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Determinants of workers' new minimum wage in Nigeria: Incorporating Nigeria's current economic situation

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ABSTRACT

The minimum wage is a government-imposed requirement that employers pay their employees a specified minimum amount in compensation. This study makes a unique contribution by investigating the factors that determine the new minimum wage for workers in Nigeria. This investigation will take into account Nigeria's current economic situation, which led to the consideration of economic indices to determine the new minimum wage while also controlling for the country's population growth rate. This study used yearly time series data collected from the World Bank development indicators spanning from 1991 to 2023. According to the results, the applied OLS regression model reveals a significant relationship between the new minimum wage and its determinants, including the inflation rate, unemployment rate, public debt, poverty rate, and GDP, while controlling for the population growth rate. The VAR model demonstrated a significant short-run relationship between the minimum wage, inflation, unemployment, public debt, poverty, GDP, and population growth rate. The FMOLS model demonstrates that inflation has a negative long-run effect on the minimum wage, whereas unemployment, public debt, GDP, and population growth rate have a positive long-run effect on the minimum wage. Therefore, it is crucial to determine the new minimum wage in Nigeria holistically, taking into account the economic reality of the

inflation rate hike and other economic indices. This will not only enhance the standard of living and productivity of workers but also positively impact economic growth in the long run.

Keywords: New minimum wage, Inflation, OLS regression, VAR model, FMOLS.

1 Introduction

The minimum wage is a legally enforced obligation for companies to compensate employees with a predetermined minimum sum as remuneration (Alege et al., 2019). Based on the Nigerian economic output indicator, specifically inflation, which experienced a significant increase of 33.2% in March 2024, there has been a widespread rise in the prices of goods and services (NBS, 2024). This has resulted in severe difficulties for Nigerian citizens, who are now facing challenges in their daily lives and struggling to cope with the high cost of living. In addition, despite the ongoing escalation in the costs of commodities and services in Nigeria, there has been no corresponding increase in workers' salaries, leading to a substantial level of poverty among them. Consequently, the Nigerian labour union has lately requested a rise in the minimum wage from the government (Punch newspaper, 2024). Their objective is to enhance the quality of life for Nigerian workers and enable them to fulfil their daily household needs.

Imobighe (2007) researched to find out how hikes in the minimum wage affected employment and productivity in Nigeria. He discovered that employment and the minimum wage are significantly associated, meaning that a rise in the minimum wage increases employment. His actual model showed that productivity and the minimum wage correlated well. He concluded, based on this observation, that raising the minimum wage increases worker productivity by inspiring people to work more and create more. Additionally, Keji (2021) posited that the notion of human capital refers to the talents and efforts of the workforce, including workers' renumeration, in an economy with the aim of achieving economic progress.

Several economic studies have examined the effects of increasing the minimum wage on employment and unemployment rates, worker mobility between jobs, poverty levels, and the overall labour market. These studies include the works of Marginean and Chenic (2013), Addison (2013), and Alaniz (2011). Examining the US economy as an example, Addison (2013) analysed the extent to which a raise in the minimum wage can affect workers. As per the authors (Marginean and Chenic, (2013); Addison, (2013); and Alaniz, (2011)) wage increases have a limited impact on a small group of low-paid workers and do not instantly result in a greater control for unemployment rate. Alaniz. (2011) used a more comprehensive method to examine the impact of alterations in legal minimum salaries on the outcomes of the local labour market. He concludes that the adjustments will mostly impact a specific group of workers who currently earn a wage that is around 20% below the average.

In Nigeria, Onyechi and Edet (2017) documented the initial effort to implement a national minimum wage in the old Western regional government in 1954. The need to provide fair compensation to workers motivated this initiative. The plan suggested increasing the workers' daily salary to more than fifty kobo for a four-hour work week. This plan was submitted to the national government for approval, potentially making it Nigeria's national minimum wage. However, the national government rejected the wage programme, citing concerns that its approval could result in a surge in unemployment and inflation, potentially leading to a nationwide industrial crisis in the form of a walkout.

Abada et al. (2019) authored a publication discussing the 2019 national minimum wage negotiations. The authors identified the viability of Nigerian states and the national economy's instability as obstacles to the payment of the proposed 56,000 Naira. Some states have not fully implemented the 18,000 Naira minimum wage of 2011. After the official enactment of the new national minimum wage, the analysis suggests that states will abandon their responsibilities and fade into obscurity due to their insufficient financial resources to meet the payment requirements. In a similar vein, Oforle (2014) contends that the level of adherence by states to the payment of the minimum wage varies among different states. He attributes this to the financial stability of individual states, which has been a significant factor in public sector employers' adherence to wage directives from the federal government in Nigeria since 1991. Both investigations highlighted concern regarding the inability of certain state governments to meet the 18,000 Naira minimum salary, which raises doubts about the complete implementation of the new minimum wage.

This study is based on the bargaining theory, which emphasises that workers, employers (the Nigerian government), and unions—the Nigeria Labour Congress (NLC) and Trade Union Congress (TUC)—determine wages through absolute negotiation, tailored to the Nigerian economic context (Davidson and Edgeworth, 1899). Currently, negotiations are ongoing between the NLC, TUC and Nigerian government to reach a consensus on the new minimum proposed by the unions for the welfare and betterment of Nigerian workers. Therefore, this study will make a unique contribution by investigating the factors that determine the new minimum wage for workers in Nigeria. This investigation will take into account Nigeria's current economic situation, which led to the consideration of economic indices such as the inflation rate, unemployment, public debt, poverty rate, and GDP to determine the new minimum wage while also controlling for the country's population growth rate.

The graph in Figure 1 illustrates the minimum wage in Nigeria from 1991 to 2023. It shows that the minimum wage for Nigerian workers increased from 18,000 Naira in 2018 to 30,000 Naira in 2019. Despite the country's economic hardship, the federal government of Nigeria maintained the minimum wage of 30,000 Naira as a mandatory remuneration for all employees until 2023. This has led to ongoing negotiations between Nigerian labor unions and the federal

government to determine the new minimum wage, with the aim of improving living conditions for Nigerian workers.

