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## Research Report

# Fiscal deficit and inflation dynamics in the WAMZ

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# WEST AFRICAN MONETARY INSTITUTE

WAMI OCCASIONAL PAPER SERIES NO. 37



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**FISCAL DEFICIT AND INFLATION DYNAMICS IN THE WAMZ**

**JUNE 2025**



WEST AFRICAN MONETARY  
INSTITUTE



INSTITUT MONETAIRE DE  
L'AFRIQUE DE L'OUEST

## Fiscal Deficit and Inflation Dynamics in the WAMZ\*

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\* The views expressed in this paper are those of the authors and do not necessarily reflect the official position of the West African Monetary Institute (WAMI). Corresponding authors: John M. Collins Jr ([jmcollins200631@gmail.com](mailto:jmcollins200631@gmail.com)).

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## Abstract

*The West African Monetary Zone (WAMZ) 's economy has faced persistent fiscal deficits over the years, and this has affected other macroeconomic indicators like inflation. This study empirically examines the effect of fiscal deficit on inflation dynamics in the WAMZ. It employs the Panel Smooth Threshold Regression model, using annual data spanning from 2002 to 2023. The findings revealed a nonlinear relationship between inflation and fiscal deficit in the WAMZ, with two distinct regimes. These regimes comprise a linear part and a nonlinear part, with the fiscal deficit as the threshold variable alongside key inflation drivers. The estimation of the model coefficients smoothly switches from linear to nonlinear forms, with an optimal fiscal deficit threshold of 6.16 percent per annum in the Zone. Below this threshold, the fiscal deficit in WAMZ member states mitigates significant welfare losses. However, above this threshold, its coefficient becomes positive and statistically significant at the 5 percent level of significance, suggesting that exceeding this level of deficit funding would negatively affect the inflation rate, leading to potential welfare losses due to the inflation tax. The study recommends a fiscal strategy based on a threshold of 6.16 percent for fiscal deficit in the Zone to prevent the adverse effects of inflation. Additionally, the study recommends fiscal consolidation, which will help to rein in external imbalances and contain the increase in debt related to currency depreciation.*

**Key Words:** Inflation; Fiscal deficit; Panel threshold models; PSTR; WAMZ.

## 1.0 Introduction

The fiscal policy framework of any economy is crucial in determining its macroeconomic stability. In the West African Monetary Zone (WAMZ), fiscal deficit has become a recurrent issue, influencing inflation dynamics and overall economic performance. The WAMZ has experienced persistent fiscal deficits over the years. These deficits are often financed through various means, including domestic borrowing, external borrowing, and money creation. The WAMZ economies' pervasive fiscal deficit has taken center stage in recent policy discussions, particularly because the WAMZ monetary integration agenda places a high premium on the budget deficit as a percentage of GDP, which is one of the four primary convergence criteria. Although there have always been discussions around budget deficits, the magnitude of recent government fiscal deficits and the incapacity of WAMZ countries to meet and sustain the convergence criteria have reignited interest in the topic (Olowofeso *et. al.*, 2021).

The management of aggregate demand and fiscal policy both depend heavily on government borrowing. When the government has a fiscal deficit, it indicates that its total expenditure for the year exceeds its total receipts. Treasury bills and long-term bonds are examples of the debt instruments that the government can issue to raise money to cover the deficit. The literature is almost unanimous in its conclusion that macro instability could be caused by a consistently high budget deficit (Ubong and Supper, 2021). Monetary financing accounts for a significant amount of the budget deficit when the government issues debt securities, which are bought by central banks. Because of the restricted capital resulting from central banks producing banknotes or stamping currency, the financing of the deficit puts upward pressure on interest rates as government obligation securities compete with private equities and debts. An increase in the money supply is caused by the portion of the fiscal budget deficit that is funded by borrowing from the central bank. Inflation is unavoidably caused by an increase in the money supply (Muhammad, Tasos, Rakia, 2024).

