Testing the Validity of the Inflation-Unemployment Nexus within the West African Monetary Zone

Effiong, Ubong Edem and Akpan, Ekomabasi and Ekpe, John Polycarp

University of Uyo, Uyo, University of Nigeria, Nsukka

7 July 2022

Testing the Validity of the Inflation-Unemployment Nexus within the West African Monetary Zone

Ubong Edem Effiong [1], **Ekomabasi Akpan** [1], **John Polycarp Ekpe** [2]

[1] *University of Uyo*
Ikpa Road, PMB 1017, Akwa Ibom State, Nigeria

[2] *University of Nigeria, Nsukka*
Nsukka Road, 410001, Nsukka, Enugu State, Nigeria

DOI: 10.22178/pos.84-11

JEL Classification: E31, E24, E52

Received 21.07.2022
Accepted 25.08.2022
Published online 31.08.2022

Corresponding Author:
Ubong Edem Effiong
ubongeffiong3@gmail.com

Abstract. This study aimed to ascertain the validity of the Phillips Curve in six countries of Gambia, Ghana, Guinea, Liberia, Nigeria, and Sierra Leone within the West African Monetary Zone (WAMZ). The study utilised panel data from these countries varying from 2000 to 2021, which were obtained from the World Bank database. The data were analysed using the Panel unit root test, Johansen Fisher Panel (JFP) co-integration test, Pairwise Dumitrescu Hurlin Panel (PDHP) Causality Tests, and the Panel Autoregressive Distributed Lag (ARDL) approach. The PDHP Causality Test revealed a one-way causality from unemployment to inflation; hence, unemployment causes inflation. The JFP co-integration test conducted since the variables were not all stationary at levels revealed that the two variables are cointegrated, which portrayed some degree of long-run relationship. The significant findings of this study, as presented by the panel ARDL result, indicated that the inverse relationship between inflation and unemployment is only valid in the short run within the WAMZ. This finding supports the argument that there is no trade-off between inflation and unemployment in the long run and the Phillips Curve is a vertical line at the natural unemployment rate.

Keywords: Phillips Curve; Natural Rate of Unemployment; Inflation; Monetary Policy; Labour Market.

INTRODUCTION

Government macroeconomic policies of any country are aimed at achieving economic stability. Among the objectives of such policies are the promotion of economic growth and the reduction of inflation and unemployment. Both inflation and unemployment rates should be maintained to a minimum, making financial management a top priority. However, trade-offs inevitably exist, particularly in the short run, making it impossible to simultaneously achieve targets to decrease inflation and unemployment rates [32]. The short-run link between unemployment and inflation is inverse, i.e., if unemployment is high, inflation will be low, and vice versa [32].

The two most significant issues facing many nations currently are inflation and unemployment [49]. These factors affect economic activities, including saving, investment, export, poverty, economic development, and so on [9, 50]. Such factors as persistently high inflation rates reduce people's living standards. In contrast, low inflation may result in lower economic growth rates, increasing poverty, reducing employment opportunities, and eventually leading to recession. If appropriately managed, inflation has been shown to benefit GDP, as noted by [9]. On the other hand, high unemployment rates have a ripple impact in many areas of society and the economy, including slowing growth, increased crime, and so on [49].

Historically, unemployment has been a problem throughout West Africa [39], particularly in the West African Monetary Zone (WAMZ). The West African Monetary Zone (WAMZ) is a group of six ECOWAS member countries founded in 2000. The Gambia, Ghana, Guinea, Liberia, Nigeria, and Sierra Leone are all members. The organisation intended to launch a unified currency, the Eco, by 2015. Nigeria dominates the WAMZ, reflecting its role as Africa's largest oil producer and most populated country. Except for Guinea, all of the group's members are English-speaking. Since the early 2000, unemployment has reached crisis proportions, with millions of non-disabled peo-

ple unable to get work while being ready to accept salary rates at or below the market average [16] in the WAMZ. As argued by [39], policymakers in the West African bloc have long recognised unemployment as a significant threat to the region's economic growth. West Africa's monetary zone has seen serious inflation problems [19]. In most countries of the WAMZ, rising inflation has become more common than any other macroeconomic concept [16]. Low-income families lament the depreciation of their income since they cannot purchase as much as they formerly did.

Unemployment and inflation in the West Africa Monetary Zone (WAMZ) have risen to new heights due to the 2019 coronavirus pandemic [16] and the current Russia-Ukraine war that has disrupted global supply chains. As a result, achieving a middle ground between unemployment and inflation is a primary economic objective for all nations in the WAMZ. Authors [32] pointed out that all economics would benefit more from achieving price stability and full employment. Without peace, economic growth will be meaningless. According to [30], inflation and unemployment are essential economic growth and development drivers.

Although unavoidable in a market economy, inflation and unemployment have socioeconomic effects on the people who live in the nations where these processes occur. However, the primary issue is, "Does inflation cause unemployment, or are they unrelated?" This subject is becoming essential due to the observed pattern in inflation and unemployment movements among countries in the West African monetary zones, such as Nigeria, Gambia and Ghana.

Recent empirical researches have, in one way or another, refuted Phillips's posited trade-off between inflation and unemployment. For example, authors [29, 32, 49] discovered a positive relationship between inflation and unemployment in Indonesia. In contrast, authors [18, 26] found a significant negative relationship between inflation and unemployment rates in Nigeria. High inflation and high unemployment rates have been shown to coexist, particularly among countries in the WAMZ (such as Nigeria, Gambia, Ghana etc.), indicating a condition known as stagflation. Stagflation is the co-existence of low productivity or decreasing GDP with inflation. In other words, the economy is in a slump, yet inflation is on the rise.

In most countries in the WAMZ, unemployment has continued to rise at an alarming pace. The increase in the unemployment rate has paralleled the rise in inflation rates. For example, in 2019, the inflation rate in Nigeria climbed to 11.40%, with the unemployment rate increasing to 8.53%. In the Gambia, inflation went from 5.93% in 2020 to 7.12% in 2021, with the unemployment rate rising from 11.08% to 11.21%.

In Ghana, inflation rose from 7.14% in 2019 to 9.97% in 2021, while the unemployment rate rose from 4,32% in 2019 to 4.7% in 2021 [47], invalidating Philip's argument of the existence of a trade-off between inflation and unemployment. According to [16], like other WAMZ nations, the Nigerian economy is dealing with threatening inflation and a sluggish growth rate, with an astronomical unemployment rate. Authors [] concluded that the Nigerian economy is at a crossroads. Nonetheless, there are countervailing viewpoints presented by researchers such as [5], whose study validated the presence of Philip's Curve in Nigeria. The inconsistency between the conclusions of empirical research has prompted the need for more research on the topic.

It, therefore, becomes pertinent to explore the behaviour of the rate of inflation and the rate of unemployment in countries within the West African Monetary Zone (WAMZ). This behaviour is captured in Figure 1.

It can be observed from Figure 1 that the Gambia maintained a somewhat stable rate of unemployment up to 2018 before a slight upsurge set in. Meanwhile, the country's inflation rate has been a bit volatile over the years. Ghana exhibits a similar trend in inflation and unemployment as the country has been recording a continuous decline over the years, with some form of inflation rate oscillating. For Guinea, the inflation rate has been highly volatile, while the country experienced a stable unemployment rate below 8% over the years. Liberia has been experiencing a rising trend in the rate of inflation in recent years, going above 20%, while the rate of unemployment maintained a stable trend over the years. Although Nigeria's inflation rate has been highly volatile, the unemployment rate has been challenging up to 2017 before maintaining an upward trend. Finally, Sierra Leone experienced a steady rise in unemployment over the years, holding a single digit. The inflation rate in the country declined steadily up to 2014 before taking a sharply rising trend of double-digit and reaching its peak in 2017 before a deterioration set in.

