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Validity Of The Relationship Between Inflation And Unemployment In Nigeria During Economic Shocks (1991 - 2020)

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Abstract: *The study examined the existence of trade-off relationship between inflation and unemployment in Nigeria. It also assessed the applicability of the Phillips Curve during economic shock like Covid-19 pandemic in Nigeria. Macroeconomic indicators such as unemployment rate, inflation rate, money supply rate and total government expenditure rate were obtained from 1991 to 2020. Econometric models such as Augmented Dickey-Fuller (ADF), Ordinary Least Square Estimation (OLS), Engle-Granger Cointegration, First Difference Autoregressive Distributive Lag (ARDL), Normality test, Variance ipnflation factor and Breusch-pagan were used to analyse obtained data. The results showed that there was no trade-off relationship between inflation and unemployment in Nigeria. The results also revealed that the principles of Phillips Curve did not hold during economic shock like Covid-19 pandemic in Nigeria. The study concluded that that inflation and unemployment were both high during economic shocks like Covid-19 in Nigeria. The recommendation of the study was that government should formulate fiscal and monetary policies that will achieve increase in employment as well as reduction in inflation in Nigeria.*

Key words: Inflation; Unemployment; Expenditure; Macroeconomics; Economy

Introduction

Governments, regardless of their level of development, aim to achieve key macroeconomic objectives such as maintaining stable domestic price levels and ensuring full employment. The assessment of macroeconomic performance of a country relies on various indicators, among which are inflation and unemployment. Effectively managing these two factors is crucial for any economy, as they significantly influence economic growth and the broader social, political, and economic development of a nation. The success of fiscal and monetary policies implemented by governments to mitigate inflation and unemployment can profoundly impact the cost of living, quality of life, overall security, and a country's economic standing in the global community.

Inflation is described as a prolonged persistent increase in the price level within an economy, resulting in a consistent rise in the prices of goods and services, which diminishes the purchasing power of currency (Odo, Favour, Thomas & Johnson, 2017). As noted by Pigou, Crowther, Ackley and Coulbourn (as cited in Juraev & Mamatkulova, 2017), "Inflation occurs when the growth of money income outpaces the increase in productive activity." It is also seen as a scenario in which too much money is competing with few available goods which will ultimately result in a reduction in the value of a country's currency as prices escalate.

Inflation is usually estimated using the consumer price index (CPI). The Consumer Price Index estimates the changes in the price level of goods within a period of time. It can be calculated as:

$$CPI = \frac{\text{Current Year Price Index}}{\text{Base Price Index}} \times \frac{100}{1}$$

Studies have shown that high inflation has detrimental impacts on the economy, affecting both living standards and the overall well-being of the population. According to Moghalu and Ude (2023), a sustained rise in commodity prices erodes the value of real wages, thereby decreasing individuals' purchasing power and leading to a drop in demand for goods and services. Additionally, inflation often reduces the tendency to save and invest which ultimately impacts economic growth and contributes to higher unemployment rates (Udoh & Isaiah, 2018).

An examination of Nigeria's inflation trends indicates alarming inflation rates in the country. In 2019, the inflation rate was noted at 11.40%, which was a 0.7% decrease from the 2018 rate. It then rose to 15.75% in 2020, followed by a minor reduction to 15.63% in

2021. The inflation rate surged again to 21.34% in 2022 and climbed to 28.92% in 2023, ultimately peaking at 31.7% in the first quarter of 2024 (NBS, 2024; Emmanuel, 2019). It is crucial to emphasise that Nigeria's inflation is largely driven by increasing food and energy costs. In spite of the Central Bank's strategies at raising interest rates to mitigate this issue, many citizens continue to struggle to meet their basic needs. This inflationary spike has resulted in various challenges, including a drop in living standards, a rise in the cost of living, increased mortality rates, and a surge in crime rates, among other related problems (Seth, John & Dalhatu 2018; Daniel, Israel, Chidubem, & Quansah, 2021; Lawal, 2023; Umar, 2024)

While inflation poses significant economic challenges, a moderate rate of inflation is considered essential for the growth and stability of a nation's economy. Likewise, some researchers argue that although high inflation can negatively impact economic performance, too little inflation can also be harmful, potentially resulting in stagnation; thus, a small degree of inflation is crucial for economic advancement (Umar, 2024; Ahmed, 2020; Azam, Khan & Khan, 2021). The issue of inflation is not limited to developing markets; it also represents a major challenge for advanced economies. Inflation has historically been a key issue for economic policymakers around the globe. This has led to governments in various nations adopting fiscal and monetary policies aimed at controlling inflation, promoting economic growth, and improving the living standards of their citizens.

Another macroeconomic challenge affecting economic growth is unemployment. This term describes a situation where a person actively looking for work and willing to accept the prevailing wage cannot find a job (Eje, 2018). The unemployment rate measures the percentage of people who are ready and able to work but cannot secure employment (Adebowale, 2015). A high unemployment rate signifies a reduction in the economy's output which could also cause disequilibrium between demand and supply for goods and services.

