EXPLORING THE NEXUS BETWEEN INFLATION, COST OF LIVING AND ECONOMIC GROWTH IN NIGERIA: A VECM APPROACH

[1]GODWIN Friday Ojonugwa,
[2]IDACHABA Benjamin Ogasheko, [3]THAPE Innocent Ezekiel

[1]Department of Economics,
Prince Abubakar Audu University Anyigba, Kogi State.
godwin.fo@ksu.edu.ng phone no: +2347082332723
[2] Department of Economics, University of Lagos Akoka, Lagos State
idachababenjamin@gmail.com, phone no: +2348130058510
[3]Department of Economics, Lagos State University Ojo, Lagos State
thapeinnocentezekiel@gmail.com, phone no: +2347064462925

Abstract

This study examined the relationship between inflation, cost of living, and economic growth in Nigeria from 1991 to 2022 using time series secondary data sourced from the World Development Indicators and Worlddata.com. The study employed the Johansen Cointegration and Vector Error Correction Mechanism (VECM) to analyse the data. The findings revealed a long-run relationship among the variables. Specifically, inflation had a significant positive impact on the cost of living but a significant negative impact on economic growth. Real GDP also had a significant negative influence on the cost of living, while money supply had a positive and significant impact on both inflation and economic growth. The Variance Decomposition showed that most changes in these variables were driven by the variables themselves, except for real GDP, which had about 35% influence on inflation in the long-term. The study recommended that proactive measures should be taken to control inflation. In addition, there should be careful management of the money supply to balance economic activity and inflation. Additionally, the monetary authorities should consider adjusting interest rates to manage inflation effectively.

Keywords: Cost of Living, Economic Growth, Impulse Response Function, Inflation Rate, Vector Error Correction Mechanism.

JEL Classification:E31, O40

1. Introduction

Rising prices across goods and services, known as inflation, are gauged by the shift in the consumer price index (CPI), a measure that calculates the average price fluctuation of regularly purchased items such as food, clothing, and transportation (Okpi, 2021). The repercussions of inflation extend widely, impacting societal and economic stability by influencing various economic elements and imposing expenses on the overall economy (Anyanwu, 2011).

Nigeria, Africa's most populous nation and one of its largest economies has witnessed fluctuating inflation rates over the years. The well-being of the economy is closely tied to the inflation rate, especially to the purchasing power of individuals and households. Nigeria's inflation rate has consistently exceeded global and Sub-Saharan African averages, reaching 18.85% in 2022, compared to the world average of 8.27% and the Sub-Saharan African average of 14.47% (World Bank, 2022). These fluctuations have been observed in Nigeria since the Structural Adjustment Program era. For example, it was 5.7% in 1986, increased to 13.0% in 1990, and surged further to 29.3% in 1996 (Central Bank of Nigeria, 2015). In March 2021, the inflation rate hit 18.17% year-on-year, the highest since January 2017 when Nigeria faced a recession (Okpi, 2021). In 2022, Nigeria's inflation rate rose to 21.47%, with food inflation climbing to 23.75% (Ighakpe, 2023). This was accompanied by a significant increase in consumer prices for essential items (Agbon, 2022).

Inflation's impact in Nigeria is evident, with rising prices pushing millions into poverty, particularly affecting essential items like food, fuel, and medical products (Okunola, 2021). Despite stagnant wages, living expenses have risen significantly, causing heightened economic uncertainty, high inflation, and weakened purchasing power, affecting various segments of the population (Olubiyi, 2022).

Despite Nigeria's significant role in the African economy, managing inflation remains a challenge, raising concerns about the dwindling purchasing power and living standards of its citizens. Despite the Central Bank of Nigeria (CBN) implementing monetary policies to manage inflation, the expected outcomes have not materialized (Sani & Abdullahi, 2011). High inflation rates have negatively impacted economic growth in Nigeria, with fluctuations in the growth rate of Real Gross Domestic Product (RGDP) over the years. For example, the growth rate of Real Gross Domestic Product (RGDP) was 1.9% in 1986, but it declined to 0.01% in 1991. Subsequent years saw fluctuations with growth rates of 4.1% in 1996, 9.8% in 2001, 6.0% in 2006, 7.4% in 2011, and 3.9% in 2015 (CBN, 2015). In 2020, Nigeria experienced a negative growth rate in Real Gross Domestic Product (RGDP) at -1.79%, marking a 4% decrease from the previous year. The trend reversed in 2021 with a growth rate of 3.65%. However, there was a subsequent decline in 2022, with the growth rate dropping to 3.25%, indicating a 0.4% decrease from 2021 (World Bank, 2022).

Various empirical investigations have produced contrasting findings concerning the relationship between inflation and economic growth in Nigeria. Some studies have uncovered a significant negative impact of inflation on the Nigerian economy (Onwubuariri et al., 2021; Adaramola& Dada, 2018;Bassey &Onwioduokit, 2011;

Ezeanyeji& Ugochukwu, 2015; Osuala et al., 2013). Conversely, others have identified a significant positive influence (Dele &Oluwasola, 2018; Ozurumba, 2012), while some reported an insignificant relationship (Eze& Nweke, 2017; Omobolanle, 2021; Okoroafor et al., 2018).

Despite the multitude of studies that have probed into the correlation between inflation and economic growth, only a single investigation by Bozkurt et al. (2022) has ventured into the interconnection between inflation rates and the cost of living, focusing on Turkey. Notably, there is a conspicuous absence of comprehensive studies examining the intricate dynamics among inflation rates, the cost of living, and economic growth within the Nigerian context. Given the conflicting outcomes documented in the existing literature regarding the relationship between inflation and economic growth and the scarcity of research addressing the link between inflation and the cost of living in Nigeria, this study aims to explore the complex relationship between inflation, the cost of living, and economic growth in Nigeria from 1991 to 2022.

The subsequent sections of this study are organized as follows: Section 2 incorporates a review of related studies on the subject matter and establishes the theoretical framework. In Section 3, the nature and source of the data, along with the employed methodology, are elucidated. Results and their policy implications are deliberated in Section 4, and the study concludes in the last section, providing pertinent policy recommendations based on the findings.

2.0. Literature Review

Inflation, a sustained increase in the overall price level of goods and services, has remained a critical economic phenomenon affecting nations across the globe. In the context of Nigeria, a nation characterized by economic fluctuations, the interplay between inflation and the affordability of essential commodities has been of paramount concern. This section intends to offer a thorough overview of the current body of knowledge about the nexus between inflation, the cost of living, and economic growth in Nigeria.

