# UNEMPLOYMENT HYSTERESIS AND PERSISTENCE IN NIGERIA: IMPLICATION FOR POLICY RESPONSE

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**Abstract**
Unemployment has remained a perennial problem in Nigeria in the last three decades. The Nigerian government like every other government around the world is committed to reducing it to a tolerable rate. However, policy measures taken so far to tackle unemployment have not yielded the desired results. Unemployment, especially youth unemployment has been soaring. To tackle this menace, it is important to understand the nature of Nigerian unemployment. This understanding will offer policymakers some policy menu for curbing this threat. Over time, numerous studies have investigated the determinants of unemployment in Nigeria and have identified many indicators to be significant. If things were right, manipulating these fundamentals would necessarily reduce unemployment. But that is not the case in Nigeria; unemployment has been on the rise despite all the policy efforts. This, therefore, necessitated the need to study unemployment hysteresis and persistence in Nigeria. This study explored this issue using quarterly seasonally adjusted unemployment data from 1970 -2019. To capture the issue of structural break in Nigeria, our dataset was divided into sub-samples. The analysis was done using a battery of unit root tests with and without break, as well as Markov-Switching regression. The study reveals that unemployment in Nigeria is persistent and that there exists hysteresis in Nigerian unemployment. The study therefore, recommends, among other things, that while the government attempts to improve workers' welfare by a way of

good pay package, it should devote and channel more resources to providing productive jobs, like real output-oriented jobs, not just service-oriented ones.

**Keywords:** Unemployment; Hysteresis, Nigeria, Policy
**JEL Classification:** E24, E50, E60

## 1. Introduction

Nigeria is the most populous country in Africa and the eighth in the world with a population of over 190 million people according to United Nations estimates. Nigeria's population is equivalent to 2.6% of the total world population. With current nominal GDP of $376.284 billion and per capita income of $1,994.235, Nigeria ranks as the largest economy in Africa (IMF- WEO, 2018). Though impressive, the above description does not sufficiently define the Nigerian economy. A look at some other Nigeria's macroeconomic indicators, especially unemployment reveals that the economy is not doing that well. Unemployment has been on the increase, at least in the last 30 years and has become one of the major socio-economic problems confronting Nigeria. Unemployment is pervasive in all economies, though some countries have been able to keep it within tolerable rate; others are simply living with it. In fact, at any moment in all free market economies, some people are willing and able to work but unable to secure employment (Mankiw, 2010). It is a source of great concern to policymakers in both developing and developed countries because according to Kyei and Gyeke (2011), it worsens crime rates, makes misery and social instability more acute and erodes human capital, with devastating effects on economic welfare. Given the negative consequences of unemployment, governments all over the world have committed resources to reduce unemployment to its natural rate.

In Nigeria, for instance, several policies and programmes had been adopted by past governments in an attempt to reduce unemployment rates to desired levels, with little or no results. Unemployment has persisted, even after exiting the recession in the second quarter of 2017 (2017: Q2) after contracting for five consecutive quarters, unemployment has *refused to go away*. Available data show that the unemployment rate in Nigeria increased to 23.10 percent in the third quarter of 2018 from 22.70 percent in the second quarter of 2018. Unemployment Rate in Nigeria averaged 12.31 percent from 2006 until 2018, reaching an all-time high of 23.10 percent in the third quarter of 2018 and a record low of 5.10 percent in the fourth quarter of 2010 (National Bureau of Statistics, [NBS], 2018).

Numerous unemployment theories have tried to explain high and persistent unemployment. For instance, the natural rate of unemployment theory developed by Friedman(1968) and Phelps (1967; 1968), or the non-accelerating inflation rate of unemployment (NAIRU), argue that, although output fluctuations generate cyclical movements in the unemployment rate, in the long run, the rate will tend to revert to equilibrium. Friedman (1968) asserts that the natural rate of unemployment is the level which would be ground out by the Walrasian system of general equilibrium equations, as long as there areembedded in them the actual structural characteristics of the labour and commodity markets, including market imperfections, stochastic variability in demands and supplies, the cost of gathering information about job vacancies and labour availabilities, the costs of mobility, and so on. The natural rate of unemployment describes fluctuations in unemployment as movements around the natural rate. This theory characterizes unemployment dynamics as a mean reversion process.

The natural rate of unemployment theory was challenged leading to the development of alternative theories of unemployment. Two such theories have been the most dominant (Papell, Murray &Ghiblawi, 2000). The first is the "structuralist" view advanced by Phelps (1994); this view is in line with the traditional theory of the natural rate of unemployment (Candelon, Dupuy& Alana, 2009). The structuralist view argues that the persistent increase in unemployment is the result of a combination of persistent shocks that raised the natural rate of unemployment (Raurich, Sala&Sorolla,2006). Specific supply-side impediments, such as relative oil prices, real interest rates, exchange rates, stock prices (Phelps, 1999) and the rate of productivity growth (Pissadires,1990) have led to a rise in the natural rate of unemployment. If these supply-side impediments can be removed, the natural rate of unemployment could decline to the original level. This view argues that the unemployment rate is a stationary process subject to occasional but persistent structural changes. It is unsupported by convincing quantitative evidence capable of explaining the high persistentEuropean unemployment rate (Gordon, 1989). The second alternative theory is known as the hysteresis hypothesis. The hysteresishypothesis states that cyclical fluctuations have permanent effects on the level of unemployment. Advanced by Blanchard and Summers (1986; 1987), it posits that the natural rate of unemployment follows the path of the actual unemployment rate. According to this view, the level of unemployment is characterized as a non-stationary, or unit root, process.