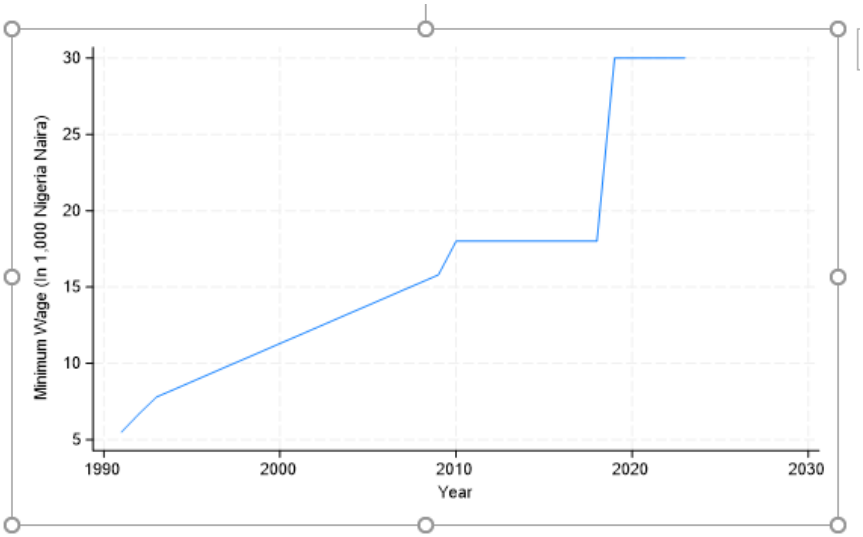

Fig. 1: Graph of the minimum wage in Nigeria from 1991 to 2023

1.1 Research gap and justification

Despite extensive research on the minimum wage and its implications on employment, productivity, and economic stability, there remains a significant gap in the context-specific examination of the determinants influencing the new minimum wage in Nigeria, particularly amidst the country's current economic turbulence. Previous studies have predominantly focused on developed economies or general outcomes without adequately addressing the unique economic and social landscape of Nigeria. For instance, while Addison (2013) and Alaniz (2011) provided valuable insights into the limited impact of minimum wage increases on unemployment in the US, these findings may not be directly applicable to the Nigerian context due to differing economic structures and labor market dynamics. Additionally, Imobighe's (2007) work, which linked minimum wage hikes to increased employment and productivity in Nigeria, did not comprehensively account for other critical economic indicators such as inflation, public debt, and poverty rate. Moreover, earlier studies like those by Onyechi and Edet (2017) and Abada et al. (2019) highlighted historical and regional challenges in implementing a national minimum wage but did not consider the full spectrum of current economic conditions, including the severe inflation rate hike reported by the National Bureau of Statistics (NBS, 2024). This study aims to fill this research gap by integrating a broader range of economic indices to analyze their collective impact on determining a new minimum wage in Nigeria.

2 Methodology

This study employed a quantitative causal research design to investigate the link between the Nigerian workers new minimum wage and its determinants while controlling for the population growth rate based on the bargaining theory (Davidson and Edgeworth, 1899; Okey, Adjor, and Ketor, 2020). The quantitative methods employed for this study include descriptive statistics, unit root tests, the ordinary least square (OLS) regression model, fully modified least squares (FMOLS), and the vector autoregressive (VAR) model:

2.1 Data Sources

The secondary data used for this study was extracted from the World Bank annual publication spanning from spanning from 1991 to 2023 on a yearly basis.

2.2 Sampling Scheme

We extracted the time series data for the study from World Bank publications using purposive sampling (Dayan, 2015), that is based on data availability and current issues in Nigeria surrounding the determination of the new minimum wage in the country.

2.3 Development of the design of the study

The OLS regression is a method for estimating the unknown parameters in a linear regression model. It minimizes the sum of the squared differences (residuals) between the observed dependent variable and those predicted by the linear function of the independent variables. The goal is to find the line (or hyperplane in higher dimensions) that best fits the data. Mathematically, the OLS regression model is expressed as:

$$Y = X\beta + \epsilon \tag{1}$$

where: Y is the dependent variable vector, X is the matrix of independent variables, β is the vector of coefficients to be estimated, ϵ is the vector of error terms. The OLS estimator of β is given by:

$$\beta = (X^{'}X)^{-1}X^{'}Y \tag{2}$$

Fully Modified Least Squares (FMOLS) is an econometric technique developed to provide optimal estimates of cointegrating regressions. It modifies the OLS estimator to account for serial correlation and endogeneity in the regressors, which often occur in time series data. FMOLS adjusts the OLS estimator by correcting for these issues, ensuring that the estimations are more reliable, especially in the presence of cointegrated relationships.

FMOLS involves:

- Adjusting for endogeneity by incorporating leads and lags of the independent variables,

- Correcting for serial correlation using a non-parametric approach.

The FMOLS estimator is given by:

$$\beta = (X^{'}X)^{-1}X^{'}(Y + \Delta) \tag{3}$$

where Δ includes adjustments for endogeneity and serial correlation.

This study adopted the Keji (2021) functional model approach, using OLS regression to establish the link between the variables and FMOLS to investigate the long-term impact of the predictor variables on the dependent variable. We can define the functional relationship between the two aforementioned models as follows:

$$Min\text{-}Wage = f(Inf, Unemp, Pdebt, Pov, GDP, Pop\text{-}growth) \tag{4}$$

The OLS regression model specification will take this form:

$$\begin{aligned} Min\text{-}Wage_t =& \beta_0 + \beta_1(Inf)_t + \beta_2(Unemp)_t + \beta_3(Pdebt)_t + \beta_4(Pov)_t \\ &+ \beta_5(GDP)_t + \beta_6(Pop\text{-}growth)_t + \epsilon_t \end{aligned} \tag{5}$$

where $\epsilon_t \sim N(0, \sigma^2)$.

The main independent variables in this scenario include inflation (Inf), unemployment (Unemp), public debt (Pdebt), poverty (Pov), and gross domestic product (GDP), while the control variable is the population growth rate (Pop-Growth). The dependent variable is the minimum wage (Min-Wage), which is a proxy for the new minimum wage. The constant term is denoted by β_0, the predictor variable coefficient estimations are represented by β1 through β6, and the residual or error term is denoted by ϵ_t , while t is the period in years. Meanwhile, the estimate of β for the FMOLS will also be evaluated to interpret the contribution of the predictors in the long run.

2.4 Unit root test

This study used the Augmented Dickey Fuller technique to conduct a unit root test. The purpose of this test was to examine the null hypothesis that a unit root exists (i.e., the series is not stationary) and compare it to the alternative hypothesis that there is no unit root, indicating the stationarity of the series. The test is crucial for detecting and removing any non-stationarity that may lead to a false correlation or incorrect conclusion.

2.4.1 Test Specification

The ADF test augments the basic Dickey-Fuller test by including lagged differences of the dependent variable to account for higher-order serial correlation. The general form of the ADF test regression is:

$$\Delta Y_t = \alpha + \beta t + \gamma Y_{t-1} + \sum_{i=1}^{p} \delta_i \Delta Y_{t-i} + \epsilon_t \tag{6}$$

where: Δ denotes the first difference operator ($\Delta Y = Y_t - Y_{t-1}$), Y_t is the time series at time t, t is a linear time trend (optional), α is a constant term, γ is the coefficient of the lagged level of the series, ρ is the number of lagged difference terms included to account for serial correlation, δ_i are the coefficients of the lagged differences, ϵ_t is the error term.

Hypotheses
Null Hypothesis (H0): $\gamma = 0$ (The series has a unit root, i.e., it is non-stationary).
Alternative Hypothesis (H1): $\gamma < 0$ (The series does not have a unit root, i.e., it is stationary).

Test Statistic
The test statistic for the ADF test is the t-statistic associated with the coefficient γ in the regression equation:

$$ADF = \frac{\hat{\gamma}}{SE(\hat{\gamma})} \tag{7}$$

where: $\hat{\gamma}$ is the estimated coefficient for Y_{t-1}, $SE(\hat{\gamma})$ is the standard error of the estimated coefficient.

Rejection Criteria

- The null hypothesis H0 is rejected if the ADF test statistic is less than the critical value from the Dickey-Fuller distribution table at a chosen significance level (e.g., 1%, 5%, or 10%).
- If the test statistic is greater than the critical value, we fail to reject the null hypothesis, indicating the presence of a unit root (non-stationarity).

2.5 Vector Autoregressive (VAR) Model

The proposed VAR model is very useful for the investigation of the short run relationship between the variables of interest which are the minimum wage and its determinants, and the VAR model can be written as follows:

$$Y_t = \mu_i + \delta(\gamma) Y_t + \epsilon_t \tag{8}$$

where $\epsilon_t \sim N(0, \sigma^2)$, Y_t represents the vector of the endogenous stationary series of minimum wage, inflation, unemployment, public debt, poverty, GDP and population growth. $\delta(\gamma)$ denotes the matrix polynomial in the lag operator with $\delta(\gamma) = \delta^1\gamma_1 + \delta^2\gamma_2 + \ldots + \delta^p\gamma_p$, and ϵ_t denotes the residual vector.