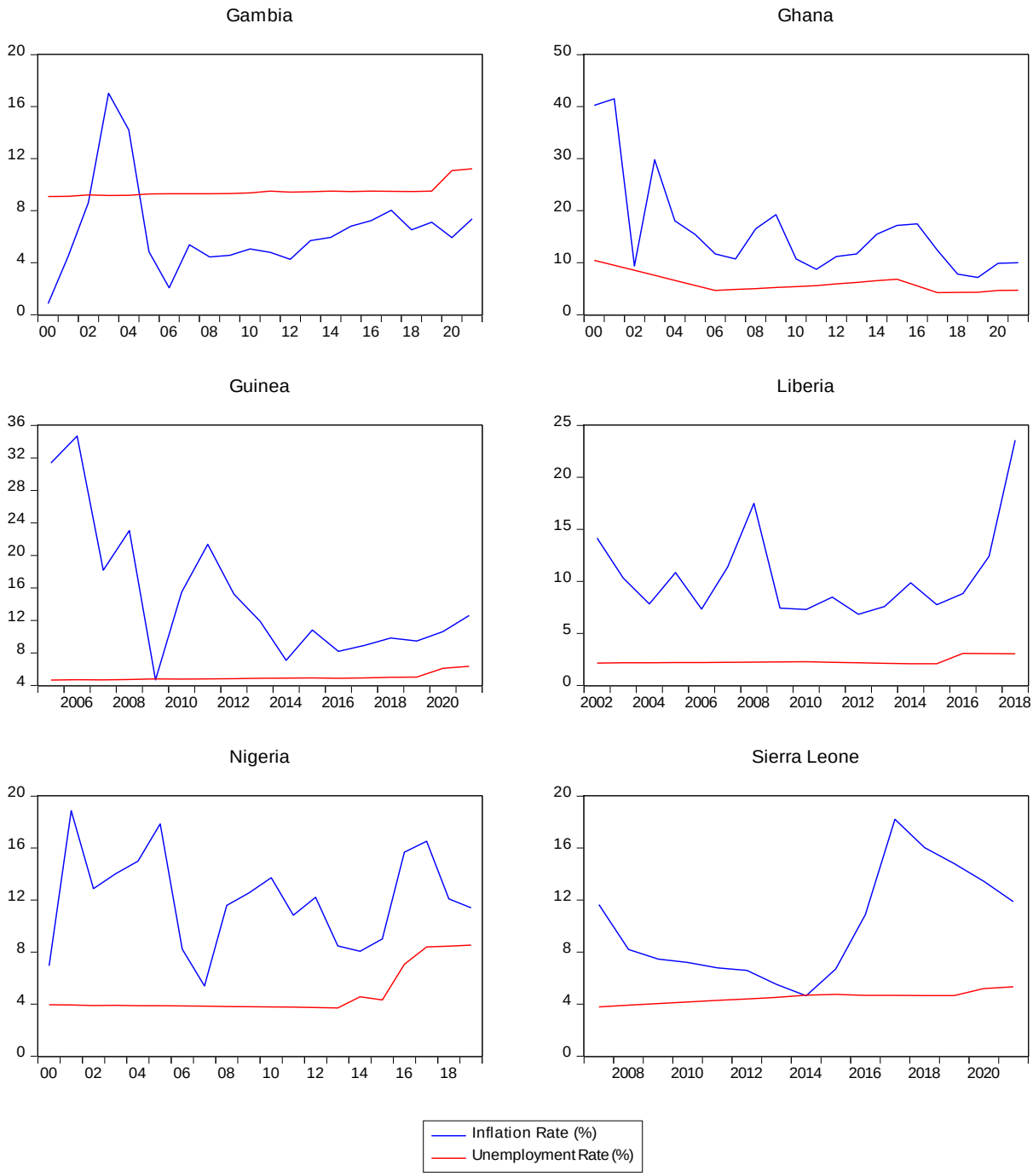

Figure 1 – Trend of Inflation and Unemployment for Countries within the WAMZ

Given the dynamics of inflation and unemployment within the WAMZ, could it be that a relationship exists between the two variables? In this regard, this study seeks to validate/invalidate the Phillips Curve postulations within the WAMZ. The study aims to ascertain an inverse relationship between the inflation rate and unemployment within the West African Monetary Zone. The study will explore whether the Phillips Curve is valid within the WAMZ in the short and long run. The paper utilises panel data of the six countries (Gambia, Ghana, Guinea, Liberia, Nigeria, and Sierra Leone) for the period 2000 to 2021, which is analysed using the causality test, co-integration test, and the panel autoregressive distributed lag (PARL) approach of estimation.

Literature review

Theoretical Framework. As mentioned earlier, there are three dominant ideas on the causes of inflation proposed by three different schools of thought; the classical (Keynesian), the monetarist and the neoclassical.

The Philips Curve (The Keynesian / Classical Approach). The Phillips Curve, as propounded by

[41] in 1958, is the early or traditional incarnation of inflation theories constructed by plotting the United Kingdom's inflation rate against the unemployment rate from 1861-1957. Phillips discovered an inverse relationship (trade-off) between inflation and unemployment, i.e., when inflation is low, it automatically implies a high unemployment rate and vice versa. According to Solow and Samuelson, this relationship between inflation and unemployment is known as the Phillips Curve after carrying out the same experiment in the United States. The Phillips Curve quickly became an essential tool in macroeconomics and for policymakers as the curve illustrates that countries could choose between different combinations of unemployment and inflation that they find desirable on the Phillips Curve [1]. This implies that a country can achieve low inflation if it's willing to accept higher levels of unemployment and vice versa and is strictly static.

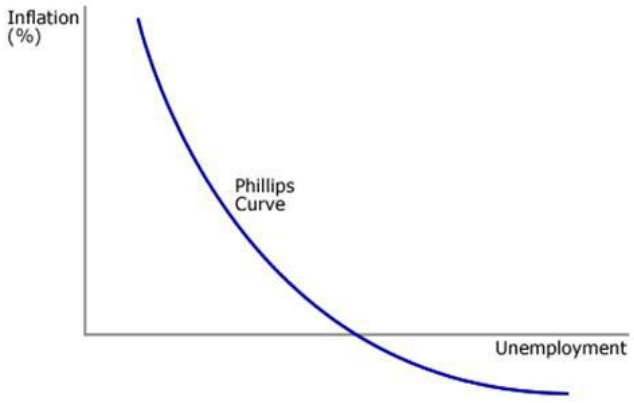

Figure 2 – Phillips Curve Showing the Trade-off between Inflation and Unemployment

However, the Phillips Curve met its shortcoming in the 1970 as the inflation-unemployment relationship broke down, and a new situation known as stagflation emerged when the United States and other countries experienced a simultaneous increase in inflation and unemployment, clearly contradicting the traditional Phillips Curve. During the 1970, "the inverse relationship between inflation and unemployment, however, broke apart, and most of the OECD member states observed stagflation which means high inflation as well as high unemployment" [39]. But although the Phillips Curve could not elucidate stagflation, a new relation between unemployment and inflation was revealed, viz. "the inverse relation of unemployment and changes in inflation" [39]. This bond was the basis for the modified Phillips Curve and is still binding and relevant for numerous developed countries.

The Monetarist Theory of Inflation. Milton Freidman and Edmund Phelps engendered the monetarist theory of inflation as a criticism of the classical approach. The authors believed that the classical system was based on static expectations of inflation among individuals; in reality, people's expectations are not fixed but rather dynamic as people tend to change their expectations about inflation over time. They named this dynamic behaviour of people's expectations 'the expectations-augmented Phillips Curve' and further introduced the concept of the natural rate of unemployment [1]. According to Edmund and Friedman, the natural rate of unemployment is the unemployment rate at which the actual inflation rate is equal to the expected inflation rate. It is the rate of unemployment required to keep the inflation rate constant. This is why the natural rate is also called the Non-Accelerating Inflation Rate of Unemployment (NAIRU) [1].

