Seun Adebowale Adebanjo
Statistical Training and
Consultation, Nigeria

Pius Sibeate
Planning, Research and
Statistics, Rivers State Ministry
of Education, Port Harcourt,
Nigeria

The dynamic relationship between unemployment and regional migration of labor in Nigeria

Seun Adebowale Adebanjo and Pius Sibeate

Abstract
Regional migration is the movement of people from one geographic location to another in search of a higher standard of living due to social unrest and violence. Due to the high unemployment rate caused by the covivirus-19 pandemic, the rate of migration in this age has accelerated significantly.

This study's primary purpose is to examine the dynamic relationship between unemployment and regional migration in Nigeria. From 1991 to 2020, secondary data will be retrieved from the World Bank's database of world development indicators (data.worldbank.org) for Nigeria's inflation, GDP growth, and wages, and from www.macrotrends.net for Nigeria's unemployment rate and migration rate. It is crucial to note that migration in this study encompasses both internal and external migration, as the available data for migration is net migration, which includes both types.

This study uses the unit root test to demonstrate that unemployment becomes stationary at zero level without the use of series differentiation. Using the augmented Dickey-Fuller technique, migration becomes stationary after the second difference, indicating integration of order 2, whereas GDP growth, inflation, and wage become stationary after the first difference.

OLS indicates that the regression model was statistically significant. This suggests that unemployment, migration, GDP growth, inflation, and compensation have a strong relationship. R-squared = 0.7913 indicates that migration and other controlled variables such as GDP growth, inflation, and wage growth can explain approximately 79% of the variance in unemployment. This demonstrates that the model fits the data well and is ideal for predicting the future unemployment rate. In the meantime, the regression model indicates that migration is statistically significant and, consequently, has a statistically significant positive effect on unemployment in Nigeria. The estimated coefficient for migration is 36.785, which indicates that unemployment will increase by approximately 37 per cent for every one per cent increase in migration. The augmented dickey fuller test was then used to determine if the series is stationary or not. The Johansen cointegration test was then utilized to conduct a cointegration analysis, revealing a long-run relationship between unemployment, migration, GDP growth, inflation, and wage.

Figure 1 depicts, on the other hand, a significant rise in inflation from 1991 to 1995, followed by a fall until 1996, and then a consistent fluctuation in the inflationary rate from 1996 to 2020. In addition, the graph illustrates that from 1991 to 2020, salary growth and GDP growth were not steady. Unemployment, however, has suddenly increased from 2015 to 2020 and appears to have peaked in 2020 due to the COVID-19 pandemic (see figure 1).

Consequently, it is suggested that the government implement policies that will increase productivity, which will create gainful employment and raise the standard of living of citizens throughout the country's geopolitical zones, thereby enhancing migration management and releasing Nigeria's greater economic potential.

Keywords: Regional migration, unemployment, unit root test, Johannes cointegration test, OLS regression

1. Introduction
Regional migration, like other social science topics, has a long and illustrious history that can be traced back to its origins (Oiarzabal, P. J and Reips, U.D, 2012). At its most fundamental level, migration can be defined as the long-term movement of people from geographically impoverished to geographically prosperous geographies through time, from one place to another particularly in Nigeria. The movement of people between geographical zones or regions is referred to as regional migration. Humans have been on the march in the hope of conquering the earth and seizing available resources and socioeconomic chances for their well-being.

Corresponding Author:
Seun Adebowale Adebanjo
Statistical Training and
Consultation, Nigeria

Additionally, humans have been forced to shift from their traditional habitats due to environmental shocks such as flooding, desertification, earthquakes, and other natural calamities. Additionally, people can be pushed or forced to transfer from one location (origin) to another (destination) as a result of social conflict and warfare. In the latter case, individuals travel in search of a safe paradise,' where their safety is substantially ensured (Adepoju, 2008; Bakewell and de Haas, 2007; Afolayan and Ikwuyatum *et al*, 2011) [3]. Migration as a process entails the migration of individuals from their existing abode (origin) to a new area (destination). The period of stay at the destination/new place of residence frequently determines whether or not the process is one of migration. Before a move is recognized or defined as a migration process, it must last between six months and one year. Internal migration occurs within the country's national borders; international migration occurs across the country's national border and/or boundaries (Castles, 2012) [7]. All information acquired for the benefit of humanity is propagated throughout the world via migrations and information exchanges, from the development of the wheel to the discovery of writing, and from illness outbreaks to the discovery of treatments for various maladies (Yilmaz, 2014). Throughout this period, travelling the world on passports and other legal benefits offered by governments, such as residency or employment permits, has grown in popularity (Gerşil and Temel, 2015). Migration is neither a singular occurrence nor a static concept. Both statements are true. Migration is a dynamic term with a complicated structural structure that requires further explanation in terms of the causal relationships between unemployment and migration. Numerous economists are captivated by the consequences of migration on economic growth and employment, which has piqued many in the discipline's attention.