The matrix form of the proposed VAR model in Equation 8 was treated as endogenous and can be written as follows:

$$\begin{aligned}\Delta(Min\text{-}Wage_t) =&\mu_1 + \sum_{j=1}^{p}\alpha_{1j}\Delta(Min\text{-}Wage_{(t-j)}) + \sum_{j=1}^{p} b_{1j}\Delta(Inf_{(t-j)}) \\ &+ \sum_{j=1}^{p}\sum_{j=1}^{p} c_{1j}\Delta(Unemp_{(t-j)}) + \sum_{j=1}^{p}\sum_{j=1}^{p} d_{1j}\Delta(Pdebt_{(t-j)}) \\ &+ \sum_{j=1}^{p}\sum_{j=1}^{p} e_{1j}\Delta(Pov_{(t-j)}) + \sum_{j=1}^{p}\sum_{j=1}^{p} f_{1j}\Delta(GDP_{(t-j)}) \\ &+ \sum_{j=1}^{p}\sum_{j=1}^{p} g_{1j}\Delta(Pop\text{-}Growth_{(t-j)}) + \epsilon_{1t}\end{aligned} \tag{9}$$

$$\begin{aligned}\Delta(Inf_t) =&\mu_2 + \sum_{j=1}^{p}\sum_{j=1}^{p}\alpha_{2j}\Delta(Min\text{-}Wage_{(t-j)}) + \sum_{j=1}^{p}\sum_{j=1}^{p} b_{2j}\Delta(Inf_{(t-j)}) \\ &+ \sum_{j=1}^{p}\sum_{j=1}^{p} c_{2j}\Delta(Unemp_{(t-j)}) + \sum_{j=1}^{p}\sum_{j=1}^{p} d_{2j}\Delta(Pdebt_{(t-j)}) \\ &+ \sum_{j=1}^{p}\sum_{j=1}^{p} e_{2j}\Delta(Pov_{(t-j)}) + \sum_{j=1}^{p}\sum_{j=1}^{p} f_{2j}\Delta(GDP_{(t-j)}) \\ &+ \sum_{j=1}^{p}\sum_{j=1}^{p} g_{2j}\Delta(Pop\text{-}Growth_{(t-j)}) + \epsilon_{2t}\end{aligned} \tag{10}$$

$$\begin{aligned}\Delta(Unemp_t) =&\mu_3 + \sum_{j=1}^{p}\sum_{j=1}^{p}\alpha_{3j}\Delta(Min\text{-}Wage_{(t-j)}) + \sum_{j=1}^{p}\sum_{j=1}^{p} b_{3j}\Delta(Inf_{(t-j)}) \\ &+ \sum_{j=1}^{p}\sum_{j=1}^{p} c_{3j}\Delta(Unemp_{(t-j)}) + \sum_{j=1}^{p}\sum_{j=1}^{p} d_{3j}\Delta(Pdebt_{(t-j)}) \\ &+ \sum_{j=1}^{p}\sum_{j=1}^{p} e_{3j}\Delta(Pov_{(t-j)}) + \sum_{j=1}^{p}\sum_{j=1}^{p} f_{3j}\Delta(GDP_{(t-j)}) \\ &+ \sum_{j=1}^{p}\sum_{j=1}^{p} g_{3j}\Delta(Pop\text{-}Growth_{(t-j)}) + \epsilon_3 t\end{aligned} \tag{11}$$

$$\begin{aligned}\Delta(Pdebt_t) =&\mu_4 + \sum_{j=1}^{p}\sum_{j=1}^{p}\alpha_{4j}\Delta(Min\text{-}Wage_{(t-j)}) + \sum_{j=1}^{p}\sum_{j=1}^{p}b_{4j}\Delta(Inf_{(t-j)})\\ &+\sum_{j=1}^{p}\sum_{j=1}^{p}c_{4j}\Delta(Unemp_{(t-j)}) + \sum_{j=1}^{p}\sum_{j=1}^{p}d_{4j}\Delta(Pdebt_{(t-j)})\\ &+\sum_{j=1}^{p}\sum_{j=1}^{p}e_{4j}\Delta(Pov_{(t-j)}) + \sum_{j=1}^{p}\sum_{j=1}^{p}f_{4j}\Delta(GDP_{(t-j)})\\ &+\sum_{j=1}^{p}\sum_{j=1}^{p}g_{4j}\Delta(Pop\text{-}Growth_{(t-j)}) + \epsilon_4 t\end{aligned} \tag{12}$$

$$\begin{aligned}\Delta(Pov_t) =&\mu_5 + \sum_{j=1}^{p}\sum_{j=1}^{p}\alpha_{5j}\Delta(Min\text{-}Wage_{(t-j)}) + \sum_{j=1}^{p}\sum_{j=1}^{p}b_{5j}\Delta(Inf_{(t-j)})\\ &+\sum_{j=1}^{p}\sum_{j=1}^{p}c_{5j}\Delta(Unemp_{(t-j)}) + \sum_{j=1}^{p}\sum_{j=1}^{p}d_{5j}\Delta(Pdebt_{(t-j)})\\ &+\sum_{j=1}^{p}\sum_{j=1}^{p}e_{5j}\Delta(Pov_{(t-j)}) + \sum_{j=1}^{p}\sum_{j=1}^{p}f_{5j}\Delta(GDP_{(t-j)})\\ &+\sum_{j=1}^{p}\sum_{j=1}^{p}g_{5j}\Delta(Pop\text{-}Growth_{(t-j)}) + \epsilon_5 t\end{aligned} \tag{13}$$

$$\begin{aligned}\Delta(GDP_t) =&\mu_6 + \sum_{j=1}^{p}\sum_{j=1}^{p}\alpha_{6j}\Delta(Min\text{-}Wage_{(t-j)}) + \sum_{j=1}^{p}\sum_{j=1}^{p}b_{6j}\Delta(Inf_{(t-j)})\\ &+\sum_{j=1}^{p}\sum_{j=1}^{p}c_{6j}\Delta(Unemp_{(t-j)}) + \sum_{j=1}^{p}\sum_{j=1}^{p}d_{6j}\Delta(Pdebt_{(t-j)})\\ &+\sum_{j=1}^{p}\sum_{j=1}^{p}e_{6j}\Delta(Pov_{(t-j)}) + \sum_{j=1}^{p}\sum_{j=1}^{p}f_{6j}\Delta(GDP_{(t-j)})\\ &+\sum_{j=1}^{p}\sum_{j=1}^{p}g_{6j}\Delta(Pop\text{-}Growth_{(t-j)}) + \epsilon_6 t\end{aligned} \tag{14}$$

$$\begin{aligned}\Delta(Pop\text{-}Growth_t) =&\mu_7 + \sum_{j=1}^{p}\sum_{j=1}^{p}\alpha_{7j}\Delta(Min\text{-}Wage_{(t-j)}) + \sum_{j=1}^{p}\sum_{j=1}^{p}b_{7j}\Delta(Inf_{(t-j)})\\ &+\sum_{j=1}^{p}\sum_{j=1}^{p}c_{7j}\Delta(Unemp_{(t-j)}) + \sum_{j=1}^{p}\sum_{j=1}^{p}d_{7j}\Delta(Pdebt_{(t-j)})\\ &+\sum_{j=1}^{p}\sum_{j=1}^{p}e_{7j}\Delta(Pov_{(t-j)}) + \sum_{j=1}^{p}\sum_{j=1}^{p}f_{7j}\Delta(GDP_{(t-j)})\\ &+\sum_{j=1}^{p}\sum_{j=1}^{p}g_{7j}\Delta(Pop\text{-}Growth_{(t-j)}) + \epsilon_7 t\end{aligned} \tag{15}$$

2.6 Model Diagnostic Tests

The FMOLS and VAR models will undergo diagnostic tests like the residuals' normality test, while the OLS regression will undergo tests for normality, multicollinearity, autocorrelation, heteroscedasticity, and model stability to confirm the validity of the model.