Unemployment is frequently seen as a measure of the economic state, health and standard. A healthy and highly performing economy will also have low level rate of unemployment and high rate of employment in a country. Low level of unemployment in a country will undoubtedly result in increase in the production of goods and services which will also result in reduction in prices and corresponding increase in people's standard of living. The unemployment rate is calculated by factoring the number of unemployed people divided by the total number of people in the labour force. In mathematical terms, the unemployment level in a country is evaluated by computing the unemployment rate. i.e.

$$\text{Unemployment rate (U)} = \frac{\text{Number of people unemployed}}{\text{Labour force}} \times 100$$

Successive administrations in Nigeria have initiated various programmes aimed at addressing inflation and unemployment. A key initiative was the Federal government's implementation of the National Economic Empowerment and Development Strategy (NEEDS), which aimed to reduce inflation and create job opportunities for the unemployed. However, despite these efforts, both unemployment rate and inflation rate have continued to rise (Emmanuel, 2019). High level of inflation and unemployment has been found to be responsible for many problems in Nigeria. Some of these problems include reduced standard of living, increased cost of living, high death rate, high crime rate, reduced economic growth and development and low level of foreign investment.

Due to the consequences of high inflation rate and low unemployment rate on the economic growth and stability of a country, several authors have attempted to investigate the connection existing between inflation and unemployment as well as the influence of both on economic growth and development of different countries. It is however revealing that no consensus has been made between the nature of the correlation between inflation rate and unemployment rate. Some findings established a positive relationship while some established negative relationship between inflation and unemployment. Some even established that no trade-off relationship exist between inflation and unemployment. The argument of the existence of relationship between inflation and unemployment deepened particularly during economic shocks like Covid- 19 pandemic that led to the disruption social order across the world

As a result of paucity of studies on the trade-off relationship between inflation and unemployment and applicability of Philips curve during economic shocks, this study is therefore aimed at investigating or examining the validity of the trade-off relationship between inflation and unemployment and applicability of Philips curve during economic shocks like Covid-19 pandemic in Nigeria.

Objectives of Study

The study:

i. examined the existence of trade-off relationship between inflation and unemployment in Nigeria.
ii. assessed the applicability of Phillips Curve during economic shocks like Covid-19 pandemic in Nigeria

Hypothesis

1. Trade-off relationship between inflation and unemployment does not exist in Nigeria

2. Philips curve is not applicable in the context of Nigeria's economy during Covid-19 pandemic.

Empirical review

A comprehensive range of studies have been conducted using different approaches and models, both in Nigeria and globally to assess the validity and applicability of the Phillips curve theory as well as trade-off relationship between inflation and unemployment. Some researchers have shown that the Phillips curve exists, while others suggest it is only applicable in the short run. Conversely, some scholars dispute its existence entirely, while others affirm its validity exclusively in the long run. Similarly, the intricate interplay between inflation and unemployment rates have generated significant research interest in both developing and developed economies, yielding varied outcomes and interpretations. Nevertheless, the empirical evidence surrounding the Phillips curve and trade-off relationship between inflation and unemployment remain inconclusive. Several of these studies include:

Umar (2024) undertook a comprehensive re-assessment of the Phillips Curve Theory in the context of Nigeria, analysing data from 1980 to 2022. By employing the ARDL model, the study explored the connection between inflation and unemployment in Nigeria. The results revealed an inverse connection between unemployment and inflation, thus supporting the application of the Phillips Curve Theory in the Nigerian context. Abu (2019) conducted a study in Nigeria utilising data from 1980 to 2016. The study employed methodologies such as ARDL, FMOLS, DOLS, and SOLS. The research focused on unemployment and inflation and data analysed revealed the existence of a trade-off, thereby supporting the Phillips curve theory in the Nigerian context. Sasongko, Yolanda, Huruta & Kim (2022) examined inflation and unemployment data from Indonesia spanning 1977 to 2019. They applied Structural Vector Autoregression (SVAR) analysis and found evidence of a trade-off, thus validating the Phillips curve theory within the Indonesian setting. Udude, Nwevo, Agbafor & Ejiofor (2021) evaluated data from Nigeria from 1981 to 2018. Utilising the Autoregressive Distributed Lag (ARDL) model, the authors analysed variables such as the unemployment rate, GDP, inflation, and total government expenditure. Their findings indicated a negative correlation existing between inflation rate and unemployment rate, thereby supporting the Phillips curve theory within the Nigerian context.