2.1. Conceptual Review

2.1.1. Inflation

Inflation signifies a sustained increase in the overall price level of goods and services within an economy over a specified duration, leading to a decline in the purchasing power of a given currency. Typically quantified as an annual percentage, inflation has the potential to diminish the value of money, giving rise to escalating prices that impact the cost of living for both individuals and businesses (Mankiw, 2014). The International Monetary Fund (2023) defines inflation as a metric gauging the extent to which a predetermined set of goods and services has experienced a rise in cost over a specific period, typically spanning one year. The widely utilized yardstick for measuring inflation is the consumer price index (CPI).

2.1.2. Cost of Living

]The cost of living, as defined by the US Office for National Statistics (2014), denotes the expenditure necessary to uphold a specified minimum standard of living at a given point in time. Alternatively termed as the cost of procuring adequate quantities of diverse items to sustain a minimal standard of living, Salvucci (2022) characterizes the cost of living as an assessment of the financial outlay associated with residing in a specific location throughout a designated timeframe, encompassing elements such as food, rent, and gas expenses. In essence, it encapsulates the monetary requisites for maintaining a lifestyle at a particular juncture, covering fundamental living costs such as food, shelter, transportation, healthcare, and sundry other expenditures (Nova Credit, 2023).

2.1.3. Economic Growth

Economic growth signifies the augmentation in the production and consumption of goods and services within an economy over a defined period. This advancement is quantified by the escalation in the Gross Domestic Product (GDP) or Gross National Product (GNP) of a nation. Serving as a pivotal gauge of an economy's vitality and advancement, economic growth is subject to influences such as investment, technological innovations, enhancements in productivity, and population expansion (Robinson & Acemoglu, 2012). Kimberly (2021) elucidates economic growth as the appreciation in the value of a country's products and services, resulting in increased profits for businesses. Roser (2021) interprets economic growth as a rise in both the quantity and quality of economic goods and services produced by a society

2.2 Theoretical Framework

This study relies on the Quantity Theory of Money (QTM), first introduced by Professor Irving Fisher. QTM establishes a connection among the money supply (M), the price level (P), the velocity of money (V), and the real level of output or real GDP (Y), encapsulated in the core equation $M. V = P. Y$

Where Money Supply (M) is the total amount of money in circulation on average in an economy in a given year. Velocity of money i.e. the average frequency across transactions with which a unit of money is spent.

The quantity theory of money is based on the following assumptions: the amount of real output (Q) is exogenous, the velocity of money (V) is constant over time, and the supply of money (M) is exogenous and can only be controlled by the monetary authority.

According to QTM, a key factor driving inflation is the money supply (M). If the central bank increases the money supply without a corresponding uptick in real output (Y), it can result in an excess supply of money in the economy. This surplus money, competing for a relatively stable amount of goods and services, propels prices (P) upward, giving rise to inflation.

QTM establishes a direct link between the money supply (M) and inflation (P). An increase in the money supply, without a proportional boost in economic output, would lead to elevated prices and an increased cost of living. Inflation resulting from an augmented money supply diminishes the purchasing power of money, necessitating more money to acquire the same goods and services.

Moreover, QTM holds implications for economic growth, suggesting that an excessive increase in the money supply relative to real GDP (Y) can have adverse effects on economic growth. When there is an excess of money in the economy without a corresponding rise in productive output, it can disrupt resource allocation and may not contribute to sustained economic growth.

2.3 Empirical Literature

In the quest to assess the relationship between inflation rate, cost of living and economic growth in Nigeria, various studies have been scrutinized. The majority of these studies focused on exploring the impact of inflation on economic growth, with only one delving into the specific realm of inflation and the cost of living (Bozkurt et al., 2022). The study was concentrated on urban residents in Turkey. Employing a descriptive research design, the study surveyed respondents in Istanbul, Ankara, and Izmir. The data, collected from a sample of 479 respondents through simple random sampling, underwent analysis using correlation analysis, regression, and analysis of variance. The outcomes unveiled a noteworthy and positive relationship between inflation and the cost of living in Turkey.

While no specific Nigerian study has directly addressed inflation and the cost of living, a wealth of literature exists on the correlation between inflation and economic growth in the country. Numerous studies have identified a significant positive relationship between inflation and economic growth. One such study by Dele and Oluwasola (2018) employed the Autoregressive Distributed Lag model (ARDL) and the cointegration model, analyzing time series data spanning from 1993 to 2016. Their findings unveiled a long-term connection between money supply, inflation, and economic growth, with a positive linear relationship in both the short-run and long-run.

However, contrasting perspectives emerge from certain studies, indicating a notable adverse impact of inflation on the Nigerian economy. For example, research conducted by Ezeanyeji and Ugochukwu (2015), Yelwa et al. (2015), and Haliru (2021) scrutinized the relationship between inflation and economic growth in Nigeria. Employing the ordinary least squares (OLS) simple regression method, their findings unveiled a significant negative relationship between inflation and economic growth in the country. Similarly, studies by Onwubuariri et al. (2021), Adaramola and Dada (2018), and Ahmed et al. (2018) found a significant negative impact of inflation on the Nigerian economy both in the short-term and long-term using the Autoregressive Distributed Lag (ARDL) technique. Another study conducted by Ugwuanyi (2018) focused on the relationship between inflation, money supply, and economic growth, revealing a significant negative influence of inflation on economic growth in Nigeria through the error-correction mechanism.

On the other hand, an alternative perspective emerges from a distinct body of literature, indicating an insignificant relationship between inflation and economic growth in Nigeria. For instance, studies conducted by Eze and Nweke (2017) and Omobolanle (2021) both employed the Vector Error Correction Mechanism (VECM) to scrutinize the impact of the inflation rate on Nigeria's economic growth, concluding that the inflation rate exhibited insignificance about economic growth. Similarly, Okoroafor et al. (2018) utilized the Autoregressive Distributed Lag (ARDL) and Autoregressive Integrated Moving Average (ARIMA) models to explore the causal relationship between inflation and economic growth. The study also did a forecast for the inflation threshold in Nigeria from 1961 to 2016. Their findings indicated no causal relationship between inflation and economic growth in the Nigerian context. Anochiwa and Maduka (2015) employed the error correction model to examine the relationship between inflation and economic growth from 1970 to 2012, revealing an insignificant nonlinear negative correlation between inflation and economic growth, with no demonstrated causality between the two variables in Nigeria.

