MRS Journal of Accounting and Business Management
Abbriviate Title- MRS J Acco Bus Manag
ISSN *(Online) 3049-1460*
Vol-2, Iss-4(April-2025)

Analyzing the Influence of Budget Deficit Variations on Nigeria's Macroeconomic Performance

Ndubuisi Eme Uguru[1*], Amos Williams[2]

[*1] Department of Economics, University of Uyo, Akwa Ibom State Nigeria

[2] Central Bank of Nigeria

Corresponding Author Ndubuisi Eme Uguru

Department of Economics, University of Uyo, Akwa Ibom State Nigeria

Article History

Received: 06 / 04/ 2025

Accepted: 22 / 04 / 2025

Published: 25 / 04 / 2025

Abstract: *The research investigates the influence of budget shortfalls on key economic indicators in Nigeria. spanning the period from 1981 to 2022 through the utilization of VAR analysis. The findings reveal that budget deficits negatively affect the exchange rate in both the short and long run Moreover, they negatively influence the real interest rate in the short term but exhibit a positive impact in the long run. Furthermore, money supply responds unfavorably to budget deficit shocks in both time frames. The study aligns with Keynesian principles and proposes the adoption of restrictive measures in monetary, fiscal, and exchange rate policies to address ongoing inflation and escalating interest rates.*

Keywords: *Budget Deficit, Macroeconomic Variables, Vector-autoregresion*

JEL Classification: E03, H63, C32.

Cite this article: Uguru, N. E., Williams, A., (2025). Analyzing the Influence of Budget Deficit Variations on Nigeria's Macroeconomic Performance. *MRS Journal of Accounting and Business Management, 2 (4),18-27.*

Introduction

Since the mid-1970s, debates on government budget deficits' impact on macroeconomic variables have been significant. A budget deficit arises when government expenditures exceed its revenue, leading to a shortfall in public savings. While overspending can be justified for infrastructure enhancement and economic stability, it poses serious implications for financial, economic, and political stability, influenced by factors like money supply, rates of interest, exchange rates, inflation, plus real GDP.

Theoretical connections between budget deficits and macroeconomic variables function in dual directions: some theories explore deficit impacts, while others examine how macroeconomic and fiscal factors determine deficits. Three main schools of thought, the Ricardian Equivalent theory, Neoclassical Paradigm, and Conventional Keynesian Proposition have emerged. The Neoclassical Paradigm predicts adverse effects, including higher interest rates, unfavorable exchange rates, reduced private investments and spending, increased inflation, higher current account deficits, and slowed economic growth through resources crowding out.

The Conventional Keynesian Proposition (CKP) challenges the neoclassical paradigm's crowd-out effect, asserting that budget deficits lead to domestic production growth, fostering optimism among private investors. This results in increased investment and money supply, termed the "crowding-in" effect. Increased deficits lead to elevated interest rates, attracting investments and leading to the strengthening of the currency's value, thereby boosting the current account surplus. Barro's Ricardian Equivalence Hypothesis (REH) offers a contrasting view, arguing that interaction of taxes and deficits doesn't affect actual interest rates, current account balance or the level of investment. According to REH, a budget deficit is equivalent to future tax increases, nullifying any influence on macroeconomic variables.

Numerous studies have explored the connection between government budget deficits and macroeconomic indicators in advanced and emerging economies. However, conclusive findings are elusive due to diverse models and findings across different economies and times, sparking debates on the relationship's nature and its impacts on factors such as interest rates, currency exchange rates, inflation and money supply. Nwanna and Umeh (2019) underscore that financing deficits through methods like printing money, debt financing, or using foreign reserves can influence the economy, with a focus on the significant cost and inflationary consequences of printing more money to cover deficits.

The budget deficit trend in Nigeria has shown an increase from N47.38 billion in 2008 to N6.97 trillion in 2020, with consistent deficits since 2015. The interest rate fluctuated, decreasing from 17.59 in 2010 to 9.0 in 2019 before rising to 11.5 in 2020. The exchange rate against the U.S. dollar witnessed a continuous increase from 150.2980 in 2010 to 412.77 in 2021and currently to 1555 in February 2024. Money supply has also consistently risen from 9,687.51 in 2010 to 43,975 in 2021. These trends indicate dynamic economic conditions in Nigeria over the specified period. (CBN, 2021).

The unclear relationship between budget deficits and macroeconomic factors in developing nations, encompassing Nigeria results from diverse empirical studies using varied data and estimation techniques globally. The present study intends to address deficiencies in the existing literature by systematically investigating the relationship in Nigeria. Previous cross-country analyses, like Yaya (2019), yielded mixed results, emphasizing the need for country-specific studies due to unique characteristics. This diversity complicates achieving a consensus on the exact connection between macroeconomic variables and budget deficit especially in emerging economies like Nigeria. Addressing this, the study focuses exclusively on Nigeria, aiming to determine the precise relationship with key variables such as interest rate, exchange rate, money supply, and inflation. Various studies specific to Nigeria, such as those carried out by Obi & Nuruden (2008), Chimobi & Igwe (2010), Onyedibe et al. (2021), Oke & Shittu (2021), Oluwole et al. (2020), Eigbiremolen et al. (2015), Onwioduokit (1999), Uma et al. (2020), applied VAR and ARDL models, along with Granger Causality tests using annual data. Chukwu, Otiw & Okere (2009) employed two-stage least square and Granger causality. An important drawback of the Granger Causality test is its susceptibility to the number of lags introduced in the model (Gujarati & Sangeetha, 2007).

This study differs from previous studies in Nigeria (Obi & Nuruden, 2008; Chimobi & Igwe, 2010; Onyedibe et al., 2021; Oke & Shittu, 2021; Oluwole et al., 2020; Eigbiremolen et al., 2015; Onwioduokit, 1999; Uma et al., 2020) in three significant ways. Firstly, it utilizes high-frequency data (quarterly) and employs a Vector Autoregressive (VAR) model in a multivariate framework, deviating from studies exclusively using annual data. Secondly, to eliminate co-integration and causality inferences, a pertinent variable (money supply) is incorporated, and inflation rate serves as a control variable to prevent variable omission. Finally, the response function analysis and variance decomposition analysis are employed to monitor the effects of shocks on present and future figures and examining the spread of periodic disturbances, respectively.

Given this context, it is pertinent to explore the effects of deficit budget on selected macroeconomic variables such as interest rate, exchange rate, money supply while using inflation rate as a control variable to avoid omission of important variable. The subsequent sections of this study are organized as follows: section 2 examines relevant literature, section 3 elaborates on data characteristics and methods employed, section 4 scrutinizes findings and discusses them, and Section 5 offers a synopsis along with suggestions for policy.

