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Modelling the asymmetric growth implications of fiscal deficits and taxation in the West African monetary zone

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Abstract
Achieving rapid and sustainable growth has become pivotal across Africa, particularly among the member countries of the West African Monetary Zone (WAMZ). This involves, on one hand, establishing a robust and efficient tax system to boost revenue generation, and on the other, creating a sustainable debt strategy that includes cost-effective debt servicing. In this light, we quantify the asymmetric effects of fiscal deficit, tax revenue and debt servicing using a non-linear autoregressive distributed lag model (NARDL) and causality test with panel datasets from the Organization of Economic Cooperation and Development (OECD) Statistics and World Development Indicators (WDI). The findings show that tax revenue plays a significant and positive role in driving GDP growth in the region, highlighting its importance in fostering sustainable development. However, we found that deficit financing, especially external debt and debt servicing, negatively affected GDP growth. This points to the challenges posed by external debt and the adverse effects of debt servicing on economic prosperity. Based on these findings, the study concludes that tax revenue is crucial for long-term growth in the WAMZ. Therefore, we recommend that policymakers in the WAMZ diversify the tax base to increase tax revenue and prioritize essential social and economic infrastructure when allocating tax revenue to support sustained growth.

Keywords: Economic growth, GDP, fiscal deficit, tax revenue, debt servicing and WAMZ

1. Introduction
The West African Monetary Zone (WAMZ), which includes countries such as The Gambia, Ghana, Guinea, Liberia, Nigeria, and Sierra Leone, has continued to grapple with the issue of fiscal deficit in the past few years. This is largely attributed to high public expenditure, fiscal imbalances, infrastructural development and economic shocks, among others. At the same time, the countries in the WAMZ have poor tax collection processes, which affect their fiscal stance. Ebeke & Ehrhart (2011) [13] point out that tax revenues in Africa tend to be quite unstable, largely because of political and economic instability. This unpredictability makes it tough to project future tax revenues, which in turn hampers the creation of medium-term financial plans aimed at achieving better macroeconomic results. In the WAMZ, the administration of the tax system is plagued by inefficiency, primarily due to a weak institutional framework (see Nikiema & Zore, 2025; Bekana, 2023; Epaphra & Massawe, 2017) [22, 10, 14]. The institutions responsible for effective administration and maintaining transparency and accountability within the tax system have proven to be both ineffective and inefficient.

Furthermore, the rising deficit financing in the member countries of WAMZ is worrisome. The World Bank Report in 2019 recorded an increase in deficit financing in Africa and other developing countries due to the demand for infrastructural facilities and other essential goods and services. The WAMZ countries, which depend heavily on exporting primary commodities for most of their income, are particularly vulnerable to shocks in the global commodities market. This instability in export earnings poses a significant risk to managing fiscal deficits. As a result, these countries are facing increasing challenges in fulfilling their deficit financing obligations. Nwanna & Umeh (2019) [23] asserted that deficit financing arises as a result of government inefficiency caused by tax evasion or excessive spending on

non-productive ventures. Arestis & Sawyer (2004) [8] pointed out that deficit financing can be a valuable source of funding that stimulates economic activity by increasing aggregate demand. It allows governments to tackle fiscal pressures that can undermine macroeconomic goals.

While there are supportive arguments for deficit financing, as highlighted by Koatsa, Paramaiah & Scona (2021) [18], and Chigbo, Adeniyi & Orekoya (2020) [11], there are also dissenting views regarding its negative impacts. For instance, Amgain & Dhakal (2017) [6] argue that deficit financing leads to debt accumulation, which means future generations will face huge tax burdens capable of hindering the long-term growth potential of tax revenues. These have continued to generate arguments on the perceived benefits of taxation and deficit financing in the WAMZ. In light of these unending controversies, this study examines how tax revenues and deficit financing influence long-term growth in the WAMZ. Given this introduction, the rest of the research is organized as follows: Section II covers the related literature, while Section III embodies the methodology and data issues. Then, in Section IV, we present and discuss the findings. Finally, Section V concludes the paper and provides some policy insights.