Regional migration arises substantially from persistent unemployment, which has grown much more prevalent in Nigeria as a result of the COVID-19 pandemic's influence, among other factors (World bank, 2021) [19]. Thus, regional migration has expanded to include international migration as Nigeria's unemployment rate has deteriorated to the point where the majority of graduates and professionals have been forced to seek better employment opportunities outside the country, resulting in the number of migrants steadily increasing year after year and even more so during this COVID-19 era as a result of Nigeria's deplorable unemployment rate (World migration report, 2020). However, primary objective of this work is to apply econometric models to examine the relationship between unemployment rate and migration in Nigeria.

1.1 Research question
What is the relationship between unemployment rate and migration in Nigeria?

1.2 Research hypothesis
H_1: There is a relationship between unemployment rate and migration in Nigeria

1.3 Statement of the problem
Regional migration has been a current concern in Nigeria since the country's founding in 1960. According to the results of a poll done by the National Population Commission during the 2006 census, more than 10% of Nigerians live in states other than their state of origin in order to improve their economic situation. People also tend to shift from one geographical zone to another inside the country in order to

take advantage of social services and employment possibilities available in the area.

According to Abiola *et al*. (2019) [1], the increase in migration in Nigeria is a result of the high level of unemployment that the country is experiencing.

Meanwhile, the negative impact of the COVID-19 pandemic has wreaked further havoc on the economies of each state, resulting in an unprecedented high level of unemployment, which has resulted in an unprecedented increase in the rate of migration in Nigeria, as citizens seek better and greener pastures in other states and countries.

Consequently, the purpose of this study is to explore the relationship between migration and unemployment in order to determine how Nigeria can manage its migration and unemployment situations so that it can maximize its economic potential.

2. Literature Review
2.1 Conceptual issues [and historical backgrounds] of Migration in Nigeria
Several migration theories and models have been investigated in the literature on migration in Nigeria; however, no concise or precise model or theory has been developed for the study of migration in Nigeria. In Nigeria, the pattern and characteristics of migrations are influenced by several different factors. These are both exogenous and endogenous factors that contribute to the predisposing of the migration process to take place. In addition to economic differentials, exogenous factors include the decision-making process of individuals that shape their aspiration and perception of potential places for relocation, as well as social-economic networks that influence the migration dynamics. Although these factors are not directly related to the decision-making process of individuals, they are related to how they envision and perceive potential places to relocate as well as the influence of social-economic networks on the migration dynamics (Mabogunje, and Afolayan, 2004) [15].

It is common for people to decide to leave rural areas because of socio-economic inadequacies that exist in the source region (rural); this creates a trajectory or pattern of movement from places (rural) with 'push' endogenous factors (unemployment, lack of socioeconomic opportunities, poverty, etc.) to destinations with attractive exogenous factors (pull) such as employment opportunities, accessibility and availability of socio-economic facilities, and a better quality of life in general (Castles, 2012) [7]. Since it is multifaceted and fluid, the migration process and pattern in Nigeria, as well as in other countries in West Africa, is extremely dynamic and complex. However, notable epochs of migration have been identified, including pre-colonial, colonial, postcolonial, and post-independent periods, as well as the COVID-19 epoch of migration. To investigate the issue, it is necessary to first classify it. Labor migration in Nigeria dates back to four eras of the slave trade between 1400 and 1900, during which more than 12 million slaves were exported from west, west-central, and eastern African countries (including Nigeria) to European Colonies in the Americas in the 15th century, according to historical records (Mberu, 2010). During this period of slavery, Nigeria suffered a net loss of approximately 2 million forced labour migrants (Dunn, 2008). Aside from that, intraregional migration occurred during this time, which is now referred to as international migration, across national borders to restore ecological balance and in search of new land that was safe for settlement and productive for farming (ECA, 1983). Women were disproportionately represented in

trade-related migration between Nigeria and the Gold Coast (Ghana) during this period, which included both male and female migrants. Indeed, migrants have always regarded West Africa as a single economic unit within which people, goods, and services could freely circulate and trade freely. Also noteworthy is that there was little distinction made between internal and international migration: migration and intraregional labour migration took place between countries that shared similar social and ethnocultural characteristics. It took place regularly, and these factors also made it easier for migrants to relocate once they arrived at their destination (Adepoju, 2008) [3].

Large-scale intraregional labour migration was made possible by colonial rule, as described in Migration in the Colonial Era. The arrival of the British in the mid-19th century provided the framework for large-scale intraregional labour migration. In addition, they introduced export-oriented political and economic policies into the country, which completely transformed the face of migration, particularly intraregional labour migration in Nigeria, and the face of the world. It was necessary to open up new resource-rich areas in Nigeria's northern (groundnuts and tin) and southern (cocoa, kola nuts, rubber and coal) regions to maintain the colonial policy. When there was a demand for labour to keep up with the production of these resources, people were forced to migrate from rural to urban areas to work as migrant tenant workers, farm labourers, miners, and migrant traders, among other jobs.