Foreign studies have also delved into the relationship between inflation and economic growth, and some of them have uncovered a negative correlation. For instance, Rehman et al. (2022) utilized an asymmetric non-linear Autoregressive Distributed Lag (ARDL) model on time series data spanning from 1986 to 2020 to assess the impact of inflation, poverty, unemployment, and population growth on economic growth in Pakistan. Their results indicated that inflation and poverty exerted a significant and negative influence on economic growth in Pakistan. Similarly, Karahan and Colak (2020) conducted a study using the ARDL model on quarterly data from 2003 to 2017 to explore the relationship between inflation and economic growth in Turkey. Their findings unveiled a long-run negative and non-linear relationship between inflation and economic growth.

Indeed, foreign studies presented a diverse range of findings, with some revealing a positive relationship between inflation and economic growth. For example, Najid and Uma-Tul (2012) employed the ordinary least squares (OLS) method to investigate the nexus between inflation and economic growth in Pakistan with time series data spanning from 1971 to 2011. Their results pointed to a positive correlation between inflation and economic growth in Pakistan. Taking a broader perspective, a cross-country study conducted by Behera and Mishra (2016) explored the inflation and economic growth nexus among the BRICS countries, utilizing time series data spanning from 1980 to 2012. Employing the Autoregressive Distributed Lag (ARDL) model, the study unveiled a positive and long-run relationship between inflation and economic growth for both China and South Africa.

2.4. Research Gaps

This study explored the nexus between inflation, cost of living and economic growth in Nigeria. A lot of studies have been done on the relationship between inflation and economic growth (Dele &Oluwasola, 2018; Ezeanyeji& Ugochukwu 2015; Yelwa et al., 2015; Haliru, 2021; Onwubuariri et al., 2021; Adaramola& Dada, 2018; Ahmed et al., 2018; among others). Despite the multitude of studies that have probed into the

relationship between inflation and economic growth, only a single investigation by Bozkurt et al. (2022) was done on the interconnection between inflation rates and the cost of living, albeit in the context of Turkey.

Notably, there is a conspicuous absence of literature examining the intricate relationship between inflation rates, the cost of living, and economic growth in a single study within the Nigerian context. This study intends to fill thisgap by examining the relationship between inflation, cost of living and economic growth within the context of Nigeria.

3.0. Methodology

3.1 Data

This research employed annual time series secondary data covering the period from 1991 to 2022. The Cost-of-Living Index data were obtained from Worlddata.info, while data on Real Gross Domestic Product (RGDP), Money Supply (MS), Inflation Rate (INF), and Interest Rates (INT) were sourced from the World Development Indicators, 2022.

3.2 Model Specification

To examine the relationship between inflation, Cost of Living and Economic Growth in Nigeria, the model for the study was adapted from the work of Dele and Oluwasola (2018) where GDP was a function of Inflation Rate, Money Supply and Government expenditure in their study on the impact of inflation on economic growth in Nigeria.

The functional form of the model for the study is stated in Equation 1.

RGDP=ƒ(COL, INFL, MS, INT) ---------- (1)

The Vector Error Correction Model is specified in Equations 2, 3, and 4 respectively.

$$\Delta LCOL_t = \alpha_0 + \sum_{i=1}^{k} \alpha_{1i}\, \Delta LCOL_{t-i} + \sum_{i=1}^{k} \alpha_{2i}\, \Delta LRGDP_{t-i} + \sum_{i=1}^{k} \alpha_{3i}\, LINFL_{t-i} + \sum_{i=1}^{k} \alpha_{4i}\, \Delta LMS_{t-i} + \sum_{i=1}^{k} \alpha_{5i}\, \Delta LINT_{t-i} + \partial_1 ECT + \varepsilon_{1t} \quad (2)$$

$$\Delta LRGDP_t = \beta_0 + \sum_{i=1}^{k} \beta_{1i}\, \Delta LCOL_{t-i} + \sum_{i=1}^{k} \beta_{2i}\, \Delta LRGDP_{t-i} + \sum_{i=1}^{k} \beta_{3i}\, LINFL_{t-i} + \sum_{i=1}^{k} \beta_{4i}\, \Delta LMS_{t-i} + \sum_{i=1}^{k} \beta_{5i}\, \Delta LINT_{t-i} + \partial_2 ECT + \varepsilon_{2t} \quad (3)$$

$$\Delta LINFL_t = \omega_0 + \sum_{i=1}^{k} \omega_{1i}\, \Delta LCOL_{t-i} + \sum_{i=1}^{k} \omega_{2i}\, \Delta LRGDP_{t-i} + \sum_{i=1}^{k} \omega_{3i}\, LINFL_{t-i} + \sum_{i=1}^{k} \omega_{4i}\, \Delta LMS_{t-i} + \sum_{i=1}^{k} \omega_{5i}\, \Delta LINT_{t-i} + \partial_2 ECT + \varepsilon_{3t} \quad (4)$$

Where COL is the Cost of Living Index, RGDP is the Real Gross Domestic Product, INFL is the inflation rate, MS is the Money Supply, INT is the Interest Rate, and ECT is the Error

Correction Term. α, β and ω, represent the short-run coefficients of the variables in the model. ∂_i represents the coefficient of the error correction component representing the speed of adjustment from short-run disequilibrium to long-run equilibrium. ε represents the stochastic or white noise error component. The Δ is the difference operator.

Since all the variables are in different units, the log-log form of the model was used to ensure that all the variables are in the same form to have more realistic and unbiased estimates. It is also necessary to log the variables to avoid the problem of changing variance (Ozturk et al., 2020).

3.3. Description of Variables

The Cost of Living Index (COL) is derived from figures provided by the OECD, World Bank, IMF, and Eurostat. Calculated based on the price of consumer goods with an index of USA=100 as the base, a COL of 130 implies goods are assumed to be 30% more expensive than in the United States, while an index of 50 suggests goods are 50% less expensive than in the USA (World data, 2023).

Real Gross Domestic Product (RGDP), measured in Billion Naira, represents inflation-adjusted GDP, indicating the value of goods and services produced by an economy in a given year. RGDP served as a proxy for economic growth in this study. Money Supply (MS), also measured in Billion Naira, is the total amount of money circulating in an economy. The study utilized the broad money supply, encompassing narrow money plus savings and time deposits with banks. The broad money supply was utilised because it gives a more comprehensive representation of the amount of money in circulation.

