Unemployment, Inflation and Productivity Nexus; Evidence from Nigeria

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Abstract
This study looked at the relationship between the nexus between unemployment, inflation and Productivity growth in Nigeria. Investigating the long-term relationships between productivity growth, unemployment rate, labor input, capital input and inflation rate is the aim of the study. The secondary data needed for the analysis came from the Central Bank of Nigeria (CBN) Statistical Bulletin and the World Bank development indicators. Co-integration and Error Correction Methodology (ECM), was used to estimate the equation. Our research revealed an inverse relationship between productivity growth (Y) and unemployment (UNEM) in the long run while having a positive relationship in the short run. However, labor input (LAB) and productivity growth (Y) both in the short and long run exhibit direct relationship conforming to the a priori expectation. In addition. There is inverse relationship between productivity growth (Y) and capital input in the short run while having a positive relationship in the long run. It shows an inverse relationship between productivity growth (Y) and inflation rate in the long run while having a positive relationship in the short run. Based on the findings, this study recommends that concerted efforts should be made by the government to provide basic infrastructural facilities such as electricity, good road, pipe borne water and so on. So as to increase level of output in all sectors of the economy.

Keywords: Unemployment, Inflation rate, Labor input, Capital input and Productivity growth

Introduction

Inflation, which connotes the general increase in the price level, is broadly an average measure because at any point in time, prices may be increasing, decreasing or constant; a persistent increase in prices hurts the economy, particularly the poor who have little or no savings to cushion rising prices. The average person in any household or family knows when the money in his possession can only purchase less quantity of goods and services than was previously possible. Generally, economic agents (households, private sector and government) would raise an alarm because their earnings have declined in real terms due to rising prices. It is even worse when uncertainty follows price increases (Nwaobi, 2019).

The trends in economic growth rates, unemployment and inflation in Nigeria over the years have been puzzling. The data obtained from the Central Bank of Nigeria (CBN) statistical bulletin revealed that by 1986 economic growth rate stood at 3.1 percent, in 1987 the value became negative -0.69 implying retrogression and was the least ever achieved for the period under review; the highest economic growth rates achieved was 11.36 in 1990 after which the rates has been abysmally until in 2003 when the growth rates hits 10.2 percent; from 2003 economic growth rate has been less than 10 percent, in 2012 the growth rate recorded was 6.58. The trend in economic growth has been fluctuating over the years under review. Furthermore, the trend revealed that by 1986 unemployment rate was 5.3 percent while inflation rate was 5.4 percent. Both unemployment rates and inflation rates were not stable but fluctuating over time. The lowest rates of unemployment and inflation recorded were 1.8 percent and 0.2 percent in 1995 and 1990 respectively. Unemployment reaches 24.7 percent by 2012 while inflation reaches the highest in 1999.

The rapid depreciation of the naira exchange rate since 1986 and the inability of most industries to obtain adequate raw materials required to sustain their output levels fuelled inflation. There was rapid depreciation of the naira which caused sharp rise in the general price level, leading to a significant decline in real wages and increased poverty. The low wages contributed to a weakening of the purchasing power of wage earners and declining aggregate demand. Consequently, industries started to accumulate unintended inventories. Economic growth in Nigeria was not encouraging between 1986 and 2012. The continuous economic crisis reflected in high inflationary pressure, high level of corruption, exchange rates distortions, debt overhang, high rates of unemployment to mention a few. Unemployment and inflation are two twin evils that have eaten deep into the fabric of the Nigerian economy over the years.

The economy has continued to witness economic recovery which is immediately followed by economic recession and depression. The situation in Nigeria is disturbing. The various macroeconomic policies by government have been unable to achieve sustained price stability, reduction in unemployment and sustained growth cannot be achieved. The poor state of the economy has confirmed the need to manage the economy effectively. The essence of macroeconomic management underlines the rationale for the existence of government as a vital economic agent. However, it appears that government intervention has not been able to cure the ills in the Nigerian economy. The continued economic crisis, with the associated problems of high inflationary pressure, high exchange rate, and debt overhang, adverse balance of payment and high inflation rates is difficult to explain. Against a high rate of unemployment and underemployment, a large public sector, low wages and poor working conditions has been persistent high inflation rates in Nigeria. Also, underemployment and unemployment is a prominent feature of the Nigerian economy. Consequently, the full potentials of labour-surplus economy have not been fully exploited.

