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A RE-EXAMINATION OF THE INFLATION-UNEMPLOYMENT TREND RELATIONSHIP ON PHILIP'S CURVE HYPOTHESIS: EVIDENCE OF NIGERIA

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ABSTRACT

This paper posed to discuss the relationship between inflation and unemployment in Nigeria. The study employed the new Keynesian theories on annual time series data sampled from 1991-2017 to test for the trade-off relationship. The regression results were conducted using econometrics model. The result of the descriptive statistics confirmed with the existing literature of an inverse relationship existing between inflation and unemployment in Nigeria. The bound test result indicated statistically significant of the variables, that' no long-run relationship exists between inflation and unemployment in Nigeria. This contradicts a vast majority of the existing literature on Philip's curve hypotheses on the nature of the relationship existing among countries. As a result of the peculiarity in Nigeria's economy where inflation and unemployment grow simultaneously and repels Philip's law, we, therefore, submit that both monetary and fiscal policies should be adopted concurrently to achieve good results in Nigeria.

Introduction:

Inflation and unemployment are too essential to the market economy because they are interwoven that policymakers cannot put them aside. In an economy where there is an occurrence of this economic abnormalities, negative socio-economic consequences are observed within the economy. Inflation, as measured by the consumer price index, reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. The rate of inflation in Nigeria has over time dwindled at different intervals. According to (NBS, 2019), Nigeria consumer price index which measures the weighted average of prices of a basket of consumer

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Goods and services, stands at 278.6 for February 2019. Changes in the CPI are used to assess price fluctuations linked with the cost of living; which is one of the statistics for identifying periods of inflation and deflation. Generally, the Laspeyres formula is used to determine an inflation rate.

On the other hand, Unemployment is often used as a measure of economic health. According to (NBS report,), unemployment is the proportion of those in the labour force (not in the entire economic active population, nor the entire Nigerian population) who were actively looking for work but could not find work for at least 20 hours during the reference period to the total currently active (labour force) population,(NBS, 2019). Accordingly, one is unemployed if only such an individual did absolutely nothing at all or did something but for less than 20 hours during the reference week (Chima,2019). Most frequently, measures of unemployment are the; unemployment rate.

According to the (Statistics, 2018), Youth unemployment rate in Nigeria decreased to 36.50 percent in the third quarter of 2018 from 38 percent in the second quarter of 2018. The youth unemployment rate in Nigeria stands on an average of 23.63 percent from 2014 until 2018, reaching an all-time high of 38 percent in the second quarter of 2018 and a record low of 11.70 percent in the fourth quarter of 2014.

Over time, Studies have shown that Inflation and Unemployment has an inverse (negative) relationship in the short term. This is to say that, when Inflation is high, Unemployment is low, and when Inflation is low, unemployment is high. This relationship is called the Philip curve. But in the long-run, this ceases to exist due to what economists call the natural unemployment. In reality, in Nigeria and other developing nations in Africa, we understood the opposing existence of Philip's curve. In these countries, both inflation and unemployment grow high simultaneously, defiling the Philip's curve of the inverse relationship between inflation and unemployment.

The effect of inflation on unemployment has been long in existence. This Debate of the relationship between inflation and unemployment, which relates inflation to measure index on macroeconomics slack, such as unemployment is a yardstick to determine the quality of national currency over purchases. Therefore, as a universal phenomenon, inflation is an important indicator of the well-being of the

economy(Kogid, Asid, Mulok, Lily, & Intensity, 2011). Everyone is affected by inflation. The subject of price or wage inflation and unemployment has been a major concern for economists and common economic agents (Zaman, Khan, Ahmad and Ikram, 2011). In view of this, there is a serious need to re-examine the Philip's curve or theory on the relationship between inflation and unemployment in Nigeria to underscore if such law holds water in recent Nigeria case.

The work proceeds as follows. Section 1 introduces the research by discussing the objective, hypothesis, and significance of the study. A literature review is in section two which reviews the literature, whereas methodology outlines and discusses the methodology used in the study in section three. Empirical results and analyses are presented in section four. Conclusion, concludes the study, with some policy recommendations on how to stabilize the economy of Nigeria and insulate it from the twin adverse effects of high unemployment and high inflation.