Due to its effects on the economy, inflation has been a crucial macroeconomic variable. According to the International Monetary Fund (2018), inflation is a measure of how much the price of a particular set of products and/or services has increased over a given period, usually a year. The price of a basket of commodities in the current year is compared to the price of the same basket in the prior year, or base year, to calculate the rate of inflation. According to Totonchi (2011), one of the most important macroeconomic discussions in the field of economics has most likely resulted from the causes of inflation. The divergent assumptions stem mostly from a variety of conventional viewpoints regarding the best course of action to curb inflation, as well as from variations in economies (developed versus underdeveloped).

Many theories have been proposed to explain inflation, including the cost-push theory, the monetary theory, the demand-pull theory, and, more recently, the structural theory of inflation. Demand-pull inflation was primarily caused by a growth in aggregate demand, according to

John Maynard Keynes and his colleagues. Investment, consumption, and government spending make up the aggregate demand. Cost-push inflation is brought on by wage increases engineered by unions and profit increases by employers. The money supply's impact on inflationary pressures was emphasised by the monetarists under Friedman's leadership in 1968. They argue that "a more rapid expansion in the quantity of money without a corresponding increase in total output" is the cause of inflation, which is a monetary phenomenon that occurs everywhere and always. To investigate inflation in South America, notably Chile, Sunkel (1958) formalised the structuralist theory of inflation. The endeavour to attain economic expansion, primarily in less developed nations, is the cause of this inflation (Totonchi, 2011).

All economies, however, are dynamic, and the factors influencing inflation keep taking on new forms. According to Acquah-Sam (2017), the theoretical and empirical literature on inflation appears to indicate that the reasons behind inflation are complex, time-specific, and contingent upon a nation's degree of development. It wasn't until Sargent and Wallace (1981) formalised the relationship between inflation and monetary financing of a budget deficit. Since then, the contribution of fiscal considerations to the explanation of the primary causes of inflation has received a great deal of attention.

For the WAMZ countries in particular, a study on the possible impact of budget deficit on inflation dynamics is crucial for several reasons. One, it is especially important for the proposed monetary union, as nations in the Zone will depend on fiscal policy as a stabilising mechanism after losing their independent monetary policy instrument to the regional monetary authority. Two, considering the upcoming monetary union, it is pertinent to concentrate on the WAMZ region. While there are studies regarding the relationship between deficit funding and inflation in the context of individual countries, there has not been a robust empirical study for the WAMZ as a regional bloc. Three, the existence of persistent fiscal deficit and recent upswing in inflation in the Zone necessitate a study of this nature.

Each method of financing carries its own implications for inflation and economic stability. However, there is a lack of comprehensive empirical analysis that explores how different financing mechanisms impact inflation dynamics, specifically within the WAMZ as a bloc. This gap in the literature necessitates an in-depth study to inform policy decisions aimed at achieving macroeconomic stability for the region.

Currently, two of the four primary convergence criteria stipulate that the fiscal deficit should not exceed 3 per cent of GDP and that annual average inflation should be at most 5 per cent. Given that the Zone has yet to meet and sustain these criteria, this study aims to examine the relationship between the budget deficit and inflation dynamics in the WAMZ, to uncover underlying challenges and propose policy recommendations to mitigate these effects. It also aims to establish a threshold effect of the fiscal deficit on inflation, with a view to providing an optimal fiscal deficit as a share of GDP.

To achieve this goal, the remainder of the paper is structured in the following way: A brief overview of the WAMZ economies is given in section two, with a focus on fiscal developments and inflation. An assessment of the theoretical and empirical literature is contained in section three. While section four presents the methodology and data description, section five focuses on empirical results and discussions. Section six provides the summary, concluding remarks, and policy recommendations.