The main goals of macroeconomic policies were the achievement of high, rapid and sustained economic growth, stable low unemployment and relative price stability but the aforementioned

trends indicate the contrary. Among the major challenges of policy makers were how to achieved and maintain low and stable unemployment rate as well as relatively low prices so as to achieve high economic growth. In lieu of the aforementioned, this study examines the effect of unemployment and inflation on economic growth in Nigeria covering the period of 1986 to 2022. The current paper proceeds as follows, section 2 of the paper presents and briefly reviews relevant literatures and theories which have provided possible causal links between productivity inflation and unemployment the next section presents the research methodology that is to be adopted by the study, while section 4 provides discussion and interpretation of empirical result. Section 5 summarizes the main results and presents the conclusions.

2.0. Theoretical Foundation and Empirical Review
2.1. Theoretical Foundation

2.1.1 The Theory of Real Business Cycles

This theory contents that the growth of productivity of input which revolutionizes technology is the main sources of employment and unemployment that is, if the growth of output increases more than the growth of inputs, which makes the total factor productivity or the Solow's residual to receive increasing attention. For instance, if total factor productivity is not growing then firms and economies become inefficient. This therefore, follows that r reallocation of labour and capital cannot be achieved and that labour and capital will be used in less profitable opportunities. Hence, the rate of unemployment will rise according to (Chatterjee, 1995 and 1999)

As a matter of fact, many factors are likely to be responsible for the slowdown in the total factor productivity (TFP). Hence, technology may not be an improving factor of the production of goods and services while workers skills are not being enhanced. Once there is no invention in a firm and nation at large and there is continuous increase in the prices of imported goods. This in turn pinpoints a tendency for the TFP to be stagnant, such that, the co-movements in other important variables are likely to be equally slow down, hence leading to fall in productivity growth.

2.1.2 Theory of effective demand

This theory was developed by Malthus, Marx Veblen, and Keynes (1936) where they considered unemployment as an involuntary phenomenon. Keynes thought that unemployment was basically cyclical, generated by the deficiency of aggregate demand in his opinion, capitalists hire workers and invest such labor to produce – output when the expectations about the economy and profits are favorable or optimistic. To him, if expectations about the future are supported by the economic reality, investments will be increasing such that employment will continue to rise until the equilibrium condition is reached. This equilibrium is however obtained by the intersection of aggregate demand and supply – the point of effective demand will and may be less than the full employment equilibrium; such that if expectation about the future of the economy is not favourable, the capitalists will reduce investment thereby making unemployment to rise. Hence, equilibrium is achieved where unemployment exists. This unemployment is due to the deficiency of aggregate demand particularly investment expenditure.

Having reviewed the above theories, the standpoint of this current study is based on the Keynesian and Veblen's theory which believes that unemployment is typically cyclical that emanates from

the deficiency of aggregate demand from a capitalist point of view who hires and invest in workers with the aim of producing output which in turn reduces unemployment and induce productivity in the long run all things being equal.

2.3   Empirical Review

As a matter of fact, many researchers have attempted to investigate the nexus between inflation, unemployment and productivity growth in both developing and developed economies. For instance, Frimpong and Oteng-Abayie (2019) analyzed the threshold effect of inflation on economic growth in Ghana for the period of 1960–2018 by using threshold regression models. The result indicated an inflation threshold level of 11% at which inflation starts to significantly harm economic growth in Ghana. At or below the 11% level, inflation was likely to have a mild effect on economic activity, while above this threshold level, inflation would adversely affect economic growth.