In a study conducted by Ahmed (2020) in Pakistan, data on inflation and unemployment from 1991 to 2015 was analysed using Granger Causality and graphical methods. The findings revealed a negative correlation between inflation and unemployment, supporting the Phillips curve theory in the context of Pakistan. Kartika and Kurniasih (2020) investigated inflation and unemployment statistics from 2008 to 2017 in ASEAN nations, which comprise Indonesia, the Philippines, Malaysia, Singapore, Brunei Darussalam, Thailand, Vietnam, Laos, Cambodia, and Myanmar. They employed dynamic panel data techniques and discovered an inverse correlation between unemployment and inflation in both the short run and long run. Okoebor, Eje and Chude (2023) analysed data from Nigeria, focusing on inflation, unemployment rates, GDP, and exchange rates from 1991 to 2021. Adopting ARDL and Bound test analysis, the researchers found a positive connection existing between inflation rate and unemployment rate, therefore suggesting that the Phillips curve theory does not hold true in Nigeria's situation. In a study conducted by Lawal (2023) in Nigeria, data covering the inflation rate, unemployment rate, monetary policy rate, exchange rate, and poverty rate from 1986 to 2021 was analysed. The research utilised the ARDL approach and Granger Causality test, concluding that the Phillips curve theory is not applicable in the Nigerian context. Innocent and Irmiya (2019) also used data on unemployment and inflation from 1980 to 2018 to conduct a study in Nigeria. Using ARDL, the researchers discovered a positive correlation between unemployment and inflation. Tule and Adeleke (2019) used data on GDP, supply shocks, inflation rate, unemployment rate, and previous inflation rate from 1990 Q1 to 2018 Q3. The research used OLS with HAC (heteroskedasticity auto-regression robust) and discovered that rate unemployment and inflation rate in Nigeria are directly correlated. Buthelezi (2022) analysed inflation and unemployment data for South Africa from 2008 to 2022 through the application of Markov-Switching dynamic regression. The study revealed that there are periods during which the Phillips curve theory is applicable, as well as periods when it is not. Azam, *et al* (2021) used data from 1991 to 2019 to calculate the unemployment and inflation rates in Middle Eastern and North African countries using Panel ARDL/Pooled mean group (PMG). The study discovered a negative and negligible relationship in the short run, but a direct relationship in the long run.

According to Seth *et al.* (2018) who used ARDL and ECM to analyse GDP and unemployment in Nigeria from 1980 to 2015. The study found that there is no lasting correlation between unemployment and inflation in the context of Nigeria' economy. Al-zeaud and Al-hosban (2020) employed the Vector Error Correction Model (VECM) to analyse the connection existing between inflation rate and unemployment rate in Jordan, following several unit root tests. The study concluded that a negative and non-linear relationship exists between unemployment rare and inflation rate. Sisay (2020) examined the relationship between inflation,

unemployment, and expected inflation in Ethiopia, utilising data from 1985 to 2020. The study employed ARDL, Granger Causality tests, and ECM. The study concluded that while no short run relationship exists between inflation and unemployment, a negative correlation is observed in the long run. Gobhoza (2020) investigated inflation, GDP, money supply, real exchange rate, interest rates, and import prices in Botswana, covering the period from 1980 to 2017. The study found that unemployment does not significantly affect inflation. Daniel *et al* (2021) used data from 1980 to 2020 to examine GDP, unemployment, and inflation in Nigeria using VAR and ECM techniques. They found no significant correlation existing between unemployment and inflation. Emmanuel (2019) analysed Nigeria's inflation rate, GDP growth rate, and unemployment rate from 1981 to 2017 using Fully Modified Least Square (FMOLS). The study concludes that Phillips curve theory is true and that Nigeria must be prepared to accept a 49% increase in inflation in order to achieve a 1% decrease in unemployment. Chang-Shuai and Zi-Juan (2012) used annual time series data from 1970 to 2010 to investigate the connections between the unemployment rate, economic growth, and inflation in China over the long and short terms. The unit root test, cointegration test, VAR, VEC, and Granger Causality test were some of the econometric approaches that were adopted. The results showed that there is a stable equilibrium between the variables over the long term. Further, the findings indicated that unemployment and inflation have an indirect correlation while economic growth and unemployment have a short run positive correlation. Umoru and Anyiwe conducted a study to investigate the dynamics of unemployment and inflation in Nigeria over a 27-year span. The results indicated that there is a direct correlation existing between unemployment and inflation when the Eagle-Granger test, Johansen Maximum Likelihood test, and VECM were used in the estimation. This finding disproved the Phillip's curve theory and demonstrated that the Nigeria' economy experienced stagflation during the study period. Daniel *et al.* (2021) conducted an analysis of the correlation between inflation and unemployment, specifically evaluating the Philips Curve Hypotheses and exploring the underlying factors contributing to inflation and unemployment in Nigeria. The research employed secondary data sourced from the Central Bank of Nigeria (CBN) and the World Bank. For the analysis, Vector Autoregressive and Error Correction econometric models were applied. The findings indicated an absence of existence of a trade-off connection between inflation and unemployment in Nigeria.

Philips Curve during Covid-19

Ernawati and Mansyu (2022) conducted a study to determine the application of the Phillips Curve within the Indonesia's economy amid the Covid-19 pandemic. The research utilised data sourced from Statistics Indonesia (BPS), encompassing 34 provinces as units of analysis for the year 2020. The analysis employed correlation and difference testing methodologies. Findings showed that the principle of Phillips Curve was not present and applicable in the context of Indonesia's national economy during the covid-19 pandemic. Tadesse (2020) examined the impact of Covid-19 on unemployment and price fluctuations in Ethiopia, specifically in Woldia Town, under the premise of the validity of the downward slope of Phillips Curve. The data analysis employed Ordinary Least Squares (OLS) regression. Findings indicated that the Phillips Curve did not apply in Ethiopia during the covid-19 pandemic, primarily due to lockdowns and quarantines that disrupted economic activities throughout the region. Rouven and Haschka (2024) examined the New Keynesian Phillips Curve in the U.S and highlighted the reasons for the weakening of the connection between inflation and unemployment. The research found that the relationship between inflation and unemployment weakened deeply during the period of covid-19 pandemic that claimed millions of lives and grounded the economic activities across the world to a hurt. The study therefore concluded that the principle of Philips curve was not applicable in US during covid-19 pandemic. In a comprehensive analysis conducted by Higgins (2021) titled "Phillips Curve during the Pandemic: Bringing Regional Data to Bear," data was sourced from the Federal Reserve Bank of Atlanta's Policy Hub. The findings, derived from secondary data, indicated that the principles of the Phillips curve remained applicable at the regional level throughout the duration of the covid-19 pandemic. Baqaee and Emmanuel (2022) conducted an analysis of supply and demand within disaggregated Keynesian economies, specifically focusing on the implications of the Covid-19 crisis. The research explored the effects of supply and demand shocks through a disaggregated model that incorporates various sectors, multiple factors, input-output relationships, downward nominal wage rigidities, credit constraints, and a zero lower bound. The findings indicated that Philips curve did not hold during Covid-19 that led to high inflation and high unemployment rate at the same time.