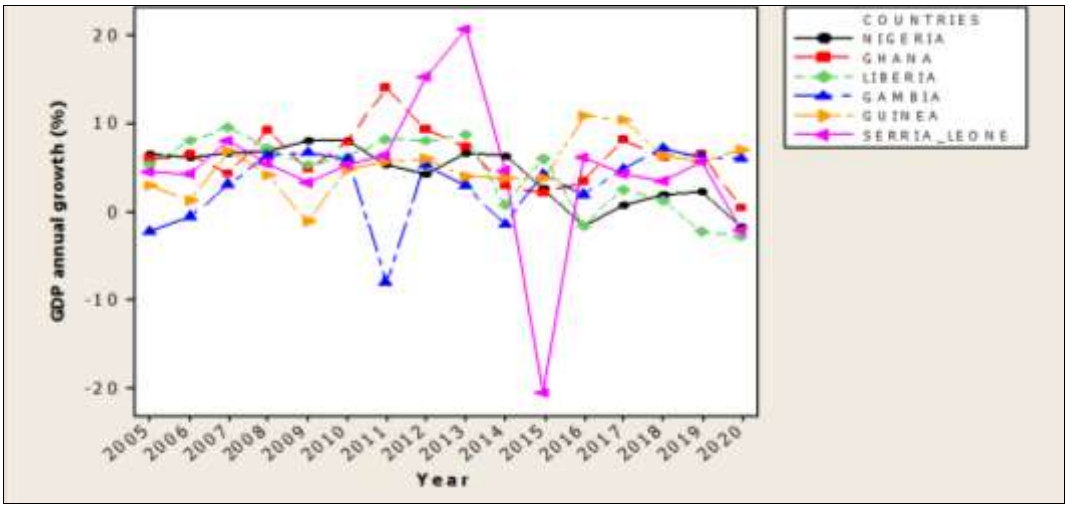
2. Related Literature

Keynes (1936) describes fiscal deficit as an instrument of economic growth in his General Theory. According to Keynesian theory, fiscal deficit boosts economic activities and enhance social welfare. This highlights a strong link between fiscal deficit and real economic growth (Dritsakis &Stamatiou 2016) [12]. This is based on the premise that fiscal deficit and government spending lead to a rise in aggregate demand, which increases the employment of redundant resources and economic growth. Thornton (1990) [30] posits that the Keynesian theory on fiscal deficit explains how governments can leverage it to address macroeconomic fluctuations. This is particularly relevant when there are discrepancies between savings and investments, often triggered by external changes in investment.

From this standpoint, deficit spending is viewed as both beneficial and essential for counteracting the cyclical fluctuations that are typical in developing economies, including the WAMZ. Renjith & Shanmugam (2018) [26] suggested that public debt can enhance overall demand and economic growth. They explained that when the government increases its spending by taking on debt, it can lead to a rise in output following the multiplier effect. Essentially, borrowing is considered as a way of shifting resources from taxpayers to those who hold bonds. Similarly, Eze & Ogiji (2016) [16] believed that governments can turn around economic distortions by borrowing from the private sector and then channeling that money back into the private sector through various spending initiatives. Aside from the theoretical propositions, several empirical studies have documented the magnitude and direction of the growth implications of fiscal deficit and taxation. For instance, earlier studies by Kormendi & Meguire (1985) [19] and Afonso & Furceri (2010) [1] provide evidence to justify the short-term positive contribution of fiscal deficit to economic growth. This is authenticated by some recent studies (Morris, Ozigbu & Ezekwe, 2018; Yusuf & Mohd, 2021; Sore, Ayana & Demissie, 2024; Yusuf & Mohd, 2024) [21, 28, 32] that found that fiscal deficit significantly drives economic growth. In contrast, the findings by Agyeman, Sakyi & Oteng-Abayie (2022) [2], Andini (2024) [7], Oyadeyi *et al*. (2024) [24] and Ahmad *et al*. (2025) [3] showed that high fiscal deficit retard growth.