Literatures

In a series of studies across African countries, researchers delved into the repercussions of budget deficits on macroeconomic variables. Gbenga's (2021) investigation in Nigeria highlighted a direct relationship between interest rates and budget deficits, emphasizing the need for economic policies to mitigate macroeconomic fluctuations and counter the adverse effects of growing government deficits. Philip's (2021) research in Kenya demonstrated a connection between budget deficits and selected macroeconomic variables, showing positive impacts of shocks from interest rates and exchange rates on deficits using the Vector Autoregression model. Shittu and Oke (2021) confirmed long-run relationships among variables in Nigeria, revealing a positive and significant link between deficits and interest rates, while the relationship with exchange rates was negative but insignificant, recommending controlled recurrent expenditure to minimize budget deficits and prevent corruption. Onyedibe, Ibeto, Ogbu, and Uchenna's (2021) focus on Nigeria found positive long-run impacts of deficit funding and monetary expansion on inflation stressing the necessity for an expansionary monetary policy in cases of insufficient money circulation relative to goods and services output, and emphasizing collaborative efforts between the central bank and the government to address persistent inflation in Nigeria.

Chukwu, Otiwu, and Okere (2020) addressed the persistent challenge of rising budget deficits amidst weak growth of Nigerian economy, employing the two-stage least square technique. Their research uncovered a substantial negative correlation between budget deficits and inflation and real exchange rate, coupled with a positive and significant relationship with real interest rates. The study suggested that financing budget deficit has failed to stimulate the desired economic growth in Nigeria, advocating for a reduction in budget deficits. Turning to Robert, Bereh and Gopar (2020) investigated the causal relationship between budget deficits and macroeconomic indicators in Nigeria by employing several statistical examinations, such as Granger Causality test within the Vector Auto-Regression Model among others. The results showed a one-way causal link from exchange rates to deficit funding to the real GDP ratio, with no reciprocal influence. The researchers recommended that the government take into account the influence of exchange rates on deficit financing, especially considering Nigeria's import-dependent economy, as fluctuations in exchange rates could undermine the objectives of deficit budgeting and negatively impact the economy as a whole.

In Yaya's (2019) study, the causal link between budget deficits and inflation WAEMU countries was investigated using modified Granger causality tests. The research identified a causal relationship from budget deficits to inflation in Benin, Niger, Senegal, and Togo. Frequency domain analysis revealed causality The research found that in Burkina Faso, there is a long-term relationship between budget deficits and inflation, while in Niger, it is medium-term and in Senegal, it is short-term. In Togo, causality exists across short, medium, and long terms. Moreover, there is evidence of reverse causality from inflation to deficits in Burkina Faso, observed in both the medium and short terms.

Manamba (2017) studied the relationship between budget deficits and macroeconomic factors in Tanzania from 1966 to 2015, using Vector Autoregression (VAR) and Vector Error Correction Model (VECM). The findings revealed a significant negative association between real GDP and exchange rates with budget deficits. Conversely, inflation, money supply, and lending interest rates exhibited a positive correlation, suggesting a long-term relationship. Also in 2014, Osuka and Achinihu explored the persistent relationship between budget shortfalls and macroeconomic factors in Nigeria. They utilized Augmented Dickey-Fuller (ADF) techniques to detect unit root presence and the Johansen Cointegration test to establish cointegration. Their findings affirmed persistent correlation among budget deficits and crucial macroeconomic indicators such as GDP, interest rates, nominal exchange rates, and inflation rates. Granger Causality analysis revealed a unidirectional relationship, with GDP influencing budget deficits. However, no significant link was observed between budget deficits and interest rate, inflation, or nominal exchange rate. In summary, the study concluded that budget deficits significantly influence the macroeconomic performance of the economy.

In their 2013 study, Odionye and Uma investigated how budget deficits affect interest rates in Nigeria, employing the Vector Error Correction model (VECM). Their findings indicate a notable and positive correlation between budget deficits and interest rates over the long term. In essence, the research indicates that increased budget deficits lead to higher interest rates domestically.

Methodology

The study utilized macroeconomic time series spanning from 1981 to 2022, sourced from the Central Bank Nigeria Statistical Bulletin and Annual Report, focusing on key variables such as inflation rate, money supply, exchange rate, interest rate and budget deficit. The research aimed to scrutinize the data generation process, starting with an assessment of the time series characteristics using the Augmented Dickey-Fuller test within a regression framework incorporating a drift. Including a constant term in the regression equations enhanced the understanding of the time series characteristics.

$$\Delta BOD_t = \omega_0 + \omega_1 BOD_t + \sum_{j-1}^{k} \rho_j \, \Delta BOD_{t-1} + \varepsilon_{1t} .... \quad (1)$$

$$\Delta INTR_t = \beta_0 + \beta_1 INTR_t + \sum_{j-1}^{k} \phi_j \, \Delta INTR_{t-1} + \varepsilon_{2t} .... \quad (2)$$

$$\Delta EXCR_{t,} = \chi_0 + \chi_1 EXCR_t + \sum_{j-1}^{k} \rho_j \, \Delta EXCR_{t-1} + \varepsilon_{3t} .... \quad (3)$$

$$\Delta MS_{tt,} = \xi_0 + \xi_1 MOS_t + \sum_{j-1}^{k} \rho_j \, \Delta MS_{t-1} + \varepsilon_{4t} .... \quad (4)$$

$$\Delta INF_t = \delta_0 + \delta_1 INF_t + \sum_{j-1}^{k} \rho_j \, \Delta INF_{t-1} + \varepsilon_{5t} .... \quad (5)$$

Here, BOD represents the budget deficit, INTR stands for the real interest rate, EXCR denotes the exchange rate, MS represents the money supply, and INF indicates the inflation rate. The symbol Δ represents the first difference operator. The terms ε_{1t} to ε_{5t} signify the random error terms that are independently and identically distributed (iid), with k representing the count of past variations. In equations (1) to (4), the null hypothesis stays applicable as: $H_0 : \omega_i = \Xi_i = \Psi_i = \xi_i = \delta_i = 1$ (non stationary) $H_0 : \omega_i \neq \Xi_i \neq \Psi_i \neq \xi_i \neq \delta_i < 1$ (level stationary). long-term equilibrium connection between the budget deficit and interest ratewas established using Full Information Maximum Likelihood Multivariate Johanson cointegration procedure. The Johansen co-integration test is given as

$$Y_t = \psi_i Y_{t-1} + ... + \psi_p Y_{t-p} + \lambda X_{t-1} + \mu_t .... \quad (6)$$

Y_t represents a collection of non-stationary I(1) variables, while X_t denotes a set of deterministic variables and μ_t is a vector of innovations. We may put the above equation in VAR form as:

In the equation 6, Y_t represents a vector of non-stationary I(1) variables, X_t symbolizes a collection of fixed variables, while μ_t signifies a set of innovations.