Madito and Khamalo (2018) examined the impact of unemployment and inflation on economic growth in South Africa. The paper uses quarterly data from 1967 to 2017 in an error-correction regression model. The results show that unemployment has no impact on economic growth in South Africa. In a study by Saidu and Muhammad (2019), the flow of causality between unemployment, inflation, and economic growth in Nigeria was investigated. The results indicate that inflation affects economic growth, but growth does not cause inflation. While there was no causality between economic growth and unemployment.

Muryani and Pamungkas (2018) investigated the impact of unemployment, inflation, government spending, labor force, and gross fixed capital formation on Indonesian economic growth.The study estimated the parameters of the population regression using an error correction model (ECM). The results showed that unemployment and gross fixed capital formation promote economic growth. Economic growth is slowed by the labour force and inflation.Government expenditure has no effect on economic growth.

The impact of unemployment on economic growth was investigated by Makaringe and Khobai (2018) for South Africa. They employed quarterly data from 1994 to 2016 in an ARDL regression model. The results of the study showed that unemployment depresses South Africa's economic growth. Tenzin (2019) investigated the impact of unemployment and inflation on economic growth in Bhutan using data from 1998 to 2016. The study uses an autoregressive distributed lag (ARDL) model to estimate the parameters of the regression model. The results show that unemployment has no impact on economic growth in Bhutan, both in the short-run and the long-run. Inflation has an impact on economic growth in the long run, indicating that inflation causes uncertainty.

A recent study was carried out by Gachoki (2021) on the impact of inflation and unemployment on economic growth in Kenya for the period 1960 to 2019. The study adopted the Vector Error Correction Model in estimating the short run and long run effects. The outcome of the results revealed that GDP per capita growth does not seem to have a direct long-term relationship with unemployment, and neither does unemployment have a direct long-run relationship with GDP per capita growth.

Joao and Francisco (2019) conduct research on does high inflation affect growth in the long and short-run in Brazil?. They used Vector Autoregressive technique. They found a zero long-run response of output to a permanent inflation shock in the context of a high inflation country, and that inflation and output are reliably related in the long-run. The results indicated that in the short-run, there is a negative impact of inflation on output. Mohsin and Abdelhak (2019) conduct research on threshold effects in the relationship between inflation and growth (a comparative study of industrial and developing countries) and found that the threshold is lower for industrialzed countries than it is for developing countries. They also found negative and significant relationship between inflation and growth above the threshold level. They suggested low inflation for sustainable growth.

Vikesh and Subrina (2018) conduct research on the relationship between inflation and economic growth in Fiji, they used simple correlation and causality techniques and found that there was a weak negative correlation between inflation and growth, while a change in output bears significant bearing on inflation. The causality between the two variables ran one-way from GDP growth to inflation.

Williams and Adedeji (2014) examine price dynamics in the Dominican Republic by exploring the joint effects of distortions in the money and traded-goods markets on inflation, holding other potential influences constant. They captured the remarkable macroeconomic stability and growth for period 1991 to 2002. Using a parsimonious and empirically stable error-correction model, they found that the major determinants of inflation were changes in monetary aggregates, real output, foreign inflation, and the exchange rate. However, there was an incomplete pass-through of depreciation from the exchange rate to inflation. They also established a long-run relationship in the money and traded-goods markets, observing that inflation was influenced only by disequilibrium in the money market.

Ayesha and Rukhsana (2019) investigate the impact of inflation and economic growth on unemployment in Pakistan. They used Augmented Dickey Fuller test and Johansen- Juselius Maximum Likelihood techniques. They found that inflation significantly increased unemployment in the long term; economic growth had a significantly adverse impact on unemployment in the long run and short run respectively. Fakhri (2021) conducts research on the relationship between inflation and economic growth in Azerbaijan, he used Threshold model and found that there is a nonlinear relationship between inflation and economic growth with the threshold level of 13%.