Inflation Rate (INF) represents the percentage increase in prices of goods and services over a specific period. The study used the headline inflation rate, comprising all items of commodities. Interest Rate (INT) is the rate at which the central bank lends money to commercial banks.

3.4. *a priori* Expectation

It is expected that variables conform to economic theory for them to be economically significant. From the model, it is expected that the signs α_1, α_3, *and* α_4 be positive because an increase in the past values of COL will increase the current COL. Similarly, an increase in the value of INFL and MS will increase COL. However, it is expected that $\alpha_2$andα_5 be negative because an increase in RGDP is expected to reduce the COL and an increase in interest rate is expected to reduce the money supply and hence reduce the COL.

Secondly, it is expected that the sign β_1 be negative because an increase in COL will reduce the RGDP. However, β_2 and β_4 are expected to be positive because an increase in the past value of RGDP is expected to increase the current RGDP. Similarly, an increase in the value of MS is expected to increase RGDP. β_3 on the other hand is expected to be negative. This is because the inflation rate is expected to reduce economic growth.

However, the economy needs to tolerate some level of inflation for there to be growth. β_5 is also expected to be negative because an increase in interest rate will reduce the money supply and hence cause a reduction in RGDP.

In addition, $\omega_1$andω_3 is expected to be positive because an increase in COL is expected to increase INFL. Similarly, an increase in MS is expected to increase INFL. However, ω_2 is expected to be negative because an increase in RGDP is expected to reduce INFL. ω_4 is also expected to be positive because an increase in the past value of INFL is expected to increase the current INFL. ω_5 is expected to be negative because an increase in interest rate is expected to reduce the money supply and hence reduce the inflation rate.

Lastly, the coefficient of the error correction terms-∂_1, ∂_2 and ∂_3 are expected to be negative to conform to economic theory.

3.4. Estimation Technique

To examine the nexus among inflation, cost of living and economic growth in Nigeria, this study adopted the vector error correction mechanism (VECM). The VECM is the appropriate model when variables are *I(1)* i.e. they are all integrated at the first difference and they are also cointegrated, an indication of short-run dynamics. It is preferable because it can be used to determine the short-term impact among the variables in a multivariate framework. Additionally, it enables the determination of the speed at which the system adjusts from short-run imbalances to long-run equilibrium, facilitated by the error correction component. In addition, the forecast error variance decomposition (FEVD) was employed to determine how much of a change in a variable is due to its shock and how much is due to shocks from other variables. The Impulse response function was also estimated to show how the variables react to different shocks in the model (Salisu, 2015).

4.0. Presentation and Analysis of Result

4.1. Descriptive Statistics

This section helps to determine the descriptive nature of the data employed in the study. This includes the mean, median, maximum, minimum, standard deviation and normality.

Table 1. Descriptive Statistics Result

	COL	RGDP	INFL	MS	INT
Mean	43.0728	44909.88	17.9363	12629.49	10.9924
Median	45.4	42044.78	12.4425	5126.031	10.1983
Maximum	60.6	72393.67	72.8355	48989.56	23.2417
Minimum	25.6	21539.61	5.3880	79.0673	4.6466
Std. Dev.	10.7871	19802.27	16.3843	14686.2	4.0567
Jarque-Bera	2.3139	3.6209	43.422*	5.1583	4.6112
Probability	0.3144	0.1636	0.0000	0.0758	0.0997

Source: Author's Computation, 2023

According to the data presented in Table 1, the mean cost of living index in Nigeria during the study period was 43.07281, with the highest value being 60.6 and the lowest value being 45.4. Additionally, the average real gross domestic product (GDP) in Nigeria amounted to 44,909.88 billion naira, ranging from a low of 21,539.61 billion naira to a high of 71,393.67 billion naira within the study period. The inflation rate, on average, was 17.9% over the study period, with a peak of 72.8% and a minimum of 5.4%. The mean value of money supply during the study period stood at 12,629.49 billion naira, with the highest recorded at 48,989.56 billion naira and the lowest at 79.0673 billion naira. As for interest rates, the average was 11%, with the highest at 23.24% and the lowest at 4.65% during the study period.

The Jarque-Bera Statistic analysis reveals that the variables COL, RGDP, MS, and INT exhibit a normal distribution while INFL does not follow a normal distribution.

4.1.1. Correlation Matrix

This section helps to determine the relationship among the variables and also to check if there is multi-collinearity in the model. The correlation matrix and the variance inflation factor are analysed below.

Table 2. Correlation Matrix and Variance Inflation Factor

	COL	**RGDP**	**INFL**	**MS**	**INT**
COL	1				
RGDP	-0.3732	1			
INFL	-0.4155	0.2638	1		
MS	0.5836	-0.31882	-0.2629	1	
INT	-0.2344	0.4533	0.5633	-0.5255	1
VIF	-	1.32	1.26	1.28	1.23
1/VIF	-	0.7575	0.7937	0.7813	0.8140
Mean VIF	1.2725				

Source: Author's Computation, 2023

Table 2 shows a moderately strong positive correlation between COL and MS with a correlation coefficient of 0.5836. Similarly, the correlation between INT and MS is negative and moderately strong with a coefficient of -0.5255. In addition, the correlation coefficient of 0.5633 shows a moderately strong relationship between INT and INFL. The correlation among the other pairs of variables is weak with their correlation coefficients below 0.5. Table 1 also shows the Variance Inflation Factor. With a mean-variance inflation factor of 1.2725, we can conclude that the model is free from multicollinearity as the value is less than the threshold of 5.

4.2. Pre-Estimation Test

This involves examining the econometric properties of the study's variables. The augmented unit root test was performed to assess the stationarity of the variables, ensuring the avoidance of spurious results (see Table 3). Subsequently, the Johansen cointegration test was applied to ascertain whether the variables exhibit a long-term relationship (see Table 4).

Table 3. Augmented Dickey-Fuller Unit Root Result

Variables	Level			First Difference			
	ADF Statistic	Critical Value @ 5%	Decision	ADF Statistic	Critical Values @ 5%	Decision	Order of Integration
LRGDP	-0.7338	-2.9604	NS	-4.5613	-2.9640	S	I(1)
LCOL	-2.6576	-2.9604	NS	-7.7703	-2.9640	S	I(1)
LINFL	-2.0504	-2.9604	NS	-5.4576	-2.9640	S	I(1)
LMS	-1.1765	-2.9604	NS	-3.6323	-2.9640	S	I(1)
LINT	-2.2241	-2.9604	NS	-6.5793	-2.9640	S	I(1)

S- Stationary, NS – Non-Stationary.