We can express the above equation in Vector Autoregressive form as follows:

$$\Delta Y_t = \pi Y_{t-1} + \sum_{i=1}^{n-1} \delta_i Y_{t-n} + \psi_{t-n} + \lambda X_t + \mu_t .... \quad (7)$$

Where

$$\pi = \sum_{l=1}^{n} \psi_t - 1,\ \delta_i = -\sum_{k-i+1}^{n-1} \psi_p + \lambda X_t + \mu_t ...... \quad (8)$$

in the case where coefficient matrix π is of reduced rank, indicated as r < k, there exist matrices ψ and δ, both with a rank of r, such that π is the outcome of multiplying ψ by δ, and δY_t has a stationary order of zero (*I*(0)). (Granger 1987 as cited in Odionye & Uma, 2013). Here "r" signifies co-integrating relations, each one column of δ acts as a co-integrating vector. Johansen's method estimates the π matrix using an unconstrained VAR and assesses if rejection indicates a π matrix with diminished rank.

The VAR model is favored for its benefits, as it can be readily converted into a vector error correction mechanism (VECM) without running into simultaneity bias. It assists in elucidating, predicting, and projecting economic variable values, as well as examining weak exogeneity and parameter limitations, all without presuming a priori causality among variables. An advantageous feature is its avoidance of deciding a priori which contemporaneous variables are exogenous, treating all variables in the VAR model as endogenous. The general form of the model is:

$$y_{1T} = \varphi + \beta_i \sum_{j-1}^{k} Y_{t-1} + \lambda_i \sum_{j-1}^{k} X_{1T} \, V_j ..... \quad (9)$$

Where $y_{1T} = 5 \times 1$ vector endogenous variables

(i.e $y_{1T} = BODt,\ INTR_t,\ EXCR_{t,} MS_t,\ and\ INF_t$). φ = 5 x 1 constant vector terms. β = 5x5 is autoregressive coefficient matrix terms, λ_i = 5x5 represent vector of explanatory variable coefficients while Vj = vector of innovations.

Converting equation (9) into VAR models yields:

$$\Delta DOB_T = \alpha_0 + \alpha_1^1 \sum_{l=1}^{K} \Delta DOB_{T-1} + \alpha_2^1 \sum_{l=1}^{K} \Delta INTR_{T-1} + \alpha_3^1 \sum_{l=1}^{K} \Delta EXR_{T-1} + \alpha_4^1 \sum_{l=1}^{K} \Delta MS_{T-1} + \alpha_5^1 \sum_{l=1}^{K} \Delta INF_{T-1} + \varepsilon_{1T} ..... \quad (10)$$

$$\Delta INTR_T = \alpha_0 + \alpha_1^1 \sum_{l=1}^{K} \Delta INTR_{T-1} + \alpha_2^1 \sum_{l=1}^{K} \Delta DOB_{T-1} + \alpha_3^1 \sum_{l=1}^{K} \Delta EXR_{T-1} + \alpha_4^1 \sum_{l=1}^{K} \Delta MS_{T-1} + \alpha_5^1 \sum_{l=1}^{K} \Delta INF_{T-1} + \varepsilon_{2T} .... \quad (11)$$

$$\Delta EXR_T = \alpha_0 + \alpha_1^1 \sum_{l=1}^{K} \Delta EXR_{T-1} + \alpha_2^1 \sum_{l=1}^{K} \Delta INTR_{T-1} + \alpha_3^1 \sum_{l=1}^{K} \Delta DOB_{T-1} + \alpha_4^1 \sum_{l=1}^{K} \Delta MS_{T-1} + \alpha_5^1 \sum_{l=1}^{K} \Delta INF_{T-1} + \varepsilon_{3T} ... \quad (12)$$

$$\Delta MS_T = \alpha_0 + \alpha_1^1 \sum_{l=1}^{K} \Delta MS_{T-1} + \alpha_2^1 \sum_{l=1}^{K} \Delta EXR_{T-1} + \alpha_3^1 \sum_{l=1}^{K} \Delta INTR_{T-1} + \alpha_4^1 \sum_{l=1}^{K} \Delta DOB_{T-1} + \alpha_5^1 \sum_{l=1}^{K} \Delta INF_{T-1} + \varepsilon_{4T} ... \quad (13)$$

$$\Delta INF_T = \alpha_0 + \alpha_1^1 \sum_{l=1}^{K} \Delta INF_{T-1} + \alpha_2^1 \sum_{l=1}^{K} \Delta MS_{T-1} + \alpha_3^1 \sum_{l=1}^{K} \Delta EXR_{T-1} + \alpha_4^1 \sum_{l=1}^{K} \Delta INTR_{T-1} + \alpha_5^1 \sum_{l=1}^{K} \Delta DOB_{T-1} + \varepsilon_{5T} ... \quad (14)$$

Where "l" represents the lag length, "K" denotes the maximum distributed lag length, α_0, α_1, α_2,... represent the intercept terms, and ε is the error term that is independent and identically distributed. In matrix form, the previously mentioned equations can be concisely expressed as:

$$\begin{bmatrix} DOP_T \\ INTR_T \\ EXCR_T \\ MS_T \\ INF_T \end{bmatrix} = \begin{bmatrix} \alpha_0 \\ \beta_0 \\ \gamma_0 \\ \varphi_0 \\ \psi_0 \end{bmatrix} + \sum_{J-1}^{K} \begin{bmatrix} DOB_{T-1} & RIR_{T-1} & EXCR_{T-1} & MS_{T-1} & INF_{T-1} \\ INTR_{T-1} & DOB_{T-1} & EXCR_{T-1} & MS_{T-1} & INF_{T-1} \\ EXCR_{T-1} & INTR_{T-1} & DOB_{T-1} & MS_{T-1} & INF_{T-1} \\ MS_{T-1} & EXCR_{T-1} & INTR_{T-1} & DOB_{T-1} & INF_{T-1} \\ INF_{T-1} & MS_{T-1} & EXCR_{T-1} & INTR_{T-1} & DOB_{T-1} \end{bmatrix} \begin{bmatrix} \alpha_1 \\ \alpha_2 \\ \alpha_3 \\ \alpha_4 \\ \alpha_5 \end{bmatrix} + \begin{bmatrix} \varepsilon_{1T} \\ \varepsilon_{2T} \\ \varepsilon_{3T} \\ \varepsilon_{4T} \\ \varepsilon_{5T} \end{bmatrix} ... \quad (10)$$