3.0. Research Methodology
3.1. *Data and Sources*

This study used annual data to examine the nexus between inflation, unemployment and productivity in Nigeria between 1986 and 2022. Yearly data on gross domestic product (y), capital stock (cap), government expenditure (gxp) and inflation rate (ifr)are collected from the Central Bank of Nigeria (CBN) statistical bulletin. Also, yearly data on unemployment (uem) rate is collected from the National Bureau of Statistics (NBS) while labour force (lab) is obtained from the World development indicator (WDI) of the World Bank. Variables including economic growth,

capital stock, government expenditure and labour force were transformed into logarithms form while inflation rate and unemployment rate were analyzed in their level form.

3.2 *Variable Measurement*

Economic growth is measured by real gross domestic product (rgdp) which is calculated by deflating
nominal gross domestic product by domestic consumer price index. Government expenditures *(gxp)* would be measured by the aggregation of the capital and recurrent expenditure of the government while capital stock is measured by the gross fixed capital formation. Labour force is measured by the total labour force as provided by the WDI while inflation rate (inf) is measured by the annual inflation rate.

3.3 *Method of Analysis*

To examine the relationship between unemployment rate, inflation rate and productivity growth in Nigeria, taking into cognizance other explanatory variables in equation (2), this study utilized the co-integration and Error Correction Methodology (ECM). On the one hand, most economic variables are observed to be non-stationary (that is, the means and variances of these economic variables are not constant). Therefore, for valid estimation and inference, a set of non-stationary variables must be co-integrated, that is, a linear combination of these variables that is stationary must exist (WakeFord,2017). On the other hand, the Error-Correction Methodology (ECM) enable us to integrate both short-run dynamic and long-run equilibrium models in a unified system while at the same time ensuring theoretical rigor and data coherence and consistency (Nwachukwu and Odigie, 2009).In applying this error correction mechanism the lag length on all the variables is set at two, to allow for sufficient degrees of freedom.

3.4 *Model Specification*

To examine the relationship between productivity growth, inflation and unemployment, the study specified a simple linear model as follows: *:*

$$Y = \alpha_0 + \beta_1 UEM_t + \beta_2 LAF_t + \beta_3 CPT_t + \beta_{4t} IFR + + \varepsilon_t \dots\dots\dots\dots\dots\dots(1)$$

Where Y = productivity growth and UNEM is unemployment rate, labor force (LAF), capital (CPT), inflation rate (IFR), equation (1) becomes

In order to estimate the short-run relationship among variables in equation (2), the corresponding error

correction equation is estimated as:

$$\Delta Y_t = \alpha_0 + \sum^2 \beta_1 \Delta Y_{t-i} + \sum^2 \beta_2 \Delta UMEt_- + \sum^2 \Delta \beta_3 I + LABt_- + \sum^2 \Delta \beta_5 + CAPt_- + \sum^2 \Delta \beta_5$$

$$i \quad IFR\ t{-}i_- + \sum^2 \Delta \beta_5 + \psi ECM_{t-1} + \varepsilon_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(2)$$

$i=1$

The ECM_{t-1} is the error correction term. The coefficient of the ECM_{t-1} measures the speed of adjustment towards the long run equilibrium

4 RESULTS AND DISCUSSION OF FINDINGS
4.1 Unit Roots Outputs
Since the study used time series data, the first step is to establish the stationarity or otherwise of the variables, a unit root test was carried out by using the ADF methodology.

Table 4: Summary of ADF Unit Root Test with trend and intercept

Variable	ADF test statistics	Mackinon Critical value @ 5%	No of time difference	Remark
LN UEM	-4.011201	- 2.352543	I (1)	Stationary
LN LAB	-7.226141	-2.501021	I (1)	Stationary
LN CAP	-6.115221	-2.732020	I (1)	Stationary
LN IFR	-6.236130	-2.420211	I (1)	Stationary

Source: Computed by the Authors

The results of unit root test above indicate that the variables used in the study which are *is unemployment rate (UNEM), labor force (LAF), capital (CPT), and inflation rate (IFR),* in the country are integrated of the same order of I (1) respectively – This means that the variables are stationary at their respective first difference