2.7 Data Description

Table 1 provides a detailed description of the variables used in the study on the determinants of the new minimum wage in Nigeria, highlighting their abbreviations, units of measurement, and data sources. The minimum wage (Min-Wage), expressed in thousands of Nigerian Naira, is derived from Statista.com and the World Bank, serving as the dependent variable in the analysis. Inflation (Inf), unemployment (Unemp), public debt (Pdebt), poverty (Pov), GDP (GDP), and population growth (Pop Growth) are the independent variables, all sourced from the World Bank. Inflation and poverty are measured as percentages, indicating the rate of price increases and the proportion of the population living below the poverty line, respectively. Unemployment is measured in percentage. Public debt and GDP are both measured in billion USD, reflecting the country's economic size and financial obligations. Population growth is also measured as a percentage, indicating the annual increase in the population.

Table 1: Variable Description

Variables	Abbreviation	Measurement	sources
Minimum Wage	Min-Wage	(In 1,000 Nigeria Naira)	Statista.com; World Bank
Inflation	Inf	Percentage (%)	World Bank
Unemployment	Unemp	Percentage (%)	World Bank
Public debt	Pdebt	Billion USD	World Bank
Poverty	Pov	Percentage (%)	World Bank
GDP	GDP	Billion USD	World Bank
Population Growth	Pop Growth	Percentage (%)	World Bank

3 Results and Discussion

Table 2: Descriptive statistics

	Min Wage	Inf	Unemp	Pdebt	Pov	GDP	Pop Growth
Mean	15.903	18.813	5.011	38.413	91.599	278.878	2.625
Median	14.800	13.007	4.015	32.410	92.250	278.261	2.600
Max.	30.000	72.836	9.788	113.420	94.000	574.184	2.800
Min.	5.500	5.388	3.700	12.960	89.500	52.058	2.410
Std. Dev.	7.103	16.102	1.989	23.088	1.192	170.291	0.115
No. Obs.	33	33	33	33	33	33	33

Table 2 shows that the average minimum wage in Nigeria is 15,903 Naira with variability of 7,103 Naira during the period under review, the average inflation rate is about 19% with variability of about 16% during the period under review, the average unemployment rate is about 5% with the variability of about 2%, the average public debt is about 38.4 Billion USD with variability of about 23.1 Billion USD, the average poverty rate is about 91.6% with variability of about 1.2% during the period under review which is very consistent with the Nigeria current situation with the high level of poverty in the country, the average GDP is about 279 Billion USD with a variability of about 171 Billion USD during the period under review and the average population growth rate is about 2.6% with variability of about 0.1% during the period under review.

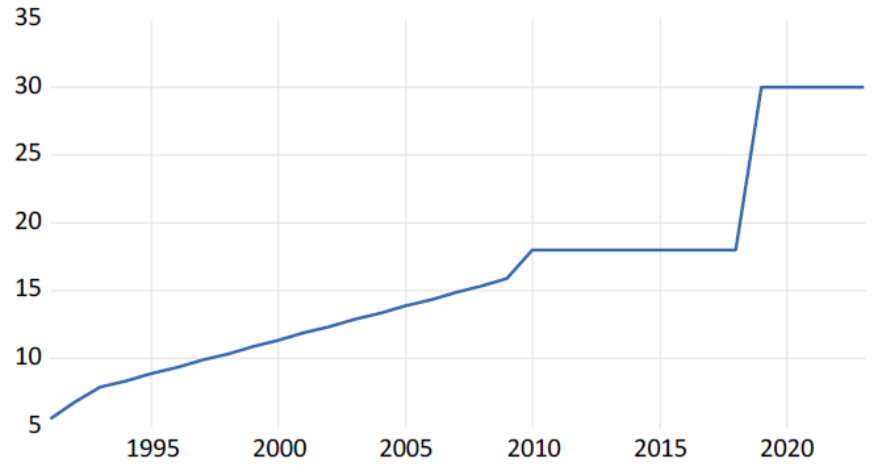

Fig. 2: Time plot of Minimum Wage

Figure 2 shows the trend of the minimum wage in Nigeria. The minimum wage demonstrates a generally increasing trend over the period, with noticeable spikes at certain points.

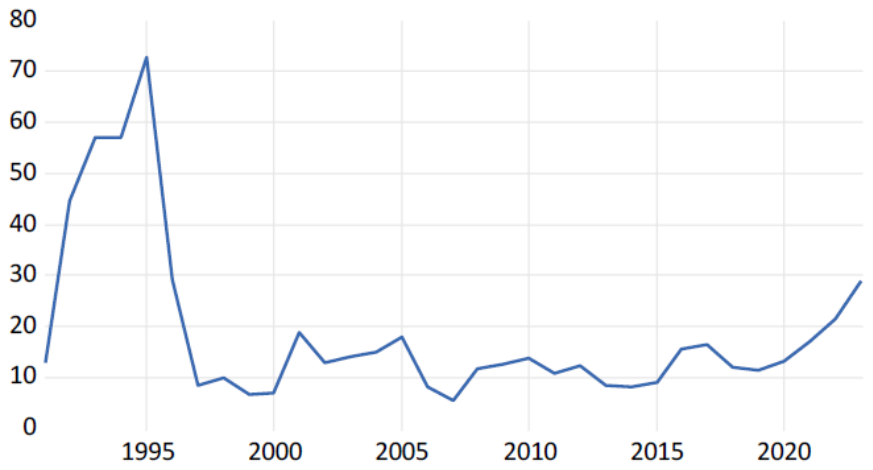

Fig. 3: Time plot of Inflation

Figure 3 tracks the annual percentage change in the general price level of goods and services. The inflation rate shows significant volatility over the period, with periods of high inflation and relatively stable prices.

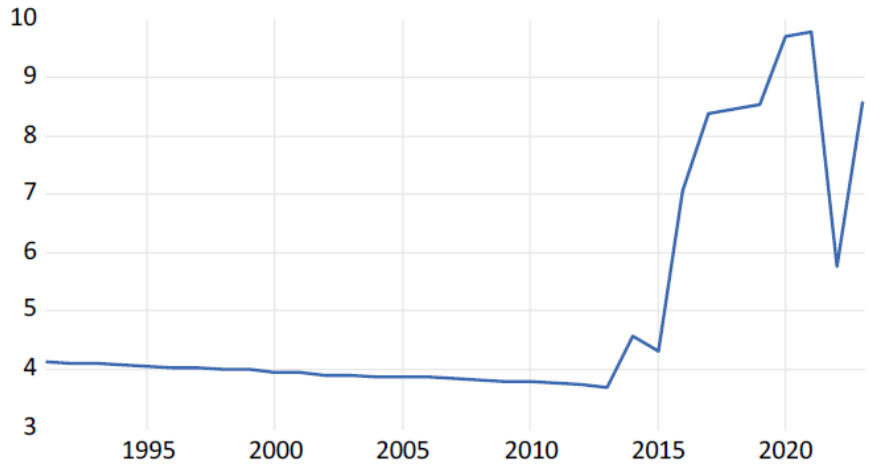

Fig. 4: Time plot of Unemployment

Figure 4 illustrates the unemployment rate, measured as the percentage of the unemployed labour force. The unemployment rate shows a gradual increase over the period, indicating a growing challenge in providing employment opportunities for the population.