The Neo-Classical Theory. The Neo-classical theory introduced the term rational expectation to criticise the augmented-expectations idea of the monetarist school. They assert that inflation occurs due to people's reasonable expectations based on the information they have concerning the price of goods and services in the present and future [43]. For instance, if people expect the prices of commodities to increase in the future, they will opt to buy more items in the present, leading to their expectations becoming evident.

Empirical Review. Inflation and unemployment were two issues that [12] investigated in Ghana. The study's secondary objective was to use the updated Keynesian Philips Curve model to look for evidence of the Philips curve in annual time series data from Ghana, covering the years 1970 through 2013. To determine whether or not the Economic Recovery Programme affected the correlation between inflation and unemployment, the researcher split the data into two groups covering different periods (1970–1982 and 1983–2013). The data was analysed using OLS. According to the empirical estimate, there is no relationship between unemployment and inflation in either subsample time. The research also debunks the existence of a Philips curve in Ghana.

To determine whether the original Phillips Curve argument holds for Nigeria, authors [39] ana-

lysed the correlation between inflation and unemployment in the country. Using information collected from 1970 to 2011, the researchers used an ordinary least squares regression model. The findings show that unemployment is a significant factor in determining the inflation rate in Nigeria and that there is a positive correlation between the two variables. This study disproves the Phillips Curve hypothesis's fundamental premise in Nigeria. Therefore, the research suggests that Nigeria's government and monetary authorities diversify the economy and implement suitable measures to lower the threat of inflation and unemployment and alleviate the stagflation situation in Nigeria.

Authors [26] studied the relationship between inflation and unemployment in Nigeria between 1980 and 2015. The causality test, VECM and Johansen co-integration tests were used to analyse the time series data set. The study's findings indicate that inflation significantly impacted unemployment in Nigeria in the short and long run. The results further revealed that fiscal policy, like increasing government expenditure, reduces unemployment by creating employment and stabilising inflation.

Authors [29] investigated the Nigerian economy's asymmetry between unemployment and price expectation (Phillips Curve). The study found a positive relationship between unemployment and inflation, thus rejecting the presence of a Phillips Curve in the Nigerian economy.

Using the Generalised Method of Moments (GMM) technique to analyse the range from the first quarter of 1990 to the fourth quarter of 2012, the author [44] estimated a New Keynesian Phillips Curve model for the Nigerian economy. The study shows a negative relationship between inflation and unemployment, thus validating that the Phillips Curve holds in Nigeria.

Authors [13] looked at inflation and unemployment in Nigeria using the ARDL model approach. In their analysis, the study used annual time series data covering the period between 1977 and 2011. The result of the co-integration development indicates that there is a long-run relationship between the variables of inflation and unemployment in Nigeria. Their finding supports the applicability of the Philips curve hypothesis in Nigeria and, as such, contradicts the popular idea of the co-existence of unemployment and inflation in the country.

Also, the study of [17] empirically investigated the Non-Accelerating Inflation Rate of Unemployment (NAIRU) in Nigeria by using annual time series data from 1972-2015 and Ordinary Least Square (OLS) method for data analysis to ascertain if Phillips Curve postulates held in Nigeria. The study's findings discovered a negative but insignificant relationship between inflation and unemployment in the short run and the long run in Nigeria.

From 1980 to 2016, authors [28] investigated the presence and validity of the Phillips Curve in Nigeria. The study employed the Vector Autoregression model and Impulse Response Function on inflation and unemployment data. The results showed an inverse relationship between the variables in the period under investigation, thus validating the presence of the Phillips Curve in Nigeria.

Authors [45] examined Nigeria's relationship between unemployment and inflation from 1961-2015. The ARDL-bound testing approach was used to capture the study's short- and long-run relationship between inflation and unemployment. The result of the study reported a positive relationship between inflation and unemployment, thereby refuting the Phillips Curve proposition of an inflation-unemployment trade-off in Nigeria.

Furthermore, using quarterly data from the 1986-2016 period and adopting the Autoregressive Distribution Lag Model (ARDL), the study [8] showed a negative relationship between the variables both in the long and short -run.

Authors [24] investigated the nexus between unemployment, inflation, and economic growth in Nigeria using the OLS technique and the Johansen co-integration and the Granger causality tests to establish the long-run relationship and direction of causality. Empirical results refuted the presence of a Phillips Curve in Nigeria's data from 1986 to 2015.

Employing the Ordinary Least Square technique (OLS), the author [20] tested for the validation of the presence of the Phillips Curve in Nigeria using annual data for the 1986-2014 period. The study showed a significant negative relationship between inflation and unemployment, implying that the Phillips Curve holds in Nigeria.

The author [3] examined the inflation and unemployment trade-off (Phillips Curve) and its stability from 1980 to 2016 in Nigeria. The following

techniques were used for the study: The Autoregressive Distributed Lag (ARDL) bounds testing approach, Canonical Cointegrating Regression (CCR), Dynamic Ordinary Least Squares (DOLS), Fully Modified Ordinary Least Squares (FMOLS) and the Static Ordinary Least Squares (OLS). The study's findings showed a long-run relationship between inflation and unemployment and that the Phillips Curve hypothesis is fully validated.

Authors [31] explored Nigeria's trade-off amid inflation and unemployment using data from 1980 to 2018 by employing the OLS and ARDL approaches. The OLS and ARDL bounds testing results reported no trade-off between inflation and unemployment. However, the ARDL short-run and long-run effects validated the existence of a negative bond between inflation and unemployment, but such a bond was insignificant.

The works of [21] looked at the relationship between inflation and unemployment in Nigeria using data from 1981 to 2017 and the Fully Modified Least Square Regression (FMOLS) for analysing data. Empirical findings of the study showed that the Phillips Curve is applicable in the Nigerian case since a 1 % reduction in unemployment will be achieved if the economy sacrifices a 49 % increase in inflation and vice versa.

The author [2] examined the Phillips Curve hypothesis (inflation and unemployment trade-off) and its stability in Nigeria from 1980 to 2016 using the Autoregressive Distributed Lag (ARDL) bounds testing approach. Other estimation techniques, including the Fully Modified Ordinary Least Squares (FMOLS), Dynamic Ordinary Least Squares (DOLS), Static Ordinary Least Squares (OLS), and Canonical Cointegrating Regression (CCR), was employed to ascertain the consistency and robustness of the results that were generated using the ARDL bounds testing method. The results of the co-integration test revealed the existence of a long-run relationship between inflation and unemployment. The results of the ARDL bounds testing, FMOLS, DOLS, static OLS and CCR estimations indicate a trade-off relationship between the variables, and higher unemployment leads to lower inflation in the long run. The plots of the cumulative sum of squares of recursive residuals (CUSUMQ) conform to the stability of the long-run parameters. The causality test results using the standard Granger causality test and the Toda and Yamamoto approach demonstrate unidirectional causality from inflation to unemployment.

Authors [18] examined Nigeria's validity of the Phillips Curve hypothesis. The study was based on quarterly data, using the following: Generalised Method of Moments (GMM), Canonical Cointegrating Regression (CCR), and the KPSS (Kwiatkowski–Phillips–Schmidt–Shin) test as techniques for data analysis. The findings of the result confirm the existence of a long-run relationship between inflation and unemployment, thus validating the Phillips Curve hypothesis in Nigeria.

