (1999) p-values.

The Trace test shows that at least six variables are cointegrated i.e have a long run relationship. This is because the prob. value (0.0019) is less than 1%, 5% and 10% levels of significance so we reject the null hypothesis that “At most 5” are cointegrated and accept the alternate hypothesis that at least six variable are cointegrated. The result of the maximum eigenvalue test also supports the above findings. This may be provided at the appendix.

The cointegration test further shows the fact that in the long run a percentage increase in inflation reduces unemployment by 0.08%. While a percentage increase in unemployment reduces inflation by 0.02%. This result is significant since half of the coefficient of DRAT-UNMT (2.9) is greater than the standard error (1.27).

TABLE 5: ERROR CORRECTION MODEL

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std-Error</th>
<th>Z-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DRAT-UNMT</td>
<td>-0.2056</td>
<td>0.2885</td>
<td>-0.7127</td>
<td>0.4760</td>
</tr>
<tr>
<td>GDPGR(-1)</td>
<td>-0.0519</td>
<td>0.0199</td>
<td>-0.0810</td>
<td>0.4231</td>
</tr>
<tr>
<td>ECT(-1)</td>
<td>-0.5312</td>
<td>0.1425</td>
<td>-3.6591</td>
<td>0.0003</td>
</tr>
<tr>
<td>C</td>
<td>-0.7741</td>
<td>2.4293</td>
<td>0.3186</td>
<td>0.7500</td>
</tr>
<tr>
<td>LR-Statistic</td>
<td>13.992</td>
<td>Prob. (LR Statistic)</td>
<td>0.003</td>
<td></td>
</tr>
</tbody>
</table>

Source: By Author
The regression result in table 5 shows the output of the Error Correction Mechanism using the Generalized Least Square Method. This model has to be transformed to take care of serial correlation and heteroskedasticity problems. Here, the researcher is more interested in the sign and level of significance of the lagged value of the ECT. The model is a good one since the Prob (LR Statistic) (0.0029) value is less than 1%, 5% and 10%.

The ECM is of the Form:

$$DINF_t = 0.7741 - 0.2056DRAT - 0.0159TGDPGR - 0.5213TECT \quad (11)$$

From equation (11), the rate of the adjustment from the short-run disequilibrium to the long run equilibrium is approximately 0.5. This result is significant at 1%, 5% and 10% levels. So it will take approximately 2 years for the disequilibrium in the short-run to be cleared.

Findings

- The regression result shows that a percentage increase in unemployment reduces inflation by 0.42% at 1%, 5% and 10% levels of significance, holding other variables constant. This finding supports the Phillips Curve in the short-run, which shows a negative relationship between inflation and unemployment.
- Also, our a priori expectation of a positive relationship between money supply and inflation is confirmed. This is because the regression result shows that if money supply is increased by one million naira, inflation will increase by 0.000002%.
- The Granger Causality test shows that there is no causality between inflation and unemployment in Nigeria.
- The Johansen Cointegration test shows the fact that in the long run a percentage increase in inflation reduces unemployment by 0.08%. In the same vein, a percentage increase in unemployment reduces inflation by 0.02%. This shows a negative relationship between inflation and unemployment in the long run. This finding supports the works of scholars such as: Karanassou, Sala and Snower (2003), Franz (2005), Schreiber and Wolters (2007), Karanassou and Sala (2010).
- The Error Correction Model shows that the rate of adjustment from the short-run disequilibrium to the long-run equilibrium is approximately 0.5. So it will take approximately two years for the disequilibrium in the short-run to be cleared.
5.0 CONCLUSION AND RECOMMENDATIONS

5.1 CONCLUSION

This paper has estimated the regression model by using time series data in Nigeria from 1970 to 2013. These series covers a span of 42 years and so it gives a robust result. The Kyock Transformation was used to transform the Phillips Curve Model before employing OLS in the estimation. Both the short run and long run impact of unemployment on inflation were negative. This confirms the inflation-unemployment tradeoffs. Though the Kyock coefficient is insignificant, showing the fact that the lagged values of inflation, unemployment, money supply, crude oil revenue, national savings and GDP growth rate do not influence the current value of inflation in Nigeria. The result therefore suggests that by using the unemployment instrument, one can control the inflation rate in the economy.

Researchers interested in macroeconomics can also re-examine this tradeoffs using the “Band-Filter Approach”.

5.2 RECOMMENDATIONS

- The relationship between money supply and inflation is positive. So policy makers especially those in the Central Bank in charge of money supply and other monetary policy instruments should ensure their regulation in order to avoid persistent increase in general price level. This is because inflation has a strong influence on cost of living, exchange rate and interest rate. Single digit inflation can therefore be achieved, if the CBN could increase GDP growth rate above money supply through increased lending to the real sector of the economy.

- Policy makers should also note that monetary policy cannot work in isolation to curb the bubbles in the economy. So a good blend of both monetary and fiscal policies by these technocrats is highly recommended.

- The slope of the Nigerian Phillips curve is far from vertical, even in the long run, which implies that the nominal and real sides of the economy are symbiotic. In the light of the significant and robust long-run inflation-unemployment tradeoffs, policy makers should reconsider the classical dichotomy thesis.
• Inflation-unemployment relation in Nigeria has been established to be negative. So policy makers should weigh the options of relatively high inflation and low unemployment, a relatively low inflation and high unemployment rate or strike a balance between inflation and unemployment in Nigeria.

REFERENCES