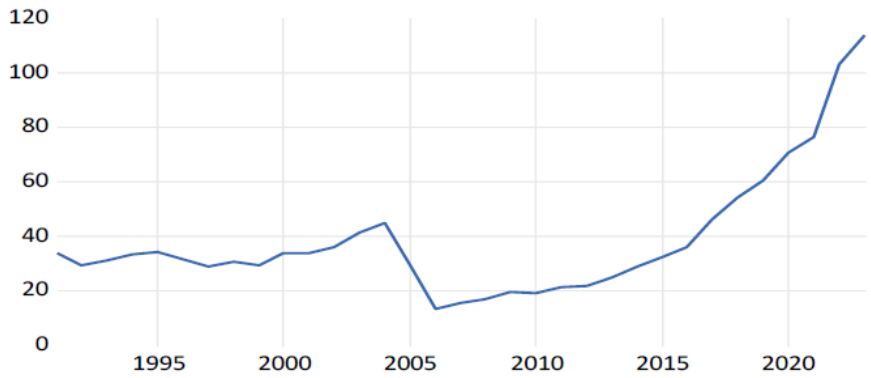

Fig. 5: Time plot of Public Debt

Figure 5 shows the trend in public debt, measured in billions of USD. Public debt has shown a dramatic increase, particularly in the later years of the period. This rising trend reflects increased borrowing by the Nigerian government to finance budget deficits and development projects, which could be a response to various economic challenges and the need to stimulate growth.

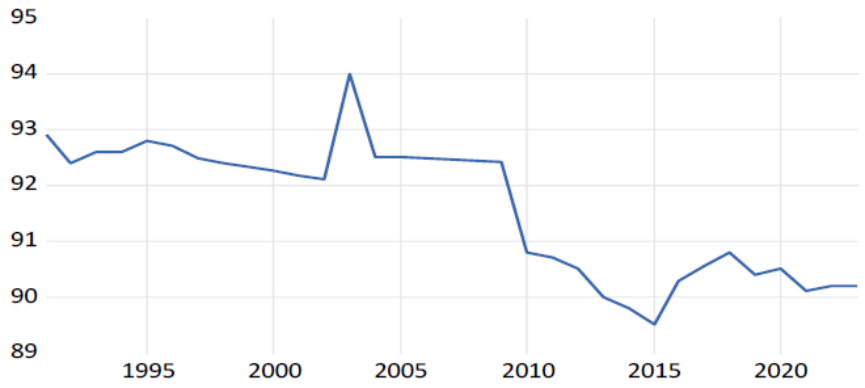

Fig. 6: Time plot of Poverty

Figure 6 depicts the percentage of the population living below the poverty line. The poverty rate shows a generally high and slightly increasing trend, indicating persistent and perhaps worsening poverty levels in Nigeria.

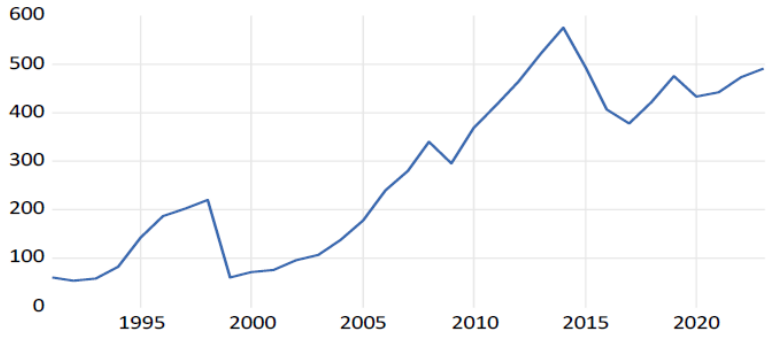

Fig. 7: Time plot of GDP

Figure 7 tracks the gross domestic product, measured in billions of USD. The GDP shows a steady increase over the period, reflecting overall economic growth. However, the growth rate appears to fluctuate, indicating periods of rapid economic expansion as well as slower growth or contraction, which may correspond to global economic conditions and domestic economic policies.

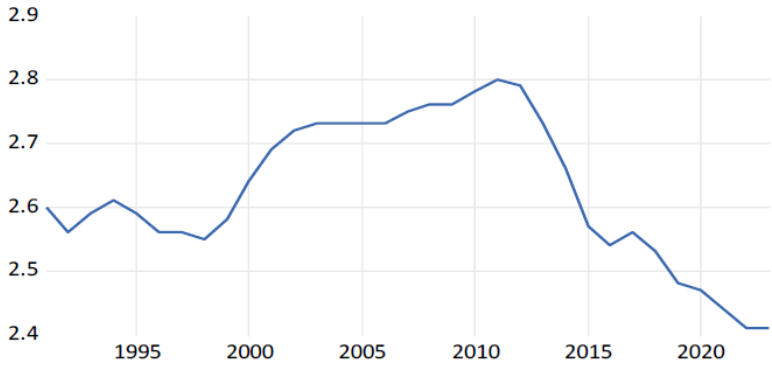

Fig. 8: Time plot of Population Growth

Figure 8 shows the annual population growth rate, measured as a percentage. The population growth rate shows slight fluctuations but generally remains stable over the period.

Table 3: Unit root test

Differenced Series	T-statistic	P-value	Order
Δ1Min-Wage	-3.42	0.0208	I (1)
Δ1Inflation	-5.38	0.0001	I (1)
Δ1Unemployment	-5.15	0.0003	I (1)
Δ1Public debt	-3.21	0.0292	I (1)
Δ1Poverty	-7.29	0.0000	I (1)
Δ1GDP	-4.49	0.0012	I (1)
Δ1 Pop-Growth	-3.91	0.0060	I (1)

Table 3 displays the unit root test results for the series under study, which include the minimum wage, inflation, unemployment, public debt, poverty, GDP, and population growth rate. The results show that all series, with a p-value of less than 0.05, are statistically significant at the 5% level after the first difference. This suggests that the series are stationary and lack a unit root, which could potentially lead to an incorrect conclusion. Thus, it is possible to conduct additional econometric analyses.

Table 4: OLS regression model

	Coefficient	Std. Error	t-Statistic	Prob.	VIF
Intercept	-36.22967	76.34389	-0.474559	0.6391	NA
Inflation	-0.041211	0.030696	-1.342517	0.1910	1.327357
Unemployment	1.074077	0.388635	2.763715	0.0104	3.245472
Public debt	0.171977	0.032329	5.319654	0.0000	3.026772
Poverty	-0.129988	0.835482	-0.155584	0.8776	4.386051
GDP	0.018991	0.005922	3.207040	0.0035	4.524306
Pop Growth	18.10977	7.003286	2.585896	0.0157	3.519003

R-squared	0.905132
Adjusted R-squared	0.883240
S.E. of regression	2.426980
Sum squared resid	153.1460
Log likelihood	-72.15056
F-statistic	41.34428
Prob(F-statistic)	0.000000

Table 4 shows that the coefficient estimate of the unemployment rate, public debt, GDP and population growth is statistically significant at 5% and has a positive and significant impact on the minimum wage, indicating that the higher unemployment, public debt, GDP and population growth rate will contribute to a higher minimum wage. This is very consistent with the disposition of Keji (2021), who stresses that part of the human resources effect in an organization is to ensure better human capital to enhance the nation's economic progress. The overall $p<0.05$ indicates that the fitted OLS regression model is statistically significant at the 5% level, suggesting that there is a significant linear relationship between the minimum wage, inflation, unemployment, public debt, poverty, GDP, and population growth rate, which contradicts the work of Imobighe (2007), who emphasizes that a hike in the minimum wage will hamper employment opportunities. The R-squared value of 0.905 suggests that inflation, unemployment, public debt, poverty, GDP, and population growth rate account for 90.5% of the minimum wage variation. This suggests that fixing the determinants that contributed 90.5%, which is relatively high, is necessary to determine a better new minimum wage in Nigeria.