Migrant labourers from a variety of West African countries, including Burkina Faso, Niger, Chad, Mali, Guinea, Cape Verde, and Togo, were also attracted to work in the mine (Udo, 1975) [18]. As a result of Colonial political-economic policies, inequity in the provision of socio-economic services and infrastructure resulted, with services and infrastructure skewed towards areas that were in the eye of the Colonial masters' political and economic interests. As a result, the rural areas were neglected and virtually abandoned, and the population declined. This resulted in the massive rural-to-urban labor migration that was observed at the time (Udo, 1975) [18]. Intraregional labor flows were exacerbated as cash crops were expanded to generate the foreign exchange required to fund the country's new development aspirations. This was especially true in regions where export crops were produced, such as cocoa belts in southern and western Nigeria and palm oil in eastern Nigeria. In addition, the discovery of petroleum in the Niger-delta region of Nigeria in 1956 resulted in a massive influx of local and international migrant labor to the region, which was subsequently re-located and circulated.

According to Afolayan *et al*. (2008), the arrival of the British in the nineteenth century marked a watershed moment in the history of intra and interregional labor migration, which was dictated by the colonial political economy. Transportation infrastructure was constructed throughout the country, and an export-oriented colonial political-economic system facilitated the intraregional movement of migrant laborers to the then-developing ports of Lagos, Port Harcourt and Calabar among other places. A reference to this latter finding can be found in Adepoju (1996), who asserts that Nigeria's political economy during the colonial period was such that it provided a framework for large-scale migration, which resulted in large numbers of people being employed in mines, plantations, and public administration. Convincing and coercing people to join the workforce was used to recruit them. There was intraregional labor migration between the three regions of

Nigeria (the northern, western, and eastern), which resulted in increased rural-rural migration of migrant tenant farmers, migrants to the tin and coal mines in Enugu and the Jos Plateau, and migrants to the oil fields in the Niger Delta. Even though goods and services were exchanged between the three regions of Nigeria, migrant traders were not left out of the action. The items of trade and the direction of their trade changed as well, shifting from locally produced to imported goods, with the majority of their trade moving in a south-north and north-south direction (Udo, 1975) [18]. There was little change in the seasonal movement of nomads that had been observed during the pre-colonial era, except movements towards more viable locations in the south, which was noted.

Researchers have discovered that migrant workers from various parts of the country, particularly rural areas, have flocked to regional capitals, administrative and market centers in cities such as Lagos, Kano and Zaria; as well cities such as Enugu and Ibadan; Sokoto and Kaduna, among many others, in search of trade and gainful employment (Udo, 1975; Shimada, 1993; Ikwuyatum, 2006) [18, 13]. For example, Abba (1993) reported that between 1914 and 1922, there was a noticeable influx of foreigners into Kano and its environs, which he attributed to the British. It was estimated that between 10,000 and 30,000 Tuaregs from the Niger Republic moved into Kano, Nigeria, during this period. In addition, Afolayan (1998) reported that migrant labourers were relocated to locations and places associated with the construction of the Nigerian Rail line in the 1900s. On the Gold Coast, some of these migrant laborers were employed, and some even took part in the construction of the Tema-Takoradi area and the Cotonou-Parakou area in Dahomey, among other projects (Adegbola, 1972) [4]. According to the available data, approximately 6,500 laborers left Lagos between 1900 and January 1902 to work on the Sekondi-Tarkwa rail line and in the gold mines of the Gold Coast, where wages were higher than those in Lagos at the time. Following the completion of the railway, many Nigerian emigrants settled in Dahomey and began trading, while others moved to Ivory Coast following World War I. Emigrants from Nigeria were attracted to the United States by reports of returnees' financial success; the belief that wealth was easier to accumulate while away from home; and, over time, as wives or new wives joined their husbands in the United States of America (Adegbola, 1972) [4].

The Structural Adjustment Programme (SAP), which was implemented in June 1986, is one such example of this. A change away from the stated objective of full employment and toward a significant reduction in government spending on key services including health, education, and housing was mandated by the SAP. As a result, there was a larger tendency for people to emigrate. In Cote d'Ivoire, for example, there is a disproportionately large number of women traders who shuttle between Lagos and Abidjan. There are also women traders in a few other coastal West African countries (Afolayan, 1998). The COVID-19 era has also brought about untold misery in the economy, with many organizations fighting to exist and, as a result, contributing to an increase in unemployment, which has led to an increase in migration in search of better employment opportunities and livelihood (NBS, 2021) [16].

2.2 Empirical literature review
The empirical literature on migration and unemployment is primarily concerned with the relationship between the two variables, the influence of migration on the unemployment

rate, and, by extension, controlling for effect modification by GDP growth, inflation, and labor wages.

Abiola, A. (2019) [1] conducted a study in Nigeria which he used the ordinary least square (OLS) regression to analyze the relationship between migration, GDP growth, and unemployment using data from a period of 1990 to 2018. The study's findings indicated that there is a statistically significant relationship between migration, GDP growth, and unemployment. The study also finds out that 1% increase in migration resulted to about 29% increase in unemployment. Abiola. (2019) [1] also established that migration have a positive significant effect on unemployment.

Meanwhile, world bank recent study reveals that regional migration rate within the geopolitical zone in Nigeria as well as Migration to outside Nigeria due to conflict, insecurity, COVID-19 pandemic effect and unemployment rate has increased significantly (World bank, 2021) [19]. The study further reveals that high level of unemployment among the Nigeria youth increases migration.