Since the existence of hysteresis offers policymakers some room to reduce the unemployment rate without altering the structure in the organisation of the labour market, it is, therefore, necessary to investigate unemployment hysteresis as well as persistence in Nigerian. Given the nature of unemployment in Nigeria over time, the following research questions emerge: (1) does hysteresis exist in Nigerian unemployment and (2) how long does unemployment persist after the initial cause/shock is cleared? The rest of the paper is structured as follows: following the introduction in section one is a brief stylised fact of unemployment in Nigeria. In section two, we review a few related literatures, section three provides the analytical framework and model specification, section four dwells on the data analysis and discussion of results and section five concludes with recommendations.

**Stylised Fact on Unemployment in Nigeria**

Unemployment in Nigeria has remained a persistent problem and is morepronounced in recent times. More worrisome is the impression that the observed unemployment situation is even more severe than what official statistics report (Adawo, Essien&Ekpo, 2012). A juxtaposition of the number of graduates churned out on an annual basis from tertiary institutions with the number of jobs available both in the private and public sectors givesa rough idea of the severity of the unemployment situation in Nigeria. Nyong (2013) reports that the high rate of unemployment observed in Nigeria can be attributed to the inability of the labour market to anticipate, absorb and respond to shocks by creating new jobs in the private sector and improving matching. This situation deteriorated since then. Figure 1.1 below shows the unemployment rate in Nigeria from 1970–2019.

In 1970, the unemployment rate in Nigeria was around 4 per cent. It experienced an increasing trend reaching an all-time high of 27.4 percent in 2000. The average unemployment rate for the study period (1970–2019) is about 10.36 per cent. Between 1970 and 2010, the unemployment rate was a singledigit with an average value of 7.93 per cent. However, from 2010 to 2018 the unemployment rate has been double-digit with an average

value of about 22.7 per cent. This implies that the unemployment situation worsened from the year 2010 and reveals a slow tendency of actual unemployment to revert to a stable underlying unemployment rate, if any.

**Figure 1.1: Unemployment Rate in Nigeria**


**Source: The Authors, (2022)**

## 2. Literature Review

### 2.1 Theoretical Literature Review

From a theoretical point, there are two opposing views concerning the behaviour ofunemployment rates, namely: the structuralist and the hysteresis schools ofthought. The structuralist view is associated with the natural rate hypothesis. Thenatural rate is the rate of unemployment towards which the economy gravitates in thelong run, given all the labour-market imperfections that hinder workers from gettingjobs instantly (Mankiw, 2010). The central theme of the natural rate hypothesis attributed to the works of Phelps (1967) and Friedman (1968) is that unemployment converges to a natural rate in the longrun and short-run deviations from the natural rate are expected to be temporary. This hypothesis therefore, characterizes unemployment dynamics as a mean reverting process such that a definite state of unemployment equilibrium exists in the long run and the unemployment series are not affected by any shock or disturbance in the long run (Leon-Ledesman, 2000;Chou & Zhang, 2012).

The unemployment hysteresis hypothesis is second and it is attributed to thework of Blanchard and Summers (1986). Unlike the structural view, the hysteresis hypothesis holds that transitory economic shocks will have permanent effects on the unemployment rate. This hypothesis thus views unemployment as a non-stationary or a random walk process which implies that the series will not return to its initial mean value after a shock or disturbance in the long run. In other words, once unemployment rates are subject to any distortions, the long-run equilibrium is affected. The hysteresis hypothesis captures the influence of past unemployment on long-run equilibrium unemployment. It is concerned with the effect of current market shocks on future market equilibrium conditions (Mohan, Kemegue&Sjuib, 2008). Both the natural rate and hysteresis hypotheses can be tested empirically by

ascertaining the time series properties of unemployment rates using the unit root tests. The existence of a unit root provides support for the hysteresis hypothesis while evidence of the nonexistence of a unit root aligns with the natural rate hypothesis.

The terms hysteresis and persistence have almost been used interchangeably in Literature, however, Leon-Ledesma (2000) distinguishes between them stating that while persistence is a special case of the natural rate hypothesis with unemployment being a near unit root process, hysteresis is a unit root process. Mohan et al (2008) posit that for persistence, labour market rigidities allow unemployment to linger as the speed of adjustment to the long-run equilibrium level is slower. This assertion is corroborated by Nyong (2013) who asserts that in the case of persistence, unemployment eventually returns to the natural rate after a shock even though it takes long periods but for hysteresis, shocks have a permanent effect and there is no return to the natural rate.The macroeconomic policy will have permanent effects on unemployment if there is hysteresis, while the effect of macroeconomic policy on unemployment would not be permanent although it may last long in the presence of persistent unemployment.