Objectives of the Study

1. To understand the trend behavioural pattern of inflation and unemployment in Nigeria's economy
2. To determine the nature of the relationship that exists between inflation and unemployment in Nigeria.

Significance of the Study

Inflation and unemployment are two economic variables that affect the entire stakeholders of the economy. Hence, this study is necessary as it will:

1. Make relevant contributions to the existing literature by giving more current detailed information on the relationship between Inflation and unemployment in the Nigeria context.
2. Provide the needed information aimed at assisting the average person to understand how changes in inflation affect employment thereby reflecting in the standard of living.

Literature Review

Here, an attempt is made to review theories of the related literature which have discussed the relationship between inflation and unemployment. Both theoretical and empirical literature will be looked into.

Theoretical Literature

The Phillips curve is categorized into four theories namely: the negative, the natural hypotheses, the positive hypotheses and shift in Phillip's curve (Qin, 2015)

Negatively sloping Philips curve

Professional analysis of the relationship between inflation and unemployment has gone through two stages since the end of World War II and is now entering a third. The first stage was the acceptance of a hypothesis associated with the Rate of price change name of A.W Philips that there is a stable negative relationship between the level of unemployment and the rate of change of wages-high levels of unemployment being accompanied by falling wages, low levels of unemployment by rising wages. The wage change, in turn, was linked to the price change by allowing for the secular increase in productivity and treating the excess of price over wage cost as given by a roughly constant mark-up factor.

The Shifting Phillips Curve

The shifting Phillips curve was postulated by Keynes in his attempt to explain the Phillips curve. To Keynes, there is bound to be shocked in an economy whereby unemployment or inflation would be affected without necessarily affecting the other. According to Keynes, during 1973 in the United States, Dollar value depreciated, also, there was an increase in OPEC oil prices and massive demand for Wheat that forced the prices of goods and services to increase (inflation raises) without a corresponding decrease in unemployment. There was also a possibility of having an increase in the unemployment rate without a corresponding decrease in the rate of inflation. For example, 20 years back there was a massive flow of teenagers and women in the labor force which lead to an increase in unemployment without a corresponding increase in prices of inflation.

Natural Rate of Unemployment Hypothesis

Proceeding along these lines, E.S. Phelps (late 1960s) and Friedman (late 1960s) developed an alternative hypothesis that distinguished between the short-run and long-run effects of unanticipated changes in aggregate nominal demand. Start from some initial stable position and let there be, for example, an anticipated acceleration of aggregate nominal demand. This will come to each

producer as an unexpectedly favourable demand for his product. In an environment in which changes are always occurring in the relative demand for different goods, he will not know whether this change is special to him or pervasive. It will be rational for him to interpret it as at least partly special and to react to it, by seeking to produce more to sell at what he now perceives to be a higher than expected market price for future output. He will be willing to pay higher nominal wages than he had been willing to pay before in order to attract additional workers. The real wage that matters to him is the wage in terms of the price of his product, and he perceives that price as higher than before. A higher nominal wage can, therefore, mean a lower real wage as he envisaged.

Positively Sloped Philips Curve

Notwithstanding that the second has not fully absorbed into the economic literature, the course of events is already producing a move to a third stage. In more recent time, higher inflation has often been accompanied by higher, not lower unemployment, especially for periods of several years in length in most developing countries. A simple statistical Philips curve for such periods seems to be positively sloped, not vertical. The third stage is directed at accommodating this apparent empirical phenomenon. To do so, Friedman suspects that it will have to include in the analysis the interdependence of economic experience and political developments. It will have to treat at least some political phenomena not as independent variables but as exogenous variables in econometric parlance; but as themselves determined by economic events as endogenous variables (Engle, 1983) The second stage was greatly influenced by two major developments events in the economic theory of the past few decades. One of the analyses of imperfect information and of the cost of acquiring information, pioneered by George Stigler (1962); the other, the role of human capital in determining the form of labor contracts, pioneered by. The third stage will, be having the greatly influenced by a third major development – the application of economic analysis to political behaviour, a field in which pioneering work has also been done by(Friedman & Hetzel, 2007). The apparent positive relation between inflation and unemployment has been of great concern to government policymakers.