4.2 Co-integration Test Results
Having established the stationarity of the variables, we determine the existence of a long run equilibrium relationship among the variables in the model. To undertake, this study employs the Johansen Co-integration techniques. The results are presented below:

Table 5:Johansen Co-Integration Test.(Trace Statistics)

Hypothesized number of (ECS)	Eigen value	Trace statistics or likelihood ratio	5% critical value	Prob**
None*	0.504650	50.04365	36.74513	0.0012
At most 1*	0.360869	21.24548	17.68601	0.0138
At most 2	0.221047	10.64205	13.40071	0.2105
At most 3	0.035186	2.013450	3.321461	0.1042

Source: Computed by the Authors (2025)

From Table 5 above there exist a long run equilibrium relationship in the model. The trace statistics shows that there are 2 Co-integration equations among series since the likelihood ratio (50.04365) is greater than 5 percent critical value (36.74513) at None hypothesized No of Ecs (None*) and (21.24548) is greater than (17.68601) at 5% critical value.

Table 6: Johansen Co-Integration Test (Maximum Eigen Statistics)

Hypothesized No of Ecs	Eigen Value	Max Eigen Statistics	5% Critical Value	Prob**
*None**	0.505642	20.55437	17.43430	0.0135
At most 1	0.350858	16.39231	17.12052	0.0631
At most 2	0.221286	6.257288	12.25350	0.3420
At most 3	0.074475	2.593544	3.741354	0.1062

Source: **Computed by the Authors (2024)**

From Table 6 above, it shows that there exist a long run equilibrium relationship in the model using the Maximum Eigen statistics (20.55437) which is greater than 5 Percent critical Value (17. 43430) at None hypothesized No of ECS (None*). All the variables therefore stand significant. Having established the long run relationship among the variables in the model, we switch to the short run Error Correction Model

Table7: **Long Run Results**

Variable	Coefficient	Std. Error	t statistics	Probability
C	-3.125515	0.610542	-2.147238.	0.0336
LN UEM	-0.078353	0.125133	-0.651443	0.4171
LN LAB	1.101437	0.264112	2.868532	0.0045
LN CAP	1.045144	0.217507	3.160120	0.0023
LN IFR	-0.103506	0.142070	-1.012755	0.0016

Source**: Computed** b**y the Authors from data (2024)**

From table 7 above, the results of the long-run shows that productivity growth is inversely related to unemployment rate in the country which is in line with the a priori prediction. However, labor force in the country and Gross productivity growth exhibit direct relationship conforming to the a priori expectation. Capital in the country and productivity growth exhibit direct relationship conforming to the a priori expectation. .Inflation Rate in the country and productivity growth exhibit an inverse relationship conforming to the a priori expectation.

4.3 Error Correction Model (ECM)

The error correction model measures the speed of adjustment to equilibrium. The result of the Error Correction Model (ECM)conforms to the rule if the value of its coefficient is negatively signed and also statistically significant if the p-value is found ≤ 0.05.The result obtained demonstrate that the present value of the dependent variable will adjusts back to long-run equilibrium in the independent variable at speed of 57 percent approximately. A higher percentage of ECM indicates a feedback of that value or an adjustment of that value from the previous period disequilibrium of the present level of dependent variable and the present and past level of the independent variables. The over-parameterized ECM is being made by the lagged value of each variable while the parsimonious ECM consider the variables that adjust rapidly to equilibrium among the lagged variables. The table 7 and 8 below show the result of both over parameterized and parsimonious ECM on the specified parameters.