Furthermore, the relatively high R-squared value and the overall regression model significance with Variance inflation factor (VIF) of all the predictors less than 5 (meaning, the model does not have a problem of multicollinearity) that suggest that the OLS regression model is a good fit for the data, valid, and suitable for future predictions of the new minimum wage in Nigeria.

Table 5: OLS Model after Removing Insignificant Variables

	Coefficients	Standard Error	t Stat	P-value	VIF
Intercept	-55.24417	18.55589	-2.9772	0.00594	NA
Unemployment	1.14659	0.38365	2.98866	0.00578	3.18202
Public debt	0.16972	0.03217	5.27637	1.3E-05	3.01455
GDP	0.02117	0.00307	6.88795	1.7E-07	1.49711
Population growth	20.18578	6.58513	3.06536	0.00478	3.13033

R-squared	0.898455
Adjusted R-squared	0.883949
S.E. of regression	2.419598
Sum squared resid	163.92480
Log likelihood	-73.27282
F-statistic	61.93509
Prob(F-statistic)	0.000000

Table 4 shows that the coefficient estimate of the unemployment rate, public debt, GDP and population growth is statistically significant at 5% and has a positive and significant impact on the minimum wage, indicating that the higher unemployment, public debt, GDP and population growth rate will contribute to a higher minimum wage. The overall $p<0.05$ indicates that the refitted OLS regression model is statistically significant at the 5% level, suggesting that there is a significant linear relationship between the minimum wage, unemployment, public debt, GDP, and population growth rate, which contradicts the work of Imobighe (2007), who emphasizes that a hike in the minimum wage will hamper employment opportunities. The R-squared value of 0.898 suggests that unemployment, public debt, GDP, and population growth rate account for 89.8% of the minimum wage variation after removing the insignificant variable. This suggests that fixing the determinants that contributed 89.8%, which is relatively high, is necessary to determine a better new minimum wage in Nigeria. Furthermore, the relatively high R-squared value and

the overall regression model significance with Variance inflation factor (VIF) of all the predictors less than 5 (meaning, the model does not have a problem of multicollinearity) that suggest that the OLS regression model is a good fit for the data, valid, and suitable for future predictions of the new minimum wage in Nigeria.

The regression model can be written as:

$$Min\text{-}Wage = -55.2442 + 1.1466(Unemp) + 0.1697(Pdebt) + 0.0212(GDP) + 20.1858(Pop\text{-}Growth)$$

Figure 9 shows that the fitted OLS regression estimated parameters fall between the two 95% confidence intervals, indicating that the estimated OLS parameters are stable. On the other hand, Figure 10 displays the normality diagnostic for the OLS regression using the Jarque-Bera test, indicating that P > 0.05. This suggests that the OLS regression residuals are normally distributed, satisfying the OLS assumptions. Meanwhile,

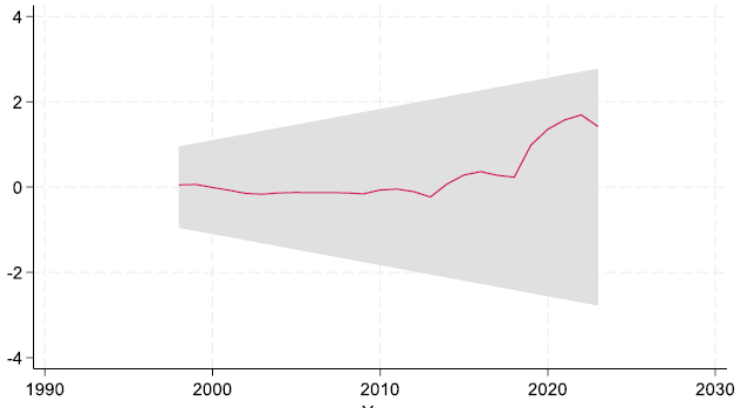

Fig. 9: CUSUM Test for OLS Regression Stability

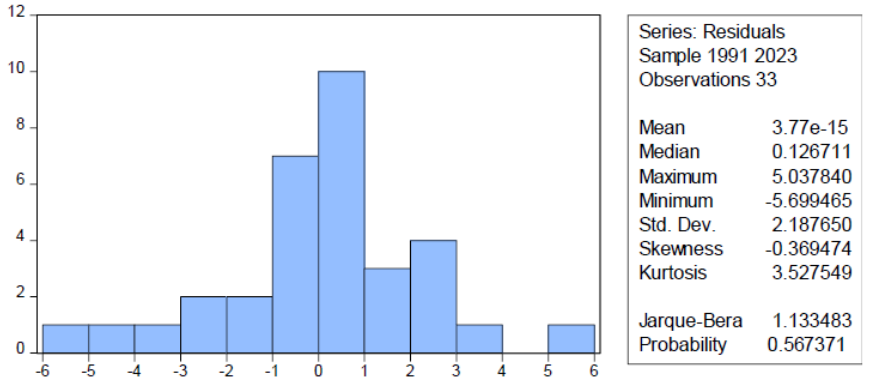

Fig. 10: Normality test for OLS regression

Table 6: Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	3.550983	Prob. F(6,26)	0.0106
Obs*R-squared	14.86273	Prob. Chi-Square(6)	0.0514
Scaled explained SS	11.65969	Prob. Chi-Square(6)	0.0700

The results of the heteroskedasticity test are shown in Table 6. The P-value of 0.0514 was greater than 0.05, which means that the fitted OLS regression does not have the problem of heteroscedasticity.

Table 7: Breusch-Godfrey Serial Correlation LM Test

F-statistic	1.278123	Prob. F(2,24)	0.2968
Obs*R-squared	3.176509	Prob. Chi-Square(2)	0.2043

Table 7 displays the results of the serial correlation testto confirm the model's validity. The P value of 0.2043 was higher than 0.05, which means that the fitted OLS regression model does not have a problem with the auto-correlation of the residuals or error term.

Table 8: Fully modified least squares (FMOLS)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Intercept	-60.75872	51.40792	-1.181894	0.2484
Inflation	-0.043721	0.021143	-2.067858	0.0491
Unemployment	1.170536	0.261924	4.468991	0.0001
Public debt	0.173344	0.021766	7.964076	0.0000
Poverty	0.118145	0.562500	0.210036	0.8353
GDP	0.019907	0.004018	4.954150	0.0000
Population growth	18.53513	4.756535	3.896771	0.0006

R-squared	0.908828
Adjusted R-squared	0.886947
S.E. of regression	2.340977
Long-run variance	2.669315

Table 8 shows that the coefficient estimate of inflation is statistically significant at the 5% level and has a negative long-run effect on the minimum

wage, suggesting that a higher level of inflation rate hurts the determination of the new minimum wage in Nigeria in the long run, which greatly translates to the current Nigerian economic situation as a hike in the inflation rate has contributed to a general rise in the price level of commodities and services, which in turn affects productivity and makes good remuneration difficult for many employers of labor in the country. The Table 7.1 result also revealed that the coefficient estimates of unemployment, public debt, GDP and population growth rate have a positive long-run effect on the minimum wage, indicating that in the long run, the high level of unemployment, public debt, GDP and population growth rate will contribute to a better minimum wage. The R-squared value of 0.9088 also shows that inflation, unemployment, public debt, poverty, GDP, and population growth rate are responsible for 90.88% of the changes in the minimum wage. This proves that the FMOLS and model fit work.