Empirical Literature

Inflation, as measured by the consumer price index, reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. The rate of inflation in Nigeria has over time dwindles at different

intervals. According to (CBN report, 2019), Nigeria consumer price index which measures the weighted average of prices of a basket of consumer goods and services, stands at 278.6 for February 2019. Changes in the CPI are used to assess price fluctuations linked with the cost of living; which is one of the statistics for identifying periods of inflation and deflation. Generally, the Laspeyres formula is used to determine an inflation rate. To cube this economic problem, which affects the general price level, monetary policy is to be adopted. This is in line with one of the functions of the central bank in price stability.

Certainly, inflation is a societal problem. Based on Philip's curve which tested the relationship between inflation and unemployment rate, both are inversely related. This further means, that a rise in the inflation will cause an increase in employment (reducing unemployment) which propels economic growth. For the assumption to be meaningful, other factors may play vital roles depending on the level of the rise of inflation.

According to (Dokken, 2014) outrageous increase will cause economic problems to the nation. (Mankiw & Reis, 2001) defines the rate of inflation as the percentage change in the overall level of prices. Inflation rate defers over time across countries, while other countries experience moderate inflation, others experience hyperinflation (an inflation rate of more than 50% in a month), as was the case of Zimbabwe in 2008. Friedman famously asserted that "the growth in the quantity of money is the primary determinant of the inflation rate", to which many economists agree. Nevertheless, there are other factors which cause inflation including the interest rate and exchange rate.

(Abu, 2017) argue that the Phillips curve is insufficient in determining the causal relationship between unemployment and inflation in China. The research posed the empirical study which investigated the correlation of coefficient and causal link between unemployment and inflation rate in China between 1978 and 2011. It was stressed that the non-applicability of the Phillips curve on the communist state was as a result of the complexity of the Chinese economy.

(Study, 2009) contends that for the case of Sri Lanka, only inflation has a significant effect in reducing unemployment while the gross domestic product exerts positive but non-significant positively influences on unemployment. The study which examined the effect of inflation and economic growth on unemployment in Sri Lanka within the period 1990 and 2012 also established a unidirectional causality between inflation and unemployment, and bidirectional

causal relationships between unemployment and gross domestic product; and between inflation and gross domestic product in Sri Lanka.

(Lijphart, n.d.) examined price dynamics in the Dominican Republic by exploring the joint effects of distortions in the money and traded -goods markets on inflation, holding other potential influences constant. The study captured the remarkable macroeconomic stability and growth for the period 1991 to 2002. Using a parsimonious and empirically stable error-correction model, the paper found that the major determinants of inflation were changes in monetary aggregates, real output, foreign inflation, and the exchange rate. However, there was an incomplete pass-through of depreciation from the exchange rate to inflation. The authors established a long-run relationship in the money and traded-goods markets, observing that inflation was influenced only by disequilibrium in the money market.

(Kinabalu & Lily, n.d.) examined the trade-off relationship between inflation and unemployment using three robust methods; ARDL bounds testing to cointegration, ECM based ARDL and Toda-Yamamoto techniques for the period of 1975-2007 in Malaysia. Not only does the study show the existence of the long-run cointegration between inflation and unemployment, but there is unidirectional causal relationship running from inflation to unemployment indicating that inflation influenced unemployment. This study eventually reveals the evidence of the inflation-unemployment trade-off relationship in Malaysia.

Research Design

The study adopted the quantitative and ex- post facto research design in obtaining, analyzing and interpreting data relating to the objectives of the study. The ex- post facto design is most suitable in studies in which the investigation starts after the fact has occurred without interference from the researcher. The choice of this type of design allowed the researcher the privilege of observing variables over a long period of time.