Source: Author's Compilation, 2023.

From Table 3, the augmented Dickey-Fuller statistic reveals that none of the variables, specifically LRGDP, LCOL, LINF, LMS, and LINT, exhibit stationarity at their original levels. This conclusion is drawn from the fact that their ADF statistics fall below the critical values at the 5% significance level. However, upon differencing them once, they do exhibit stationarity, indicating an order of integration of *I(1)*. Since all the variables are integrated in the order *I(1)*, this suggests that the model to be estimated is a short-term model. Nevertheless, we cannot dismiss the possibility of a long-term relationship. Therefore, the study conducted the Johansen cointegration for this purpose (see Table 4)

Table 4. Johansen Cointegration Result

Hypothesized No of Coint. Equa.	Trace Statistic	Critical Values	Prob.	Max. Eigen. Statistic	Critical Values	Prob.
None	118.1566	69.8189	0.0000**	59.5352	33.8769	0.0000**
At most 1	58.6214	47.8561	0.0036**	26.4807	27.5843	0.0687
At most 2	32.1407	29.7971	0.0264*	20.6768	21.1316	0.0578
At most 3	11.4638	15.4947	0.1845	8.1140	14.2646	0.3672
At most 4	3.3499	3.8415	0.0672	3.3499	3.8415	0.0672

** and * denote rejection of the hypothesis at the 1% and 5% significance level respectively.

Source: Author's Compilation, 2023.

From Table 4, the Trace test suggests the presence of three cointegrating equations at a 5% significance level. Conversely, the Max-eigenvalue test indicates the presence of one cointegrating equation at the 5% level of significance. This evidence is sufficient to affirm the existence of a long-term relationship between Inflation, the cost of living, and economic growth in Nigeria. Consequently, the study will proceed to estimate the vector error correction model, encompassing both short-term estimates and long-term error correction estimates.

4.3. Results of the Vector Error Correction Model

Before estimating the VECM model, it is appropriate to estimate the optimal lag length (see Table 5).

Table 5. Lag Length Selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-177.557	NA	0.316812	13.0398	13.2777	13.1125
1	-50.5906	199.5187	0.0002	5.7565	7.1838	6.1928
2	-2.8895	57.9227*	5.37E-05	*4.1350	6.7518*	4.9350
3	46.9684	42.7354	1.59E-05	2.3594	6.1657	3.5230
4	110.3153	31.6735	4.38e-06*	-0.3797	4.6161	1.1476*
* indicates lag order selected by the criterion LR: sequential modified LR test statistic (each test at 5% level) FPE: Final prediction error AIC: Akaike information criterion SC: Schwarz information criterion HQ: Hannan-Quinn information criterion						

Source: Author's Compilation, 2023

The sequential modified LR statistic, Akaike information and Schwarz information criterion all suggest a lag length of two. The VECM estimates were estimated based on a lag length of two (see Table 6).

Table 6. Vector Error Correction Estimates.

Dependent Variables	$\Delta LCOL_t$		$\Delta LRGDP_t$		$\Delta LINFL_t$	
	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value
$\Delta LCOL_{t-1}$	-0.2321	(0.2603)	-0.0033	(0.9134)	-0.2705	(0.5138)
$\Delta LCOL_{t-2}$	-0.1901	(0.3448)	0.0002	(0.9959)	-0.2085	(0.6062)
$\Delta LRGDP_{t-1}$	-1.3021	(0.3553)	0.5531**	(0.0096)	0.1467	(0.9586)
$\Delta LRGDP_{t-2}$	-4.8220**	(0.006)	0.3820	(0.1373)	-5.3931	(0.1209)
$\Delta INFL_{t-1}$	-0.2104	(0.0682)	-0.0067	(0.6927)	0.5637*	(0.016)
$\Delta INFL_{t-2}$	0.2335*	(0.0116)	-0.4104*	(0.0404)	0.0190	(0.9174)

ΔMS_{t-1}	-0.2197	(0.547)	0.0389	(0.4742)	1.1212*	(0.0291)
ΔMS_{t-2}	0.3165	(0.433)	0.3243**	(0.0082)	-0.2573	(0.7461)
$\Delta INTR_{t-1}$	0.3532	(0.118)	0.0303	(0.3662)	-1.2064**	(0.0089)
ECT_t	-0.1870*	(0.0247)	-0.2185*	(0.0331)	-0.4685**	(0.0056)
R^2	0.834		0.791		0.741	

** & * denote statistical significance at 1% and 5% respectively.

Source: Author's Compilation, 2023.

The data presented in Table 6 reveals several key findings. Firstly, it is evident that a two-period lag of LRGDP has a significant negative influence on LCOL, with a 1% increase causing a decrease in LCOL by 4.8220%. On the other hand, LINFL has a significant positive influence on LCOL, with a 1% increase causing an increase in LCOL by 0.2335%. A period lag of money supply has a negative impact on current COL while the two-period lag's impact is positive. However, the p-values showed that both impacts are not statistically significant at 1% and 5%. In addition, a period lag of interest rate indicates a positive relationship with LCOL with a 1% increase causing a 0.3532% increase in LCOL. However, the p-value shows that the relationship is not statistically significant at both 5% and 1%. The coefficient of determination (R^2) stands at 0.834, indicating that approximately 83.4% of the variations in the current COL index can be explained by past values of LCOL, LRGDP, LINFL, LMS, and LINT. Additionally, the coefficient of the error correction term (ECT) suggests that approximately 18.7% of short-term deviations in COL will be rectified in the long run.

Shifting the focus to LRGDP as the dependent variable, it is noteworthy that past values of LCOL have a negative impact, albeit statistically insignificant, on LRGDP. Conversely, a two-period lag of inflation (LINFL) exerts a significant negative effect on LRGDP, with a 1% increase resulting in an approximately 0.4104% decrease in LRGDP. Past values of LMS have positive and significant impacts on LRGDP with a 1% increase leading to a 0.3243% increase in LRGDP. Furthermore, past values of LINT have positive impacts on LRGDP, although these impacts do not achieve statistical significance at the 5% level. The R^2 value for this model indicates that around 79.1% of the variations in LRGDP can be attributed to past values of the variable itself, as well as other factors such as LCOL, LINFL, LMS, and LINF. The ECT coefficient reveals that roughly 21.85% of short-term deviations in LRGDP will be corrected over the long term.