## **2.0 Trends in Inflation, Fiscal Deficit, Public Debt, GDP Growth, Money Supply and Exchange Rate in the WAMZ**

The interrelationship among key indicators of interest, like the fiscal balance and inflation rate, with some control variables such as public debt as a share of GDP, GDP growth rate, Broad Money as a share of GDP and exchange rate variation are important in the WAMZ. Tables 1 and 2 present the period average inflation rate, fiscal balance as a share of GDP, public debt as a share of GDP, GDP growth rate, broad money as a share of GDP and exchange rate variation in the WAMZ from 2002 to 2023. Comparing the first half of the sample period to the second half of the same period and considering the entire sample period, we observe that the fiscal balance as a percentage of GDP is widening, averaging around negative 3.11 percent for the period under review. Ghana has the highest ratio of negative 6.47 percent and Guinea has the lowest of negative 1.38 percent during the period. For the inflation rate, Ghana had the highest of 14.68 percent while The Gambia had the lowest of 7.49 percent. Regarding the control variables, Sierra Leone had the highest growth rate of 5.85 percent compare to Liberia with the lowest of 2.47 percent of average growth rates. Public debt as a share of GDP is relatively high in the Zone. The debt increase in the Zone has been driven by widening fiscal deficits because of overlapping crises, slower growth, and exchange rate depreciations. During the period, Liberia registered the highest debt ratio of 172.12 percent while Nigeria had the lowest of 24.28 percent of GDP. With respect to Money supply as a share of GDP in the zone, The Gambia had the highest ratio of 35.95 and Liberia had the lowest of 17.8 percent of GDP. As for the exchange rate in the Zone, it is elevated and volatile because the Zone is highly dependent on imports

Regarding the variation in exchange rate, Ghana had the highest depreciation of 10.58 percent while The Gambia had the lowest of 5.32 percent for the period under review. These results show that the Zone had mixed performances in all the key indicators during the period under review.

**Table 1: Average inflation rate, Fiscal balance, GDP growth rate, public debt, M2 and exchange rate**

Period	2002-2012						2013-2023					
	Inf. Rate	Fis. Bal.	GDP growth	Pub. Debt (% GDP)	M2	Exc. Rate	Inf. Rate	Fis. Bal.	GDP growth	Pub. Debt (% GDP)	M2	Exc. Rate
Gambia	6.89	-1.87	2.43	63.17	28.05	15.39	8.09	-4.24	3.8	77.89	43.86	-5.25
Ghana	12.98	-4.58	7.02	34.5	29.52	-7.84	16.38	-8.35	4.44	64.64	27.29	-13.33
Guinea	17.77	-0.54	3.56	70.81	16.69	-9.64	9.78	-2.22	5.92	40.66	24.44	-1.58
Liberia	9.4	-0.54	3.08	304.47	14.16	-3.42	12.68	-4.2	1.86	39.76	21.44	-7.57
Nigeria	12.21	1.24	7.58	19.78	18.03	-2.86	14.09	-4.42	2.45	28.78	24.75	-12.31
Sierra Leone	8.85	-1.41	8.69	90.21	17.3	-6.72	16.09	-6.11	3	64.95	20.87	-12.92
<b>WAMZ</b>	<b>11.35</b>	<b>-1.28</b>	<b>5.39</b>	<b>97.16</b>	<b>20.63</b>	<b>-2.52</b>	<b>12.85</b>	<b>-4.92</b>	<b>3.58</b>	<b>52.78</b>	<b>27.11</b>	<b>-8.83</b>

Source: IMF, WEO database, WDI-World Bank

Note: Inf. Rate is average inflation rate, Fis. Bal. is fiscal balance (% of GDP), GDP growth is real GDP growth rate, M2 is broad money supply (% of GDP), and Exc. Rate is exchange rate variation

**Table 2: Average inflation rate, Fiscal balance, GDP growth rate, public debt, M2 and exchange rate**

Period	2002-2023					
	Inf. Rate	Fis. Bal. (% GDP)	GDP growth	Pub. Debt (% GDP)	M2 (% GDP)	Exc. Rate
Gambia	7.49	-3.06	3.12	70.53	35.95	-5.32
Ghana	14.68	-6.47	5.73	49.57	28.4	-10.58
Guinea	13.78	-1.38	4.74	55.73	20.56	-5.61
Liberia	11.04	-2.37	2.47	172.12	17.8	-5.5
Nigeria	13.15	-1.59	5.01	24.28	21.39	-7.58
Sierra Leone	12.34	-3.76	5.85	77.58	19.08	-9.82
<b>WAMZ</b>	<b>12.08</b>	<b>-3.11</b>	<b>4.49</b>	<b>74.97</b>	<b>23.86</b>	<b>-7.40</b>