Data and Methodology

To empirically establish the relationship between inflation and unemployment in Nigeria both annual time series data which are inflation rate (INFL) unemployment rate (UNE) and Exchange rate (EXR) from the periods 1991 to 2017 in this study were obtained; from multi-source such as Central Bank of Nigeria Database (CBN) National Bureau of Statistics (NBS) and World bank

database (WB). This research used descriptive statistics and ARDL bounds testing to cointegration, approach. To check the stationarity of the series variables as well as the order of integration, unit root tests were conducted using Augmented Dickey-Fuller, ADF (Dickey and Fuller) and Phillips-Perron, PP (Perron, 1986) The optimal lag length was chosen based on the lowest SIC value. This study uses the Autoregressive Distributed Lag (ARDL) bounds testing approach for cointegration developed by Pesaran, Shin and Smith (2001) to check for the long-run movement of the variables as well as to consider the robustness of the results. The ARDL bounds testing approach are thus given as:

$$\Delta \hat{y}_t = \alpha_0 + \alpha_1 \hat{y}_{t-1} + \alpha_2 \hat{y}_{t-2} + \sum_{i=1}^m \beta_i \hat{y}_{t-i} + \sum_{j=0}^m \gamma_j \hat{y}_{t-j} + \varepsilon_t \quad (1)$$

where, α_0 is the drift component, and ε_t are white noise errors. Following Pesaran et al. (2001), an F-test for the joint significance of the coefficients of the lagged levels in equation (1) (so that, $H_0: \alpha_1 = \alpha_2 = 0$) is employed to bound test for the existence of a long-run relationship. Two asymptotic critical value bounds provide a test for cointegration when the independent variables are $I(d)$ (where $0 \leq d \leq 1$): a lower value assuming the regressors are $I(0)$, and an upper value assuming purely $I(1)$ regressors. If the test statistics exceed their respective upper critical values, we can conclude that a long-run relationship exists. If the test statistics fall below the lower critical values, we cannot reject the null hypothesis of no cointegration. If the statistics fall within their respective bounds, the inference would be inconclusive. This technique is considered appropriate and robust for small and finite sample size. In addition, for long-run relations analysis, we consider the general form of conditional ARDL(p,q) model as thus:

$$\hat{y}_t = \alpha_0 + \sum_{i=1}^p \alpha_i \hat{y}_{t-i} + \sum_{j=0}^q \gamma_j \hat{y}_{t-j} + \varepsilon_t \quad (2)$$

Model Specification

The model is composed as follows:

$$INFL_t = \beta_1 + \beta_2 UNE_t + \beta_3 EXR_t + \varepsilon_t \quad (3)$$

With a priori expectation of $\beta_2 > 0, \beta_3 > 0$

Where $INFL$ = Inflation rate over a period of time

UNE = Unemployment Rate

EXR = Exchange Rate

(UNE and EXR are the independent variables of the model)

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$\hat{\epsilon}$ = Error Correction Term

Data Estimation Technique

Unit root test

A regression model is assuming to be classical when the dependent and the independent variables are stationary. Avoiding spurious in this study is of great importance, therefore, a battery of unit root test was conducted which could come in different forms. In this study, Augmented Dickey-Fuller (ADF) and (Perron, 1986) tests were used. The test will be used due to its resourcefulness of the integration of the autoregressive process of order ρ thus that investigation makes the ADF more superior, while hoping for mutually reinforcing results in order to improve efficiency and consistency of the data (Nieh and Wang, 2005). Its equation is as following:

$$y_t = \beta\theta + \rho\gamma - 1 + \sum_{i=2}^p \beta\Delta i \quad (4)$$

Empirical Results

Time series patterns generally, exhibits component trend. It represents a general systematic linear or (most often) nonlinear composition that changes over time. In this study, the preliminary views of the inflation and unemployment data show a series of unstable rates. Due to this instability, it is very difficult to meaningfully, interpret the data and different procedures are in use to determine a clearer picture of the pattern over time. Plotting the variables which are under observation -inflation and unemployment rates, a tendency of a clearer, a nonlinear trend emerges, indicating that both inflation and unemployment rates enjoy functional growth over time. From Figure 1, it can be clearly seen that the changes in both inflation and unemployment rates are somewhat larger in the early to the late 1990s but decreasing over time since the year 2017. In addition, the relationship between inflation and unemployment is somewhat in the opposite direction. This is in line with the existing literatures including the aforementioned Philip's curves, which expresses the inverse relationship between inflation and unemployment.