In addition, studies such as Ewa, Adesola, & Essien (2020) [15]; Koatsaa, Paramaiahb & Sconac (2021) [18]; Adegbie, Nwaobia, & Osinowo (2020); and Ajeigbe, Ganda, & Enowkenwa (2024) [4] established that tax revenue is growth-enhancing. On the other hand, the adverse implications of taxes on economic growth have equally been documented in extant literature (see Babatunde, Ibukun, & Oyeyemi, 2017; Akhor & Ekundayo, 2016; Maganya, 2020; Stoilova, 2024) [9, 5, 20, 29]. These contradicting findings provide the basis for further to provide more insights into the dynamics of growth following the changing dimension of tax structure and deficit financing. Thus, we took in consideration debt service, which has emerged as a huge fiscal obligation following the rising public debt in the WAMZ.

2.1 Stylized Facts on Trajectory of GDP Growth, External Debt and Taxation

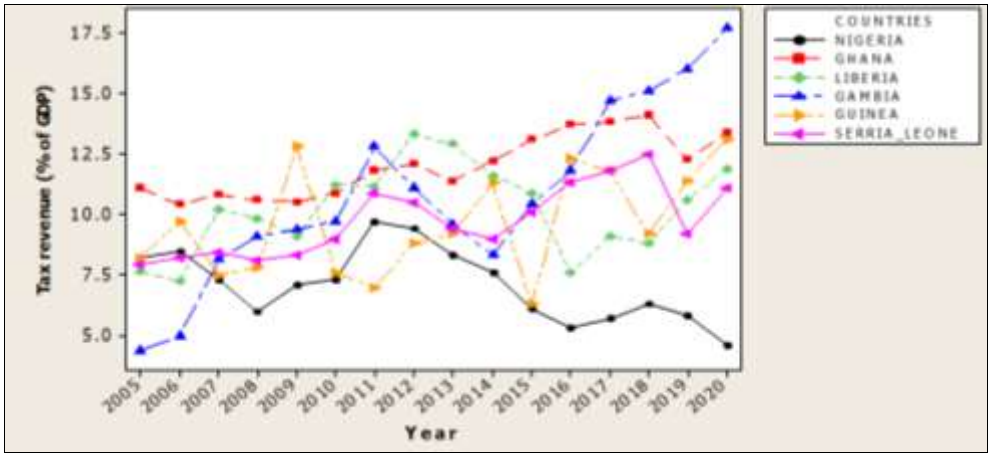


Source: Authors illustration with data from OECD Statistics and World Bank WDI

Fig 2.1: Trends of annual GDP growth in the WAMZ member countries (2005-2020)

The yearly GDP growth in the WAMZ countries showed quite a bit of variation throughout the study period. In 2013,