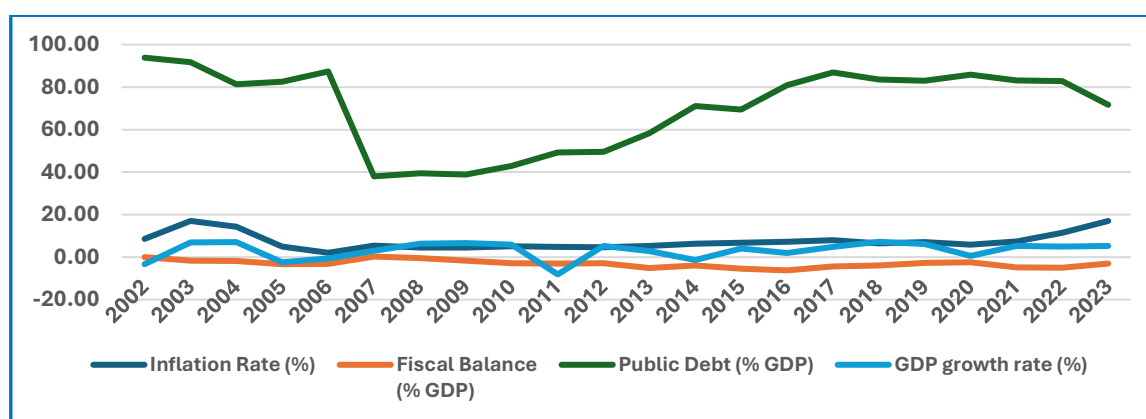
Source: IMF, WEO database, WDI-World Bank

Note: Inf. Rate is average inflation rate, Fis. Bal. is fiscal balance (% of GDP), GDP growth is real GDP growth rate, M2 is broad money supply (% of GDP), and Exc. Rate is exchange rate variation

## The Gambia

During the period under review, the Gambian economy's performance was mixed, especially when comparing the first half (2002 to 2012) of the sample period to the second half (2013 to 2023), largely due to external shocks arising from the COVID-19 pandemic and the Russia-Ukraine war. Fiscal balance deteriorated from negative 1.87 percent to negative 4.24 percent thereby causing inflation to increase to 8.09 percent from 6.89 percent while public debt increased to 77.89 percent of GDP from 63.17 percent. Real GDP growth rate improved to 3.8 percent from 2.43 percent. Inflation remained volatile because The Gambia in the second half of 2022 raised public wages because of increases in the cost of living, triggered by higher food and fuel prices.

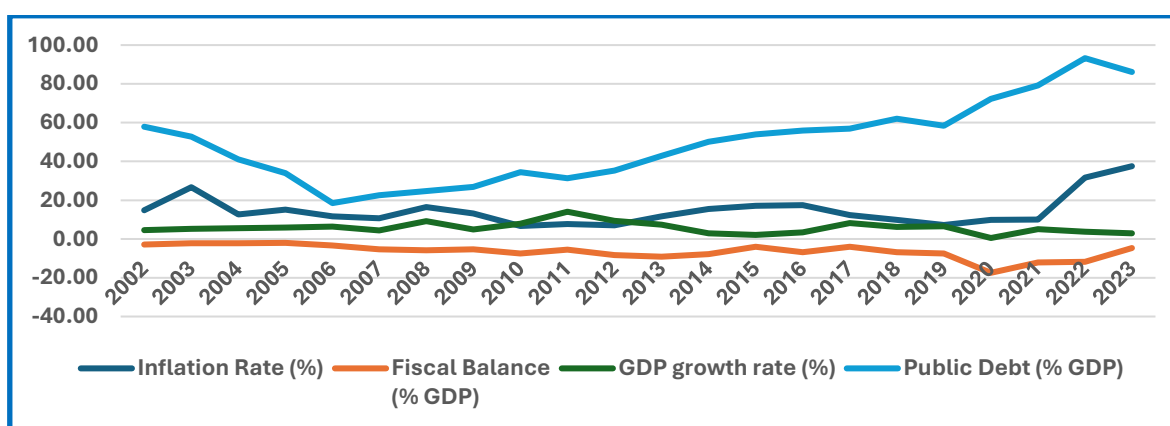
**Figure 1: Trend of key indicators during the period under review: The Gambia**