The stationarity issues of the series variables in this study have been examined using two-unit root tests namely ADF and PP. From Table 1, in general, all the unit root tests have produced mix results and inconsistent but still limited to I(0) and I(1) series. Considering the unit root tests mix results, we, therefore, applied the ARDL bounds testing approach to examine the long-run cointegration

relationship between inflation and unemployment. The results are shown below in Table 1.

The ARDL bounds test revealed that there is no long-run cointegration relationship between inflation and unemployment. The F-statistic is 4.083692 and upper bound highest value is 5 at 1% percent level. The detail of the result and other information can be seen in Table 2. Meanwhile, the associated long-run coefficient has the right sign of (negative) as expected, but insignificant, indicating that unemployment has no significant effect upon inflation in the long-run. However, there is a positive relationship between the inflation rate and the exchange rate. This is specified in the positive sign that appears on the exchange rate and it is statistically significant at 1% level (see Table 2).

The Heteroscedasticity assisted us in confirming the stability of the model. The existence of heteroscedasticity invalidates statistical tests of significance and underestimates the effectiveness of the data. Test for heteroscedasticity will be conducted to examine whether there is a difference in residual values under observations. To detect heteroscedasticity, we conducted the Breusch-Pagan-Godfrey test. From the results presented in table 3, we fail to reject the null hypothesis of homoscedasticity, an indication that the model does not suffer from author-correlation.

Cusum and Cusum of Squares. The most used tests of stability are recursive tests. The Recursive tests are conducted to test for parameter stability in recursive residuals. We use two tests here namely: Cumulative Sum (CUSUM) tests and Cumulative Sum (CUSUM) of squares tests (Brown, Durbin and Evans, 1975). The CUSUM test and CUSUM of squares test were carried out in this study to establish the stability of the data. CUSUM test is based on the cumulative sum of the equation errors in regression. EViews presents graphically the cumulative sum of errors together with critical lines of 5%. The equation parameters are not considered stable if the whole sum of recursive errors gets outside the two critical lines.

CUSUM of squares test is similarly calculated and analyzed as CUSUM test, with the modification being that instead of the recursive, errors we use the recursive double errors. For the analyzed equation, according to the CUSUM and CUSUM of squares tests presented in figure 2, the values of the equation are stable. The values are stable if, together with the increase of the pattern, their value is not modified. For calculating recursive coefficients, we start with the first observation $k + 1$ where k represents the number of coefficients of the regression

equation. We proceed similarly until we estimate coefficients for the whole pattern of available data. Then recursive coefficients are graphically represented. The CUSUM test and CUSUM of squares test results for the ARDL specification presented in figure 2 both indicate that there is no parameter instability in the model. We, therefore, conclude that this model is well specified as it passes both the residual and stability diagnostic tests.

Conclusion

Since inflation and unemployment can affect every economy, it is imperative to properly investigate the reality on the ground of the relation between these variables in Nigeria. In this study, we simply examined the trend pattern and trade-off relationship between inflation and unemployment in the long-run. In other words, we simply modified the Phillips curve theory while strictly focused on the relationship between these two variables.

In short, by applying cointegration technique based on the ARDL bounds test, the result shows the existence of no long-run cointegration relationship between inflation and unemployment. Although, there is a pattered trend relationship between inflation and unemployment from the graph, which is in tandem with Philip's curve.

This study eventually revealed evidence of the trade-off relationship between inflation and unemployment in Nigeria. Considering the importance of these two unpleasant macroeconomic variables to economic stability, it is envisaged that research of this kind must be done frequently to ensuring the future economic policy and planning is running effectively, as well as to sustain economic development more especially in Nigeria and other developing nations' where inflation and unemployment rates simultaneously increase at the same time. Future more, research may need to consider the possibility of the structural breaks that occur in the trend and other related macroeconomic variables to get better results.