Table 8: Over-parameterized ECM

Variable	Coefficient	Std. Error	t statistics	Probability
C	0.200507	0.245101	0.471153	0.2104
D(LN UEM)	-0.353320	0.206132	-1.512012	0.0516
D(LN LAB)	0.300165	0.254338	1-130617	0.2261
D(LN CAP)	0.151160	0.210930	0.673650	0.2316
D(LN IFR)	0.012125	0.140401	1.137224	0.2320
D(LN UEM(-1))	0.026701	0.237161	0.206531	0.4140
D(LN LAB(-1))	-0.076171	0.267531	-0.231120	0.5402
D(LN CAP(-1))	-0.054051	0.166201	-0.176023	0.3302
D(LN IFR(-1))	0.181000	0.210710	0.561140	0.2014
D (LN UEM (-2))	-0.041122	0.072430	-0.113271	0.5001
D((LN LAB (-2)	-0.148063	0.217140	-0.539004	0.3221
D(LN CAP (-2))	0.134100	0.164017	0.536360	0.2105
D(LN IFR(-2))	0,267052	0.248330	1.112913	0.2405
D (LN UEM (-3))	-0.51022	0.170439	-0.357220	0.5002
D((LN LAB (-3)	0,267052	0.248330	1.112913	0.2301
D(LN CAP (-3))	-0.102234	0.205162	-0.541273	0.3152
D(LN IFR(-3))	0,144030	0.246140	1.111702	0.2306
(ECM(-1)	-0.050639	0.124101	-0.209027	0.4611

Source; Computed by the Authors from data (2025)

Table 9: Parsimonious ECM

Variables	Coefficient	Std Error	T. Statistics	Probability
C	0.216310	0.257241	0.841701	0.2391
D(LNUEM)	0.509211	0.205710	2.324232	0.0171
D(LNLAB(-1))	0.171826	0.160152	1.006211	0.2180
D(LNCAP(-1))	-0.211418	0.170521	-1.121912	0.2347
D(LNIFR(-1))	0,253046	0.234631	1.111711	0.2314
ECM (-1)	-0.570172	0.134052	-2516536	0.0123

Source: Computed by the Authors from data (2025)

The table 8 and 9 above show the over-parameterized and parsimonious results. The negative sign of ECM values in both table 7 and 8indicate that the ECM is appropriately signed also statistically significant at the 0.05 per cent level. This implies that the present value of -0.570172 has a feedback of about 57% from the previous period of disequilibrium to the present level of productivity growth in a bid to determining causality between the past level of productivity growth and the present and past levels of UNEM, LAF, CPT and CPT.

Discussion of Finding
The result of our findings indicates an inverse relationship between productivity growth (Y) and unemployment (UNEM) in the long run while having a positive relationship in the short run. The long-run result conforms to the a-priori expectation of positive relationship between productivity growth (Y) and unemployment (UNEM) This finding is in agreement with the results of Gachoki (2021). However, labor input (LAB) and productivity growth (Y) both in the short and long run exhibit direct relationship conforming to the a priori expectation. This finding is in agreement with the results of Joao & Francisco (2019). In addition. There is inverse relationship between productivity growth (Y) and capital input in the short run while having a positive relationship in the long run. This finding is in agreement with the results of Ayesha & Ruksana (2019). There is inverse relationship between productivity growth (Y) and inflation rate in the long run while having a positive relationship in the short run. This finding is in agreement with the results of Vikesh & Subrina (2018).

5 Conclusion and Policy Recommendations.
This study examines the nexus between unemployment, inflation and Productivity growth in

Nigeria. The result of our findings indicates an inverse relationship between productivity growth (Y) and unemployment (UNEM) in the long run while having a positive relationship in the short run. However, labor input (LAB) and productivity growth (Y) both in the short and long run exhibit direct relationship conforming to the a priori expectation. In addition. There is inverse relationship between productivity growth (Y) and capital input in the short run while having a positive relationship in the long run. The result of our findings shows inverse relationship between productivity growth (Y) and inflation rate in the long run while having a positive relationship in the short run. Based on the findings, this study recommends that;

i.)Concerted efforts should be made by the government to provide basic infrastructure such as electricity, good road, pipe borne water etc so as to increase level of output in all sectors of the economy.

ii.) Government should diversify into the non-oil sectors of the economy and be practically involved in mechanized farming and technologically based service sector.

iii.) Government should embark on policies that discourage importation of goods that can be produced locally and encourage production of goods for exportation

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