The inflation and unemployment nexus in Indonesia were studied by [32] in 2020. This research sought to re-evaluate whether or not the Phillips hypothesis, as it was first formulated, was held in Indonesia between 1988 and 2017. Data were evaluated using an error correction model (ECM) to determine the short-term and long-term link between inflation and unemployment. According to the results, Indonesia has no trade-off between unemployment and inflation in the short run. Unemployment positively influences inflation, but the effect is not statistically significant. But unemployment has a negative and considerable impact on inflation over the long term, so there is a trade-off between the two: if unemployment rises, it will have the effect of lowering the rate of inflation, and if it declines, it will have the effect of raising the rate of inflation.

Authors [40] estimated Iran’s time-varying Non-Accelerating Inflation Rate of Unemployment (NAIRU) over the period 1986–2018 for constant NAIRU (HP filter) and time-varying NAIRU (using Kalman filter). "Results show that the NAIRU has been raised during the period. According to the econometric results, there is a structural unemployment gap in the long run, and the actual unemployment rate is approaching full employment". It shows that the high unemployment rate is linked to structural elements and cannot be reduced by applying monetary policies in the long run. Nevertheless, what these policies do in the short term is reduce the unemployment rate temporarily and, in the long run, increase inflation.

Authors [16] studied the Inflation-Unemployment Link and tested the Philips Curve Hypotheses using secondary data from the Central Bank of Nigeria and the World Bank. The study made use of Vector Autoregressive and Error Correction techniques. According to the find-

ings, inflation and unemployment in Nigeria were found to have no discernible link.

Authors [42] explored the inflation-unemployment dilemma for G7 countries. With the use of Granger, Granger-Wald and Johansen tests, the findings maintained the Phillips model in the short run, demonstrating an inverse link between the inflation rate and the unemployment rate in the G7 countries. Still, in the long run, the results indicated that a cointegrating relationship between inflation and unemployment could coexist, which permits the study to agree with the monetarist theories.

The literature examined for this study's purpose was explicitly based on the Nigerian economy. During the review, some studies revealed that the Phillips Curve hypothesis/theory holds in Nigeria [2, 8, 17, 18, 20, 21, 28, 3, 44, 13]. On the other hand, some studies' findings contradict the authors' studies listed above [24, 29, 45]. The present study will contribute to the existing works of literature in this domain by taking a deeper dive to test the Validity of the Inflation-Unemployment Nexus within the West African Monetary Zone. Most empirical studies were country-specific, regional and cross-sectional studies, but none focused on the West African Monetary Zone (WAMZ) as a whole. This study seeks to fill this gap by exploring the WAMZ's short-run and long-run inflation-unemployment nexus.

METHODOLOGY

The Model. Going by the Phillips Curve, our model is specified by [42] to capture the relationship between the inflation rate and unemployment rate within the WAMZ. The model is specified as follows:

$$INFR_{i,t} = f(UNMR_{i,t}) \quad (1)$$

Equation (1) states that the rate of inflation (INFR) in country *i* at time *t* is a function of the rate of unemployment (UNMR) in country *i* at time *t*. In equation (1), INFR is the rate of inflation (measured in percentages), UNMR is the unemployment rate (measured in percentages), *i* is the country (i = 1, 2, …, 6) comprising the six countries of Gambia, Ghana, Guinea, Liberia, Nigeria, and Sierra Leone within the West African Monetary Zone (WAMZ), and *t* is the time.

In a form conformable to estimation, equation (1) is transformed as follows:

$$INFR_{i,t} = \xi_0 + \xi_1 UNMR_{i,t} + \nu_t \quad (2)$$

In which the variables are as earlier defined, is the constant, which is expected to be non-zero ($\xi_0 \neq 0$), is the slope coefficient of UNMR, which is expected to be negative ($\xi_1 < 0$) to align with the Phillips Curve postulation of an inverse relationship between the rate of inflation and the rate of unemployment ($^{\partial INFR}/_{\partial UNMP} < 0$), and is the error term which is assumed to be normally distributed.

Nature and Sources of Data. The data utilised in this study is a panel data set obtained from six cross-sections (Gambia, Ghana, Guinea, Liberia, Nigeria, Sierra Leone) spanning from 2000 through 2021. The dependent variable is the rate of inflation (INFR), while the independent variable is the rate of unemployment (UNMR). These two variables were obtained from the [47] database. The variables are both measured in percentages, with the unemployment rate being the consumer price index, and the unemployment rate is calculated based on the International Labour Organization (ILO) estimates.

Technique of Analysis. The technique of analysis so employed in the study is sequential in order. First, we ascertain the variables' unit root properties using the individual unit root test developed by [27] and the typical unit root test developed by [33]. Further, our analysis proceeds to ascertain the causal relationship between the rate of inflation and unemployment using the Pairwise Dumitrescu Hurlin Panel Causality Test. The test for co-integration is conducted using the Johansen Fisher Panel Cointegration Test. At the same time, we estimate both the short-run and long-run effects of unemployment on inflation. We utilise the panel autoregressive distributed lag (PARDL) and error correction Models. This approach aids in the estimation of both the short-run and long-run estimates of the model at the same time and with ease.

Causality Test. The causality test is conducted using the Pairwise Dumitrescu Hurlin Panel Causality Test. The test captures the direction of the

causal relationship between the two variables of interest: inflation and unemployment. The test offers a comprehensive test designed to spot causality in panel data [34]. The test equation is specified as follows:

$$\begin{cases} INFR_{i,t} = \emptyset_{1i} + \sum_{k=1}^{k} \beta_{i,k} INFR_{i,t-k} + \sum_{k=1}^{k} \gamma_{i,k} UNMR_{i,t-k} + \varepsilon_{1t} \\ UNMR_{i,t} = \emptyset_{2i} + \sum_{j=1}^{j} \beta_{i,j} INFR_{i,t-j} + \sum_{j=1}^{j} \gamma_{i,j} UNMR_{i,t-j} + \varepsilon_{2t} \end{cases} \quad (4)$$

The lag order, k and j, are assumed to be identical (*k=j*) for all individuals, and the panel must be balanced [34]. The null hypothesis is defined as:

$$\begin{cases} H_0: \gamma_{i,1} = \gamma_{i,2} = \cdots = \gamma_{i,k} = 0 & \forall_i = 1, 2, \dots, N \\ H_0: \gamma_{i,1} = \gamma_{i,2} = \cdots \gamma_{i,j} = 0 & \forall_i = 1, 2, \dots, N \end{cases}$$

Which in reality posits the absence of causality. The alternative hypothesis is given as follows:

$$\begin{cases} H_a: \gamma_{i,1} \neq \gamma_{i,2} \neq \cdots \neq \gamma_{i,k} \neq 0 & \forall_i = 1, 2, \dots, N_1 \\ \gamma_{i,1} \neq 0 \; or \dots or \; \gamma_{i,k} \neq 0 & \forall_i = N_1 + 1, \dots, N \end{cases}$$

And

$$\begin{cases} H_a: \gamma_{i,1} \neq \gamma_{i,2} \neq \cdots \gamma_{i,j} \neq 0 & \forall_i = 1, 2, \dots, N \\ \gamma_{i,1} \neq 0 \; or \dots or \; \gamma_{i,j} \neq 0 & \forall_i = N_1 + 1, \dots, N \end{cases}$$

where $N_1 \in [0, N-1]$ is not known. If $N_1 = 0$, causality exists for all individuals in the panel.

Thus, INFR homogeneously causes UNMR (or UNMR homogenously causes INFR). It should be noted that N_1 < N. Otherwise there is no causality for all individuals, and H_a reduces to H_0. Consequently, INFR does not homogeneously cause UNMR (or UNMR does not homogeneously cause INFR). Thus, we can have a case of unidirectional causality, bidirectional causality, or no causality at all within the panel. In general, the test generates W-Statistic and Zbar-Statistic, of which the significance of these statistics at the 5% level signifies the presence of causality in the panel.