Generally, the existence of unemployment hysteresis is due mainly to market rigidities and it is explained by three theories, namely; the insider-outsider theory, the duration theory (also called depreciation of human capital) and the capital stock theory.The insider-outsider theory is concerned with the loss of the influence on wageformation by the long-term unemployed. The so-called insiders (incumbent workers) possess market power in determining wages independently of unemployment in the economy. The market power of the insiders is due to high labour turnover costs, which make it costly for firms to replace an insider with an outsider (an unemployed worker). This allows unions to influence wage determination. Insider-Outsider models are based not on human capital but on the differentiation between insiders and outsiders in a wage bargaining context (Blanchard& Summers, 1986; Mikhail, Eberwein&Handa, 2003).

The duration theory is principally concerned with the negative effects ofunemployment duration on labour demand and supply of the unemployed. It explains unemployment from the perspective that the longer prospective workers remain unemployed, the less attractive they become because firms hold the belief that the productivity of such workers has been reduced due to the depreciation of skill (Eisazadeh&Tabarsi, 2013; Marjanovic&Mihajlovic, 2014).The capital stock theory,on the other hand, focuses on the effect of negative demand shocks on capitalstock. A negative demand shock will lead to a reduction of capital stock since firms will have to restrain their level of investment, thus giving rise to unemployment. By implication, adverse capital stock shocks lead to an increase and persistent rise in the unemployment rate. This theory explains the persistence of unemployment from the point of view that since it takes time to increase the capital stock, temporary shocks in the economy can have permanent effects on unemployment (Marjanovic&Mihajlovic, 2014).

**2.2 Survey of the Empirical Literature**

Several authors have investigated empirically the existence of hysteresis, especially in OECD countries. The usual conclusion is that cyclical fluctuations have a permanent effect on unemployment. For instance, Blanchard and Summers (1986), Brunello(1990), Neudorfer, Pichelmann and Wagner (1990), Jaeger and Parkinson (1994) and Røed (1996) used Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests for testing

hysteresis. Generally, these studies found that the unemployment series is non-stationary. In other words, according to these studies, the unemployment series has a hysteresis effect.

According to Leslie, Pu, and Wharton (1995), the reason for this finding of a hysteresis effect is the use of lower-power pure unit root tests in the analysis (Strazicich, Tieslau& Lee,2001). Hence, they reconsidered hysteresis with more powerful tests. These new tests include (1) unit root tests with structural breaks and (2) panel unit root tests with and without structural breaks. Mitchell (1993), Arestis and Mariscal (1999; 2000), Papell, Murray and Ghiblawi (2000), Ewing and Wunnava (2001) and Summers (2003) suggested that there are structural breaks in the unemployment rate series. Because of such structural breaks, they argued that the hysteresis hypothesis is not valid. Their results strongly reject the hysteresis null hypothesis.

Song and Wu (1997; 1998) considered the hysteresis effect with panel data. Song and Wu (1997) employed a panel unit root test to reject the existence of a hysteresis effect in the USA and in sixteen European Union (EU) countries. However, when León-Ledesma (2002) used Im, Pesaran and Shin's (2003) panel unit root test, he did not find hysteresis in the US case but found support for the validity of the hysteresis hypothesis in EU countries.

Smyth (2003) applied both a pure time series and a panel data approach for Australia. Smyth (2003) showed that the consequence of hysteresis is valid for a pure time series, but according to the panel data, the hysteresis effect is not valid. Similarly, Osterholm (2004) used Im, Pesaran and Shin's (2003) (IPS) panel unit root test and his results are in tandem with León-Ledesma's (2002). Also, Chang et al. (2007)employed Levin, Lin and Chu (2002) (LLC), IPS, Taylor and Sarno's (1998) panel unit root tests, and they rejected the validity of the hysteresis effect for Taiwan's 27 regions. Mohan Kemegue and Sjuib (2007) used the ADF-Fisher, IPS, LLC and Breitung panel unit root tests and showed that there is no hysteresis effect in three regions of Massachusetts.

Strazicich, Tieslau, and Lee (2001) used a panel unit root test with structural breaks to investigate the hysteresis effect for OECD countries. Their results rejected the existence of hysteresis effects in OECD countries. However,Camarero, Carrion-I-Silvester&Tamarit(2006) found that the hysteresis effect is valid for nineteen OECD countries.

In Nigeria, this issue is yet to be fully investigated; the only known study to the best of our knowledge is that ofOnwukeme and Opeloyeru (2019). They interrogated the question of the existence of unemployment hysteresis in Nigeria using a conventional pure unit root test for the period 1970 – 2013. Their findings suggest that unemployment hysteresis exists in Nigeria. In this study, we attempt to advance this knowledge further. We build on previous studies andthen approach the issue from three major perspectives. First, we use conventional pure unitroot tests with/without structural breaks, followed byMarkov switching regressions. The import of Markov switching regressions is highlighted in section three. Second, we took the issues of a structural break in Nigeria's economy very seriously, as expected; Nigerian unemployment may have been affected by structural changes in the economy. Hence, we interrogate the issue taking cognizance of structural changes in Nigeria. Finally, we made use of quarterly data as opposed to annual data, this provides degrees of freedom that improve (or at least do not deteriorate) the precision of our estimates, particularly, in the Markov

Switching regression.Again, we use seasonally adjusted unemployment data to disclose the underlying trends and cycles in the Nigerian labour market.

