

# Inflation and Unemployment Dynamics in Nigeria: A Re-examination of the Philip's Curve Theory

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## Abstract

*This work had its main thrust as unraveling the existing relationship between unemployment and inflation rates in Nigeria. This was premised on the fact that inflation and unemployment are among the macroeconomic challenges faced by every economy, and as such is the case, it becomes sacrosanct that every country must strive to manage the dynamics between the two variables to ensure stability in the macroeconomy. Based on the postulate of Philip's curve, it is expected that a trade-off exists between inflation rate and unemployment rate as countries should choose either low rate of inflation with high unemployment rate or high rate of inflation with low unemployment rate. This research made its empirical investigation based on Nigeria's annualized time-series data obtained from the CBN and NBS which was modeled on Fully Modified Least Square Regression (FMOLS). From the evidence emanating from the findings, it became obvious that Philip's curve doctrine is applicable in Nigeria as our study proved that an inverse relationship exist between unemployment and inflation rates in Nigeria within the study period of 1981 to 2017. We found that for Nigeria to achieve a one-percent reduction in unemployment rate, she must be ready to tolerate a forty-nine percent increase in the rate of inflation vice-versa. Consequently, we recommend that a proper threshold should be established to ensure stability in Nigeria's macro-economy; also the government should focus more on output targeting through economic deepening rather-than relying wholly on monetary targeting as the only means of moderating inflation and unemployment rate.*

**Keywords:** Inflation, Unemployment, Philips Curve, Fully-Modified-Least-Square, Output-targeting

## 1. Introduction

In every economy the world over, there is the need to maintain a relative stability in prices, low rate of unemployment, achievement of rising economic growth and a competitive exchange rate for the currency. The above stated are the major macroeconomic goals as enumerated in economic literature. Maintenance of price stability and low rate of unemployment took another dimension and thus became a burning issue after the inroad made by J. W. Philips in 1958 on the relationship between inflation and unemployment as observed by Philips (1958) which was simply illustrated by the popular Philips curve. The doctrine of the Philip's curve states that an inverse relationship exists between inflation and unemployment; that is, there is a trade-off between the two macroeconomic variables. Consequently, nations need to choose the level of inflation and unemployment rate they could tolerate as they cannot have a very low rate of inflation at the same time with a very low rate of unemployment.

Nwaobi (2009) as cited by Orije *et al.* (2015) maintains that people (households or individuals) know when the relative value of the money in their possession loses value due to inflation. They will show their dissatisfaction when their money and their take-home can no longer take them home, which was occasioned by rising inflation rate.

Unemployment or rising level of unemployment is a problem and a disturbing one that is facing the developing economies. Achieving a low rate of unemployment is a critical macro-economic objective/goal of every action irrespective of the level of development. As aptly put by Okafor *et al.* (2016), unemployment is a global problem that possesses serious challenge to the developed and developing

countries. In most developing countries, unemployment has continued to surge upwards as the proportion of the able-bodied youths who are qualified and willing to work but cannot find any has risen to an alarming rate.

The coexistence of high-rate of unemployment and rising rate of inflation as been observed in most developing countries these days (Nigeria inclusive) seen to defeat the notion of the Philip's theory. Most researchers discovered that instead of the trade-off, a positive relationship rather exists and this is a clear evidence of stagflation and an overwhelming contradiction to Philips Curve postulation.

Currently in Nigeria, there is visible increase in the rate of unemployment and rising rate of inflation which is a clear contradiction to the assumed trade-off between the two variables. The rising unemployment level and surging rate of inflation as witnessed in Nigeria had brought untold hardship in the nation. Year in year out, millions of able-bodied youths graduated from the tertiary institution and they are thrown into the labour market that has no capacity of absorbing them.

Again, this worrisome situation seems to be one of the major causes of mass movement of Nigerian youths to other countries through any means that can be possible. The youths are unsatisfied with such situation as they cannot get any meaningful job to engage themselves profitably, still with this, the chunk of money available with them cannot command any meaningful value. It is pertinent to highlight here that for there to be any meaningful progress in the quest for development in Nigeria, the government must pay adequate attention to the problems of unemployment and rising inflation. Consequently, the current research becomes highly necessary as it promises to bring to bear the current situation relating to inflation and unemployment rate in the country, exposing some areas of strengths/weaknesses and finally suggests ways of escape.