The Phillips Curve

The Phillips curve represents an economic framework indicating a negative correlation between inflation and unemployment rates. In the short term, the model illustrates that a decrease in unemployment is typically associated with an increase in inflation, and conversely. This relationship was initially identified by an economist A.W. Phillips (1958) in his analysis of wage and unemployment statistics in Britain. The model explains that when there is inflation, producers of goods will be willing to supply and sell more quantity. For more units of output to be produced, the producer will need to engage more manpower which in turn will lead to a decrease in unemployment level

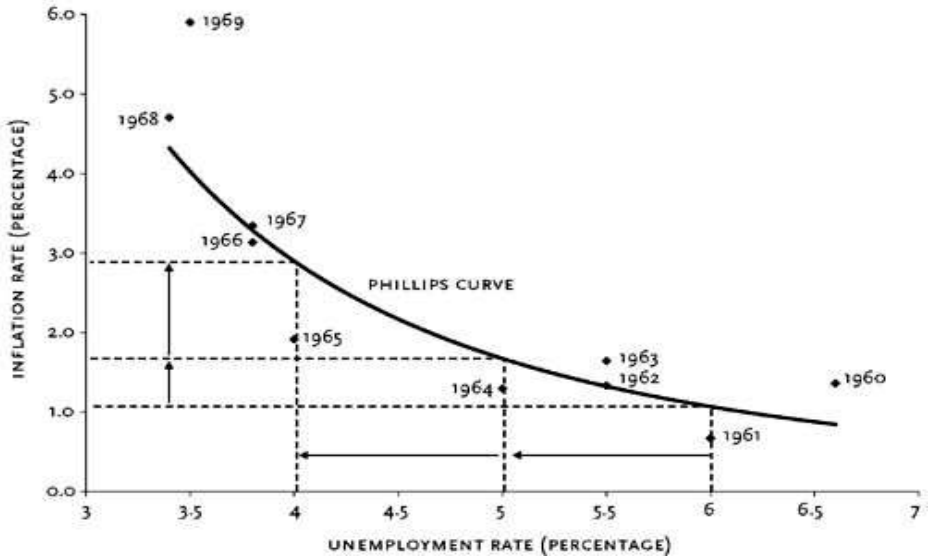

Figure 1: The Phillips curve (Adapted from Baqaee and Emmanuel, 2022)

Materials and Methods

Model specification

In an attempt to investigate empirically the relationship between inflation and unemployment in Nigeria, a model was adopted from the existing literature of Nwachukwu *et al.* (2017) study of the relationship between inflation and unemployment in Nigeria. Therefore, the model can be written as:

UNEM = F (INF, M2GDP, TGEXGDP, DECOS)

Where, UNEM = Unemployment, INF = Inflation, M2GDP = Money supply % of GDP, TGEXGDP =Total government expenditure % of GDP, DECOS = Dummy Variable for Economic Shock

DECOS = 1, if Economic shock happens; DECOS = 0, if otherwise

The model in linear form for estimation is as follows:

$UNEM_t = \beta o + \beta_1 INF_{t-1} + \beta_2 M_2GDP_{t-1} + \beta_3 TGEXGDP_{t-1} + \beta_4 UNEM_{t-1} + \beta_5 DECOS(1) + U_t$

Where UNEM, INF, M2GDP, TGEXGDP, and DECOS (1) are explained above:

β_o = Constant term, $\beta_1 - \beta 5$ = Regression coefficient of both lag of dependent and independent variables specified; U_t= Error term. In the specified model, if the coefficient of the variables INF, M2GDP and TGEX GDP are estimated and bear a positive or negative sign, this will indicate that there is a positive or negative relationship between the dependent (UNEM) and the estimated coefficients within the specified period of this study (1991-2020).

The specified period of this study helped in ascertaining the fact and also getting updated statistics from necessary agencies in examining the validity of the relationship between unemployment and inflation in this present economy.

A –Priori Expectation

This depicted the expectation about the estimated parameters based on previous studies or common sense. The expected signs of the coefficient of the regressors are mathematically denoted as follows:

$\boldsymbol{\beta}_1 < 0$: the coefficient of inflation rate would be negative because it is expected that as inflation increases, unemployment decreases.

$\boldsymbol{\beta}_2 < 0$: the coefficient of the money supply is negative because as the money supply increases, unemployment decreases.

$\beta_3 < 0$: the relationship between government expenditure and unemployment is expected to be negative because as government spending increases, it absorbs unemployment in the economy.