Converting the VAR equations into VECM specifications corresponds to

$$\Delta DOB_T = \alpha_0 + \alpha_1^1 \sum_{J=1}^{K} \Delta DOB_{T-1} + \alpha_2^1 \sum_{l=1}^{K} \Delta INTR_{T-1} + \alpha_3^1 \sum_{l=1}^{K} \Delta EXR_{T-1} + \alpha_4^1 \sum_{l=1}^{K} \Delta MS_{T-1} + \alpha_5^1 \sum_{l=1}^{K} \Delta INF_{T-1} + \delta ECM_{T-1} + \varepsilon_{1T} ..... \quad (16)$$

$$\Delta INTR_T = \beta_0 + \alpha_1^1 \sum_{J=1}^{K} \Delta INTR_{T-1} + \alpha_2^1 \sum_{l=1}^{K} \Delta DOB_{T-1} + \alpha_3^1 \sum_{l=1}^{K} \Delta EXR_{T-1} + \alpha_4^1 \sum_{l=1}^{K} \Delta MS_{T-1} + \alpha_5^1 \sum_{l=1}^{K} \Delta INF_{T-1} + \psi ECM_{T-1} + \varepsilon_{2T} ..... \quad (17)$$

$$\Delta EXR_T = \alpha_0 + \alpha_1^1 \sum_{J=1}^{K} \Delta EXR_{T-1} + \alpha_2^1 \sum_{l=1}^{K} \Delta INTR_{T-1} + \alpha_3^1 \sum_{l=1}^{K} \Delta DOB_{T-1} + \alpha_4^1 \sum_{l=1}^{K} \Delta MS_{T-1} + \alpha_5^1 \sum_{l=1}^{K} \Delta INF_{T-1} + \varphi ECM_{t-1} + \varepsilon_{3T} ... \quad (18)$$

$$\Delta MS_T = \alpha_0 + \alpha_1^1 \sum_{J=1}^{K} \Delta MS_{T-1} + \alpha_2^1 \sum_{l=1}^{K} \Delta EXR_{T-1} + \alpha_3^1 \sum_{l=1}^{K} \Delta INTR_{T-1} + \alpha_4^1 \sum_{l=1}^{K} \Delta DOB_{T-1} + \alpha_5^1 \sum_{l=1}^{K} \Delta INF_{T-1} + \lambda ECM_{T-1} + \varepsilon_{4T} ... \quad (19)$$

$$\Delta INF_T = \alpha_0 + \alpha_1^1 \sum_{J=1}^{K} \Delta INF_{T-1} + \alpha_2^1 \sum_{l=1}^{K} \Delta MS_{T-1} + \alpha_3^1 \sum_{l=1}^{K} \Delta EXR_{T-1} + \alpha_4^1 \sum_{l=1}^{K} \Delta INTR_{T-1} + \alpha_5^1 \sum_{l=1}^{K} \Delta DOB_{T-1} + \phi ECM_{T-1} + \varepsilon_{5T} ... \quad (20)$$

In the equations, α_s denote the parameters for estimation, Δ denotes the difference operator, and ε_t, k are as defined in equations 1 to 5 previously mentioned. The estimated parameters of λ, ψ and δ should all be negatively signed (<0). In essence, equations 16 to 20 can be summarized as:

$$y_{iT} = \Phi_i + \Psi_i \sum_{J=1}^{K} y_{t-1} + \Upsilon_i \sum_{J=1}^{K} X_{iT-1} + \xi.ECM_{T-1} + \varepsilon_{iT} ... \quad (21)$$

Results and Discussions

This study uses the Augmented Dickey Fuller (ADF) unit roots test to evaluate the time series characteristics of model variables. The null hypothesis, suggesting a unit root presence, is tested against the alternative hypothesis of no unit root. Rejection occurs when the ADF statistic surpasses the critical value at the selected significance level. Results in Table 1 show non-stationarity in level forms, with ADF values below critical levels at 1%, and 5%, The null hypothesis of a unit root is accepted for all variables in their level forms but rejected in first differences. Thus, the study concludes an integrated order of one ($I(1)$) for the variables, leading to an examination of their co-integrating relationships using the Johansen co-integration procedure.

Table 1: Unit Root test.

Variables	**AUGUMENTED DICKEY FULLER STATISTICS**					
	Level	**Critical Values**	**1st Difference**	**Critical values**	**p-values**	**Order of integration**
BOD	-0.8592	1% -3.4723 5% -2.8798 10% -2.5766	-4.6955	1% -3.4723* 5% -2.8798** 10% -2.5766	0.0121	*I*(1)

EXCR	0.1888	1% -3.4723 5% -2.8798 10% -2.5766	-4.6966	1% -3.4723* 5% -2.8794** 10% -2.5764	0.0001	*I*(1)
INTR	-1.3396	1% -3.4712 5% -2.8793 10% -2.5764	-15.6566	1% -3.4712* 5% -2.8794** 10% -2.5764	0.0000	*I*(1)
MS	1.7628	1% -3.4743 5% -2.8807 10% -2.5771	-4.6103	1% -4.0208* 5% -3.4403** 10% -3.1446	0.0014	*I*(1)
INFR	-1.7190	1% -3.4734 5% -2.8804 10% -2.5769	-7.0440	1% -3.4734* 5% -2.8804** 10% -2.5769	0.0000	*I*(1)

Author's computation. * &** signifies stationary at 1% and 5% significant levels respectively.

Co-integration Test Result

Considering their shared order of integration. To mitigate simultaneity bias, inflation rate (INFR) is included as a control variable. Utilizing the Johansen co-integration test, hypotheses are examined across various scenarios, ranging from no co-integration to full co-integration. Detailed outcomes are provided in Table ii.