## 3. Data and Methodology

### 3.1 Data

The empirical analysis uses quarterly, seasonally adjusted unemployment data spanning from 1970 – 2019. The use of high-frequency (i.e. quarterly) data helps to capture the aspects of the rapidly changing Nigeria's labour market. Also, quarterly data as opposed to annual data, provides degrees of freedom that improve (or at least do not deteriorate) the precision of our estimates, particularly, in the Markov Switching regression. Again, we use seasonally adjusted unemployment data to reveal the underlying trends and cycles in the Nigerian labour market.

### 3.2 Theoretical Framework and Model Specification

The traditional approach for testing the existence of hysteresis in the unemployment rate is to examine the time series properties of the data to know whether they are stationary or not. The existence of a unit root would thereforesuggest that unemployment does not revert to its natural rate after a shock. According to Layard, Nickell and Jackman(1991) if the root is high but below one, there is *partial hysteresis* and *purehysteresis*if the root is one. In the latter case, equilibrium isnot defined. This study followed the unit-root definition of hysteresis as the first approximation and then considers linear and nonlinear variants.

Suppose we have the following AR(K) process for the unemployment rate ($UN^R$):

$$UN^Rt = \Omega_0 + \sum_{k=1}^{K} \Omega_k UN^R_{t-k} + U_t \quad (3.1)$$

From equation 3.1 and following Leon-Ledesman and McAdamnn (2004), we define the natural mean or equilibrium rate to which unemployment reverts over time as $UN^{-R} = \frac{\Omega 0}{1-\sum k\, \Omega K}$with the assumption that$\sum_k \Omega K < 1$ and no intercept shifts, i.e. $\Omega_0 = \Omega_0 \forall_t$.However, if $\sum_k \Omega K = 1$unemployment follows a random walk and displayspath-dependence (pure Hysteresis). Thus, shocks $U_t$either from supply or demand will have permanent effects.

In testing for unit roots in unemployment rates, we use a battery of univariate tests; namely the Augmented Dickey-Fuller test (Said & Dickey, 1984), the Augmented Dickey-Fuller (ADF) test with GLS detrending, ERS (Elliot, Rothenberg & Stock, 1996) test and KPSS (Kwiatkowski, Phillips, Schmidt & Shin, 1992) test. The first two test whether the time series in question has a unit root versus the alternative hypothesis of stationarity; the KPSS test on the other hand has stationarity under the null, thereby reversing the burden of proof. The three-unit root tests provide a reasonably wide range of different null and alternative hypotheses for a broad empirical investigation.

For the ADF and ADF-GLS, i.e. (ERS), we first determine the lag length in the test equations. The Hannan-Quinn (1979) information criterion is used for this purpose; this criterion seems like the best compromise between the Schwarz(1978) criterion, which is well-known for choosing too low a lag length, and the Akaike (1974)criterion, which lacks consistency properties and may be overly generous in modellingdynamics. Just like the Schwarz criterion, the Hannan-Quinn criterion is consistent in the sense that for large enough samples, it will choose the correct model given that the true model belongs to the set of models one is searching. The KPSS test is employed with a Newey-West estimator to correct for serial correlation.

Leon-Ledesman and McAdamnn(2004) argue that testing for unit roots for the presence of pure linear Hysteresis provides anupper bound test of the hypothesis, given that this is an extreme case of path dependence where any shock, large or small, matters. But since unemployment rates are necessarily bounded, unemployment should be stationary over longer periods; as a consequence, Hysteresis as a unit root should not necessarily be understood as a 'true' description of the underlying data-generating process but as a local approximation during a sample period. A less restrictive hypothesis considers Hysteresis as a process by which unemployment switches equilibria whenever 'sufficiently large' shocks affect its value; that is if only large shocks enter the long-run memory of the unemployment series because they generate changes in the 'natural' or equilibrium level of unemployment (Leon-Ledesman&McAdamnn, 2004)).

Many studies have tested for unemployment hysteresis/persistence using the unit root approach. However, some studies have used Markov Switching Regression to assess how fast a variable changes from one regime to another. Toeing this line, this study analysed unemployment persistence using Markov switching regressions. This allows us not only to test for hysteresis with a changing average level of unemployment but also to analyse the frequency of regime changes and the behaviour of unemployment in each of these regimes. Another advantage is that it accounts for non-linearity in the trend unemployment function accruing not only from structural breaks but also from normal business cycle fluctuations.