Besides, Akanbi, O. A. (2017) [2] applied ordinary least square regression using secondary data from a period of 1980 to 2016 to investigate the impact of migration on unemployment rate and he found out that migration has a positive impact on unemployment in sub-Saharan countries including Nigeria.

Epiphany and G. Gancia (2005) [11] examined the relationship between unemployment and migration using cointegration analysis. Their findings indicate that the unemployment rate and migration have a long-term link. Additionally, the study indicated that migration will eventually increase regional unemployment.

More precisely, Kikulkolkarn and T. Potipiti (2007) [14] examined the relationship between migration, earnings, and unemployment in Thailand using ordinary least square regression, and discovered a statistically significant relationship between migration, wages, and unemployment rate. According to the study's conclusions, migration exacerbated unemployment.

Numerous studies, including Ahmed et al. (2008) [5], have analyzed the relationship between migration in Nigeria and inflation, unemployment, and wages using a secondary data, concluding that there is a statistically significant relationship between migration, inflation, unemployment, and Nigerian workers' earnings.

Meanwhile, Fromentin (2013) [12] examined the relationship between migration, GDP growth, and unemployment in France using the Johansen cointegration test with secondary data from a period of 1980 to 2012 via quantitative research design, and he discovered that there is a long-term relationship between migration, GDP growth, and unemployment.

Apart from that, Ruist (2013) [17] examined the influence of migration on employment rates and discovered that when ordinary least squares (OLS) regression was used, with secondary data from a period of 1970 to 2012 migration had no statistically significant effect on unemployment rates.

According to S. Darkwah and N. Verter (2014) [10] findings from an economic model approach, the factors of regional migration in Nigeria are unemployment, GDP growth, and worker pay, with unemployment serving as the primary motivation for both internal and foreign movement by Nigerians.

Chamunorwa and Mlambo (2014) [9] applied OLS regression with the use of secondary data from 1985 to 2013 in south Africa to investigate the association between unemployment and migration. They discovered a statistically significant link between migration and unemployment.

F. Rios-Avila and G. Ganavire-Bacaneza (2016) examined the effect of migration on unemployment in the United States of America using linear regression with secondary data spanning from 1975 to 2015 and found that migration had no statistically significant effect on the country's unemployment rate.

Atunc et al. (2017) [6] examined the relationship between migration, unemployment, inflation, and GDP growth using econometric analysis with secondary data from a period of 1989 to 2016. The findings indicate that migration and GDP growth are negatively related. Additionally, significant relationship between GDP growth, inflation, and unemployment, is also established in this study using Turkey's economy as a case study.

R. Celik and I. Arslan (2018) [8] conducted a correlational investigation of the relationship between migration and unemployment in Turkey and discovered a robust and positive relationship between migration and unemployment using primary data collected through the return of 650 questionnaires by the participants of the survey.

Numerous studies indicate that migration has a detrimental effect on unemployment, while some say that migration has a positive effect on the unemployment rate. The primary objective of this research is to examine the relationship between unemployment rate and migration.

3. Data and methodology
This study tends to model the relationship between migration and unemployment with the aid of econometric models. The dependent variable is Nigeria unemployment rate, while the independent variables are migration rate, GDP growth, Nigeria Inflation and Nigeria annual workers wage. The data for this work is a secondary data and will be extracted from the world development indicators database of world bank (data.worldbank.org) to source for Nigeria inflation, GDP growth and wages while www.macrotrends.net to source for Nigeria unemployment rate, migration rate, within a period of 1991 to 2020. It is important to note that migration in this study include both the internal and external migration as the data available for migration is the net migration that covers all.

3.1 Variable measurements

Variables	Measurements (unit)
Nigeria unemployment rate	Percentage (%)
Migration rate	Percentage (%)
GDP growth	Percentage (%)
Inflation	Percentage (%)
Wage	Percentage (%)

3.2 Method of data analysis
The econometric models that will be adopted to examine the relationship between migration and unemployment are ordinary least square (OLS) regression, Unit root test, and Johansen cointegration test. EViews software version 11.0 will be used to estimate the models for this study. Meanwhile, Pearson correlation will also be performed to examine the direction and strength of association between migration and unemployment rate.

3.3 Model specification
The formulated hypothesis will be tested using the functional description of the model which can be expressed as:
Unemployment = f (migration, GDP growth, Inflation and wage).

Meanwhile, Econometrically, the OLS regression model can be written as:

Unemployment$_t$ = β$_0$ + β$_1$Migration$_t$ + β$_2$ GDP growth$_t$ + β$_3$ Inflation$_t$ + β$_4$ Wage$_t$ + ε$_t$ where β$_1$ to β$_4$ are the coefficients of the independent variables while β$_o$ is a constant term. ε$_t$ is the random error term that takes care of all unaccounted factors in the model.

Ordinary least square (OLS) regression is used to determine or predict a continuous dependent variable with one independent variable if it is simple regression model and more than one independent variables for a multiple regression model. It also helps to study the independent variables that influence or have an impact on the dependent variable. Meanwhile, the necessary OLS assumptions such as Normality, autocorrelation and heteroscedasticity will also be examining so as to ensure that the model is robust and reliable.

3.3.1 Decision rule
Reject the null hypothesis (Ho) if the probability value (P-value) is less than the significance level. The acceptable significant levels are 1%, 5% and 10% respectively.