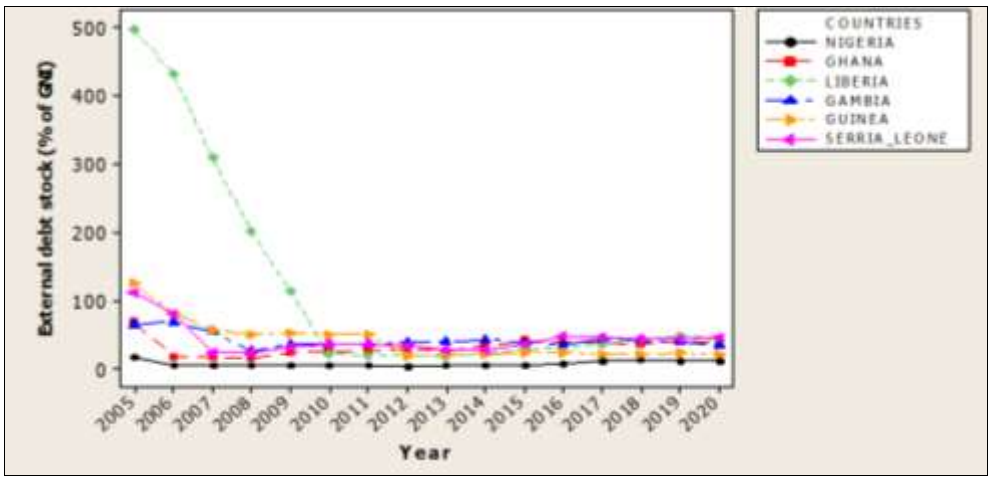
Sierra Leone stood out with an impressive GDP growth rate of 20.72%, outpacing the other five countries. However, just two years later, it faced a significant downturn, recording a staggering negative growth of -20.59% in 2015. Overall, the GDP growth trends among the WAMZ member countries provide valuable insights into their macroeconomic performance, reflecting how their economies adapt to shifting dynamics in of overall output and prices across various sectors.



***Source*:** Authors illustration with data from OECD Statistics and World Bank WDI

Fig 2.2: Trends of tax revenue (% of GDP) in the WAMZ member countries (2005-2020)

The trends of tax revenue as a percentage of GDP showed that the performance of Ghana is very impressive. The level of tax revenue in the rest of the countries fluctuated over the study period. This is indication of the instability in the revenue generating process in the member countries of the WAMZ. Beginning from 2012, the tax revenue to GDP trended downward reaching an all-time low in 2020. This suggests that Nigeria's performance has not been very impressive and this could be linked to the seemingly limited tax base and ineffective administration process in addition to the systemic corruption in the system.



***Source*:** Authors illustration with data from OECD Statistics and World Bank WDI

Fig 2.3: Trends of external debt stock (% of GNI) in the WAMZ member countries (2005-2020)

A cursory look at Figure 2.3 shows that external debt stock in Liberia trended downward from 497 per cent of GNI in 2005 to 113.9 per cent in 2009. This is an indication of the growing level of public debt from bilateral and multilateral sources. It, however, remained relatively stable in the rest of the study period. Amongst the six countries, Nigeria stood out as the country with the external debt stock to GNI. This suggests that the level of external borrowing in the country is far below the GNI. Overall, the graph showed that all the countries in the WAMZ are associated with increasing levels of external debt stock. This explains that the countries have continued to leverage foreign loans to address their increasing fiscal deficits and achieve certain macroeconomic objectives.

3. Data and Methodology

3.1 Data Description and Measurement

The annual percentage growth of GDP is used in this study to assess economic growth. It is viewed as a means of providing insights into the size of the economy and its performance over a specified period, typically one year. The external debt stock as a percentage of gross national income (GNI) is utilized to capture deficit financing. In response to increasing fiscal deficits, developing economies often depend on external borrowing to fulfill their fiscal obligations, and it is anticipated that a rise in external borrowings will stimulate GDP growth. Furthermore, taxation is measured as the ratio of tax revenue to GDP in the WAMZ countries. This means it measures tax revenue

relative to the economy's size. An increase in tax revenue is expected to enhance GDP growth, improve the government's capacity to create employment, and alleviate inflationary pressures. However, debt servicing is captured by the total debt service as a proportion of GNI. A rise in total debt servicing is likely to provoke a debt crisis and retard growth. The panel datasets for this study were obtained from the World Bank World Development Indicators (WDI) and International Debt Statistics.