Table ii: Result of the Johansen Cointegration Test for the Variables: BOD, INTR, EXCR, MS, and INF

No of CE (s)	Eigen-value	Trace statistic	Critical value at 5%	P- Value
None	0.171759	69.45510	69.81889	0.0534
At most 1	0.121331	39.49139	47.85613	0.2412
At most 2	0.058194	18.92526	29.79707	0.4983
At most 3	0.038835	9.392177	15.49471	0.3303
At most 4	0.019273	3.094389	3.841466	0.0786
No of CE (s)	**Eigen-value**	**Max-Eigen statistic**	**Critical value at 5%**	**P- Value**
None	0.171759	29.96371	33.87687	0.1367
At most 1	0.121331	20.56613	27.58434	0.3033
At most 2	0.058194	9.533080	21.13161	0.7872
At most 3	0.038835	6.297788	14.26463	0.5753
At most 4	0.019273	3.094389	3.841467	0.0786

Authors computation. Trace test and Max- Eigen value indicates no cointegration at 0.05 level

The Johansen cointegration results in Table 2, presenting both the Trace and Max-Eigen statistics, indicate the absence of cointegration between BOD and RIR, BOD and EXCR, BOD and MS, and BOD and INFR at the 0.05 significance level. This finding supports and justifies the application of the unrestricted VAR for the analysis. The selection of the lag order for Cointegration testing and VAR models was determined through VAR Order Selection, considering the Akaike Information Criterion (AIC) and Hannan-Quinn Information Criterion (HQ), as illustrated in Table 3. Both AIC and HQ favor lag 8, leading to the subsequent examination of the directional causality between the model variables.

Table iii: Lag Order Selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-5834.012	NA	2.23e+26	74.85913	74.95688	74.89883
1	-5289.996	1046.185	2.88e+23	68.20507	68.79159	68.44329
2	-5220.277	129.6062	1.62e+23	67.63175	68.70702	68.06848
3	-5134.822	153.3808	7.49e+22	66.85669	68.42072*	67.49193
4	-5085.012	86.20940	5.48e+22	66.53861	68.59140	67.37237
5	-5033.140	86.45345	3.91e+22	66.19410	68.73564	67.22636
6	-4998.408	55.65979	3.49e+22	66.06933	69.09964	67.30011
7	-4954.352	67.77802	2.78e+22	65.82503	69.34409	67.25432
8	-4861.962	136.2163*	1.19e+22*	64.96105*	68.96888	66.58886*

Author's computation ****indicates lag order selection by the criterion***

Pair-wise Granger Causality

The Pair-wise Granger causality test assesses the causal relationship between variables within the model. The Null Hypothesis suggests no Granger causality, while the alternative hypothesis proposes the presence of Granger causality. The decision rule entails rejecting the null hypothesis if the probability value of the F-statistic is equal to or less than 0.05. Table iv displays the findings of the Pair-wise Granger causality test.

Table iv: Pair-wise Granger Causality Tests Results

Null Hypothesis:	Obs	F-Statistic	Prob.
INTR does not Granger Cause BOD	162	0.90804	0.4054
BOD does not Granger Cause RIR		4.54587	0.0120
EXCR does not Granger Cause BOD	162	0.21762	0.8047
BOD does not Granger Cause EXCR		1.51861	0.2222
MS does not Granger Cause BOD	162	24.9063	4.E-10
BOD does not Granger Cause MS		13.4792	4.E-06
INFR does not Granger Cause BOD	162	0.41182	0.6632
BOD does not Granger Cause INFR		0.49127	0.6128

Author's computation

Table 4 presents the Pair-wise Granger causality findings, revealing a one-way causality from interest rate to budget deficit, suggesting interest rate doesn't influence budget deficit, but the reverse is true with probabilities of 0.4054 and 0.0120 respectively. Conversely, the relationship between budget deficit and exchange rate appears independent with insignificant probabilities of 0.8047 and 0.2222. There's bidirectional causality between budget deficit and broad money supply, each influencing the other significantly. Inflation rate and budget deficit show no causality, with probability values of 0.6632 and 0.6128. The Impulse Response Function (IRF) is employed to monitor the propagation of shocks between budget deficits and interest rates, exchange rates, money supply, and inflation over a decade

Impulse Response Function

This is a tool utilized to track how periodic disturbances between the budget deficit and selected macroeconomic indicators unfold over a decade. Graphing these responses, such as interest rate (INTR), exchange rate (EXCR), broad money supply (MS), and inflation rate (INFR), reveals their reactions to a one standard deviation shock in the budget deficit. In Figure 1, the IRF graph demonstrates that a budget deficit shock leads to an initial increase in itself, followed by a gradual decrease until stabilizing around the 7th period. This suggests a positive impact of the budget deficit on itself both in the short and long term.

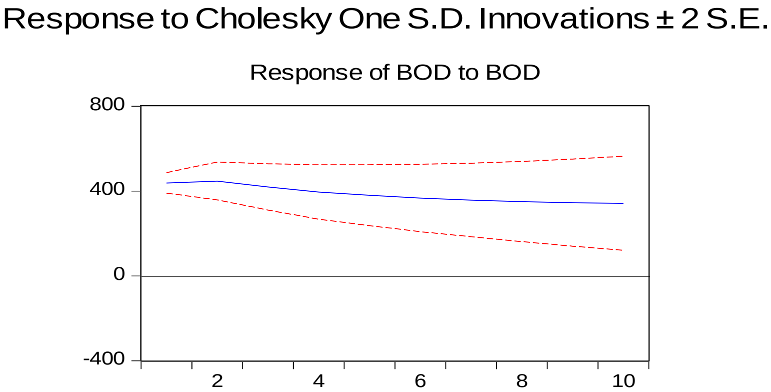

Fig.1

From figure 2 below, one standard deviation shock to BOD initially has declining impact on EXCR in periods 1 and 2. From the 2nd period, it increases gradually from 3rd period and then continue to rise and remain in the negative region throughout the periods, so BOD has negative impact on exchange rate in the short run and in the long run.