## Ghana

In the first half of the sample period, Ghana experienced relatively high growth driven by strong performance in sectors such as agriculture, services and the beginning of oil production. In the second half, growth declined to 4.44 percent from 7.02 percent due to global economic conditions, while inflation increased to 16.38 percent from 12.98 percent mainly on account of currency depreciation. Public debt as a share of GDP increased significantly to 64.64 percent from 34.5 percent, driven by high fiscal deficits, borrowing to finance infrastructure projects, and other expenditure needs. Fiscal balance deteriorated to negative 8.35 percent from negative 4.58 percent.

**Figure 2: Trend of key indicators during the period under review: Ghana**

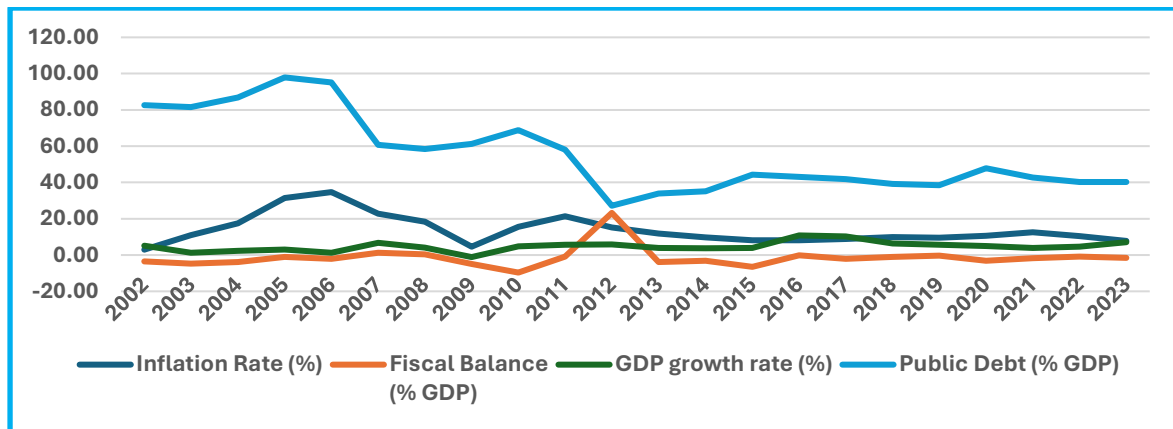


## Guinea

During the period under review, especially during the second half of the sample period, the growth rate of Guinea saw some improvements, with an average growth rate of 5.92 percent from 3.56 percent in the first half, particularly benefiting from high commodity prices. The fiscal deficit worsened slightly, with a deficit of 2.22 percent from 0.54 percent of GDP due to lower revenue collection. However, public debt as a share of GDP improved to 40.66 percent

from 70.81 percent and average inflation moderated to 9.78 percent from 17.77 percent largely due to government stabilisation measures.

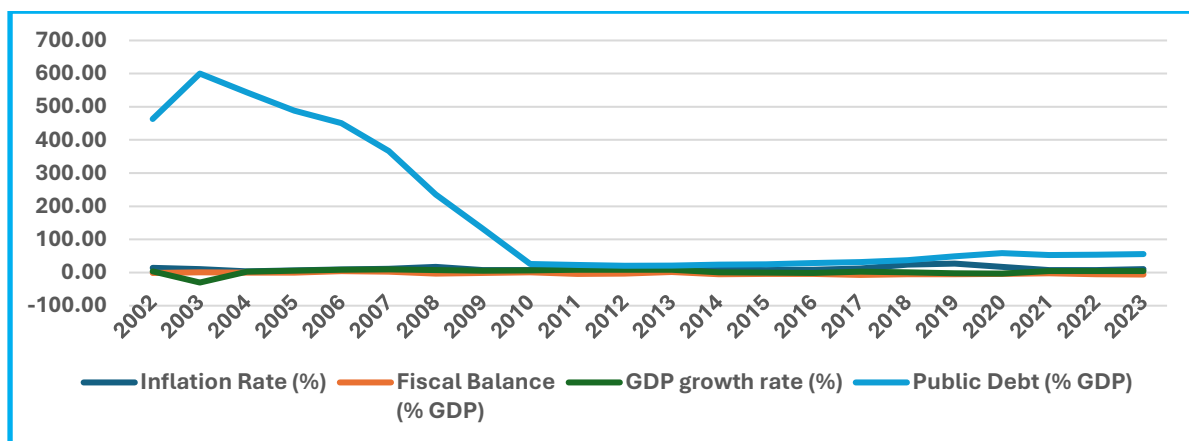
*Figure 3: Trend of key indicators during the period under review: Guinea*