β_4: the relationship between the lag of unemployment and unemployment

β_5: the effect of economic shock on unemployment

Estimation Techniques

This research first carried out pre-estimation statistical testing by using Augmented Dickey-Fuller (ADF) to test for stationarity of the time series data. The reason for this was that a major characteristic of time series data is the time trends which usually lead to the problem of non-stationarity. When the result of the Augmented Dickey-Fuller (ADF) unit root test showed that the series/variables were all stationary at level, then Ordinary Least Square Estimation (OLS) technique was adopted to analyse the data. However, when the variables were not stationary at level, particularly when the series were all I (1) series (stationary at first difference) then the Engle-Granger Cointegration test was adopted to test if a long-run relationship exists among the I (1) series. Based on the Engle-Granger Cointegration test result, when the result revealed that the series were not cointegrated, then First Difference Autoregressive Distributive Lag (ARDL) regression analysis were carried out. However, when the series were cointegrated, short-run Error Correction Model was estimated.

However, when the ADF unit root test result showed a combination of the I (0) and I (1) series, the ARDL bound testing procedure was adopted to determine if a long-run relationship exists among the variables. When the bound test result revealed that a long-run relationship exists, then the ARDL cointegrating and long-run form which is a short run Error Correction technique that combines the short-run and long-run characteristics of the series were adopted. However, when the bound test result revealed no long-run relationship existed, then the I (1) series entered the ARDL model at first difference while the I (0) series entered the model at its level. Thereafter series of post-estimation tests was carried out ranging from the Normality test, Variance inflation factor, and Breusch-pagan test among others.

Statistical software package E-views (10.0) was used to carry out the data analysis. The data were imported from the excel file into E-view. Stationarity test was carried out to check for unit root by using Augmented dickey fuller and Philip perron test. After this study, we proceed to the cointegration test using the Johansen cointegration test to identify if long run relationship exists among the variables. From this, the appropriate choice of techniques was determined.

Results and Discussion

Hypothesis 1:

There is not trade-off relationship between inflation and unemployment in Nigeria

Data Presentation

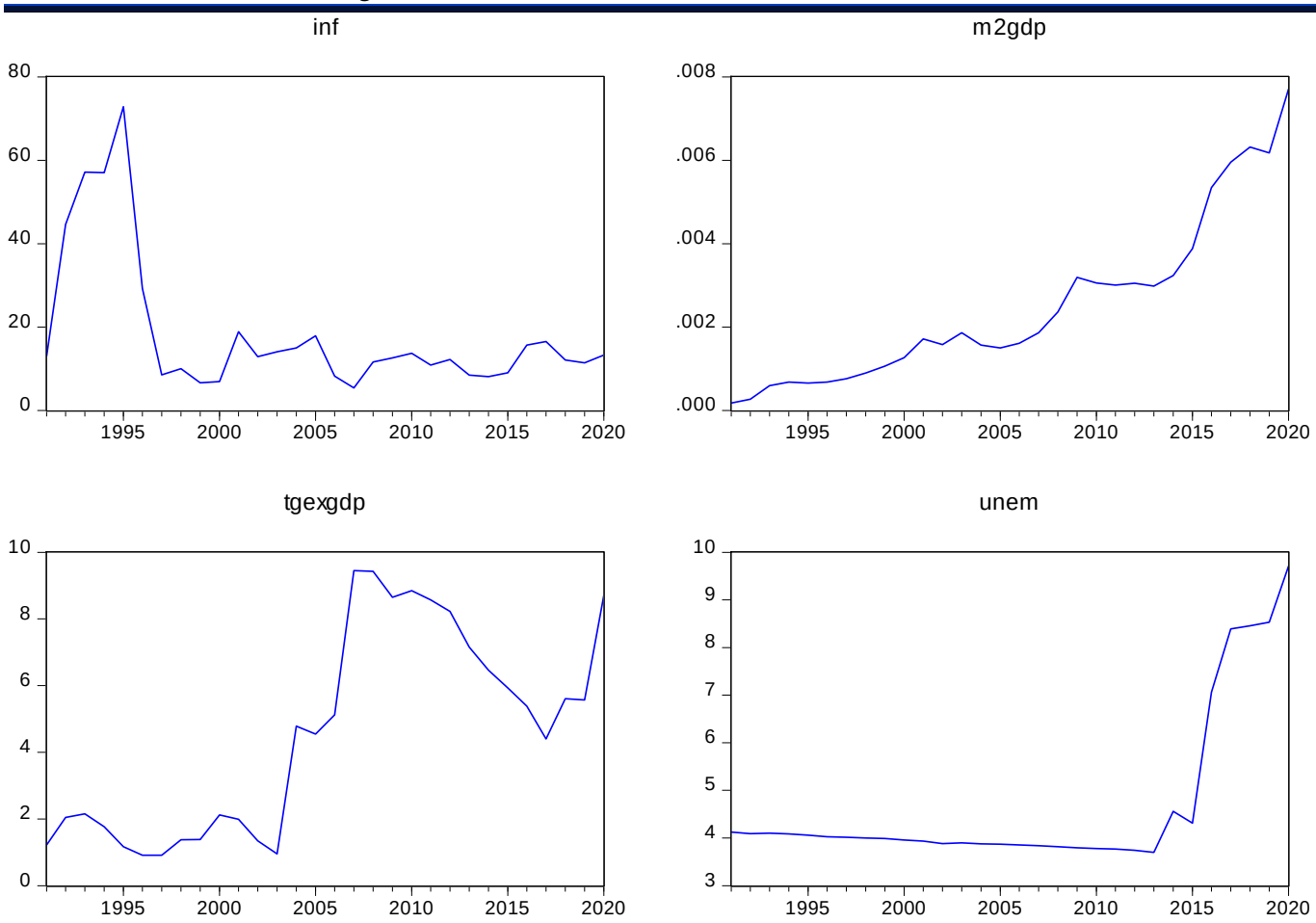

Figure 2: Multiple Graph for Individual Time Plot

Examination of the Trade-Off Relationship between Inflation and Unemployment Rate