Regarding LINFL, a lag of LINT exhibits a significant negative relationship with the current LINFL, with a 1% increase causing a decrease in D(LINF(-1)) by 1.206%. Similarly, a period lag of money supply has a significant positive relationship with Inflation with a 1% increase causing an increase in inflation rate by 1.1212%. However, past values of LCOL and LRGDP do not show statistically significant impacts on current LINFL. A period lag of Interest rate shows a negative impact on LINFL with a 1%

increase causing a 1.2064% decrease in the inflation rate. The p-value of 0.0089 also indicates that the impact is statistically significant at 1%. The ECT coefficient in this context indicates that approximately 46.85% of short-term deviations in the inflation rate will be corrected over the long run. The R^2 value demonstrates that approximately 74.1% of the variations in the inflation rate can be attributed to past values of the explanatory variables.

4.4. Model Diagnostic Test

Before a model can be appropriate for policy formulation, it is important to verify that the estimates of the chosen model are reliable. Three post-estimation tests- serial correlation, normality and heteroscedasticity were conducted to check the robustness of the model (see Table 7).

Table 7. Summary of Model Diagnostic Test

Test	**Probability value**
Serial Correlation LM	0.7466
Jarque-Bera Normality	0.4175
Heteroscedasticity	0.4634 (Chi-sq.)

Source: Author's Compilation, 2023

From Table 7, the probability value of 0.7466 indicates that the model does not exhibit serial correlation, as it exceeds 5%. Likewise, the Jarque-Bera probability value of 0.4175 suggests that the model follows a normal distribution. Finally, the Chi-squared p-value of 0.4634 suggests that the model displays homoscedasticity, as it is greater than 5%.

4.5. Variance Decomposition

The variance decomposition was estimated to determine the amount of the forecast error variance that is explained by the variables themselves as well as the proportion responsible for other variables (See Figure 8).

Table 8. Variance Decomposition Result

Variance Decomposition of LCOL:						
Period	S.E.	LCOL	LRGDP	LINFL	LMS	LINT
1	0.2025	100	0.0000	0.0000	0.0000	0.0000
2	0.2574	87.4575	8.9830	3.3308	0.2280	0.0007

3	0.2933	82.4953	7.5150	3.4434	5.3703	1.1761
4	0.3409	76.4253	8.2185	2.7812	8.8430	3.7321
5	0.3950	72.2586	7.1886	2.3385	12.2320	5.9823
Variance Decomposition of LRGDP:						
Period	S.E.	LCOL	LRGDP	LINFL	LMS	LINT
1	0.0302	0.9816	99.0184	0.0000	0.0000	0.0000
2	0.0534	1.0736	95.7249	1.3464	1.8307	0.0245
3	0.0829	1.0617	91.7316	0.5999	6.4625	0.1443
4	0.1097	0.8323	87.2525	0.5742	10.8566	0.4842
5	0.1371	0.7029	83.8013	1.2724	13.5545	0.6688
Variance Decomposition of LINFL:						
Period	S.E.	LCOL	LRGDP	LINFL	LMS	LINT
1	0.4078	10.2576	0.1809	89.5614	0.0000	0.0000
2	0.5002	15.3040	2.6493	79.7661	0.6327	1.6478
3	0.5442	14.0468	5.5203	70.8116	3.9513	5.6700
4	0.6884	8.7987	21.7803	46.7073	7.4177	15.2960
5	0.8028	6.5828	35.0228	34.9999	7.1365	16.2580

Source: Author's Compilation, 2023

From Table 8, the Variance Decomposition analysis reveals that all of the forecast error variance in LCOL is attributable to internal shocks within the variable itself, accounting for 100%. This suggests that LRGDP, LINF, LMS, and LINT exert only minimal influence on LCOL in the short-term, rendering them strongly exogenous. Similarly, in the long run, the explanation for the forecast error variance in LCOL remains weak. In the long-term perspective, LCOL primarily impacts itself, explaining approximately 72.26% of its forecast error variance.

Similarly, approximately 98.16% of the forecast error variance in LRGDP is explicable by internal shocks within the variable, indicating that LCOL, LINF, LMS, and LINT have limited influence on LRGDP in the short run, making them strongly exogenous. Likewise, in the long run, their contribution to explaining the forecast error variance in LRGDP remains feeble. In the long term, LRGDP mainly affects itself, accounting for about 83.8% of the forecast error variance.

Lastly, around 89.56% of the forecast error variance in LINFL can be attributed to internal shocks within the variable. This implies that LRGDP, LCOL, LMS, and LINT have little impact on LINFL in the short term, classifying them as strongly exogenous. However, in the long run, LRGDP explains about 35.02% of the forecast error variance in LINFL, while LMS and LINT continue to exert a weak influence on LINFL in the long term.

4.6. Impulse Response Functions

This section helps to determine the response of variables to shocks from within themselves and shocks from other variables. The Cholesky impulse response function is depicted in Figure 1.