Again, hysteresis involves stronger properties than those conveyed by the use of the term to describe persistence or zero/unit roots. In the persistence case, the natural rate equilibrium is unchanged by shocks affecting actual unemployment, whereas hysteresis implies that each new extreme value of the shocks experienced will lead to a new unemployment equilibrium. In the zero/unit root case, all the shocks experienced shape the equilibrium, whereas hysteresis involves only the non-dominated extreme values of the shocks counting in the equilibrium selection process.

Building on equation 3.1, Suppose that a random variable of interest Y$t$ (in this case unemployment rate) follows a process that depends on the value of an unobserved discrete state variable $st$. It is assumed that there are $M$ possible regimes (we assume two regimes, high and low rate of unemployment), and it is said to be in state or regime $m$ in period $t$ when $st = m$, for $m = 1, \ldots, M$. The switching model assumes that there is a different regression model associated with each regime and that the regression errors are normally distributed with a variance that may depend on the regime. The first-order Markov assumption requires that the probability of being in a regime depends on the previous state, so that

( = j | $st$−1 = i ) = (t) (3.2)

Typically, these probabilities are assumed to be time-invariant so that (t) = $pij$ for all $t$, but this restriction is not required. We write these probabilities in a transition matrix

$$\mathbf{P^{(t)}} = \begin{pmatrix} P_{11}^{(t)} & \ldots\ldots\ldots\ldots & P_{1m}^{(t)} \\ \vdots & & \vdots \\ P_{m1}^{(t)} & \ldots\ldots\ldots\ldots & P_{mm}^{(t)} \end{pmatrix} \quad (3.3)$$

Where the $ij^{th}$ element represents the probability of transitioning from regime $i$ in period t – 1 to regime $j$ in period $t$.According to Diebold, Lee and Weinbach, (1994)$P_{11}^{(t)} = P(st = 1| st-1 = 1, Xt-1; \beta i) = \exp(Xt-1' \beta 1) 1+\exp(Xt-1' \beta 1)$; $P_{1M}^{(t)} = (1 - P_{11}(t))$.
Also, $P_{MM}^{(t)} = p(st = M \mid st-1 = M, Xt-1; \beta M) = \exp(Xt-1' \beta M) 1+\exp(Xt-1' \beta M)$; $P_{M1}^{(t)} = ( 1 - pMM(t) )$.

This study assumes a two-state Markov process which implies that M =2, these two regimes or states are low unemployment rate (regime 1) and high unemployment rate (regime 2). This equation 3.3 reduces to:

$$\mathbf{P^{(t)}} = \begin{pmatrix} P_{11} & P_{12} \\ & P_{22} \end{pmatrix} \qquad (3.4)$$

Where the transition probabilities are defined as follows:
$P_{11}$is defined as the probability that the current regime (regime 1) remains in that regime; $P_{12}$ is defined as the probability that the current regime (regime 1) moves to another regime (regime 2); $P_{22}$ is defined as the probability that current regime (regime 2) remains in that regime and $P_{21}$is defined as the probability that current regime (regime 2) moves to another regime (regime 1).

The two transition probabilities are time-varying, evolving as logistic functions of $Xt-1'$, i = 1,2, where the vector $Xt-1$ contains economic variables that affect the state transition probabilities. The two sets of parameters governing the transition probabilities are a (2k x1) vector, $\beta = (\beta 1', \beta 2')$. As in the simple switching model, the probabilities may be parameterized in terms of a multinomial logic. Note that since each row of the transition matrix specifies a full set of conditional probabilities, a separate multinomial specification for each row $i$ of the matrix is defined thus:

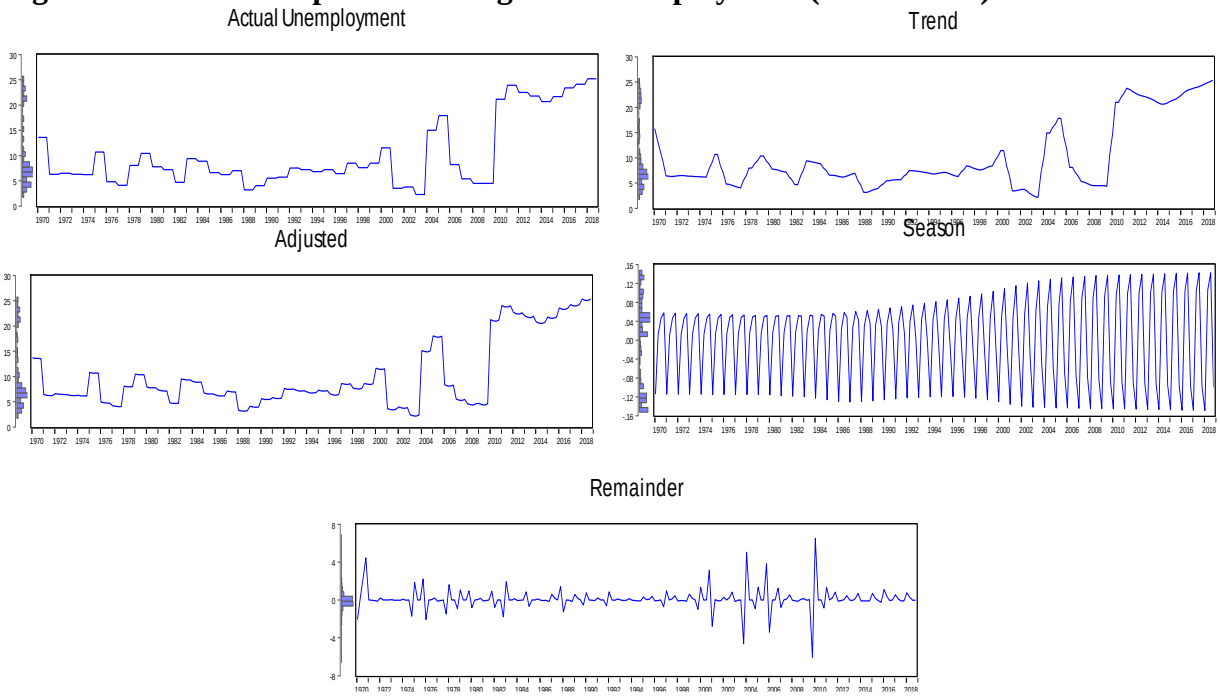
$$Pij(-1, \delta i) = \frac{\exp(Gt-1, \delta ij)}{\Sigma \exp Ms=1(Gt-1, \delta is)} \qquad (3.5)$$