The assumption of examining the long-run relationship between variables of interest is to evaluate their stationarity condition. Augmented Dickey fuller unit root test and Philips-Perron unit root test were run to test the unit root for variables. The tests were conducted at both levels and first differenced series. The result in terms of p-value were shown in Table 1 below

Table 1: Unit Root Test

	ADF		PP		
Variables	**Level**	**First Differencing**	**Level**	**First Differencing**	**Remark**
UNEM	0.5657	0.7468	0.999	0.0059**	I(2) / I(1)
INF	0.2887	0.0002	0.2003	0.000***	I(1)
M2GDP	0.9999	0.0269	0.9999	0.0306**	I(1)
TGE2GDP	0.7322	0.001	0.6871	0.0009***	I(1)

Sig 10%*, 5%**, 1%***

The Table above shows the p-value for both ADF and PP at both levels and the first difference. The p-value was compared with 0.05. Both ADF and PP tests indicated that INF, M2GDP and TGE2GDP were stationary at first differencing and are classified as order 1. For UNEM, the ADF test indicated that it is stationary at the second difference while the PP test indicated stationarity at the first difference. This may be due to economic shocks but since PP tests are robust to general forms of heteroskedasticity in the error term, UNEM is regarded as I(1).

Co-integration Test

Since both the inflation rate and unemployment rate series together with other variables are not stationary at the level but are stationary at the first difference for the Philips-Perron test, a co-integration test to examine the trade-off of the relationship in the long is required. The result of the Johansen co-integration test is shown in Table 2 below.

Johansen Co-integration Test

Date: 11/12/22 Time: 05:34
Sample (adjusted): 3 30
Included observations: 28 after adjustments
Trend assumption: Linear deterministic trend
Series: INF M2GDP UNEM TGEXGDP
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.591590	40.17590	47.85613	0.2163
At most 1	0.291117	15.10233	29.79707	0.7734
At most 2	0.103824	5.468496	15.49471	0.7572
At most 3	0.082117	2.399185	3.841466	0.1214

Trace test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

From Table 2 above, the result from the Johansen Co-integration test indicates that there is no co-integration among the variables at 5%. This indicates that the Inflation rate and unemployment rate do not have a trade-off relationship in the long run. A further test was conducted using ARDL bound test. The result is shown in Table 3 below.

Table 3: ARDL Bound Test with Estimated ECM

ARDL Error Correction Regression
Dependent Variable: D(UNEM)
Selected Model: ARDL(1, 0, 1, 1)
Case 2: Restricted Constant and No Trend
Date: 11/12/22 Time: 06:15
Sample: 1 30
Included observations: 29

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(M2GDP)	958.1844	125.4027	7.640857	0.0000
D(TGEXGDP)	-0.021120	0.046951	-0.449838	0.6572
CointEq(-1)*	-0.475071	0.102618	-4.629492	0.0001

R-squared	0.727816	Mean dependent var	0.192828
Adjusted R-squared	0.706879	S.D. dependent var	0.611799
S.E. of regression	0.331232	Akaike info criterion	0.725701
Sum squared resid	2.852578	Schwarz criterion	0.867145
Log-likelihood	-7.522662	Hannan-Quinn criteria.	0.769999
Durbin-Watson stat	2.448269		

* p-value incompatible with t-Bounds distribution.

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	3.626987	10%	2.37	3.2
K	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66

The statistic for F-Bounds Test indicated that the cointegration test is inclusive of a 1% to 5% level of significance. This is similar to the result obtained in the Johansen Cointegration test. At 10%, the f-statistic (3.62699) is greater than the upper bounds which indicate that a cointegration exists but with a money supply rate. In particular, the result from ARDL bound test together with Johansen indicates that the unemployment rate and inflation rate have no trade-off the relationship in the long run.