As Orji, *et al* (2015) noted, the stability of inflation and unemployment rate is of great advantage for any economy to achieve sustainable growth and development. It is equally critical for the achievement of other macroeconomic goals. In the same direction, Jelilov *et al* (2016) confirmed that inflation and unemployment are among the critical factors of economic growth and development. They maintained that both variables are used in ascertaining the level of poverty and hunger in developing countries. Mori *et al* (2016) citing Tella *et al*; Dausa *et al* affirmed that inflation and unemployment rates are universal phenomena and such they are important indicators of economic well-being of any country.

### *1.1 Unemployment and Inflation Trend in Nigeria.*

Currently, the unemployment rate in Nigeria is double digit, likewise the rate of inflation. In 2001, the unemployment rate in Nigeria stood at 13.6%, 14.8% in 2003, it hovers within that range till 2009 when it rose to 19.7%. It has continued on the rise from 21.4 in 2010, 27.4% in 2012 and decline slightly to 23.1% in 2017. Inflation rate in Nigeria stood at 16.49% in 2001, it rose to 23.84% in 2003, it dropped to 6.56% in 2007, it then rose again to 15.05% in 2008, then from 2009 to 2013, it hovers around 12.14%, 12.10%, 10.80%, 12.90% and 8.84% respectively. In 2014 it stood at 8%, it moved to 9% in 2015, it surged to 15.7% and 16.3% in 2016 and 2017 respectively (NBS, 2017).

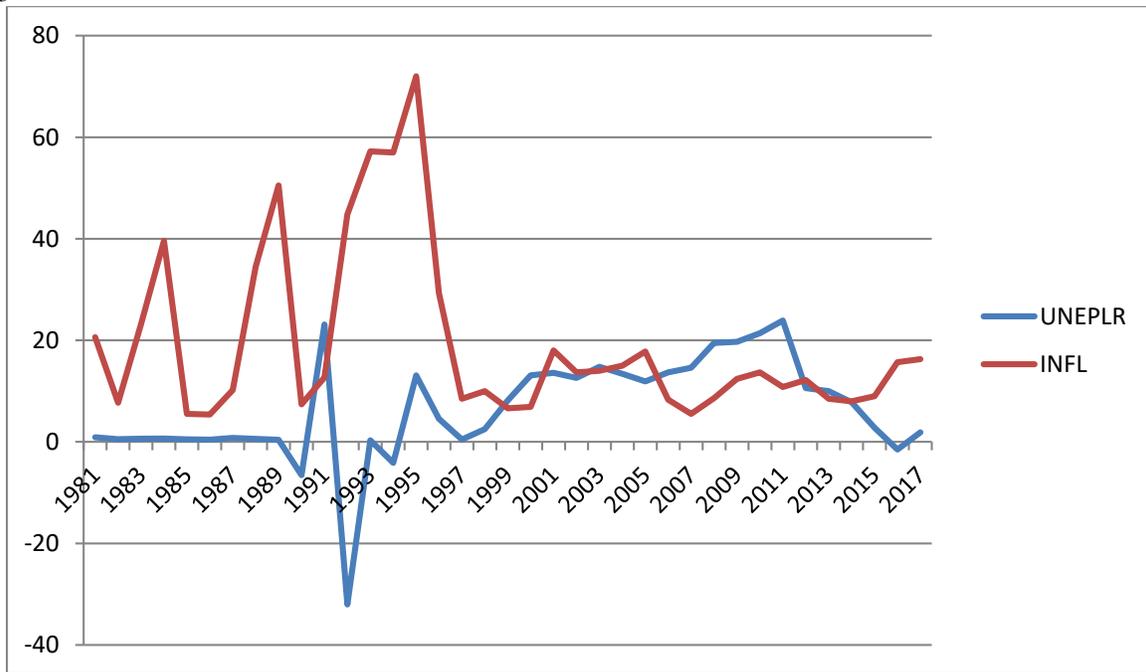


Fig. 1: Inflation – Unemployment Trend in Nigeria.