Table 9: Fully modified least squares (FMOLS)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
UNEMPLOYMENT	1.146222	0.26571	4.31383	0.0002
PUBLIC_DEBT	0.171608	0.02208	7.77361	0.0000
POPULATION_GROW	18.98722	4.70708	4.03376	0.0004
GDP	0.019664	0.0023	8.56488	0.0000
INFLATION	-0.043363	0.02146	-2.02038	0.0538
C	-50.82704	13.435	-3.78318	0.0008

R-squared	0.908799
Adjusted R-squared	0.89126
S.E. of regression	2.295883
Long-run variance	2.750949

Table 9 shows that the coefficient estimate of inflation is statistically significant at the 5% level and has a negative long-run effect on the minimum wage, suggesting that a higher level of inflation rate hurts the determination of the new minimum wage in Nigeria in the long run, which greatly translates to the current Nigerian economic situation as a hike in the inflation rate has contributed to a general rise in the price level of commodities and services, which in turn affects productivity and makes good remuneration difficult for many employers of labor in the country. The Table 7.2 result also revealed that the coefficient estimates of unemployment, public debt, GDP and population growth rate have a positive long-run effect on the minimum wage,

indicating that in the long run, the high level of unemployment, public debt, GDP and population growth rate will contribute to a better minimum wage. The R-squared value of 0.9088 also shows that inflation, unemployment, public debt, GDP, and population growth rate are responsible for 90.88% of the changes in the minimum wage.

Figure 11 displays the normality diagnostic of the FMOLS using the Jarque-Bera test, revealing that P > 0.05. This indicates that the FMOLS residuals are normally distributed, further validating the fitted FMOLS.

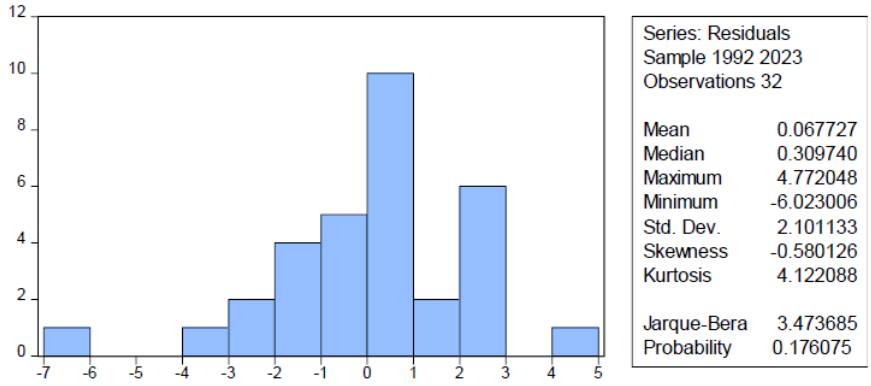

Fig. 11: Normality test for FMOLS

Table 10: VAR Model

Variable	MIN-WAGE	UNEMP	P-DEBT	POP-GROW	GDP	INF	POV
MIN-WAGE(-1)	0.349967	0.1231	0.866764	0.005255	-4.305877	0.56674	0.020801
	-0.20294	-0.11745	-0.64341	-0.00239	-4.64657	-1.3103	-0.06763
	[1.72446]	[1.04812]	[1.34715]	[2.20119]	[-0.92668]	[0.43253]	[0.30759]
MIN-WAGE(-2)	-0.074872	-0.261986	0.967331	-0.001033	2.536501	0.66832	0.027942
	-0.22218	-0.12858	-0.70441	-0.00261	-5.08712	-1.4345	-0.07404
	[-0.33698]	[-2.03746]	[1.37325]	[-0.39536]	[0.49861]	[0.46588]	[0.37740]
UNEMP(-1)	0.277471	0.451216	-0.382579	-0.010216	-0.934155	-1.1056	-0.013212
	-0.43504	-0.25177	-1.37924	-0.00512	-9.9606	-2.8088	-0.14497
	[0.63781]	[1.79219]	[-0.27739]	[-1.99628]	[-0.09378]	[-0.39361]	[-0.09114]
UNEMP(-2)	2.435279	0.092192	3.001758	0.002257	39.16788	3.0204	0.020525
	-0.73652	-0.42625	-2.33506	-0.00866	-16.8634	-4.7553	-0.24543
	[3.30645]	[0.21629]	[1.28551]	[0.26051]	[2.32265]	[0.63516]	[0.08363]
P-DEBT(-1)	0.010865	0.049356	0.846385	-0.001048	-1.225491	0.27208	-0.008865
	-0.07065	-0.04089	-0.224	-0.00083	-1.61769	-0.4562	-0.02354
	[0.15378]	[1.20705]	[3.77850]	[-1.26045]	[-0.75756]	[0.59643]	[-0.37654]
P-DEBT(-2)	-0.009241	-0.006969	-0.647478	-0.000131	1.562215	-0.8928	-0.012581
	-0.10691	-0.06187	-0.33894	-0.00126	-2.44778	-0.6903	-0.03563
	[-0.08644]	[-0.11263]	[-1.91029]	[-0.10428]	[0.63822]	[-1.29348]	[-0.35315]
POP-GROW(-1)	1.900475	3.519487	-119.2224	1.113875	803.5411	-132.9	-6.637198
	-23.4511	-13.5718	-74.3489	-0.27588	-536.935	-151.41	-7.81459
	[0.08104]	[0.25932]	[-1.60355]	[4.03758]	[1.49653]	[-0.87773]	[-0.84933]