Recommendations

The nature and the pattern of inflation and the unemployment rate in Nigeria have defiled Philip's law and other existing literature. In view of this Nigeria peculiar case, proper recommendations will be made to enhance the existing laws or make a paradigm shift from what may be working in Europe and another

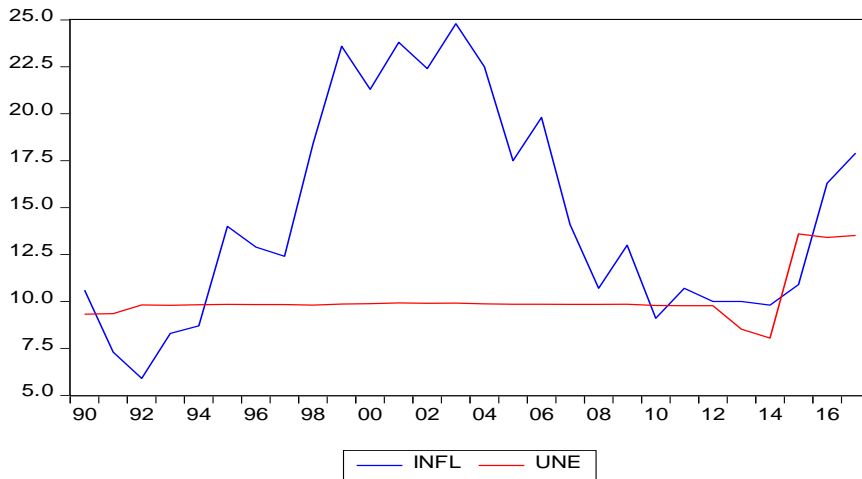
developed economy where Philip's law is tenable. As such, we, therefore, submit the following recommendations as follows:

That monetary policy is not sufficient in solving Nigeria's inflation-unemployment problems, therefore, in view of the above statement both monetary and fiscal policies are called for reprisal for meaningful development. Government of Nigeria should diversify the economy by developing other economic sectors such as agriculture, mining, education and health sectors in other to increase job opportunities and such will go a long way in reducing pressure on the local currency which does have a positive influence on the inflation rate.

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Figure1: Inflation and Unemployment rates trend



Source: Author's Computation

Variables	ADF Statistics		Philip Perron Test (PP)	
	t-statistics	P-value/1(d)	t-statistics	P-value/1(d)
INFL	-4.040124	0.0055 I(0)	-5.180005 I(1)	0.0003
UNE	-3.324673	0.0255 I(1)	-5.754379 I(1)	0.0001
EXR	-2.987665	0.0493 I(1)	-2.987665 I(1)	0.0493

Table 1 Unit Root Test Note: Figures in I(0) and I(1) indicates the stationarity values of the tested Variables and statistically significant at 1%, 5%, and 10% respectively

Level of Significance	Critical Value		F-statistics	K-Value	Co-Integration
	lower	Upper			
Nigeria-Growth			4.083692	2	Indicating the no co-integration was existing between external debt and economic growth.
10%	2.63	3.35			
5%	3.1	3.87			
2.5%	3.55	4.38			
1%	4.13	5			

Note:

- (*), (**), (***) (****) denotes Significance at 10%, 5%, 2.5% and 1% respectively using E- Views.
- In the economic growth model, the number of independent variables (k) is two, and the number of observation (N) is 24.
- The critical values are taken from Narayan (2005) table case 2, restricted in intercept and no trend

Table 2 Bound Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	1.427180	Prob. F(7,16)	0.2616
Obs*R-squared	9.225236	Prob. Chi-Square(7)	0.2369
Scaled explained SS	3.654761	Prob. Chi-Square(7)	0.8186

Table 3: Heteroskedasticity Test

Figure 2: CUSUM TEST

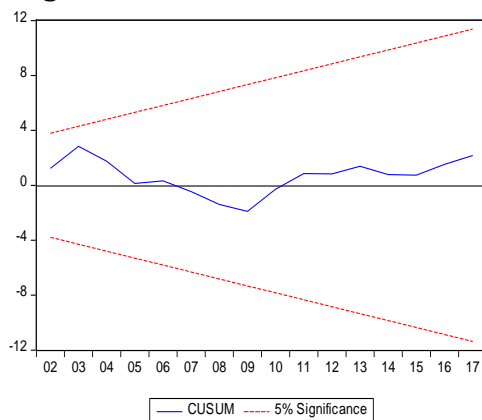


Figure 3: CUSUM OF SQUARES