## Liberia

Liberia saw a robust growth in the early 2000s following the civil war, with a slowdown in growth from 2013 onwards to the sample period. The average growth rate stood at 1.86 percent during the second half from 3.08 percent in the first half of the sample period. The growth was impacted by external factors such as the Ebola outbreak and global commodity price fluctuations. In addition, the fiscal deficit increased over the period, reflecting rising public spending and economic challenges. The deficit worsened to 4.2 percent from 0.54 percent during the review period. Also, average inflation remained relatively high during the second half, hovering around 12.68 percent from 9.4 percent, influenced by currency depreciation and high import costs. However, public debt improved significantly simply due to the stability of economic activities after the war.

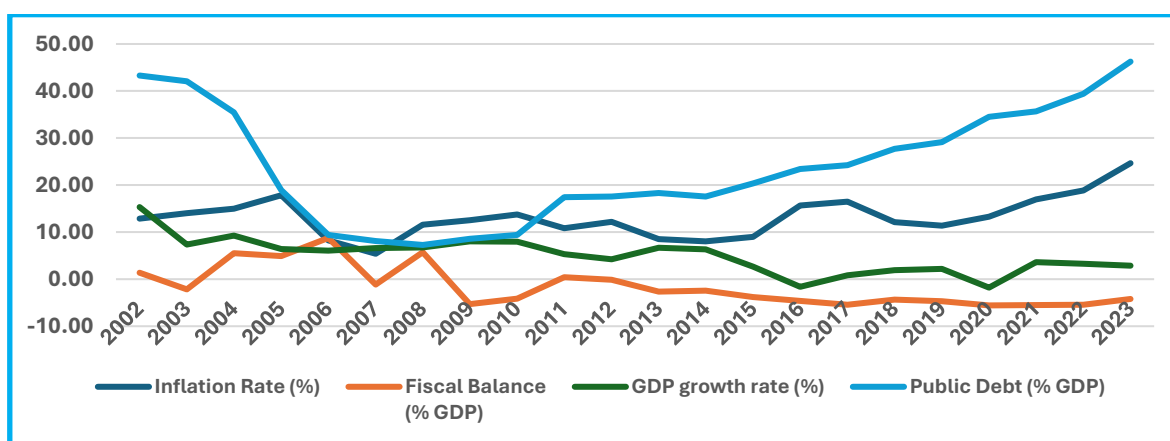
*Figure 4: Trend of key indicators during the period under review: Liberia*



## Nigeria

Nigeria experienced robust growth from 2002 to 2012, with a notable slowdown and economic challenges from 2013 to 2023, including a recession in 2016. Growth was impacted by several factors, including oil price volatility, economic policies, security challenges, and global economic conditions. The recession in 2016 was due to a significant drop in oil prices and subsequent economic pressures. The average growth rate declined to 2.45 percent (between 2013-2023) from 7.58 percent (2002-2012). The fiscal balance improved in the early 2000s but deteriorated significantly in the latter period due to increased deficits. The increase in fiscal deficits was due to decline in oil revenues, increased public spending, and economic challenges. The fiscal balance deteriorated from 1.24 percent of GDP in the first half of the sample period to negative 4.42 percent in the second half. Also, Average inflation rate remained relatively high, averaging 12.21 percent in the first half and 14.09 percent in the second half of the sample period, driven by factors including currency devaluation, economic instability, and supply chain disruptions.