Auto Regressive Distributed Lag Model for Short run

The ARDL model was used to examine the short-run relationship among variables at maximum length 2. The model considers a dummy economic shock represented as DECOS. The Akaike information criteria were used to automatically select the suitable ARDL model from the top 20 models. The criteria graph is shown in Figure 3

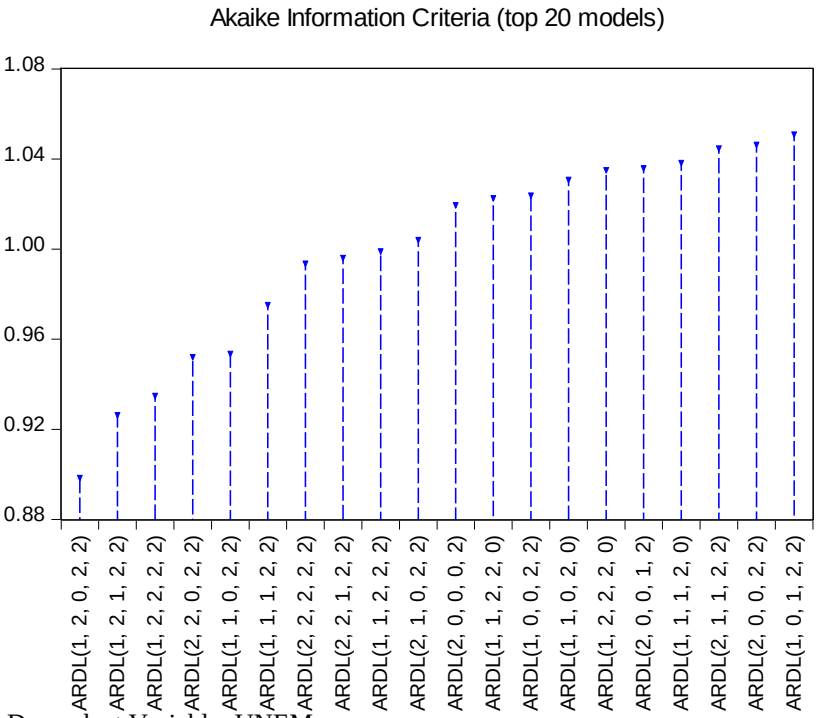

Figure 3 Criteria Graph

Model Summary

Following the selection of a suitable model, the model coefficient is shown in Table 4

Table 4: ARDL Coefficient

Dependent Variable: UNEM
Method: ARDL
Date: 11/12/22 Time: 06:22
Sample (adjusted): 3 30
Included observations: 28 after adjustments
Maximum dependent lags: 2 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (2 lags, automatic): INF M2GDP TGEXGDP DECOS
Fixed regressors: C

Number of models evaluated: 162
Selected Model: ARDL(1, 2, 0, 2, 2)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
UNEM(-1)	0.274790	0.171597	1.601369	0.1289
INF	0.002387	0.007039	0.339075	0.7390
INF(-1)	0.004908	0.009027	0.543710	0.5941
INF(-2)	0.009220	0.006274	1.469480	0.1611
M2GDP	766.8821	199.3691	3.846544	0.0014
TGEXGDP	0.014327	0.051796	0.276607	0.7856
TGEXGDP(-1)	-0.030123	0.073359	-0.410621	0.6868
TGEXGDP(-2)	-0.159930	0.068916	-2.320646	0.0338
DECOS	0.198720	0.252364	0.787433	0.4425
DECOS(-1)	-0.023576	0.306576	-0.076901	0.9397
DECOS(-2)	0.597668	0.251345	2.377879	0.0302
C	1.797238	0.488139	3.681819	0.0020

R-squared	0.980309	Mean dependent var	4.750500
Adjusted R-squared	0.966771	S.D. dependent var	1.792643
S.E. of regression	0.326780	Akaike info criterion	0.898465
Sum squared resid	1.708558	Schwarz criterion	1.469410
Log-likelihood	-0.578516	Hannan-Quinn criteria.	1.073009
F-statistic	72.41216	Durbin-Watson stat	2.375853
Prob(F-statistic)	0.000000		

The regression coefficients following a dependent unemployment rate indicate that the rate of inflation does not influence the unemployment rate while money supply and total government expenditure are present in the model. The M2GDP, TGEGDP and dummy ECOS are significant (p-value<0.05) to UNEM. The result indicates that the money supply rate at level influence unemployment, and total government expenditure at lag 2 influence unemployment. This met our prior expectation for a negative coefficient. The dummy economic shock at lag 2 also has a p-value < 0.05 which indicates the previous occurrence of economic shock influenced the lead unemployment rate. In all, the presence of other indicators limits the influence of the inflation rate on the unemployment rate as it was found to be insignificant at all lag (p-value > 0.05). The overall model explained 98% variation in unemployment. The overall model was significant (p-value<0.05).

Hypothesis 2: Philips curve does not exist in the context of Nigeria's economy during economic shocks like Covid-19 in Nigeria

To examine the existence of the Philip curve, two bidirectional models were established for INF and UNEM. The two models were fitted along the economic shock variable (DECOS). The result of the model is shown in Table 5 and 6

Case 1: When the inflation rate is the dependent variable.

Table 5: Ordinary Least Square

Dependent Variable: INF
Method: Least Squares
Date: 11/12/22 Time: 06:34
Sample: 1 30
Included observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
UNEM	4.073670	0.801834	5.080438	0.0000
DECOS	-14.26804	8.978876	-1.589068	0.1233

The above table 5 shows the model coefficient when the inflation rate is dependent on the unemployment rate along with the economic shock. The regression coefficient for unemployment is positive which indicated that an inverse relationship between the inflation rate and unemployment rate is not applicable in Nigeria. An increase in the unemployment rate caused an increase in inflation indicating the non-existence of the Philip curve in case 1. The dummy economic shock was not significant on the inflation rate when the unemployment rate is in the model.

Case 2: When the unemployment rate is the dependent variable.