For, $j$ = 1, …… $M$ and $i$ = 1, …, $M$ with the normalizations $\delta iM$ = 0. The Markov property of the transition probabilities can be evaluated recursively, each step begins with filtered estimates of the regime probabilities for the previous period.

## 4. Empirical Results

We begin by decomposing our series. The seasonal and trend decomposition using Loess(STL) technique was used to obtain the seasonal values. Figure 4.1 shows the graphic summary of this decomposition.

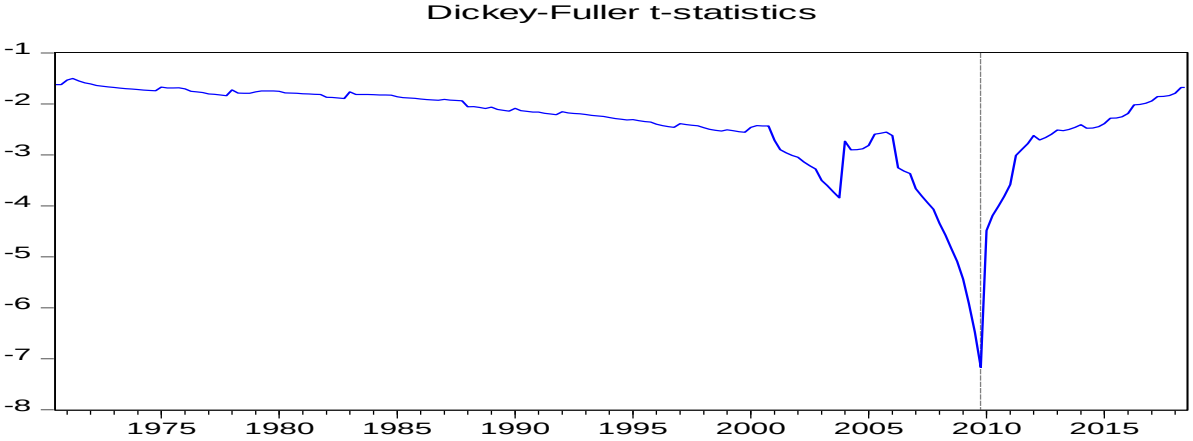
**Figure 4.1 STL Decomposition of Nigerian Unemployment (1970 – 2019)**




**Source: The Authors, (2022).**

### 4.1Unit Root Test with Structural Breaks

Traditional unit root tests ignore the presence of breaks in timeseries. We first apply a unit root test with breaks on seasonally adjusted unemployment data in Nigeria for the period 1970 – 2019. This ensures that we mitigate estimation bias. Most importantly, this is necessary because the Nigerian macro environment has not been the same since 1970, it has gone through significant changes, and the behaviour of the unemployment rate may have changed as well. We test for a structural break in Nigerian unemployment data using Perron (1998) and Vogelsang and Perron (1998) breakpoint unit root test. The result is shown in Figure 4.1.




**Source: The Authors, (2022).**

The Dickey-Fuller t-statistics indicate that there is a breakpoint in the Nigerian unemployment rate from 1970 – 2019, which occurred in 2010. We, therefore, implemented the conventional unit roots based on evidence of structural breaks in Nigerian unemployment. Consequently, we test for unit root on three sets of data; namely: the period from 1970 – 2019, this period

covers the full sample period; we then have two sub-samples, 1970 – 2010 and 2010 – 2019. These periods capture the break in unemployment in Nigeria.

### 4.2 Unit Root Tests without Structural Breaks

In Table 4.1 we present the ADF, ADF-GLS detrending (ERS) and KPSS unit root test results, which ignore structural breaks.While the Augmented Dickey-Fuller (ADF) andADF-GLS (ERS) test for the null of a unit root, the KPSS test for the null of stationarity.We report the tests with and without a time trend and also provide the estimated auto-regressive root for the ADF test together with the derived half-life for the shocks.