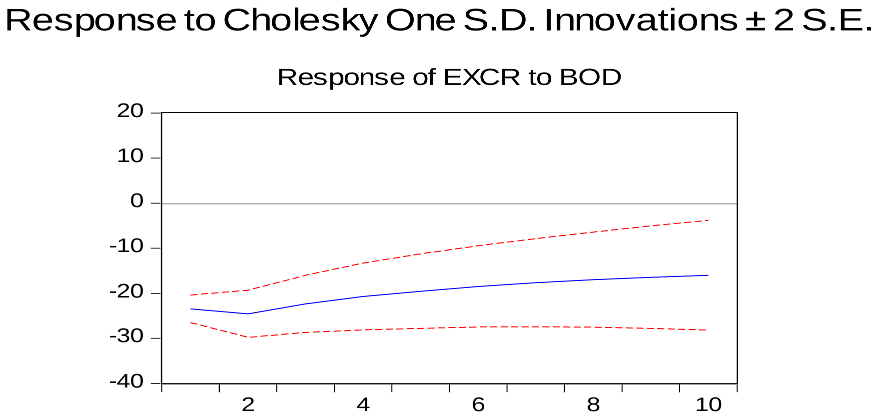

Fig.2

INTR remains stable in the negative region to a one standard deviation shock to BOD from the first period, it starts to increase from the 2nd and 3rd periods and started rising, it hit the positive region in 4th period and continue to increase slightly from the 5th period in the positive region continue rising throughout the periods. BOD has negative impact on interest rate in the short run and a positive impact on interest rate in the long run as shown in figure 3 below

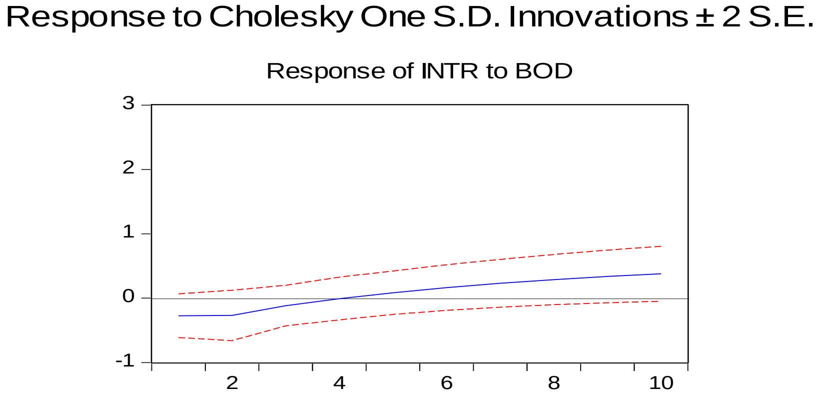

Fig.3

The IRF graph shows that a one standard deviation to BOD has a negative impact on MS from the 1st period, it increases gradually throughout the periods in the negative region although the increment is negligible. MS therefore response negatively to shock in BOD in both short run and long run as can be seen in figure 4.

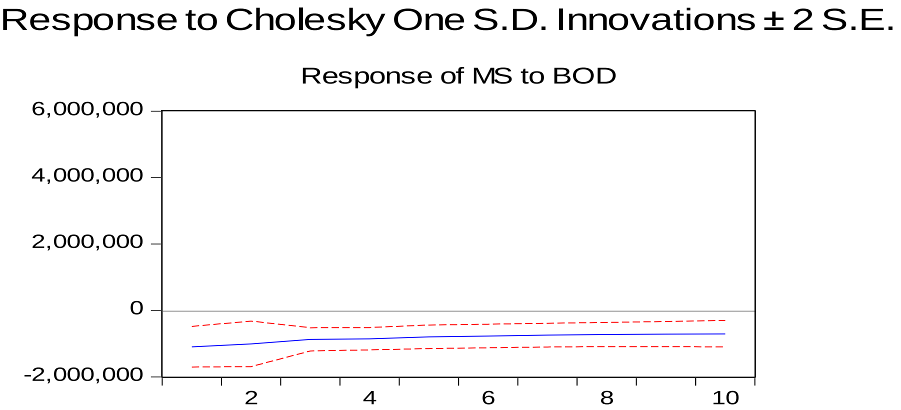

Fig.4

Inflation rate (INFR) shows a negative response a one standard deviation shock to BOD which increases slightly from the 1st periods until the 9th period when it remain stable in the negative region. Thus BOD has a negative impact on inflation rate both in the short run and long run as evident in the figure 5 below.

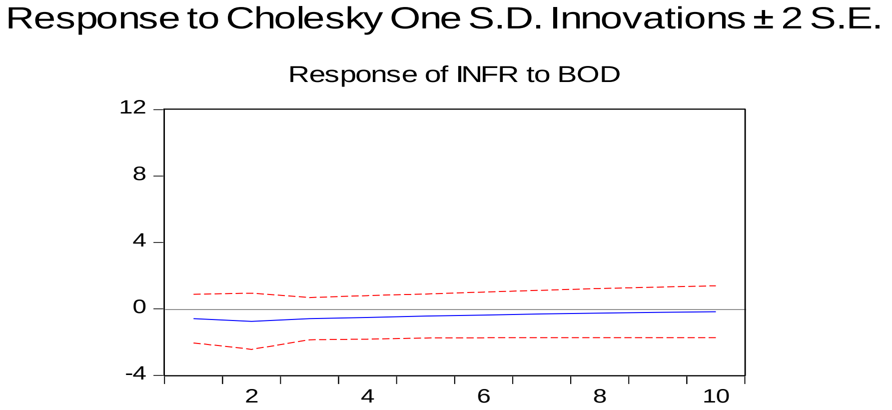

Fig.5

Forecast Error Variance Decomposition

The study analyzed the variance in forecast errors over a decade, specifically focusing on. The connection between budget shortfalls and various economic aspects like money supply, interest rates, inflation rates, and exchange rates. This analysis utilized Cholesky Forecast Error Variances Decomposition (FEVD) to orthogonalize the innovations during computation.

Table 5: Variance Decomposition of BOD

Period	S.E.	BOD	EXCR	INTR	MS	INFR
1	438.1161	100.0000	0.000000	0.000000	0.000000	0.000000
2	629.4131	98.85357	0.188514	0.000187	0.953657	0.004069
3	821.6963	84.00772	0.270003	0.043023	15.66495	0.014300
4	988.9878	73.93224	0.591925	0.031321	25.43053	0.013985
5	1139.119	66.86411	0.673459	0.053807	32.39393	0.014696
6	1269.835	62.13476	0.732317	0.160152	36.95790	0.014867
7	1385.906	58.80358	0.743138	0.375605	40.06301	0.014671
8	1490.378	56.36019	0.739472	0.688073	42.19799	0.014283
9	1586.306	54.47979	0.726082	1.087567	43.69289	0.013664
10	1675.814	52.97537	0.709758	1.553061	44.74886	0.012951

From the forecast error variance decomposition table, BOD is strongly endogenous, this implies that budget deficit exhibits strong influence on its own self. BOD accounted for 100% deviation to itself in the short run and about 56% deviation to itself in the long run.