Source: Authors computation

The table above shows that unemployment has witnessed cyclical movements within these years with years of increases and decreases. Equally, inflation equally witnessed fluctuations within the very high rates and very moderate rates. On a closer observation of the table, it demonstrates an existence of rising inflation rate and declining rate of unemployment and this point towards the establishment of the Philips curve doctrine within the Nigerian economy.

Based on these multiple-insight scenarios and the effects of inflation and unemployment in the country, it is therefore a great motivation of this research work to empirically unravel the relationship between these two macroeconomic variables in Nigeria. The main focus of the sturdy is to ascertain the nature of trade-off if any between inflation and unemployment in Nigeria between 1986 – 2016. The research is of paramount importance as it will provide policy directions for policy makers in ensuring stability in the Nigerian macroeconomy. The rest of the paper is organized as follows: section 2 focused on review of literature, section 3 is concerned with the methodology adopted, section four (4) demonstrates the data analysis and discussion of empirical findings. Section 5 being the last offers conclusion and some policy recommendations.

## 2 Literature

### 2.1 Theoretical Literature

#### 2.1.1 The Philips Curve Theory

It was A. W. Philips, a British Economist who in 1958 gave a graphical illustration of the existence of an inverse relationship (trade-off) between unemployment rate and inflation rate, As Ezeaku and Ugwuebe (2016) narrated it, the Philips curve identifies that decrease in unemployment rate (increased in employment rate) moves in reverse order with increases in the rate of inflation. That is to say that a lower rate of inflation will bring about an increase in the level of unemployment. The above scenario which is a likely outcome will most likely operate only in the short-run, but at the long run other policies targeted at inflation may not guarantee such outcome. In similar scenario, a study on the relationship between unemployment and inflation in the US economy by Samuelson and

Solow (1960) as cited in Ezeaku and Ugwuebe (2016), who empirically demonstrated that there exists an inverse relationship between the variables of unemployment and inflation. That is when unemployment rate increases, inflation will take a downward trend, but when unemployment rate decreases, inflation will invariably increase. Such scenario entails a trade-off between the two variables and this becomes an issue of great concern to policy makers as either to accept higher rate of inflation will lower rate of unemployment or vice-versa. Invariably, this situation entails that government cannot achieve the objectives of full employment and at the same time maintain price stability, rather such calls for the establishment of an appropriate threshold that could prevail as it becomes almost practically impossible to simultaneously maintain low inflation rate and low rate of unemployment.

#### *The Philips Curve*

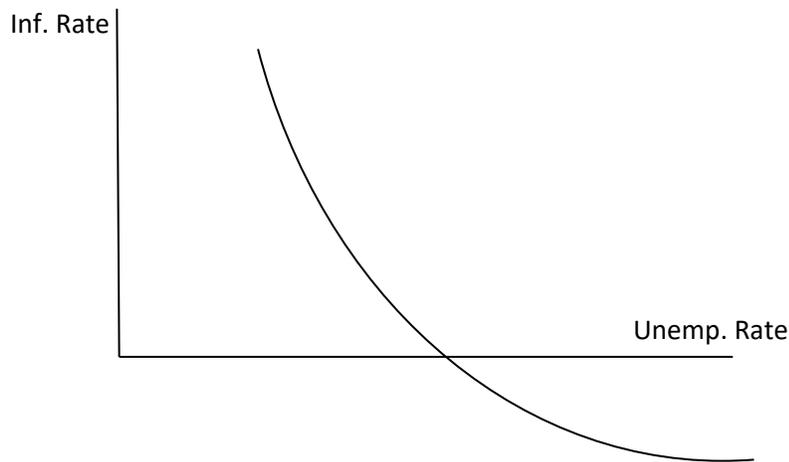


Fig. 2: The relationship between unemployment and inflation

The above curve demonstrates the typical Philips curve and it shows that as unemployment rate decreases, inflation rate increases and vice versa.

#### *2.1.2 The Modified Philips Curve*

Orji *et al.* (2015) noted that the Philips curve hypothesis enjoyed some successes in its early stage as it became a popular macroeconomic yardstick that enjoyed greater acceptability and greater influence on government policies of the 1960s. In the words of Blanchard and Illing (2009), the Philips curve influence and great regard for it as an instrument for policy making, the governments believe that they can either achieve low rate of unemployment amidst higher rate of inflation or alternatively tolerate higher unemployment rate amidst lower rate of inflation (price stability).