3.2 Model Specification

We follow**ed** the works of Morris, Ozigbu & Ezekwe (2018) [21] and Ajeigbe, Ganda, & Enowkenwa (2024) [4], but with some improvements by introducing tax revenue and The functional specification of the model is provided as:

$$GDPR = f(TXR, EXB, DSV) \quad (1)$$

Where: GDPR = GDP growth used in measuring the level of economic growth, TXR = Tax revenue, EXB = External borrowing and DSV = Debt servicing

The panel non-linear autoregressive distributed lag (NARDL) model is specified as:

$$GDPR_t = \lambda_0 + \lambda_1 GDPR_{t-1} + \theta_1^+ TXR_{t-1}^+ + \theta_2^- TXR_{t-1}^- + \theta_1^+ EXB_{t-1}^+ + \theta_2^- EXB_{t-1}^- + \theta_1^+ DSV_{t-1}^+ + \theta_2^- DSV_{t-1}^- + \sum_{j=1}^{p} \beta_1 \Delta GDPR_{t-j} + \sum_{j=1}^{q} \left(\Omega_1^+ \Delta TXR_{t-j}^+ + \Omega_1^- \Delta TXR_{t-j}^-\right) + \sum_{j-1}^{q} \left(\Omega_1^+ \Delta EXB_{t-j}^+ + \Omega_2^- \Delta EXB_{t-j}^-\right) + \sum_{j=1}^{q} \left(\Omega_1^+ \Delta DSV_{t-i}^+ + \Omega_2^- \Delta DSV_{t-i}^-\right) + e_{1t} \quad (2)$$

Where: TXR^+ and TXR^- = partial sums of positive and negative changes in tax revenues, EXB^+ and EXB^- = partial sums of positive and negative changes in external borrowings, DSV^+ and DSV^- = partial sums of positive and negative changes in debt servicing, θ_1^+ *and* θ_2^- = Long run multipliers of the partial sums of positive and negative changes in the explanatory variables, Ω_1^+ *and* Ω_2^- = short run parameters, P and q = maximum lag orders for the dependent and independent variables, Δ = First difference operator and e_{1t} = error term

3.3 Data Analysis Techniques

We employed the NARDL method, developed by Shin, Yu, & Greenwood-Nimmo (2014) [27], to analyze how tax revenue and deficit financing impact economic growth. This method builds on the standard ARDL approach introduced by Pesaran, Shin, & Smith (2001) [25], as it effectively captures the asymmetries in the explanatory variables by breaking down their positive and negative changes. For the NARDL to be applicable, all variables under investigation must be integrated to an order less than two. We also employ descriptive statistics to better understand how each variable was distributed throughout the study period and across the WAMZ countries. We further explored the direction of causality among the variables by applying the modified Wald test from Tado & Yamamoto (1995) [31] and tested for unit root using the Im, Pesaran and Shin (IPS, 2003) [17] panel unit root test.

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4. Findings and Discussion

Table 1: Descriptive statistics of the variables

Variable	Obs	Mean	Std. Dev.	Min	Max
GDPR	96	4.593	4.745	-20.59	20.715
TXR	96	9.909	2.593	4.38	17.7
EXB	96	48.365	73.057	4.950	497.93
DSV	96	2.700	7.957	0.102	59.67

***Source*:** E-views output

As observed from the basic descriptive statistics, the annual GDP growth in the WAMZ countries averaged 4.593 per cent. This finding suggests that the countries in the zone, on the average, maintained a positive growth rate. The annual GDP growth varied between a minimum value of -20.59 per cent and a maximum value of 20.72 per cent. Additionally, tax revenue as a percentage of GDP varied too, with a minimum of 2.59 percent and a maximum of 17.7 percent of GDP. On average, tax revenue made up about 9.91 percent of GDP, which means that tax revenue accounts for less than 10 percent of GDP in the WAMZ. This suggests that the WAMZ countries are not generating enough revenue from taxes. The external debt stock and total debt servicing averaged 48.365 and 2.700 percent of GNI, respectively. The standard deviations indicate that the tax revenue observations are closely grouped around their mean values, as the standard deviations for each variable are less than their corresponding mean values. In contrast, GDP growth, external debt stock, and total debt servicing show higher standard deviations, suggesting that their observations tend to deviate further from their average values.