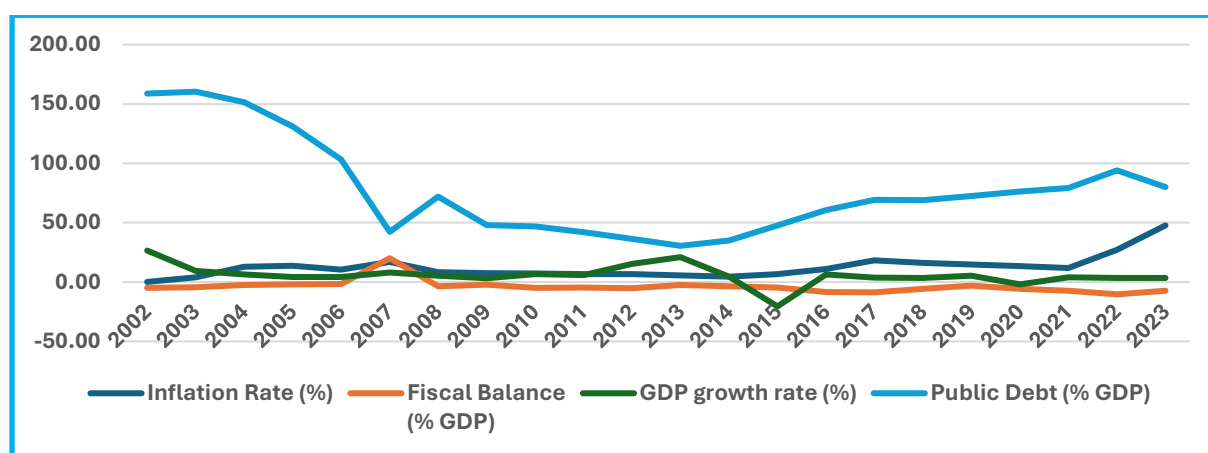
*Figure 5: Trend of key indicators during the period under review: Nigeria*



## Sierra Leone

Sierra Leone experienced strong growth in the early 2000s, with notable slowdown in recent years due to the Ebola outbreak and global commodity price fluctuations. Sierra Leone's economy recorded a growth rate of 8.69 percent in the first half but declined to 3.0 percent in the second half of the sample period. Moreover, the fiscal deficit widened from negative 1.41 percent to negative 6.11 percent, driven by increased public expenditure, including spending on infrastructure and social programs, combined with revenue shortfalls and economic pressures. Also, inflation increased to 16.09 percent in the second half from 8.85 percent in the first half of the sample period due to currency depreciation and fluctuations in global commodity prices.

**Figure 6: Trend of key indicators during the period under review: Sierra Leone**



From the above analyses, all WAMZ countries that experiences a deficit fiscal balance, also recorded higher inflation. Therefore, there appears to be a direct correlation between fiscal deficit, inflation and to some extent high public debt.

### 3.0 Literature Review

#### 3.1 Theoretical Framework

Fiscal deficit financing occurs when a government raises money to meet its obligations, particularly capital expenditures. The government may have financing options such as taxing, borrowing, either internally or externally, creating or printing money (seigniorage), etc. However, if the deficit is financed due to recurrent expenditures, as in the case of most countries in the WAMZ, such financing may spur inflation.

According to Carlstrom and Fuerst (1999), the effect of fiscal deficit on inflation depends on the method of financing. The relationship between fiscal deficits and inflation in the WAMZ is complex and multifaceted. While fiscal deficits can stimulate economic growth and development, excessive deficits financed through unsustainable means can lead to inflationary pressures and macroeconomic instability. The theoretical link between fiscal deficits and inflation is rooted in several economic concepts and frameworks. Here are the key theoretical explanations for how fiscal deficits can influence inflation: Demand-Pull Inflation, which is one of the primary mechanisms through which fiscal deficits can lead to inflation by boosting aggregate demand beyond the economy's capacity to supply goods and services. When the government increases spending or reduces taxes to stimulate economic activity, it can lead to higher consumption and investment. If the economy is already operating at or near full capacity, increased demand can push up prices of goods and services, resulting in inflation (Nguyen 2018; Aiyagari *et al.* 1992). Another channel through which fiscal deficit can lead to inflation is through the crowding-out effect of the private sector. Large fiscal deficits can crowd out private investment, where governments compete for available savings and resources in the