3.4 Unit root test
The unit root test, also known as the stationarity test, indicates the presence of a unit root if the series lacks stationarity and may lead to spurious results and the absence of a unit root if the series does have stationarity. To avoid the problem of spurious results, the unit root test is accomplished through the use of the augmented Dickey-Fuller test (ADF). The hypothesis to accomplish the unit test can be stated as:

H$_0$: there is a presence of a unit root (series is not stationary) vs H$_a$: there is no unit root (the series is stationary). The ADF test can be presented mathematically as:

$$\Delta Y_t = \theta + \gamma Y_{t-1} + \sum_{i=1}^{p} \beta_i Y_{t-i} + \omega_t \qquad (1)$$

Where, θ is a constant, γ is the coefficient of process root, β_i coefficient in time tendency, p is the lag order and ω_t is the disturbance (error) term

3.5 Cointegration test
Johansen cointegration test is an approach for testing cointegration of integrated series with same level I (0) or of order 1, I (1)- after first difference and of order 2, I (2). This test permit more than one cointegrating relationship. So, it is usually conducted after testing for the stationarity of the series (variables of interest) which is based on the Dickey-fuller (or augmented) test for unit root. There are two types of Johansen test which are the trace and max eigen value, and they form the basis of the inference or decision and their result might be little different from other.

3.6 Correlation analysis
To understand the direction of relationship between two variables, we will adopt Pearson correlation coefficient (r) which lies between -1 and +1.

Correlation is a measure of direction, strength and association between variables. To understand the direction of relationship between two variables, we will adopt Pearson correlation coefficient (r) which lies between -1 and +1 in this study. Besides, the test of significance of correlation has the hypothesis: Ho: *P = 0 vs H1: P ≠ 0.* The statistical software applied for the computation is EViews version 11.0

4. Result and Discussion

Table 1: Summary statistics

Variables	N	Min	Max	Mean	Standard Dev
Unemployment	30	3.59	9.01	4.5710	1.72177
Migration	30	-.404	-.165	-.27973	.080306
GDP growth	30	-2.04	15.33	4.0947	3.90726
Inflation	30	5.39	72.84	18.4553	16.79738
Wage	30	14.93	18.85	17.0643	1.46299
Unemployment	30	11.02	2.66	5	15

Source: Author's computation using EViews software

Table 1 shows that on the average unemployment is about 5% of the 30 observations, migration is about -0.3% on average which implies more people leave their state of origin than receiving people there, GDP growth is about 4% on average, Inflation is about 18% on average, and labor wage is about 17% on the average. However, inflation tends to have the highest mean value with highest variability of about 17% from the mean.

Table 2: Ordinary least square (OLS) regression

Variables	Coefficient estimate	STD error	Test statistic	P-value
Unemployment				
Migration	36.785	6.234	5.900	0.0000
GDP growth	-0.081	0.052	-1.541	0.1357
Inflation	0.012	0.012	0.999	0.3272
Wage	2.541	0.349	7.290	0.0000
Constant	-28.393	4.600	-6.172	0.0000
Model P-value	0.0000			
R-squared	0.7913			

Source: Author's computation using EViews software

Table 2 shows that migration (β = 36.785, *P*<0.01) which indicate that migration is statistically significant and therefore have a positive significant impact on unemployment in Nigeria. The coefficient estimates of 36.785 tells us that for 1% increase in Migration, unemployment will also increase by about 37%. Similarly, Wage (β = 2.541, *P*<0.01) implies that wage is statistically significant and therefore have a positive significant impact on unemployment. The coefficient estimates of 2.541 implies that for 1% increase in the labor wage, unemployment will also rise by about 3% which is consistent with current happening in Nigeria as employer could not employ labor with high wage demand. Besides, the coefficient of determination R-squared = 0.7913 which indicate that about 79% variation in unemployment can be explained by migration and other controlled variables such as GDP growth, inflation and wage. The overall model *P*<0.01 which means that the fitted OLS regression is statistically significant and this indicate a significant relationship between Unemployment, migration, GDP growth, inflation and wage. This suggest that the model is a good fit for the data and it is very suitable for future prediction of unemployment rate.

Table 3: Correlation analysis

	Unemployment	Migration	GDP growth	Inflation	Wage
Unemployment	1.000	-.0.162	-0.430**	-0.135	0.467*
Migration	-0.162	1.000	-0.355	0.488*	-0.928*
GDP growth	-0.430**	-0.355	1.000	-0.407**	0.191
Inflation	-0.135	0.488*	-0.407**	1.000	-0.541*
Wage	0.467*	-0.928*	0.191	-0.541*	1.000

Source: Author's computation using EViews software
Where ** and * are asterisk for 5% and 1% significant level respectively

Table 3 reveals that there is a negative correlation between migration and unemployment (r = -0.162) and this indicate that the higher the migration rate, the lower will be the rate of unemployment in the country. Unemployment and GDP growth (r = -0.430, $P<0.05$) indicate a negative and significant association between GDP growth and unemployment rate. Unemployment and wage (r = 0.467, $P<0.01$) implies that there is a positive and significant relationship between unemployment and wage. GDP growth and migration (r = -0.355) indicate that GDP growth and migration are negatively related. Migration and inflation (r = 0.488, $P<0.01$) indicate a positive and significant relationship between migration and inflation.