Panel Unit Root Test. The panel unit root test for both the individual and common unit root is conducted to detect the time series properties of the WAMZ's inflation rate and unemployment rate. The test equation is specified as follows:

$$\begin{cases} \Delta INFR_{i,t} = \alpha_i + \beta_i INFR_{i,t-1} + \sum_{j=1}^{k} \gamma_{ij} \Delta INFR_{i,t-j} + \delta_i t + \varepsilon_{1t} \\ \Delta UNMR_{i,t} = \alpha_i + \beta_i UNMR_{i,t-1} + \sum_{j=1}^{k} \gamma_{ij} \Delta UNMR_{i,t-j} + \delta_i t + \varepsilon_{2t} \end{cases} \quad (5)$$

Equation (3) captures the model for the unit root test, with the upper segment capturing the test equation for the inflation rate and the lower segment capturing the test equation for the unemployment rate. Where Δ is the first difference operator, ε_{1t} *and* ε_{2t} are the disturbance term (which is assumed to be white-noise), *i* = 1, 2, 3, …, N indexes country, *t* = 1, 2, 3, …, T indexes time, and k is the number of lags which is often detected using the Akaike Information Criterion (AIC), Schwarz-Bayesian Criterion (SBIC) or Hannan and Quinn Information criteria (HQIC). The null hypothesis (H_0) and alternative hypothesis (H_a) for the stationarity of the panel data set from Equation (3) are given as:

$$\begin{cases} H_0: \beta_i = 1 \\ H_a: \beta_i < 1 \end{cases}$$

The decision rule is that for the null hypothesis to be rejected, the W-Statistic (for individual unit root test) and the t* Statistic (for the common unit root test) must be signed at the 5% level as reported by the p-values.

Test for Co-integration. Since our interest also centres on determining a long-run relationship between the rate of inflation and unemployment, the test for co-integration is of paramount interest. This is done using the Johansen Fisher Panel Co-integration test, which utilises the Trace and Max-Eigen Statistic. For co-integration to exist, the test result must report at least one co-integrating equation in the Trace Statistic and Max-Eigen Statistic at the 5% level.

Panel Autoregressive Distributed Lag Vector Error Correction Mechanism. Using the Panel Autoregressive Distributed Lag (PARDL) approach aids in estimating both the short-run dynamics and the long-run estimates. Also, it provides a medium through the error correction term where we can detect the speed of adjustment of the short-run distortions for equilibrium to be achieved in the long run. The model to be estimated in this regard is specified as follows:

$$\Delta INFR_{i,t} = \theta_{i,j} + \sum_{k=0}^{n} \beta_i \Delta INFR_{i,t-k} + \sum_{j=0}^{m} \sigma_j \Delta UNMR_{i,t-j} + \lambda ECM_{t-1} + \epsilon_{i,t} \quad (6)$$

Equation (6) is the specified ARDL error correction model, and the variables are as earlier defined. The component ECM captures the Error Correction Mechanism, and λ is the error correction term which captures the speed of adjustment of the model to long-run equilibrium. For such correction to occur, λ must be negative ($\lambda < 0$) and statistically significant at the 5% level.

RESULTS AND DISCUSSION

Descriptive Measures. The exploration of the descriptive properties of the is portrayed in Table 1, where reflections are made on the inflation and unemployment rates.

Table 1 – Descriptive Properties of Unemployment and Inflation Rate

	Inflation Rate (%)	Unemployment Rate (%)
Mean	11.6692	5.5628
Median	10.3303	4.7730
Maximum	41.5095	11.2120
Minimum	0.8450	2.0800
Standard Deviation	6.9178	2.4878
Skewness	2.0100	0.5967
Kurtosis	8.3760	2.1983
Jarque-Bera	212.1647	9.7328
Probability	0.0000	0.0077
Observations	113	113

It is clear from Table 1 that the rate of inflation within the WAMZ averaged 11.67% with a standard deviation of 6.92%. The distribution exhibits positive skewness given the skewness coefficient of +2.01, implying that the distribution has an elongated tail to the right. The distribution is leptokurtic, given the coefficient of kurtosis of 8.376, which is greater than 3. The maximum inflation rate within the WAMZ was 41.51%, while the minimum rate was 0.845%. The distribution is not normally distributed since the Jarque-Bera statistic of 212.1647 is statistically significant at the 1% level. In the same vein, unemployment within the region averaged 5.56% with a standard deviation of 2.49%. The minimum and maximum values of the variables were 2.08% and 11.21%, respectively. The distribution is positively skewed given that the coefficient of skewness is +0.5967 and is also platykurtic as the coefficient of kurtosis (2.1983) is less than 3. Also, the distribution is not normally distributed given the significance of the Jarque-Bera statistic at the 5% significance level.

Correlation Analysis. The correlation result presented in Table 2 captures the nature of the covariability between the rate of inflation and the rate of unemployment within the WAMZ.

Table 2 – Correlation Result

No	Country	Correlation Coefficient
1	The Gambia	-0.0068
2	Ghana	0.7968
3	Guinea	-0.3043
4	Liberia	0.4619
5	Nigeria	0.2084
6	Sierra Leone	0.3287
Overall	WAMZ	-0.0361

The correlation result obtained in Table 2 portrays that the correlation between unemployment and inflation is negative in Gambia and Guinea, implying that as unemployment increases in these countries, the inflation rate declines. Meanwhile, such correlation is weak, as captured by their respective correlation coefficient of -0.0068 and -0.3043. The correlation coefficients were negative for Ghana, Liberia, Nigeria, and Sierra Leone. However, only Ghana exhibited a strong positive correlation between inflation and unemployment, given the correlation coefficient of +0.7968. This implies that for these countries, the rate of inflation and unemployment were moving in the same direction. Overall, the correlation between inflation and unemployment within the WAMZ is weak and damaging, as the correlation coefficient is reported to be -0.0361. This means that within the WAMZ, inflation and unemployment move in the opposite direction. Figure 3 captures the scatter plots for the six countries within the WAMZ.