Table 6: Ordinary Least Square

Dependent Variable: UNEM
Method: Least Squares
Date: 11/12/22 Time: 06:37
Sample: 1 30
Included observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INF	0.117746	0.023176	5.080438	0.0000
DECOS	-5.001171	1.283408	-3.896788	0.0006

Table 6 shows the model coefficient when the unemployment rate is dependent on the inflation rate along with the economic shock. The regression coefficient for the inflation rate is positive which indicated that an inverse relationship between the inflation rate and the unemployment rate is not applicable in Nigeria for the period of inconsideration. An increase in the inflation rate caused an increase in unemployment rate indicating the non-existence of the Philip curve in case 2. The dummy economic shock was significant on the unemployment rate indicating that the presence of economic shock increases the unemployment rate.

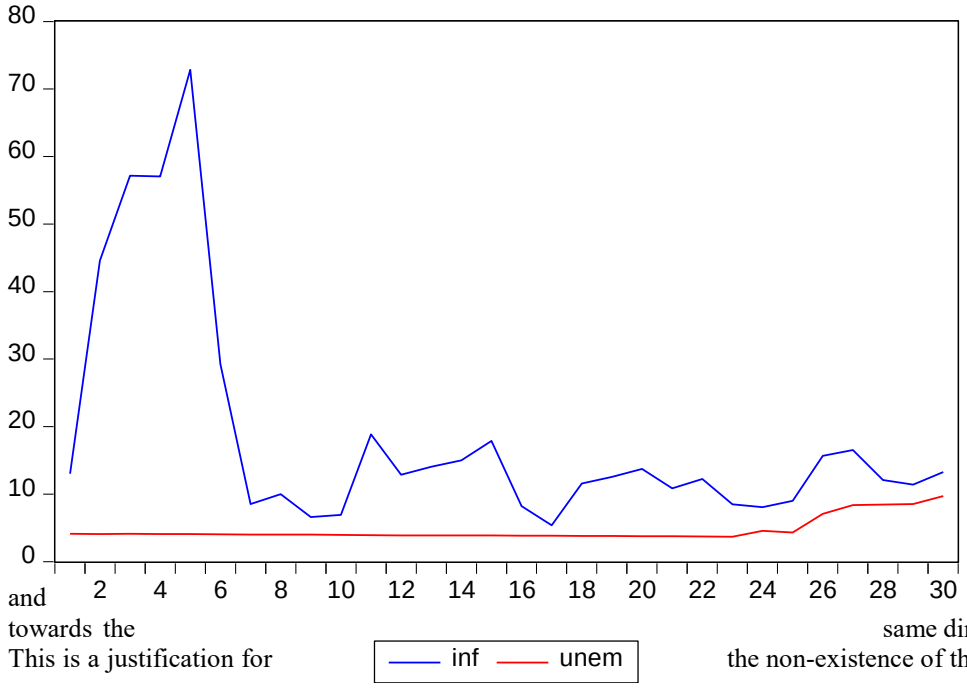

Figure 4: Plot of Inflation Rate and Unemployment Rate

The plot above shows that both inflation and unemployment rate were moving towards the same direction during the period in consideration. This is a justification for the non-existence of the Philips curve in Nigeria.

Discussion of Findings

The results of data analysis on the existence of trade-off relationship between inflation and unemployment in Nigeria revealed that there is no significant relationship between inflation and unemployment in the context of Nigeria's economy. The results of this findings is in tandem with Seth *et al.* (2018); Gobhoza (2020); Daniel *et al* (2021) who found that there was no trade-off relationship between inflation and unemployment in Nigeria. However, the results negate the findings of Umar (2024), Emmanuel (2019); Sisay (2020); Abu (2019); Sasongko, *et al* (2022); Udude *et al* (2021); Ahmed (2020); Kartika & Kurniasih (2020); Innocent and Irmiya (2019); Tule Adeleke (2019); Azam *et al* (2021); Al-zeaud and Al-hosban (2020) who all established ether positive or negative trade-off relationship between inflation and unemployment.

The results of the analysis of findings on the applicability of Philips curve during economic shocks like Covid-19 in Nigeria indicated that the principle of Philips curve did not exist and applicable in the context of Nigeria's economy. In other words, both inflation and unemployment were both on the increase during Covid-19 in Nigeria which is against Philips curve. The outcome of this study is not different from Okoebor *et al* (2023); Lawal (2023) who found that Philips curve did not exist and it was not applicable in Nigeria's economy. Similarly, Ernawati and Mansyu (2022) found that Philips curve did not exist in Indonesia during Covid-19. Tadesse (2020) found that Phillips Curve did not apply in Ethiopia during the COVID-19 pandemic, primarily due to lockdowns and quarantines that disrupted economic activities throughout the region. In a similar study, Rouven and Haschka (2024) found that the principles of Philips curve was not applicable in United States during COVID-19 pandemic. Baqaee and Emmanuel (2022) in their study found that that Philips curve did not hold during Covid-19 that led to high inflation and high unemployment rate at the same time.

Conclusion

The study concluded that there is no trade-off relationship between inflation and unemployment in Nigeria. Similarly, Philips curved was not applicable during economic shocks like Covid-19 pandemic in Nigeria.

Recommendation

In view of the findings of this study, the study recommended that governments at all levels should formulate fiscal and monetary policies that will reduce inflation as well as increasing employment opportunities for the citizens.

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