Table 2: Summary of IPS panel unit test results

Variable	Levels test results IPS statistic	First difference test results IPS statistic	Order of Integration
GDPR	-2.0126 (0.022)	-	I(0)
TXR	-1.849 (0.032)	-	I(0)
EXB	-11.778 (0.000)	-	I(0)
DSV	-1.798 (0.761)	-5.235 (0.000)	I(1)

***Source*:** E-views output

Note: Figures in parenthesis are the corresponding probability values associated with the IPS statistics

The results from the IPS unit root test shown in Table 2 indicate that the GDP growth rate, tax revenue, and external debt stock are all stationary at their levels, as their respective IPS statistics have probability values below 0.05. On the other hand, total debt servicing does not show stationarity at levels, with its IPS statistics yielding a probability value greater than 0.05. Since total debt

servicing is non-stationary at levels, we applied the first difference, and it turned out to be stationary at that stage. In summary, we have a mix of integrated variables [I(0) and I(1)]. This mixed integration provides the necessary evidence to fit the NARD model, which helps us understand the asymmetric relationship between each of the dependent variables and their corresponding explanatory variables.

Table 3: Pedroni residual cointegration test results

Series: GDPR TXR EXB DSV				
Sample: 2005 2020				
Null Hypothesis: No cointegration				
Alternative hypothesis: common AR coefs. (within-dimension)				
	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	-2.087917	0.9816	-2.263511	0.9882
Panel rho-Statistic	2.332948	0.9902	2.274853	0.9885
Panel PP-Statistic	-2.188157	0.0143	-3.147956	0.0008
Panel ADF-Statistic	-4.103373	0.0000	-4.004932	0.0000
Alternative hypothesis: individual AR coefs. (between-dimension)				
	Statistic	Prob.		
Group rho-Statistic	2.655592	0.9960		
Group PP-Statistic	-4.947659	0.0000		
Group ADF-Statistic	-4.370770	0.0000		

Source: E-views output

The results from the Pedroni residual-based cointegration test, as shown in Table 4 revealed that six out of the eleven test statistics are statistically significant at the 5% level. This indicates that a long-term relationship exists between GDP growth, tax revenue, external debt stock, and total debt servicing. The evidence of cointegration among these variables aligns with the findings of Shkolnyk & Koilo (2018), Koatsaa, Paramaiahb & Sconac (2021) [18], Adegbite (2020), and Nwakobi, Echekoba & Ananwude (2018), among others. This observation also lays the foundation for applying the NARDL model, which help us understand the asymmetric effects of the key explanatory variables on GDP growth.

Table 4: Asymmetric long and short run results

Dependent Variable: D(GDPR)				
Method: NARDL				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.***
Long run equation				
TXR_POS	1.010080	0.235536	4.288427	0.0001
TXR_NEG	-0.461708	0.357643	-1.290975	0.2049
EXB_POS	-0.440905	0.056369	-7.821726	0.0000
EXB_NEG	0.053751	0.081371	0.660567	0.5131
DSV_POS	-0.493313	0.181470	-2.718427	0.0082
DSV_NEG	-0.118540	0.234869	-0.504707	0.6168
Short run equation				
COINTEQ01	-0.982655	0.389843	-2.520643	0.0163
D(TXR_POS)	2.727443	1.253164	2.176445	0.0498
D(TXR_NEG)	0.369876	2.749798	0.134510	0.8937
D(EXB_POS)	-0.959583	0.252810	-3.795668	0.0005
D(EXB_NEG)	0.497221	0.546454	0.909904	0.3689
D(DSV_POS)	-2.687273	4.037201	-0.665628	0.5099
D(DSV_NEG)	20.61626	19.59753	1.051983	0.2998
C	22.91825	11.23462	2.039966	0.0487