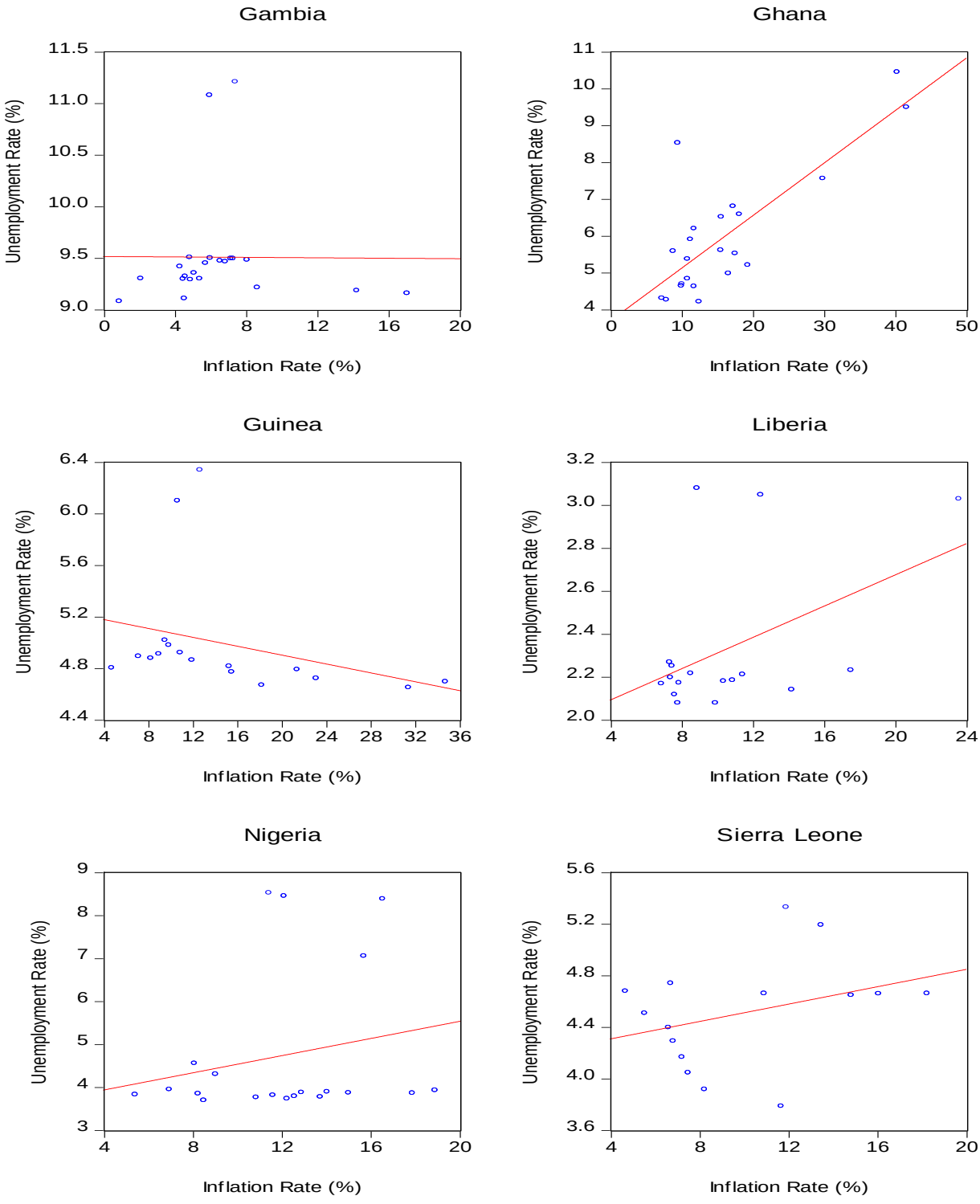

Figure 3 –Scatter Diagram for the Unemployment-Inflation Relationship within the WAMZ

Granger Causality Test. The Granger Causality test unveils the causal relationship concerning the rate of inflation and unemployment within the WAMZ. Table 3 reflects on the empirical result obtained.

Table 3 – Pairwise Dumitrescu Hurlin Panel Causality Tests Result

Null Hypothesis:	W-Stat.	Zbar-Statistic	Probability	Decision
UNMR does not Homogeneously cause INFR	5.5903	2.4887	0.0128**	Reject
INFR does not Homogeneously cause UNMR	1.0950	-1.0636	0.2875	Accept

Notes: ** denotes significance at the 5% level

With the W-statistic of 5.5903 and Zbar-Statistic of 2.4887, which are significant at the 5% level given the p-value of 0.0128, the null hypothesis that unemployment does not homogenously causes inflation is rejected. Consequently, unemployment causes inflation and inflation do not cause unemployment, as reflected in the acceptance of the second null hypothesis. The implication is that a unidirectional causality flows from unemployment to inflation within the WAMZ.

Unit Root Test. To detect the time series properties of the data, Table 4 captures the variables' individual and standard unit root test results.

Table 4 – Panel Unit Root Test Result

	Individual Unit Root Test (Im, Pesaran and Shin) W-stat		Common Unit Root Test (Levin, Lin & Chu) t* Statistic	
Variables	I(0)	I(1)	I(0)	I(1)
UNMR	-2.3528 (0.0093)**		1.4166 (0.9217)	-4.7053 (0.0000)***
INFR	-0.5312 (0.2976)	-6.8156 (0.0000)***	0.3213 (0.6260)	-6.8358 (0.0000)***

Notes: ** and *** denotes significance at the 5% and 1% respectively

Table 4 reflects that while the unemployment rate is stationary at the level of the individual unit root test reported by [24] W-Statistic, the variable only becomes fixed at the first difference under the standard unit root test reported by [33] t* statistic. On the other hand, the inflation rate at both the individual and standard unit root tests is stationary at first.

Co-integration Test. Because the variables are stationary at the level and first difference, it is pertinent to ascertain whether the variables exhibit any form of long-run relationship (co-integration). The Johansen Fisher panel co-integration test is conducted in that regard, and the result is presented in Table 5.

Table 5 – Johansen Fisher Panel Co-integration Test Result

Hypothesized No. of CE(s)	Fisher Statistic (from Trace test)	Probability	Fisher Statistic (from Max-Eigen test)	Probability
None	47.53	0.0000***	42.33	0.0000***
At most 1	22.62	0.0311**	22.62	0.0311**

Notes: ** and *** denote significance at 5% and 1%, respectively

As can be observed in Table 5, both the Fisher Statistic (from Trace tests) and the Fisher Statistic (from Max-Eigen test) are statistically significant. The result, therefore, reports the existence of two co-integrating equations (CEs); hence, co-integration exists, and a long-run relationship exists between inflation and unemployment within the WAMZ.

Panel Autoregressive Distributed Lag Model Result. For the existence of co-integration, it is, therefore, imperative to estimate both the short-run and long-run estimates of the model. Table 6 captures the result, calculated using the panel autoregressive distributed lag (PARDL) approach following one lag.

Table 6 – Short-Run and Long-Run Results

Variable	Coefficient	Std. Error	t-Statistic	Probability
Long Run Equation				
UNMR	3.6482	0.6456	5.6508	0.0000***
Short Run Equation				
ECM(-1)	-0.5997	0.1733	-3.4602	0.0008***
D(UNMR)	-3.3975	1.0964	-3.0987	0.0026**
C	-3.7569	2.0874	-1.7998	0.0751*

Notes: *, ** and *** denotes significance at 10%, 5% and 1% respectively

In the short run, it is observed that unemployment has a negative and significant effect on inflation, which validates the Phillips Curve argument of an inverse relationship between inflation and unemployment. It is clear from the short-run coefficient that a 1% change in unemployment will cause inflation to change in the opposite direction by 3.3975% on average. This validity of the Phillips Curve aligns with the findings of [38, 22, 14, 48, 36, 23, 37, 30, 15, 6, 20, 18, 42, 7]. The error correction term indicates that 59.97% of the short-run errors in inflation are corrected yearly to attain long-run equilibrium. It, therefore, requires about one year and seven months for equilibrium to be fully established in the long run.

In the long run, the Phillips Curve argument does not hold since our result reveals that unemployment positively and significantly affects the inflation rate. This aligns with the criticisms of the original Phillips Curve, where it has been asserted that the trade-off between inflation and unemployment is only valid in the short run. There is no trade-off between inflation and unemployment in the long run, and the Phillips Curve is perfectly inelastic at the natural unemployment rate. It, therefore, follows that any policy put forth to reduce unemployment will instead increase the price level. Upon our result, a 1% increase in unemployment will cause inflation to rise by 3.6482% within the WAMZ. This no trade-off between inflation and unemployment aligns with the findings [11, 39, 12, 29, 35, 32, 46, 4].

Cross-Section Short-Run Coefficients. Going by the country level, Table 7 captures the validity of the Phillips Curve in the different countries within the WAMZ in the short run.

Table 7 – Short-Run Country-Specific Estimates

No	Country	Coefficient	Probability
1	The Gambia	-2.8048	0.5009
2	Ghana	-4.2528	0.4515
3	Guinea	-2.7953	0.9457
4	Liberia	-3.9539	0.8200
5	Nigeria	0.8514	0.7946
6	Sierra Leone	-7.4294	0.7140

In the short run, it is noted that none of the countries within the WAMZ exhibited a significant effect of unemployment on inflation. Meanwhile, the coefficient sign, which captures the Phillips Curve's validity, is valid for some countries (Gambia, Ghana, Guinea, Liberia, and Sierra Leone) while not for Nigeria. This can be due to the rising trend of inflation and unemployment in Nigeria, as seen earlier in Figure 1.