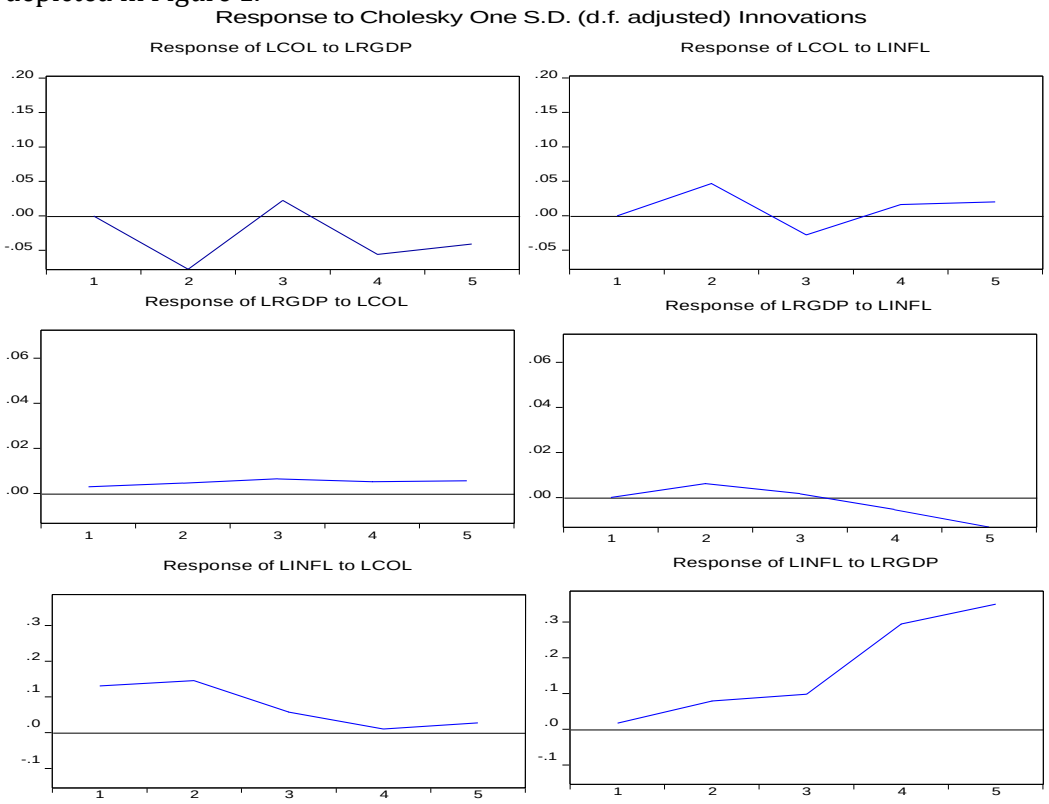

Figure 1: Cholesky Impulse Response Functions

Source: Author's Compilation, 2023

From Figure 1, one S.D. shock in LRGDP causes LCOL to decrease from period 1 up to period 2 and then increase up till period 3, from which it falls again and rises from period 4 to period 5. This shows that the response though negative is not stable along the forecast horizon. On the other hand, the response of LRGDP to one S.D. shock in COL is positive and stable from period 1 to period 5.

In addition, one S.D. innovation in LINF causes LCOL to increase from period 1 and then fall from period 2 until period 3 where it begins to increase till period 4 and then remains in a steady state till period 5. The response falls within the positive region except for period 3 where it was negative. However, the path of the response is not stable during the forecast horizon. On the other hand, LINFL remains in a steady state from period 1 to period 2 due to one S.D. shock in LCOL. It decreases down to period 4 and thereafter remains in a steady state till period 5. This response though falls within the positive axis, it shows an unstable trend along the forecast horizon.

Lastly, LRGDP initially increases slowly from period 1 to period 2 due to one S.D. shock in LINFL and then starts decreasing down till period 5. Initially, from period one to 3, it is positive but it becomes negative from period 3 down to period 5. On the other hand, LRGDP increases slightly from period 1 to period 2 due to one S.D. shock in LINFL. It remains in a steady state from period 2 to period 3 and then increases sharply up till period 4 from where it increases slowly. The response also is positive but the pattern is not stable along the forecast horizon.

4.7. Discussion of Findings and Policy Implications

This study examined the relationship among inflation, cost of living and economic growth in Nigeria. The Vector Error Correction Model was adopted and the findings are discussed as follows with their key policy implications.

Firstly, given that a two-period lag of LINFL has a significant positive influence on LCOL, monetary policies should be implemented to control inflation (LINFL) to prevent it from eroding the purchasing power of consumers and causing an increase in the cost of living. Also, given that the two-period lag of LRGDP has a negative impact on LCOL, policymakers should consider strategies to promote economic growth (LRGDP) through investments in infrastructure, education, and technology to improve employment and income levels, ultimately mitigating the increase in the cost of living. A thriving economy enhances employment opportunities and income levels, thereby mitigating the rise in the cost of living (LCOL).

Two-period lag of the inflation rate has a significant negative impact on economic growth suggesting that policies that will reduce the rate of inflation should be encouraged as a high inflation rate is detrimental to the growth of the economy. This negative impact of inflation on economic growth is similar to the findings ofEzeanyeji and Uhgochukwu (2015), Onwubuariri et al. (2021), Haliru (2021), Yelwa et al. (2015), Adaramola and Dada (2018), Ahmed et al., (2018) and Ugwuanyi (2018).

In addition, the positive and significant impact of money supply on both inflation and economic growth suggests the need for a proper management of money supply. Policymakers need to strike a balance between promoting economic growth and controlling inflation. An expansionary monetary policy, which increases money supply, can stimulate economic activity and support growth. However, if left unchecked, it can also lead to inflationary pressures. Also, the significant negative relationship between

LINT and LINFL implies that interest rate policy can be used as a tool to influence inflation. Central banks should consider adjusting interest rates to control inflation levels.

The Variance Decomposition analysis reveals that most of the changes in LCOL, LRGDP, and LINFL, which are the main variables in the study, are caused by the variables themselves both in the short-term and the long-term. Only LRGDP has some influence on changes in LINFL in the long term, but it's not very strong (about 35%). What this means is that when making policies in the short term for LCOL, LRGDP, and LINFL, it's essential to focus on factors and issues within these variables because external factors don't have much impact. However, in the long term, policies related to LRGDP might have a small effect on LINFL. Policymakers should keep this in mind when planning economic and financial strategies, emphasizing fixing internal problems for short-term stability and considering long-term goals for how these variables interact.

5.1 Conclusion and Recommendations

In this investigation, the interplay between the cost of living, inflation rate, and economic growth in Nigeria was scrutinized. Employing a vector error correction model, the study assessed the connection among these three variables, yielding valuable insights. A high inflation rate poses a threat to economic growth, diminishing individuals' purchasing power and subsequently raising living costs. Enhanced economic growth has the potential to alleviate the burden of living expenses. The study underscores the substantial impact of money supply on both inflation and economic growth, highlighting the necessity for policymakers to strike a balance between fostering economic growth and managing inflation through prudent money supply management. Furthermore, the research underscores the significance of interest rates in stabilizing prices in Nigeria. In light of these findings, policymakers should take proactive measures to control inflation through monetary policies. Additionally, they should prioritize investments in infrastructure, education, and technology to spur economic growth. Maintaining a delicate equilibrium in regulating money supply is crucial to promoting economic activity while averting inflationary pressures. Lastly, central banks should consider adjusting interest rates judiciously to effectively control inflation levels.

References

Robinson, J. A., & Acemoglu, D. (2012). *Why Nations Fail: The Origins of Power, Prosperity and Poverty,* 45-47. London: Profile.

Ahmed, A. O., Daniel, G. A., & Kayode, K. D. (2018). Re-examining the Relationship between Inflation, Exchange Rate and Economic Growth in Nigeria. *International Journal of Accounting Research*, *42(6056)*, 1-6.