**Table 4.1: Unit root test**

| | Augmented Dickey-Fuller | | | | ADF-GLS | | KPSS | |
|---|---|---|---|---|---|---|---|---|
| | Intercept | | With Trend | | Intercept | With Trend | Intercept | With Trend |
| Period | T-ratio | Estimate (Half-life) | T-stat | Estimate (Half-life) | DF-GLS | DF-GLS | $Z_u$ | Zt |
| 1970 – 2018 | -1.6324 (-2.8762) | 0.03684 (18.8) | -2.9220 (-3.4330) | 0.0809 (8.6) | -1.6418 (-1.9425) | -1.9064 (-2.9350) | 0.9573** (0.4630) | 0.3165** (0.1460) |
| 1970 – 2010 | -3.3287** (-2.8792) | 0.1569 (4.4) | -3.5049** (-3.4376) | 0.1655 (4.2 | -2.1485** (-1.9428) | -2.5804 (-2.9670) | 0.1888 (0.4630) | 0.1062 (0.1460) |
| 2010 – 2018 | -1.1229 (-2.9484) | 0.0949 (7.3) | 1.5412 (-3.5443) | 0.1510 (4.6) | -0.8739 (-1.9507) | -1.6369 (-3.1900) | 0.3760 (0.4630) | 0.1544** (0.1460) |

*Note: ** indicates rejection of the null of a unit root at the 5% level for the ADF and ADF-GLS test and not rejection of the null of stationarity for the KPSS test at the 5% level.The half-life was calculated as: –log(2)/(δ), where δ is the auto-regressive root of unemployment in the ADF test, and it is expressed in quarters.*
**Source: The Authors, (2022).**

Table 4.1 reports the results of three conventional unit root tests. We split our dataset in two to capture the revealed breakpoint in unemployment in Nigeria. For each unit root test, we make two assumptions: (1) the unemployment series has intercept only (2) it has intercept and trend. We also report the estimated auto-regressive root of ADF for each period and then derive the half-life of unemployment in Nigeria. Calculating the half-life of a mean reversion time series is very interesting because it gives us the measure of how long it takes to mean revert. The results of the unit root tests indicate that we cannot reject the null of the hysteresis hypothesis for the unemployment series in Nigeria for the period; 1970 – 2019.By implication, there is hysteresis in Nigeria's unemployment from 1970 – 2019. During this time, the calculated half-life of the ADF auto-regressive root is about 18.8 quarters in 196 quarters (every 4.7 years in 49 years). This indicates that any sudden shock in unemployment will have permanent effects on the unemployment rate. This speed of adjustment is slow.This result agrees with that of Onwukeme and Opeloyeru (2019). However, any conclusion made based on the full sample (1970 – 2019) estimates may be misleading, because the macro environment in Nigeria has changed substantially between then and now.

A look at our two sub-samples (1970 – 2010 and 2010 – 2019) revealed mixed evidence of hysteresis in Nigeria. For the period, 1970 – 2010, we can reject the null of the hysteresis hypothesis with a fast speed of adjustment, about 4.4 quarters in 164 quarters (every 1.1 years in 41 years). The null of the hysteresis hypothesis for the unemployment series in Nigeria for the period 2010 – 2019 cannot be rejected. Hence, there is a hysteresis in unemployment between 2010 and 2018. The calculated half-life of the ADF auto-regressive root is about 7.3 quarters in 36 quarters (every 2 years in 9 years), revealing a substantial slow adjustment.

This indicates that any sudden shock in unemployment will have permanent effects on the unemployment rate. This finding is in line with that of the full sample (1970- 2019) estimates and further corroborates the earlier findings ofOnwukeme and Opeloyeru (2019).

**Markov-Switching Regression Analysis**

**Table 4.2: Markov Switching Result**

| | | **Full Sample Estimates (1970 – 2019)** | **Sub-Sample Estimates (1970 – 2010)** | **Sub-Sample Estimates (2010 – 2019)** |
|---|---|---|---|---|
| Regime One | Coef. | 6.7568** | 6.5656** | 21.53665** |
| | Std Error | 0.2049 | 0.18376 | 0.1602 |
| | Z- stat | 32.9690 | 35.7283 | 134.43 |
| | p-value | 0.0000 | 0.0000 | 0.0000 |
| Regime Two | Coef. | 21.5811** | 16.9004** | 24.1366** |
| | Std Error | 0.3845 | 0.5618 | 0.1814 |
| | Z- stat | 56.1265 | 30.0819 | 133.05 |
| | p-value | 0.0000 | 0.0000 | 0.0000 |

**Source: The Authors, (2022)**

In Table 4.2 we present the Markov-switching result. The Markov-Switching model was estimated for three different periods. The full sample model was estimated with the assumption of no structural break in the Nigerian unemployment rate. Relaxing this assumption based on the outcome of the structural break unit root result (see Figure 4.1), we estimated two different models. In each model, we identified two unemployment rate regimes; namely: low unemployment rate (regime 1) and high unemployment rate (regime 2). In the full sample estimate, the result shows that Nigeria has an average unemployment rate of 6.8% in Regime 1 and 21.6% in Regime 2.