***Source*:** E-views output

The findings showed that tax revenue contributed positively to GDP growth. This implies that an increase in tax revenue has the potential to promote economic growth in the WAMZ. This finding corroborates the results of previous studies, such as Ewa, Adesola, & Essien (2020) [15]; Adegbie, Nwaobia, & Osinowo (2020); and Owuru & Olabisi (2020). It further explains that Nigeria can leverage tax revenue to foster rapid and sustained economic growth. Furthermore, the asymmetric effects of external borrowing on GDP growth and the employment rate are negative. This finding is in tandem with previous results, such as those from Mhlaba & Phiri (2019) and Festus & Saibu (2019), which revealed that government deficit finance over the years has contributed negatively to output growth. Although this finding contradicts the assumptions of Keynesian theory, it explains that loans available to the member countries of WAMZ have not yielded the expected growth benefits. This could be attributed to the incidence of corruption, misappropriation of borrowed funds, and poor governance and institutional quality, which undermine the effectiveness of foreign loans in driving the process of economic growth in the zone. The results further reveal that total debt servicing has adverse implications for GDP growth and the employment rate. The negative effect of debt servicing on GDP growth aligns with theoretical expectations and the findings of some previous studies, such

as Ayomitunde (2020), Benli (2020); and Muhammad-Abdulaziz & Kabir (2020). The error correction coefficient (-0.982) is negative and significant, indicating that the adjustment toward long-run equilibrium can be achieved at the speed of 98.2 percent. This suggests that any disequilibrium in the short run will be reconciled quickly to the long-run equilibrium position.

Table 5: Causality test results

Null Hypothesis (H_0): No causality relationship between the variables Series: GDPR TXR EXB DSV			
Direction of causality	**Chi-square (X^2) Statistic**	**P-value**	**Decision**
GDPR → TXR	0.0297	0.8630	Accept H_0
TXR → GDPR	29.918	0.0000	Reject H_0
GDPR → EXB	3.316	0.0686	Accept H_0
EXB→ GDPR	2.6109	0.1061	Accept H_0
GDPR → DSV	0.124	0.7247	Accept H_0
DSV→ GDPR	0.1048	0.7461	Accept H_0
TXR, EXB and DSV → GDPR	43.092	0.0000	Reject H_0

Source: Researcher's computation (2021) using E-views 10

Note: → shows direction of causality

The causality test results revealed that unidirectional causality flows from tax revenue to GDP growth. This is based on the fact that the corresponding probability of the chi-square statistic is less than 0.05. This implies that tax revenue has a forecasting ability for economic growth in Nigeria. GDP growth also has a causality relationship with external borrowing at 10 per cent level. More importantly, a joint causality flows from all the explanatory variables (tax revenue, external borrowings and total debt servicing) to GDP growth given that the corresponding probability of the chi-square statistic is less than 0.05. This provides the empirical condition for rejecting the null hypothesis. This finding implies that the variables are collectively important in predicting changes in economic growth during the study period.

5. Concluding Remarks

Achieving rapid and sustainable growth while maintaining fiscal sustainability has become a key policy goal across Africa, particularly among the member countries of WAMZ. Thus, we improved the understanding of how tax revenue, deficit financing, and debt servicing impact GDP growth within the WAMZ. The results indicate that tax revenue plays a significant and positive role in driving GDP growth in the region, highlighting its importance in promoting sustainable development. However, we found that deficit financing, especially external debt and debt servicing, have a negative effect on GDP growth. This points to the challenges posed by external debt and the adverse effects of debt servicing on economic stability. Based on these findings, the study concludes that tax revenue is crucial for long-term growth in the WAMZ. Therefore, we recommend that policymakers in the WAMZ diversify the tax base to increase tax revenue and prioritize essential social and economic infrastructure when allocating tax revenue to support sustained growth. Additionally, policymakers need to ensure that loans from external sources are directed towards initiatives that promote higher long-term growth for the member countries of WAMZ.

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