Agbon, I. (2022). The Rising Cost of Living in Nigeria. I*ndependent,* retrieved from: Https://independent.ng/the-rising-cost-of-living-in-nigeria/.

Adaramola, A. O., & Dada, O. (2020). Impact of Inflation on Economic Growth: Evidence from Nigeria. *Investment Management and Financial Innovations*, *17*(2), 1-13. DOI:10.21511/imfi.17(2).2020.01.

Anochiwa, L. I., &Maduka, A. (2015) Inflation and Economic Growth in Nigeria: Empirical Evidence? *Journal of Economics and Sustainable Development, 6(20),* 113-121.

Anyanwu, J.C. (2011). *Nigeria Public Finance.*Joanee Educational Publishers Limited,Onitsha Nigeria.

Bassey, G. E., &Onwioduokit, E. A. (2011). An Analysis of the Threshold Effects of Inflation on Economic Growth in Nigeria. *WAIFEM Review,8(2), 95-124.*

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

Bozkurt, A. C., Quartz, D.C., & Schneider, S. B. (2022). Influence of Inflation on Cost of Living among the Urban Residents in Turkey. *Journal of Economics, 6(1)*, 1-10. Https://doi.org/10.53819/81018102t5083.

Central Bank of Nigeria (2015). Annual statistical report: Central Bank of Nigeria.

Dele, O., &Oluwasola, O. (2018). Impact of Inflation on Economic Growth in Nigeria, *Caleb Journal of Social and Management Sciences, 4(2*), 8-21. Doi:10.26772/CJSMS/2018040201.

Eze, O. M., &, Nweke. A. M. (2017). Assessment of the Effect of Inflation on Nigeria's Economic Growth: Vector Error Correction Model Approach. *European Journal of Business and Management, 9(15)*, 18-29.

Ezeanyeji, C. I., & Ugochukwu, F. E. (2015). Inflation and Economic Growth in Nigeria: An impact analysis. *Continental Journal of Social Sciences, 8(1),* 22-33.

Haliru, B. (2021). Impact of Inflation on Nigerian Economic Growth. Available at SSRN: https://ssrn.com/abstract=4124745 or http://dx.doi.org/10.2139/ssrn.4124745.

Ighakpe, D. (2023) Nigeria's High Cost of Living. *Thisdaylive, https: www.thisdaylive.com/index.php/2023/01/19/nigerias-high-cost-of-living.*

International Monetary Fund(2023), IMF Glossary.

Karahan, O. &Colak, O. (2020). Inflation and Economic Growth in Turkey: Evidence from a Nonlinear ARDL Approach. In: Janowicz-Lomott, M., Łyskawa, K., Polychronidou, P.

Karasavvoglou, A. (eds), *Economic and Financial Challenges for Balkan and Eastern European Countries.* Springer Proceedings in Business and Economics. 33- 45. https://doi.org/10.1007/978-3-030-39927-6_3.

Kimberly, A. (2021). What is Economic Growth? Economic growth explained; Retrieved from:https://www.thebalance.com/what-is-economic-growth-3306014

Mankiw, N.G. (2014). *Principles of Microeconomics (7th Edition)*, Cengage Learning, Mason, USA.

Najid, A. & Uma-Tul, S. J. (2012). The Relationship between Inflation and Economic Growth in Pakistan: An Econometric Approach. *Asian Journal of Research BusinessEconomics and Management, 2(9),* 38-48.

Nova Credit (2023). What is the Cost of Living in the United States? Retrieved from: *https://www.novacredit.com/resources/what-is-the-cost-of-living-in-the-united-states.*

Ugwuanyi, C.H. (2018). Money Supply Inflation and Economic Growth in Nigeria: Error Correction Model (ECM) Approach. *Lafia Journal of Economics and Management Sciences, 3(1)*, 237-255.

Okunola, A. (2021) 5 Living Expenses Worst Hit by Rising Prices in Nigeria, *Global Citizen.* http://www.globalcitizen.org/en/content/living-expenses-worst-hit-rising-prices- Nigeria/.

Okoroafor, D.O.K., Adeniji, S.O.&Olasehinde, T. (2018). Estimating and Forecasting the Impact of Inflation on Economic Growth in Nigeria Using Threshold Analysis. *CBN Journal of Applied Statistics Vol. 9(1)*, 1-22.

Okpi, A.(2021). What is behind Nigeria's Rising Cost of Living? African Check Fact Sheets. Retrieved from http://africancheck.org/fact-fact-checks/factsheets/factsheet-whats- behind-nigerias-rising-cost-of-living.

Olubiyi, T. (2022) The Downside of Salary and Business Income: What's Next?*Businessday. http://businessday.ng/opinion/article/the/-downside-of-salary-and-business-income-whats next-2/.*

Omobolanle, Y. R. (2021). The Effect of Inflation on Economic Growth in Nigeria. *International Journal of Innovative Research and Development, 10(6)*, 111-123.

Onwubuariri, S.E., Oladeji, S.I., &Bankola, R.F. (2021). Inflation and Economic Growth in Nigeria: An ARDL Bound Testing Approach. *Sapientia Foundation Journal of Education, Sciences and Gender Studies, 3(1)*, 277-290.

Ozturk, S., Cinar, U.&Emek, M.L. (2020).The Relationship Between Public External Debt and Economic Growth: An Empirical Application on Turkey. *ISPEC International Journal of Social Sciences & Humanities, 4(5),* 552-568.

Ozurumba, B. A. (2012). Fiscal Deficits and Inflation in Nigeria: The Causality Approach. *International Journal of Scientific and Technology Research, 1(8)*, 6-12.

Roser, M. (2021). What is economic growth? And why is it so important? Retrieved from: https://ourworldindata.org/what-is-economic-growth.

Salisu, A.A. (2015). Estimation Procedure for Linear Regression Model Involving Time Series. Centre for Econometric and Allied Research, University of Ibadan, Ibadan Nigeria.

Salvucci, J. (2022). What is the Cost of Living? Definition, Examples and Importance. *The Street Dictionary*

Sani, B., & Abdullahi, I.S. (2011). Threshold Effect of Inflation on Economic Growth in Nigeria. *CBN Journal of Applied Statistics, 3(1)*, 43-63.

World Bank (2022). Global Database of Inflation.

Yelwa, M., Okoroafor, O.K., & Awe, E. (2015). Analysis of the Relationship between Inflation, Unemployment and Economic Growth in Nigeria: 1987-2012, *Applied Economics and Finance, 2, (3),* 102-109.