In 1970s, the existence of the inverse relationship between unemployment and inflation as Philips curve suggests became questionable as nations began to notice the existence of both high rate of unemployment and high rate of inflation. Such scenario which was regarded as stagflation persists in the OECD countries. The Philips curve could not account for such situation where both factors were increasing at the same time (stagflation). This new discovery – stagflation led to the more discoveries between unemployment and inflation, such as inverse relation of unemployment and inflation. According to Orji *et al.* (2015), the discovery of the new relationship gave credence to the concept of modified Philips curve and such is still valid, visible and applicable in many developed and developing economies the world over. Accordingly, the concept has witnessed modest pressure from the turn of events and economic theorizing which had eventually led to incorporation of more and new concepts such as the NAIRU (Non-Accelerating Inflation Rate of Unemployment), the adaptive expectation theory and the rational expectation hypothesis.

### 2.1.3 Empirical Literature

So many scholars have conducted intensive study on the dynamic relationship existing between unemployment and inflation rate. Such empirical studies had been conducted in both developed and developing countries but there are still more rooms to cover as the controversies still remain.

Todorova (2012) studies the economic dynamics of inflation and unemployment under the Blanchard treatment of taken monetary policy into account. His analysis which was modeled both in continuous and discrete time series reveals that inflation and unemployment fluctuate around their intertemporal equilibria. Inflation fluctuates around the growth rate of nominal money supply while unemployment fluctuates around the natural rate of unemployment. They conclude that while the continuous-time case shows uniform and smooth fluctuation for both variables, in discrete time, they show an explosive and nonoscillatory time path.

Umoru and Anyiwe (2013) in their study of the dynamics of inflation and unemployment in Nigeria using a Vector Error Correlation Model over a period of 27 years discovered the existence of stagflation in Nigeria over the studied period. They discovered that Nigerian economy is battling with a shocking rate of inflation alongside a severe recession as the unemployment rate had risen astronomically. They conclude that the Nigerian economy is at the cross-road.

Kogid *et al.* (2013) while studying inflation-unemployment trade-off relationship in Malaysia using three robust econometrics methods of ARDL bonds testing technique, ECM based ARDL and Toda-Yamamoto techniques for the period 1975 – 2007. Their empirical result demonstrates that a longrun cointegration relationship exist between inflation and unemployment and a unidirectional causal relationship running from inflation to unemployment. They conclude that there is an evidence of inflation-unemployment trade-off relationship in Malaysia.

Orji *et al.* (2015) while conducting their research on inflation and unemployment nexus in Nigeria; another tests of Philips curve, made use of ARDL in studying the data covering the period 1970 – 2011 in Nigeria. Their results indicate that unemployment is a significant determinant of inflation as a positive relationship exists between inflation and unemployment rate in Nigeria. They conclude that the Philips curve proposition is not applicable to the situation in Nigeria.

Ezeaku and Ugwuebe (2016) in a related study, the responsiveness of unemployment to inflation in Nigeria made use of data between 1989 to 2014. They adopted the Error Correlation Model (ECM) and the Johansen technique in their study. Their findings reveal that inflation has negative impact on unemployment while money supply and exchange rate were found to positively influenced unemployment in Nigeria. They conclude that despite the existence of long-run association between unemployment and inflation, there exists a divergence along the equilibrium part but such divergence is corrected anomaly at 65% speed of adjustment.

Jelilov, Obasa and Isik (2016) studied the impact of inflation on unemployment in Nigeria between 2001– 2013. They adopted the OLS method in their empirical analysis and their results indicate that monetary and fiscal policies were effective in controlling inflation and unemployment. They recommend that to curb the surging rate of unemployment as been witnessed in the country, efforts must be made to achieve a labour intensive system of production as labour is cheaply and readily available than concentrating on capital intensive method as the economy is faced with limited availability of capital.

Odo *et al.* (2017) conducted a similar study titled understanding the relationship between unemployment and inflation in Nigeria between 1980 – 2015. They modeled unemployment as a function of inflation and adopted causality test, VECM and Johansen cointegration tests in their analysis. Their findings indicate that inflation had a significant impact on unemployment in Nigeria both in

the short and long-run. They maintain that increases in government expenditure reduce unemployment and such government spending creates employment to the extent that inflation remains within the single digit ambit.