Table 6: Variance Decomposition of EXCR

Period	S.E.	BOD	EXCR	INTR	MS	INFR
1	25.58990	84.25972	15.74028	0.000000	0.000000	0.000000
2	36.49735	86.82702	12.36827	0.003669	0.747325	0.053715
3	47.37941	73.80054	11.15034	0.062308	14.82722	0.159593
4	56.86450	64.55374	11.05148	0.051313	24.12476	0.218712
5	65.13533	58.22543	10.69520	0.056016	30.73392	0.289442
6	72.17830	53.98945	10.48989	0.134545	35.03009	0.356025
7	78.25816	51.03355	10.28905	0.317773	37.93845	0.421177
8	83.58468	48.87407	10.12316	0.597292	39.92207	0.483413
9	88.34465	47.22046	9.972452	0.966512	41.29914	0.541433
10	92.67316	45.90159	9.837113	1.405995	42.26020	0.595094

BOD also accounted for 84% forecast error in EXCR in the 1st year, and 45% in the 10th year. This means that BOD exhibits strong influence on EXCR or BOD is weakly endogenous. This implies that exchange rate is strongly predicted by budget deficit in Nigeria.

Table 7: Variance Decomposition of INTR

Period	S.E.	BOD	EXCR	INTR	MS	INFR
1	2.169483	1.608856	6.927697	91.46345	0.000000	0.000000
2	2.374641	2.628464	9.345441	87.94155	0.009004	0.075539
3	2.755169	2.132895	8.573469	88.87388	0.275198	0.144556
4	2.931637	1.884466	9.210978	88.22406	0.546827	0.133672
5	3.108972	1.747962	9.020456	88.48829	0.544887	0.198409
6	3.226127	1.880753	9.005335	88.37867	0.506246	0.228993
7	3.334110	2.236373	8.785248	88.14182	0.549078	0.287477
8	3.424361	2.824730	8.558080	87.52045	0.765921	0.330822
9	3.512131	3.602191	8.263782	86.53519	1.222540	0.376293
10	3.596995	4.542512	7.951185	85.17935	1.916247	0.410704

Table 8: Variance Decomposition of MS

Period	S.E.	BOD	EXCR	INTR	MS	INFR
1	3976094.	7.598322	0.735131	2.878357	88.78819	0.000000
2	4170571.	12.76453	2.483312	2.630428	82.03849	0.083239
3	4261879.	16.44054	2.385419	2.529444	78.56279	0.081806
4	4384664.	19.36406	2.290651	2.418263	75.84258	0.084437
5	4513885.	21.39466	2.166274	2.295437	74.06254	0.081096
6	4649638.	22.92196	2.041673	2.163428	72.79598	0.076958

7	4780497.	24.10831	1.932320	2.055716	71.83082	0.072841
8	4906298.	25.08503	1.834529	1.991519	71.01969	0.069234
9	5026524.	25.91718	1.747828	1.980105	70.28850	0.066387
10	5142557.	26.64535	1.670038	2.025096	69.59509	0.064425

Table 9: Variance Decomposition INFR

Period	S.E.	BOD	EXCR	INTR	MS	INFR
1	9.352930	0.393523	0.441269	4.088946	0.000922	95.07534
2	10.22568	0.876224	0.433257	4.822526	0.032694	93.83530
3	11.48695	0.958662	0.369288	5.777538	0.364802	92.52971
4	12.12418	1.045163	0.336091	6.600644	0.711832	91.30627
5	12.66599	1.076305	0.310219	7.338799	0.984586	90.29009
6	13.03607	1.096493	0.311509	7.974460	1.184004	89.43353
7	13.32491	1.103228	0.346475	8.526030	1.311200	88.71307
8	13.54297	1.104349	0.418812	8.998899	1.388130	88.08981
9	13.71588	1.101253	0.529602	9.404184	1.428693	87.53627
10	13.85470	1.096076	0.677435	9.748884	1.445986	87.03162

INTR, MS and INFR all predict themselves from the 1st year into the future 10th year while other variables in the model are weakly exogenous as can be seen in table 7,8 and 9 above. This implies that BOD has weakly exogenous impact on INTR, MS and INFR in Nigeria.

The research findings, as revealed by the impulse response function, provide valuable insights into the dynamic relationships between budget deficit and various macroeconomic variables. A budget deficit shock of one standard deviation leads to an immediate adverse effect on the exchange rate, suggesting a possible depreciation effect in the short term. Remarkably, this negative influence persists over the long term. Moreover, the study observes that budget deficit reacts negatively on real interest rates in the short term but positively in the long run, suggesting a complex interplay over time.

The reaction of money supply to budget deficit shocks is significant, demonstrating consistent adverse effects in both the short and long run. This suggests that rises in budget deficit could result in a reduction in the money supply, potentially impacting liquidity within the economy. The findings further suggest that budget deficits have a negative impact on the inflation rate, both in the short run and the long run. This means that when there is a budget deficit, it tends to reduce inflation, indicating the significance of fiscal policy in controlling inflationary pressures. Overall, these results contribute valuable insights into the intricate dynamics between budget deficit and key macroeconomic indices, providing basis for informed policy decisions.

Summary and Policy Recommendations

This research explored the impact of budget deficit on certain macroeconomic factors in Nigeria. The primary discoveries can be summarized as follows: The Augmented Dickey Fuller (ADF) outcomes reveal that the series, in their initial state, lack stationarity, affirming they possess first-order integration. The Johansen co-integration test indicate that there is no evidence of co-integration, implying a lack of enduring correlation between Nigeria's budget deficit and its exchange rate, interest rate, money supply, and inflation. Additionally, the Granger causality test results suggest a one-way causal relationship from interest rate to budget deficit. This implies that there is no evidence to suggest that interest rates cause changes in the budget deficit, but rather, changes in the budget deficit influence interest rates. The findings also indicate an autonomous connection the budget shortfall and the rate of exchange. Furthermore, there is a mutual causal relationship among broad money supply and the budget deficit, suggesting that changes in one can influence the other, supported by significant probability values. Additionally, the analysis reveals that there is no causal relationship between inflation rate and the budget deficit.

The impulse response function demonstrates that a one standard deviation shock to the budget deficit negatively influences the exchange rate in both short and long-term contexts. This suggests that acceleration in the budget deficit has an adverse effect on the Nigerian exchange rate compared to other currencies worldwide. Additionally, the budget deficit negatively impacts the real interest rate in the short term and positively affects it in the long term. This suggests that that a rise in budget deficit will increase interest rate in the long run and thus validates the Keynesian Proposition. MS also response negatively to shock in Budget deficit, this implies that an increase in budget deficit will definitely decrease money supply in the economy. This agrees with economic theory. Budget deficit has a negative impact on inflation rate.