Long-Run Cross-Section Coefficients. We also explore the long-run estimates to capture the Phillips Curve's validity in the WAMZ countries. Table 8 captures the result so obtained.

Table 8 – Long-Run Country-Specific Estimates

No	Country	Coefficient	R^2
1	The Gambia	-0.4673 (0.7949)	0.0053
2	Ghana	3.9059 (0.0000)***	0.4818
3	Guinea	5.2396 (0.2984)	0.0545
4	Liberia	8.0827 (0.0045)**	0.2366
5	Nigeria	0.2289 (0.6706)	0.0293
6	Sierra Leone	6.45738 (0.1473)	0.1378

Notes: ** and *** denotes significance at 5% and 1% respectively

In the long run, our result revealed that the Phillips Curve is still valid in the Gambia though such is not significant. This is portrayed by the weak explanatory power of the model given the R^2 of 0.0053, which implies that the unemployment rate account for only 0.53% of the total variation in the rate of inflation in the Gambia. For Ghana and Liberia, the Phillips Curve is no longer valid in the long run as the rate of unemployment put forth a positive and significant effect on the rate of inflation in the two countries. Consequently, a 1% increase in unemployment leads to a 3.9059% and 8.0827% increase in the rate of inflation in Ghana and Liberia, respectively. For Guinea, Nigeria and Sierra Leone, the Phillips Curve is not valid in the long run as the rate of unemployment put forth a positive but insignificant long-run effect on the inflation rate.

CONCLUSIONS

The notion of the Phillips Curve has been centred on the inverse relationship between inflation and unemployment. Criticisms of this argument introduced the concept of the natural unemploy-

ment rate to argue that there is no trade-off between inflation and unemployment in the long run and that the Phillips Curve is vertical at the natural unemployment rate. This framework explored the validity of the Phillips Curve within the West African Monetary Zone (WAMZ) comprising Gambia, Ghana, Guinea, Liberia, Nigeria, and Sierra Leone. The study utilised the panel ARDL approach, where we examined both the short-run and long-run effects of unemployment on inflation. The Johansen-Fisher panel cointegration result revealed a long-run relationship between inflation and unemployment. The ARDL result reported that the Phillips Curve is only valid in the short run within the WAMZ, which showed a negative and significant effect of unemployment on inflation in the short run. But unemployment and inflation have a positive and significant impact in the long run, pointing out that the Phillips Curve is not valid within the WAMZ.

Considering a country-specific analysis, all the countries except Nigeria reported a negative effect of unemployment in the rate of inflation in the short run, which validates the Phillips Curve postulation. Meanwhile, such a damaging effect was reported to be insignificant. In the long run, only Gambia said a negative impact of unemployment on inflation, pointing to the validity of the Phillips Curve in the country even in the long run. Other countries within the WAMZ (Ghana, Guinea, Liberia, and Sierra Leone) reported a positive effect of unemployment on inflation in the long run, therefore stating that the Phillips Curve argument is not valid in these countries' run.

This paper, therefore, concludes that the Phillips Curve argument within the WAMZ is only valid in the short run. However, country-specific results may differ due to structural issues that may cause differences among countries in the zone. Consequently, an expansionary monetary policy aimed at reducing the zone's unemployment will likely result in a higher level of inflation due to the increase in the money supply. The policy action that should be taken to reduce unemployment without increasing the rate of inflation could be related to the resting place of the money supply that may result from an easy monetary policy. Instead of boosting social assistance through unemployment insurance, that money may enhance labour market job prospects. While the former may increase unemployment and even its duration since people are unmotivated to seek work, the latter may strengthen the rate of employment.

REFERENCES

1. Abel, A., Blanchard, O., Bernanke, B., & Croushore, D. (2017). *Macroeconomics*. London: Pearson.
2. Abu, N. (2019). Inflation and Unemployment Trade-off: A Re-examination of the Phillips Curve and its Stability in Nigeria. *Contemporary Economics, 13*(1), 21–35.
3. Abu, N. (2019). Inflation and Unemployment Trade-off: A Re-examination of the Phillips Curve and its Stability in Nigeria. *Contemporary Economics, 13*(1), 21–35.
4. Ait Lahcen, M., Baughman, G., Rabinovich, S., & van Buggenum, H. (2022). Nonlinear unemployment effects of the inflation tax. *European Economic Review, 148*, 104247. doi: 10.1016/j.euroecorev.2022.104247
5. Ajie, H., A., Ani, E. C., &Ameh, O. E. (2017). An Examination of the Impact of Unemployment and Inflation on the Nigerian Economy: A Bounds Testing Approach.*Journal of Public Policy and Administration, 1*(1), 22–34.
6. Aliyu, H. B., & Jelilov, G. (2018). *Does Phillips Curve Hold in Nigeria? An Empirical Investigation on the Relationship between Inflation and Unemployment*. Retrieved from https://www.researchgate.net/publication/325880498_DOES_PHILLIPS_CURVE_HOLD_IN_NIGERIA_AN_EMPIRICAL_INVESTIGATION_ON_THE_RELATIONSHIP_BETWEEN_INFLATION_AND_UNEMPLOYMENT
7. Ascari, G., Bonomoloz, P., & Haque, Q. (2022). *The Long-Run Phillips Curve is ... a Curve*. Retrieved from https://www.ecb.europa.eu/pub/conferences/shared/pdf/20220512_IRFMP/Ascari_Paper.pdf

8. Balewa, A. H., & Jelilov, G. (2018). *Does Phillips Curve hold in Nigeria? An Empirical Investigation on the Relationship Between Inflation and Unemployment*.

9. Behera, J., & Mishra, A. K. (2017). The Recent Inflation Crisis and Long-run Economic Growth in India: An Empirical Survey of Threshold Level of Inflation. *South Asian Journal of Macroeconomics and Public Finance, 6*(1), 105–132. doi: 10.1177/2277978717695154

10. Benati, L. (2015). The long-run Phillips curve: A structural VAR investigation. *Journal of Monetary Economics, 76*, 15–28. doi: 10.1016/j.jmoneco.2015.06.007

11. Berentsen, A., Menzio, G., & Wright, R. (2011). Inflation and Unemployment in the Long Run. *American Economic Review, 101*(1), 371–398. doi: 10.1257/aer.101.1.371

12. Boateng, E. (2015). The Relationship between Inflation and Unemployment in Ghana: Analysis of the Philips Curve. *African Journal of Economic Review, 3*(2), 1821–1848.

13. Buba, S., &Aljadi, S. (2017). Inflation and unemployment in Nigeria: An ARDL approach.*World Journal of Economic and Finance, 32*, 69-74.

14. Carlos, J. G. (2010). *Is the Phillips Curve Useful for Monetary Policy in Nigeria?* Retrieved from https://fen.uahurtado.cl/wp-content/uploads/2010/07/inv250.pdf

15. Chuku, C., Atan, J., & Obioesio, F. (2017). Testing for the Stability and Persistence of the Phillips Curve for Nigeria. *CBN Journal of Applied Statistics, 8*(1), 123–147.