Iyeh and Edame (2017) in a similar investigation on price expectations and the Philips curve hypothesis in the Nigerian economy made use of Persimonus Error Correction Model and Johansen method of cointegration. Their result revealed the prevalence of a direct (positive) relationship between inflation and unemployment in Nigeria and thus invalidates the Philips curve hypothesis of an inverse (negative) relationship.

Saed and Salim (2017) undertook a study on inflation and unemployment in Nigeria using an ARDL model approach. They made use of annual time series data of 1977 to 2011 in their analysis. The result of the cointegration result indicates that a long-run relationship exists between the variables of inflation and unemployment in Nigeria. Their finding supports the applicability of Philips curve hypothesis in Nigeria and as such contradicts the popular idea of the co-existence of unemployment and inflation in the country.

Edeme (2018) in his study, providing an empirical insight into Nigeria’s Non-Accelerating Inflation Rate of Unemployment (NAIRU) made use of annual time series data between 1972 – 2015 obtained from the statistical bulletin of CBN. The Ordinary Least Square (OLS) method was adopted to ascertain if Philips curve postulate exists in Nigeria both in the short-run and long-run. He equally estimated the non-accelerating inflation rate of unemployment in Nigeria. The emanating evidence from the empirical analysis established the existence of a negative but insignificant relationship between inflation and unemployment both in the short-run and long-run in Nigeria.

*Gap in the Literature*

Having reviewed several empirical works done in the dynamics of inflation and unemployment both in Nigeria and some other economies, we identified that most of these authors made use of data that do not consider the current realities in the case of Nigeria. The most current of the data as reviewed was 2015 and adopted OLS technique in its analysis. To extend the frontiers of knowledge in this direction, this study made use of data between 1981 and 2017 so as to give a clear identification of current realities in Nigeria. Equally, we deviated in the choice of analytical technique by adopting the robust econometrics tool of Fully Modified Least Square (FMOL) regression technique as developed by Philips and Hansen (1990). We incorporated the Gross Domestic Product (GDP) growth rate to serve as a check variable in the model.

**3 Methodology:**

*3.1 Data and Model Specification*

The data for this research was sourced from the annual data from the statistical bulletin of the Central Bank of Nigeria (CBN) and annual data set of the National Bureau of Statistic (NBS) 2018 edition. The timeframe covers the period of 1981 – 2017, covering annual data of the variables of inflation, unemployment rate and data for Gross Domestic Product (GDP) growth which serves as a check variable.

Our model specification is therefore given as:

Unemp = f(Inf, GDP) ..... 1

Unemp = a<sub>0</sub> - a<sub>1</sub>inf + a<sub>2</sub>GDPGR ..... 2

Unemp = a<sub>0</sub> + a<sub>1</sub>inf + a<sub>2</sub>GDPGR<sub>t</sub> + e<sub>t</sub> ..... 3

Where a<sub>0</sub>, a<sub>1</sub> and a<sub>2</sub> are coefficients of the constant, inflation and GDP respectively.

Unemp = unemployment rate

Infl = inflation rate

GDPGR = Growth rate of GDP

et = Error term or stochastic term

### 3.2 Estimation Procedure

The analysis of data in this research started by test of stationarity of the data in order to avoid working and interpreting a spurious result as time series data are mostly unstable in their natural form. We adopted the Philip-Perron (PP) and Elliot-Rothenberg-Stock DF-GLS test of stationarity. After determining the unit-root properties of the variables and ascertaining their levels of properties, we proceed to determining the long-run and short-run dynamics and elasticities of the coefficients.

## 4 Empirical Analysis

### 4.1 Unit Root Test

In order to have a very robust stationarity check result, we employed the Philips-Perron (PP) and the Elliot-Rothenberg-Stock DF-GLS unit tests in our analysis.