Table 4: Unit root test (Augmented Dickey fuller)

Differenced Variables	Test statistic	P-value	Order
Unemployment	-3.39	0.0227**	I (0)
Migration	-5.02	0.0004*	I (2)
GDP growth	-7.23	0.0000*	I (1)
Inflation	-4.25	0.0027*	I (1)
Wage	-3.17	0.0328**	I (1)

Source: Author's computation using EViews software
Where ** and * are asterisk for 5% and 1% significant level respectively

Table 4 shows that unemployment becomes stationary at zero level without differencing the series. Migration becomes stationary after the second difference which means migration is integrated of order 2 while GDP growth, inflation and wage become stationary after the first difference using the augmented dickey fuller approach of unit root test. Since all the series are confirmed stationary, then further econometric analysis such as cointegration can be perform.

Table 5: Johansen Cointegration test

Series: Unemployment Migration Gdp_Growth Inflation Wage				
Lags interval (in first differences): 1 to 2				
Unrestricted Cointegration Rank Test (Trace)				
Hypothesized	Trace		0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.682597	76.81571	69.81889	0.0124
At most 1	0.583599	45.83097	47.85613	0.0765
At most 2	0.379709	22.17607	29.79707	0.2888
At most 3	0.289719	9.281764	15.49471	0.3400
At most 4	0.001674	0.045228	3.841466	0.8316
Trace test indicates 1 cointegrating eqn (s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				

Source: Author's computation using EViews software

Table 5 shows that one of the cointegrating equation is statistically significant at 0.05 level and its trace statistic (76.816) is greater than the critical value (69.819) which indicate that the series cointegrate and this implies that there is a long run association between Unemployment, migration, GDP growth, inflation and wage.
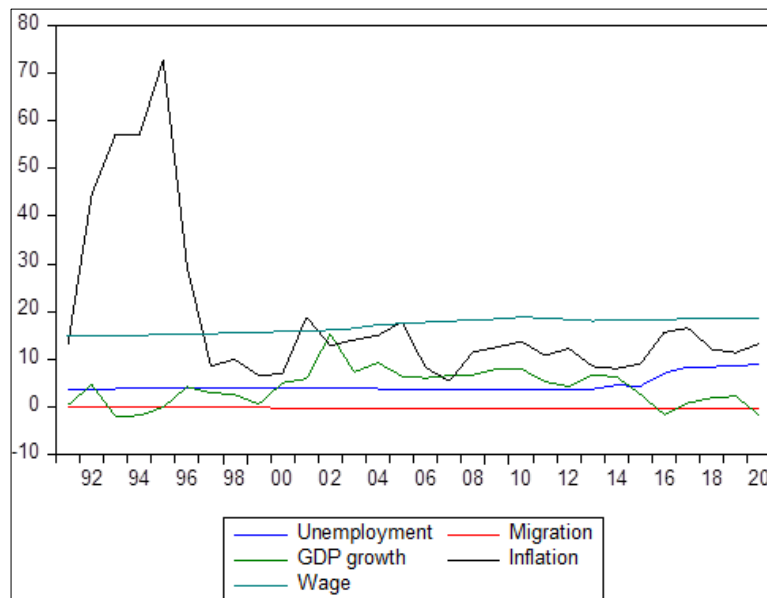
Fig 1: Line graph of Unemployment, migration, GDP growth, Inflation and Wage

Figure 1 shows the line graph of Unemployment, migration, GDP growth, Inflation and Wage from 1991 to 2020 being the period under review. We can see from the graph that there is a sharp rise in inflation rate from 1991 to 1995 and then decline to 1996 with consistent fluctuation in the inflationary rate from 1996 to 2020. The graph also show that wages and GDP growth are not also stable from 1991 to 2020. Meanwhile, unemployment and migration be seen to appear constant over time expect for the unemployment for the unemployment that suddenly rise from 2015 to 2020 and it appear more peak in 2020 due to the effect of COVID-19 pandemic.
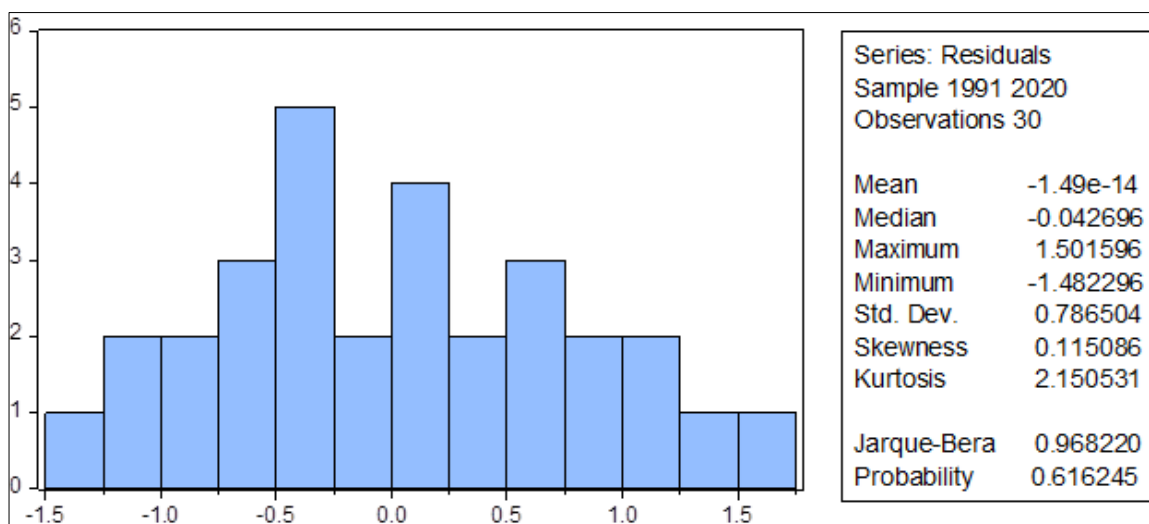
4.1 Assumption test