Variable	MIN-WAGE	UNEMP	P-DEBT	POP-GROW	GDP	INF	POV
POP-GROW(-2)	17.94214	-2.909573	76.021	-0.34036	-92.80107	117.959	5.049259
	-23.3287	-13.501	-73.9608	-0.27444	-534.132	-150.62	-7.7738
	[0.76910]	[-0.21551]	[1.02785]	[-1.24021]	[-0.17374]	[0.78315]	[0.64952]
GDP(-1)	0.002191	-0.002345	-0.035246	-0.00026	0.590645	-0.0754	-0.00264
	-0.01056	-0.00611	-0.03348	-0.00012	-0.24181	-0.0682	-0.00352
	[0.20744]	[-0.38360]	[-1.05266]	[-2.09576]	[2.44261]	[-1.10508]	[-0.75023]
GDP(-2)	0.004828	0.008306	-0.054012	0.000115	0.344	-0.0312	-0.005203
	-0.01143	-0.00661	-0.03623	-0.00013	-0.26165	-0.0738	-0.00381
	[0.42250]	[1.25583]	[-1.49077]	[0.85399]	[1.31471]	[-0.42224]	[-1.36636]
INF(-1)	-0.033512	0.000429	-0.058324	-8.45E-05	0.454876	0.78834	-0.011484
	-0.03499	-0.02025	-0.11094	-0.00041	-0.80121	-0.2259	-0.01166
	[-0.95766]	[0.02120]	[-0.52571]	[-0.20518]	[0.56774]	[3.48924]	[-0.98484]
INF(-2)	-0.00456	-0.000406	0.024779	-0.000485	1.663258	-0.1748	0.005942
	-0.03358	-0.01943	-0.10645	-0.00039	-0.76875	-0.2168	-0.01119
	[-0.13583]	[-0.02090]	[0.23278]	[-1.22907]	[2.16360]	[-0.80648]	[0.53106]
POV(-1)	0.228472	0.20694	-0.799853	0.001673	-10.38621	-5.1108	0.222013
	-0.74376	-0.43043	-2.358	-0.00875	-17.0291	-4.802	-0.24784
	[0.30719]	[0.48077]	[-0.33921]	[0.19126]	[-0.60991]	[-1.06429]	[0.89578]
POV(-2)	-0.113397	-0.412321	-5.329214	0.004621	1.596128	-0.6358	-0.066997
	-0.7329	-0.42415	-2.32356	-0.00862	-16.7804	-4.7319	-0.24422
	[-0.15472]	[-0.97212]	[-2.29355]	[0.53597]	[0.09512]	[-0.13437]	[-0.27433]
C	-65.23222	18.54375	689.2962	0.083286	-1232.354	593.242	83.67701
	-84.0226	-48.6262	-266.384	-0.98844	-1923.78	-542.49	-27.9988
	[-0.77637]	[0.38135]	[2.58761]	[0.08426]	[-0.64059]	[1.09356]	[2.98860]
R-squared	0.966193	0.872185	0.971736	0.984214	0.969621	0.73826	0.876918
Adj. R-squared	0.936611	0.760347	0.947005	0.970401	0.943039	0.50924	0.76922
Sum sq. resids	47.6343	15.95398	478.7877	0.006592	24971.07	1985.67	5.289397
S.E. equation	1.72544	0.998561	5.470305	0.020298	39.50559	11.1402	0.574967
F-statistic	32.6621	7.798652	39.29198	71.25419	36.47705	3.22355	8.14244
Log likelihood	-50.64536	-33.69078	-86.41478	87.07886	-147.7051	-108.46	-16.57871
Akaike AIC	4.235185	3.14134	6.542889	-4.650249	10.4971	7.96534	2.037336
Schwarz SC	4.92905	3.835205	7.236754	-3.956384	11.19097	8.65921	2.731201
Mean dependent	16.53548	5.069742	38.87387	2.627419	293.2706	18.1686	91.53161
S.D. dependent	6.853201	2.03978	23.76253	0.117982	165.5277	15.9023	1.196863

Table 10 presents the estimation of the vector autoregressive (VAR) model, treating each of the variables of interest as endogenous. Each endogenous series has 12 lag parameters, and the p-values are less than 0.05. This suggests a significant short-run relationship between the minimum wage, inflation, unemployment, public debt, poverty, GDP, and population growth rate. We also validated the VAR model results with relatively high R-squared values for each of the lag parameter estimates. A positive coefficient for a variable lagged by one period implies that an increase in that variable in the previous period is associated with an increase in the minimum wage in the current period and a negative coefficient implies an inverse relationship. The VAR model can be written as:

$$\begin{aligned}\Delta(Min\text{-}Wage_t) = &-65.23222 + 0.349967\Delta(Min\text{-}Wage_{(t-1)}) \\ &- 0.074872\Delta(Min\text{-}Wage_{(t-2)}) - 0.033512\Delta(Inf_{(t-1)}) \\ &- 0.004560\Delta(Inf_{(t-2)}) + 0.277471(Unemp_{(t-1)}) \\ &+ 2.435279(Unemp_{(t-2)}) + 0.010865\Delta(Pdebt_{(t-1)}) \\ &- 0.009241\Delta(Pdebt_{(t-2)}) + 0.228472\Delta(Pov_{(t-1)}) \\ &- 0.113397\Delta(Pov_{(t-2)}) + 0.002191\Delta(GDP_{(t-1)}) \\ &+ 0.004828\Delta(GDP_{(t-2)}) + 1.900475\Delta(Pop\text{-}Growth_{(t-1)}) \\ &+ 17.94214\Delta(Pop\text{-}Growth_{(t-2)})\end{aligned}$$

The VAR Model also satisfy normality test as each of the endogenous variable p-values exceed the 0.05 significant level (See the appendix).

Table 11: Correlation Matrix

	Min-Wage	Inflation	Unemp.	Pub-debt	Poverty	GDP	Pop-growth
Min-Wage	1						
Inflation	-0.2951	1					
Unemp.	0.74881	-0.0539	1				
Pub-debt	0.70953	0.10274	0.73228	1			
Poverty	-0.7577	0.27678	-0.5655	-0.4207	1		
GDP	0.79914	-0.3674	0.50782	0.34496	-0.8856	1	
Pop-growth	-0.4256	-0.2374	-0.7164	-0.7726	0.33603	-0.189	1

Table 9 presents the correlation matrix for various economic variables in relation to the minimum wage in Nigeria. The matrix reveals that the minimum wage is positively correlated with unemployment (0.74881), public debt (0.70953), and GDP (0.79914), suggesting that increases in these factors are associated with higher minimum wages. In contrast, the minimum wage shows a negative correlation with inflation (-0.2951), poverty (-0.7577), and population growth (-0.4256), indicating that higher levels of these variables are linked to lower minimum wages.

4 Conclusion

This study makes a unique contribution by investigating the factors that determine the new minimum wage for Nigerian workers. This investigation will take into account Nigeria's current economic situation, which led to the con-

sideration of economic indices such as the inflation rate, unemployment, public debt, poverty rate, and GDP to determine the new minimum wage while also controlling for the country's population growth rate. The results of the analysis show that the minimum wage for Nigerian workers increased from 18,000 Naira in 2018 to 30,000 Naira in 2019. Despite the economic hardship of the country, the Nigerian federal government maintained the minimum wage of 30,000 Naira as a mandatory remuneration for all employees until 2023. This has led to ongoing negotiations between Nigerian labor unions and the federal government to determine the new minimum wage, with the aim of improving living conditions for Nigerian workers. The analysis further reveals using the OLS regression analysis that there is a significant relationship between the new minimum wage and its determinants, which include the unemployment, public debt, and GDP, while controlling for the population growth rate. The VAR model demonstrated a significant short-run relationship between the minimum wage, inflation, unemployment, public debt, poverty, GDP, and population growth rate.

The long-run benefits of the new minimum wage in Nigeria are very significant to the current Nigerian economic situation as a hike in the inflation rate has contributed to a general rise in the price level of commodities and services, which in turn affects productivity and makes good remuneration difficult for many employers of labor in the country while the unemployment, public debt, GDP and population growth rate have a positive long-run effect on the minimum wage, indicating that in the long run, the high level of unemployment, public debt, GDP and population growth rate will contribute to a better minimum wage.

Consequently, it is imperative to determine the new minimum wage in Nigeria holistically, considering the economic reality of the hike in the inflation rate and other economic indices, in order to enhance workers' standard of living and productivity, which will positively impact economic growth in the long run.

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Appendix

Table 12: Skewness normality test for the VAR model

Equation	Skewness	chi2	df	Prob>chi2
Minimum Wage	-0.43674	0.986	1	0.32084
Inflation	-0.11516	0.069	1	0.79351
Unemployment	-1.056	5.762	1	0.01638
Public debt	-0.09382	0.045	1	0.83113
Poverty	0.94467	4.611	1	0.03177
GDP	0.50861	1.337	1	0.24765
Population growth	0.09199	0.044	1	0.83438
All		12.852	7	0.07579