During the period1970 – 2010, Nigeria has an average unemployment rate of 6.6% and 16.9% in Regime 1 and Regime 2 respectively, while average unemployment rates of 21.5% and 24.1% in Regime 1 and Regime 2 respectively during the period 2010 – 2019. The estimates in all the periods are statistically significant at a 5% level as indicated by the probability values ($p<0.05$). This implies that the dynamics in the first regime and second regime are substantial for all the periods.

Finally, we present both the constant transition probabilities and the constant expected durations of unemployment in the two regimes (regime 1 = low rate and regime 2 = high rate) for each of the sample spaces. The result is shown below.

**4.3 Transition Summary: Probabilities and Durations**

| | | **Full Sample (1970 –2019)** | | **Sub-Sample (1970 – 2010)** | | **Sub-Sample (2010 –2019)** | |
|---|---|---|---|---|---|---|---|
| Transition probabilities | | Regime 1 | Regime 2 | Regime 1 | Regime 2 | Regime 1 | Regime 2 |
| | Regime 1 | 0.99 | 0.01 | 0.98 | 0.02 | 0.92 | 0.08 |
| | Regime 2 | 0.03 | 0.97 | 0.08 | 0.92 | 0.09 | 0.91 |
| Expected duration | | Regime 1 | Regime 2 | Regime 1 | Regime 2 | Regime 1 | Regime 2 |
| | | 87.88 | 33.76 | 52.70 | 11.87 | 12.57 | 10.64 |

**Source: The Authors, (2022).**

In Table 4.3, we show the transition probability matrix and the expected durations. Concentrating on the result for 2010 – 2019, the probabilityregime 1 remains in that regime is 0.92; while the probabilityregime 2 remains in that regime 2 is 0.91. This suggests that if we are in high unemployment, the probability of staying there is high. The probabilitiesof moving from low unemployment to high unemployment and vice versa are 0.08 and 0.09 respectively. Again, this result shows that there is difficulty in moving from one unemployment regime to another in Nigeria. The corresponding expected durations in a regime are approximately 12.6 quarters for Regime 1 and 10.6 quarters for Regime 2. This implies that the unemployment rate will remain in the origin state for a very long time before moving to the second state. This is similar to the result of the half-life calculated using the auto-regressive roots of ADF for the period.

## 5. Conclusion, Policy Implications and Recommendations

Unemployment has remained a perennial problem in Nigeria in the last three decades. Nigerian government like every other government around the world is committed to it to a tolerable rate. However, policy measures taken so far to tackle unemployment have not yielded the desired results. Unemployment, especially youth unemployment has been soaring. To tackle this menace, it is important to understand the nature of Nigerian unemployment. This understanding will offer policymakerssome policy menu for curbing this threat. Over time, numerous studies have investigated the determinants of unemployment in Nigeria and have identified many indicators to be significant. If things were right, manipulating these fundamentals would necessarily reduce unemployment. But that is not the case in Nigeria; unemployment has been on the rise despite all the policy efforts. This, therefore necessitated the need to study unemployment hysteresis and persistence in Nigeria. According to Magnus and Par (2006) knowing whether one-time shocks have permanent or transitory effects is vital for understanding the behaviour of the labour market. Using the evidence as revealed by the recent dataset (2010 – 2019), the conclusion is that Nigerian unemployment is generated by unit root process, suggesting the existence of hysteresis, also unemployment is persistent in Nigeria. Persistence implies a slow rate of adjustment towards a long-run equilibrium, and both the half-life of auto-regressive roots of ADF and the constant transition probabilities revealed this.

The policy implication is that in the absence of hysteresis in unemployment, for example, if the central banks wish to lower the inflation rate it may shift to a contractionary monetary policy, which if not fully anticipated and believed will temporarily increase the unemployment rate; if the contractionary policy persists, the unemployment rise will eventually disappear as the unemployment rate returns to the natural rate. Then the cost of the anti-inflation policy will have been temporary unemployment. But if hysteresis does exist, the unemployment rise initiated by the contractionary policy will never completely go away; hence, the cost of the anti-inflation policy would be permanent higher unemployment, making the policy less likely to have greater benefits than costs.

Currently, the Central Bank of Nigeria (CBN) is fighting hard to curtail inflation, targeting single-digit inflation amidst rising unemployment characterised by hysteresis. This calls for caution because any contractionary monetary policy would lead to a permanent rise inunemployment. The study, therefore, recommends that while the government attempts to improve workers' welfare by a way of good pay package, it should devote and channel more resources to providing productive jobs, like real output-oriented jobs, not just service-oriented

ones. Again, infrastructural and human capital development should drive the Nigerian economy; this will help in absorbing idle resources, such as labour while at the same time improving marginal productivity of labour. Finally, the government should encourage entrepreneurship by providing start-up capital for newcomers and making the macro environment attractive for them to function.

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