16. Daniel, S. U., Israel, V. C., Chidubem, C. B., & Quansah, J. (2021). Relationship Between Inflation and Unemployment: Testing Philips Curve Hypotheses and Investigating the Causes of Inflation and Unemployment in Nigeria. *Path of Science, 7*(9), 1013–1027. doi: 10.22178/pos.74-13

17. Edeme, R. K. (2018). Providing an Empirical Insight into Nigeria's Non-acceleration Rate of Unemployment. *Journal of Development Policy and Practice, 3*(2), 179–190. doi: 10.1177/2455133318777161

18. Efayena, O. O., & Olele, H. E. (2020). *A validation of the Phillips curve hypothesis in Nigeria: A quarterly data based approach*. Retrieved from https://mpra.ub.uni-muenchen.de/98804/1/MPRA_paper_98804.pdf

19. Egbuna, N. E. (2018). Evolution of Monetary Integration: Case of the West African Monetary Zone. *West African Journal of Monetary and Economic Integration, 18*(1), 1–20.

20. Eje, G. C. (2018). Effectiveness of Stabilization Policies in Nigeria under the Phillips Curve Framework. *European Journal of Social Sciences Studies, 2*(11), 16–27.

21. Emmanuel, U. (2019). Inflation and Unemployment Dynamics in Nigeria: A Re-examination of the Philip's Curve Theory. *International Journal of Scientific and Research Publications, 9*(1), 85–108. doi: 10.29322/ijsrp.9.01.2019.p85108

22. Erbaykal, E., & Okuyan, H. A. (2008). Does Inflation and Economic Growth? Evidence from Turkey. *International Research Journal of Finance and Economics, 17*, 40–48.

23. Furuoka, F., & Munir, Q. (2014). Unemployment and Inflation in Malaysia: Evidence from Error Correction Model. *Malaysian Journal of Business and Economics, 1*(1), 35–45.

24. Gyang, E. J., Anzaku, E., Iyakwari, A. D., & Eze, F. (2018). An Analysis of the Relationship Between Unemployment, Inflation and Economic Growth in Nigeria: 1986-2015. *Bingham Journal of Economics and Allied Studies, 11*, 1–11.

25. Hasanov, F. (2011, June). *Relationship between inflation and economic growth in Azerbaijani economy: is there any threshold effect?* Retrieved from https://mpra.ub.uni-muenchen.de/33494/3/MPRA_paper_33494.pdf

26. Idenyi, O., Favour, E.-O., Johnson, N., & Thomas, O. (2017). Understanding the Relationship between Unemployment and Inflation in Nigeria. *Advances in Research, 9*(2), 1–12. doi: 10.9734/air/2017/32218

27. Im, K. S., Pesaran, M. H., & Shin, Y. (2003). Testing for unit roots in heterogeneous panels. *Journal of Econometrics, 115*(1), 53–74. doi: 10.1016/s0304-4076(03)00092-7

28. Isa, C., &Joel, E. (2018). *Applicability and the working of Phillips curve on the Nigerian economy*. Retrieved from https://fud.edu.ng/journals/dujeds/2018_DEC_Vol_6_No_2/DUJEDS%20026_CHARITY2.pdf

29. Iyeli, I., & Ekpung, E. (2017). Price expectation and the Philips curve hypothesis: the Nigeria case.*International Journal of Development and Economic Sustainability, 5*(4), 1–10.

30. Jelilov, G., Obasa, O., & Isik, A. (2016). The impact of inflation on unemployment in Nigeria (2001–2013). *Sacha Journal of Policy and Strategic Studies, 6*(1) 28–34.

31. Kairo, C. I., Irmiya, S. R., & Bitrus, D. J. (2019). The Philip Curve Theory and Nigeria Economy. *International Journal of Innovative Research in Social Sciences and Strategic Management Techniques, 6*(1), 198–219.

32. Kurniasih, E. P., & Kartika, M. (2020). Do Trade-off Inflation and Unemployment Happen in Indonesia? *International Journal of Economics, Business and Management Research, 4*(4), 46–57.

33. Levin, A., Lin, C.-F., & James Chu, C.-S. (2002). Unit root tests in panel data: asymptotic and finite-sample properties. *Journal of Econometrics, 108*(1), 1–24. doi: 10.1016/s0304-4076(01)00098-7

34. Lopez, L., & Weber, S. (2017). Testing for Granger Causality in Panel Data. *The Stata Journal, 17*(4), 972–984.

35. Nakamura, E., Steinsson, J., Sun, P., & Villar, D. (2018). The Elusive Costs of Inflation: Price Dispersion during the U.S. Great Inflation*. *The Quarterly Journal of Economics, 133*(4), 1933–1980. doi: 10.1093/qje/qjy017

36. Ogujiuba, K. & Abraham, T. W. (2013). Testing the Philips Curve Hypothesis for Nigeria: Are there likely Implications for Economic Growth? Economics, Management and Financial Markets, 8(4), 59-68.

37. Okafor, I. G., Ezeaku, H. C., &Ugwuebe, S. U. (2016). Responsiveness of unemployment to inflation: Empirical evidence from Nigeria.*International Journal of Scientific Research in Science and Technology, 2*(4), 173–179.

38. Onwioduokit, E. A. (2006). *Character of Unemployment in Nigeria and its Links with the Macroeconomy*. Retrieved from http://publications.emmanuelonwioduokit.com.ng/product/conference-proceeding-2/

39. Orji, A., Orji, O. I. A., & Okafor, J. C. (2015). Inflation And Unemployment Nexus In Nigeria: Another Test of the Phillips Curve. *Asian Economic and Financial Review, 5*(5), 766–778. doi: 10.18488/journal.aefr/2015.5.5/102.5.766.778

40. Oskouie, N. N., Abbasinejad, H., & Mehrara, M. (2020). Examining the Nexus between Inflation and Unemployment (NAIRU Estimation) in Iran. *Iranian Economic Review, 24*(4), 1119–1137.

41. Phillips, A. W. (1958). The Relation between Unemployment and the Rate of Change of Money Wage Rates in the United Kingdom, 1861-1957. *Economica*, *25*(100), 283–299. doi: 10.2307/2550759

42. Popescu, C. C., & Diaconu (Maxim), L. (2022). Inflation – Unemployment Dilemma. A Cross-Country Analysis. *Scientific Annals of Economics and Business, 69*(3), 377–392. doi: 10.47743/saeb-2022-0012

43. Pratinidhi., & Verma, N. (2020). Theoretical Relationship between Inflation and Unemployment: A Macro Study. *International Journal of Humanities and Social Sciences, 9*(2), 17–25.

44. Rasaki, M. G. (2017). An Estimated New Keynesian Phillips Curve for Nigeria. *Acta Universitatis Danubius. Œconomica, 13*(2), 203–211.

45. Salisu, B. M., Chindo, S., Yahaya, Y., & Bello, I. U. (2018). Inflation and Unemployment in Nigeria: Does the Philips Curve Hold? An ARDL Bound Approach. *International Journal of Education and Social Science Research, 1*(2), 136–148.

46. Sheremirov, V. (2020). Price dispersion and inflation: New facts and theoretical implications. *Journal of Monetary Economics, 114*, 59–70. doi: 10.1016/j.jmoneco.2019.03.007

47. The World Bank. (2021). *World Development Indicators*. Retrieved from https://databank.worldbank.org/source/world-development-indicators

48. Umaru, A., & Zubairu, A. A. (2012). *An Empirical Analysis of the Relationship between Unemployment and Inflation in Nigeria from 1977-2009*. N. d.: Lambert.

49. Wulandari, D., Utomo, S. H., Narmaditya, B. S., & Kamaludin, M. (2019). Nexus between Inflation and Unemployment: Evidence from Indonesia. *The Journal of Asian Finance, Economics and Business, 6*(2), 269–275. doi: 10.13106/jafeb.2019.vol6.no2.269

50. Yolanda, Y. (2017). Analysis of Factors Affecting Inflation and its Impact on Human Development Index and Poverty in Indonesia. *European Research Studies Journal, 20*(4B), 38–56.