Table 1: Result of Philip-Perron (PP) stationarity test

Variable	PP Test Statistic	5% critical	10% critical	Prob.	Order of Integration
UNEMP	-4.690739	-2.945842*	-2.611531**	0.0006	I(0)
INFL	-2.952425	-2.945842*	-2.611531**	0.0493	I(0)
GDPGR	-3.168633	-2.945842*	-2.611531**	0.0303	I(0)

Source: Authors' computation, 2019. Eviews 9

Table 2: Result of Elliot-Rothenberg-Stock DF-GLS stationarity test

Variable	DF-GLS Test Statistic	5% critical	10% critical	Order of Integration
UNEMP	-1.959875	-1.950687*	-1.611059**	I(0)
INFL	-3.020464	-1.950394*	-1.611202**	I(0)
GDPGR	-2.924336	-1.950394*	-1.611202**	I(0)

Source: Authors' computation, 2019. Eviews 9

\*, \*\* represents significant at 5% and 10% level respectively.

The results emanating from the unit root test in table 1 and 2 above show that all the variables are stationary at levels, and having determined that all our variables are stationary at levels I(0), therefore we have the justification to apply the Ordinary Least Square model to determine the longrun elasticities of the coefficients. Bearing in mind the endogeneity problem which the static OLS may not take care of, we adopted the Fully Modified Least Square (FMOL) regression model is superior to the OLS and it provides a more consistent and robust result. The FMOL of econometrics analysis is preferred to OLS because it provides more superior, reliable and consistent results and it takes into account the endogeneity problem that might rise in such analysis which the OLS cannot take care of (Philips and Hansen, 1990).

### Table 2: Result of the FMOL

Variable	Coefficient	t-value	P-value
Infl	-0.492102	-3.402040	0.0018*
GDP	0.312950	1.721586	0.09***
Constant	9.703822	2.957208	0.0057*

Source: Authors' computation, 2019. Eviews 9

\*, \*\*\* represents significant at 5% and 10% level respectively.

Table 2 above presents the result of the FMOL model of our analysis. The result provides a reliable and empirical evidence that an inverse relationship exists between unemployment and inflation in Nigeria over the study period. The coefficient of inflation is -0.492 (0.0018) probability value in bracket. This shows that inflation and unemployment share a negative and significant relationship in Nigeria within the period under investigation. Or findings are in line with the findings of Okafor *et al.* (2016), Edeme (2018) and Buba *et al.* (2017). On the other hand, it contradicts the findings of Iyeli and Edeme (2017) and that of Orji *et al.* (2015) whose empirical findings show that a rather than inverse, a direct relationship exist between inflation and unemployment in Nigeria.

Having ascertained that an inverse relationship exists between the two variables, we therefore support that Philips curve theory is applicable in the Nigeria context as it can serve as a policy guide to policy makers. The empirical evidence emanating from this research is that for Nigeria to achieve a one-percent reduction in unemployment rate, she must allow inflation rate of increase at about forty-nine percent. This shows that a trade-off exist between the two variables. Our findings conform to the postulates of Philips curve theory.

#### Diagnostic Tests

The Breusch-Godfrey Serial Correlation LM Test and Harvey heteroskedascity Test show that there is no presence of serial correlation or heteroskelasticity in the model; therefore our empirical findings are consistent and reliable for policy making.

### 5.1 Conclusion and Policy Recommendations

The study relied on available data in Nigeria to empirically prove and contribute the ever unending debate of the existing relationship between the twin problems of unemployment and inflation in Nigeria. Every country both the developed and emerging economies contend with the challenges presented by the evils of unemployment and inflation rates. The idea of a trade-off between the two variables as Philips curve theory suggested had opened up more interesting aspect of the debate as Economists and other researchers are trying to prove the applicability of such trade-off in their various economies.

Every nation wants to achieve the macro-economic goals of reduction in unemployment rate and stability in general price level. Making use of annualized time-series data of Nigeria between 1981 to 2017 which was obtained from the statistical bulletin of the CBN and that of the NBS, we discovered that such trade-off as postulated by Philips curve do actually exist in the Nigerian economy. Our findings indicate that inflation significantly impacted negatively on unemployment in Nigeria, while GDP has a positive and significant effect on unemployment within the period under review. Based on the aforementioned scenario, we suggest that Nigeria should strive to establish a proper balance between the two variables as the study had proved that actually such trade-off exists. Secondly, the research had brought to bear that the government should not rely only on monetary target alone as a means of controlling inflation in Nigeria rather they should employ other avenues that can increase output and invariably increase the rate of employment in Nigeria (Economic deepening). They should adopt economic deepening as such would guarantee increases in output and invariably leads to a reduction on unemployment rate.

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