Recommendations

Based on the findings of this study, suggested measures to address the aforementioned issues include advocating for an optimal combination of monetary and fiscal policies, considering the enduring positive implications of budget deficits on the rate of interest in Nigeria. To accomplish this, attention should be directed towards the following strategies.

- Economic policy and decision makers need to focus on achieving a balance between internal and external debt ratios, employing strategies such as ways and means and bonds to address national budget shortfalls, while also keeping a close watch on inflation levels.

- Implementing rigorous monetary, fiscal, and exchange rate policies is recommended to address persistent inflation and increasing interest rates effectively. Additionally, adopting inflation-adjusted interest rate policies can help mitigate debt servicing costs and decrease the national budget deficit.

References

1. Allen, Polly, R. (1977). Financing budget deficits: the effects on income in closed and open economies, *European Economic Review*, pp.345-373.
2. Awe, A.A & Shina, O.S (2012). The nexus between budget deficit and inflationary in the Nigeria economy (1980-2009), "*Research Journal of Finance as Accounting, 3, (10), Pp 78-92.*
3. Barro, Robert J. (1989). Are government bonds net wealth? *Journal of Political Economy, , pp. 1095-1117.*
4. Bernheim, B. (1989). A Neoclassical perspective on budget deficits, *Journal of Economic Perspective, vol.3.*
5. B. O. Osuka & Achinihu, J. C (2014). The impact of budget deficits on macro-economic variables in the nigerian economy (1981 – 2012). *International Journal for Innovation Education and Research*, Vol. 2
6. Bundt, T. & Solocha, A. (1988). Debt, deficit and dollar, *Journal of policy modelling*, No. 4, pp. 581-600
7. Chimobi, O. P & Igwe O. L. (2010). Budget deficit, money supply and inflation in Nigeria *European Journal of Economics, Finance and Administrative Sciences ISSN 1450-2275 Issue 19* © Euro Journals, Inc. 2010 http://www.eurojournals.com.
8. Diamond, P. (1965).National debt and neoclassical economic growth, *American Economic Review*,. 55, 1125−1150.
9. Doris, S. P. (2021). Budget deficit-macroeconomic variables nexus in Kenya. *Journal of Economics and Management.* ISSN 1732-1948, Vol. 43
10. Ezeabasiti, V.N. (2012). Economic growth and fiscal deficits: empirical evidence from Nigeria", *Economics and Financial Review*, 2 (6) Pp 85-96.
11. Fleming, J. M. (1962). Domestic financial policies under fixed and under floating exchange rates, *International Monetary Fund Staff Papers*, No. 10, pp. 369-380.
12. Gujarati, D.M. & Sangeetha (2007) "Basic econometrics forth edition," *Tata Mc Graw-Hill Publishing Co. Ltd., New Delhi*
13. Jhingan, M.L (2004). Macroeconomic Theory (11th. Ed), *New Delhi, Vrinda Publications (P) Ltd.*
14. Lwanga M.M., Mawejje J. (2014). Macroeconomic effects of budget deficits in Uganda: A VAR-VECM approach. "*Advances in Management & Applied Economics*", Vol. 4(6), pp. 81-108.
15. Manamba, E. (2017). Analysis of budget deficits and macroeconomic fundamentals: A VAR-VECM approach. *Journal of Economics and Management. ISSN 1732-1948 Vol. 30*
16. Mika'ilu, A., Haruna, M. A., & Ali, D.U. (2014). An empirical analysis on the relationship between fiscal deficit and inflation in Nigeria. *Annals of "Dunarea de Jos" University of Galati Fascicle . Economics and Applied Informatics* Years XX – no2/2014, ISSN-L 1584-0409
17. Mundell, R. A. (1963). Capital Mobility and Stabilization Policy Under Fixed and Flexible Exchange Rates, *Canadian Journal.*
18. Ndanshau M.O.A. (2012). Budget deficits, money supply and inflation in Tanzania: *A riate granger causality test, 1967-2010. Working Paper No. 04/12, Uni- versity of Dar es Salaam, Dar es Salaam.*
19. Nwanna, I. O., & Umeh, G. N. (2019). Deficit financing and economic growth: The Nigerian experience. *International Journal of Economics and Financial Management*, 4(1), 28-49.
20. Nzotta, S.M (2004). Money, banking and finance: Theory and practice, *Owerri, Hudson-Jude publishers.*
21. Obaden, M. (2011). External sector polices in fiscal budget national center for economic and management administration (NCEMA*) Policy Analysis Series, 1, (5.l) of Economics and Political Science, pp. 475-485.*
22. Obi, B. & Nurudeen, A. (2008). Effect, of fiscal deficits and government debt. *Journal of Applied Quantitative Methods. 4 (3)*
23. Odionye, J.C & Uma, K.E (2013). The Relationship between budget deficit and interest rate: evidence from Nigeria, *European Journal of Business and Social Sciences, 2, (1,) PP 158-167.*
24. Onyedibe, C.F., Ibeto, C.V., Ogbu, O.K. & Udedi, U.C (2021). Impact of budget deficits financing and money supply on inflation in Nigeria: an empirical investigation of causal relationship. *journal of international economic relations and development economics(jierade) 1. (1)*
25. Onwioduokit, E. A (1999) "Fiscal deficits and inflation dynamics in Nigeria: An empirical investigation of causal relationship". *Central Bank Nigeria Economic and Financial Review 37(2): 1—16.*
26. Oluwole, F.O., Solawon, M.D., & Odueke, H.A. (2020). An analysis of budget deficit and inflation on economic development in Nigeria. *IOSR Journal of Economics and Finance(IOSR-JEF)e-ISSN:2321-5933,p-ISSN:23215925. 11,(3)*
27. Robert, U. S., Monday, N.B., & Jina, K.G (2020). Relationship between budget deficit financing & macroeconomic variables in Nigeria. *Tax academy research journal (tarj), 1 (1) pp 49-60*.
28. Shittu ,I.O & Oke, M. O (2021). Government budget deficits and macroeconomics variables: Nigeria experience. *Gusau Journal of Accounting and Finance, (2,) 1,*
29. Taiwo, M & Abayomi, I. (2011), "Government expenditure and economic development: empirical evidence from nigeria", *European Journal of Business and Management, 3, (1).*
30. Ukeje, E.U., Essien, S.N., Yakubu, M.U & Akimboye, L (2004). Critical issues in finance, investment and growth in nigeria, in *CBN Finance, Investment and Growth in Nigeria.*