Fig 2: Normality test

Figure 2 shows the test of normality of the residual error ($P>0.05$) using Jarque-Bera test and the test reveal that the residual error is normally distributed which satisfy the ordinary least square (OLS) assumption of normality and this make the model more valid.

Table 6: Heteroscedasticity and Autocorrelation

Test	Chi-squared value	P-value
Heteroscedasticity	16.838	0.8876
Autocorrelation	2.105	0.7165

Source: Author's computation using EViews software

Table 6 shows the test of autocorrelation and heteroscedasticity test of the model and we can see that p-values for both are greater than 0.05 ($P>0.05$) which means that there is no presence of autocorrelation and heteroscedasticity. This implies that the model does not suffer from the problem of autocorrelation and heteroscedasticity. This also satisfy the ordinary least square assumption.

4.2 Discussion of Findings

Table 1 shows that the average unemployment rate is approximately 5% of the 30 observations, migration is approximately -0.3 percent on average, which indicates that more people leave their state of origin than are welcomed there, GDP growth is approximately 4% on average, inflation is approximately 18% on average, and labor wages are approximately 17 percent on average, all based on the analysis of this work. Inflation, on the other hand, has the highest mean value and the greatest variability, with a standard deviation of approximately 17 percent from the mean.

Table 2 shows that migration ($\beta= 36.785$, $P<0.01$) has a statistically significant impact on unemployment in Nigeria, indicating that migration is statistically significant and, as a result, has a positive significant impact on unemployment in Nigeria. According to the coefficient estimates of 36.785, for every one percentage point increase in migration, unemployment will increase by approximately 37 percent as well. A similar result is obtained by looking at Wage ($\beta = 2.541$, $P<0.01$), which indicates that wage is statistically significant and, therefore, has a positive significant impact on the unemployment rate. According to the coefficient estimates of 2.541, for every one percent increase in the labor wage,

unemployment will rise by approximately three percent, which is consistent with what is currently happening in Nigeria, where employers are unable to employ workers due to high wage demand. Furthermore, the coefficient of determination R-squared = 0.7913 indicates that migration and other controlled variables such as GDP growth, inflation, and wage can explain approximately 79 percent of the variation in unemployment. It is statistically significant that the fitted OLS regression is statistically significant, which indicates that there is a significant relationship between Unemployment, migration, GDP growth, inflation, and wage in the overall model ($P<0.01$). This suggests that the model provides a good fit for the data and is particularly well suited for forecasting the unemployment rate in the future.

Table 3 reveals that there is a negative correlation between migration and unemployment (r = -0.162), which indicates that the higher the rate of migration, the lower the rate of unemployment in the country will be in the future. In this case, the relationship between unemployment and GDP growth (r = -0.430, $P<0.05$) indicates a negative and statistically significant relationship between GDP growth and unemployment rate. The positive and statistically significant relationship between unemployment and wage (r = 0.467, $P<0.01$) indicates that there is a positive and statistically significant relationship between unemployment and wage. The negative relationship between GDP growth and migration (r = -0.355) indicates that GDP growth and migration are negatively related, which is consistent with the findings of Atunc *et al.* (2017) [6]. Inflation and migration (r = 0.488, $P<0.01$) indicate that there is a positive and statistically significant relationship between migration and inflation

Table 4 demonstrates that unemployment becomes stationary at the zero level when the series is not differentiated. While migration becomes stationary after the second difference, implying that migration is integrated on the second level of integration, GDP growth, inflation, and wage growth all become stationary after the first difference when utilizing the augmented dickey fuller technique of the unit root test. Given that all of the series have been proved stationary, it is possible to conduct additional econometric analysis such as cointegration.

Unemployment, migration, GDP growth, inflation, and wage are all shown to be associated in Table 5 at the 0.05 level, with the trace statistic (76.816) being greater than the critical

value (69.819), indicating that the series cointegrate over the long run.

The ordinary least square assumption test, on the other hand, demonstrates that the assumptions of normality, autocorrelation, and heteroscedasticity have been met, and that the model's results are valid and dependable.

5. Conclusion and recommendation

The primary goal of this study is to apply an econometric model to investigate the relationship between unemployment rate and migration in Nigeria. And from the findings above, we can see that ordinary least square regression was used, and that the regression model was found to be statistically significant. This indicates that there is a significant relationship between unemployment, migration, GDP growth, inflation, and wage, which is consistent with the work of Abiola, A. (2019) [1], Akanbi, O. A. (2017) [2], R. Celik, and I. Arslan (2018) [8]. In this case, R-squared = 0.7913 indicates that approximately 79 percent of the variation in unemployment can be explained by migration and other controlled variables such as GDP growth, inflation, and wage growth. This suggests that the model provides a good match for the data and is particularly well suited for forecasting the unemployment rate in the future. Meanwhile, the regression model reveals that migration is statistically significant and, as a result, has a positive significant impact on unemployment in Nigeria, which is consistent with Abiola's research (2019) [1]. Migration has a coefficient estimate of 36.785, which means that for every one percent increase in migration, unemployment will increase by approximately 37 percent. It was then determined whether or not the series is stationary using the augmented dickey fuller test and then cointegration analysis was performed using the Johansen cointegration test, which revealed that there is a long-run relationship between unemployment, migration, GDP growth, inflation and wage that is consistent with the work of Fromentin (2013) [12].

The graph in figure 1 shows, on the other hand, that there is a sharp increase in the inflation rate from 1991 to 1995, followed by a decline until 1996, with a consistent fluctuation in the inflationary rate from 1996 to 2020. In addition, the graph demonstrates that wages and GDP growth have not remained stable from 1991 to 2020. Meanwhile, unemployment and migration have been observed to remain constant over time, with the exception of unemployment, which has suddenly increased from 2015 to 2020 and appears to have reached a peak in 2020 as a result of the effect of the COVID-19 pandemic (see figure 1).

In light of the foregoing, it is recommended that the government implement useful policies that will improve productivity, which will in turn create gainful employment, as well as raise the standard of living of citizens throughout the country's geopolitical zones, thereby better managing migration and unlocking Nigeria's greater economic potentials.

6. References

1. Abiola A. Labor migration, unemployment and economic growth in Nigeria: An ordinary least square regression approach. International Journal of Research and Scientific Innovation. 2019;6(8):2321-2705.
2. Akanbi OA. Impact of migration on unemployment rate: Case of sub Saharan African countries. International Journal of Social Economics. 2017;44(5):683-695.
3. Adepoju Aderanti. Migration and social policy in sub-Saharan Africa February 2008 prepared for the UNRISD – IOM – IFS project on Social Policy and Migration in Developing Countries, 2008.
4. Adegbola O. The impact of migration on the rural economy of Osun division of western Nigeria. Unpublished Ph.D. Dissertation, Department of Geography, University of Ibadan, Ibadan Nigeria, 1972.
5. Ahmad N, Hussain Z, Sial MH, Husaain I, Akram W. Macroeconomic Determinants of International Migration from Pakistan, Pakistan Economic and Social Review. 2008;46(2):85-99.
6. Altunç ÖF, Uçan O, Akyıldız A. The Effects of Immigration on Unemployment, Inflation and Economic Growth in Turkish Economy: An Econometric Analysis (1985-2015), Social Science Studies. 2017;5(8):197-212.
7. Castles S. Methodology and Methods-Conceptual Issues In: African Migrations Research Innovative Methods and Methodologies Edited by Mohamed Berriane and Hein de Haas, African World Press, 2012, 31-70.
8. Çelik R, Arslan I. The Relationship between Migration and Unemployment: An Empirical Investigation, Journal of Social Policy Conferences. 2018;74:65-75.
9. Chamunorwa W, Mlambo C. The Unemployment Impact of Immigration in South Africa. Mediterranean Journal of Social Sciences. 2014;5(20):2631-2640.
10. Darkwah SA, Verter N. Determinants of International Migration: The Nigerian Experience, Acta Unıversıtatıs Agrıculturae Et Sılvıculturae Mendelıanae Brunensıs. 2014;62(2):321-327.
11. Epiphany P, Gancia GA. Trade, migration and regional unemployment, Regional Science and Urban Economics. 2005;35:625-644.
12. Fromentin V. The relationship between immigration and unemployment: The case of France, Economic Analysis & Policy. 2013;43(1):51-66.
13. Ikwuyatum GO. A Spatial Analysis of Rural Out-migration and its consequences in Benue State, Nigeria. Department of Geography University of Ibadan, Nigeria, 2006.
14. Kulkolkarn K, Potipiti T. Migration, Wages and Unemployment in Thailand. Chulalongkorn Journal of Economics. 2007;19(1):1-22.
15. Mabogunje AL. Systems approach to a theory of rural-urban migration. Geographical Analysis. 2004;2(1):1-8.
16. NBS. National bureau of statistics report on migration and unemployment in Nigeria, 2021.
17. Ruist J. The labor market impact of refugee immigration in Sweden 1999-2007, The Stockholm University Linnaeus Center for Integration Studies (SULCIS), Working Paper, 2013, (1).
18. Udo RK. Migrant tenant farmers of Nigeria: a geographical study of rural migrations in Nigeria. African University Press, Lagos, 1975.
19. World Bank. Managing migration can help unlock Nigeria's unrealized economic potential, 2021.