economy. This can lead to higher interest rates as the government borrows more, which in turn can reduce private sector investment and consumption. Higher interest rates can also increase costs for businesses, potentially leading to higher prices and contributing to inflation. The Classical and the Neoclassical considered fiscal policies to have minimal impact on economic growth due to this effect. Another channel by which fiscal deficit can lead to inflation is through monetary expansion. According to Phelps (1973), if a government finances its deficit by borrowing from the central bank (monetising the deficit), it effectively increases the money supply. An increase in money supply without a corresponding increase in output can lead to inflationary pressures, as more money chases the same amount of goods and services (Bassetto and Cui, 2018).

Another channel is the Fiscal Theory of the Price Level (FTPL) developed by Leeper (1991), which supports the positive correlation between fiscal policy and inflation. This theory emphasises that the price level is largely influenced by fiscal policy rather than monetary policy (Farmer and Zabczyk, 2019). The exchange rate channel is another link to inflation in the Zone. The theoretical views on the relationship between fiscal deficit and inflation through the exchange rate channel have been explored by several economists, but a key figure in developing these ideas is Rudiger Dornbusch. Dornbusch's work on the relationship between fiscal policy, monetary policy, and exchange rates, particularly his Dornbusch Overshooting Model, provides insights into how fiscal deficits can impact inflation through their effects on exchange rates. In his overshooting model, Dornbusch explains how changes in fiscal policy can lead to immediate effects on the exchange rate, which in turn affect inflation. According to the model, an increase in the fiscal deficit can lead to a depreciation of the domestic currency. This depreciation can then lead to higher import prices, which contribute to inflationary pressures (Dornbusch, 1976).

Fiscal deficit and macroeconomic dynamics, especially inflation, are a serious concern for Member States of WAMZ as the process of establishing a common currency has reached an advanced stage. According to WAMI (2023), a fiscal deficit of at most 3 percent of GDP and an annual average inflation rate not exceeding 5 percent are the main primary convergence criteria challenges for all the member States to meet as a precondition for establishing a monetary union. Therefore, an in-depth investigation regarding the dynamics between fiscal deficit and inflation is crucial for the region. Effective fiscal management and coordination with the monetary authorities are essential to maintain economic stability and manage inflation in the WAMZ.

### **3.2 Empirical Literature**

The relationship between fiscal deficit and inflation has been a long-standing topic of debate among economists. In the context of the West African Monetary Zone (WAMZ), this relationship is particularly significant due to the region's aspirations for monetary integration

and the establishment of a common currency. This literature review synthesises recent research on the dynamics between fiscal deficit and inflation, providing insights into the theoretical underpinnings, empirical findings, and policy implications.

Empirical studies on the fiscal deficit-inflation relationship in WAMZ countries offer mixed results, reflecting the complexity of this relationship in different macroeconomic contexts. There is a dearth of empirical studies on the subject matter for the entire region, but individual member States have some studies.

For Nigeria, research indicates a positive relationship between fiscal deficits and inflation, driven by the monetisation of deficits (Olorunleke, 2015; Akpan, 2016). However, some studies suggest that the effect is more pronounced in the short run than in the long run (Masha, 2018). Similar to Nigeria, empirical evidence for other countries also points to a significant impact of fiscal deficits on inflation. Studies by Osei and Quartey (2020) highlight that fiscal deficits financed by domestic borrowing exert upward pressure on inflation rates. In Sierra Leone and The Gambia, evidence is less extensive, but available studies (e.g., Sesay, 2017; Jallow, 2019) suggest a positive correlation between fiscal deficits and inflation, although the magnitude and significance vary across different periods and methodologies. On a regional basis, cross-country analyses (e.g., Adam *et al.*, 2021) in WAMZ show a general trend of fiscal deficits contributing to inflation but emphasise the role of structural factors such as exchange rate regimes, monetary policy frameworks, and institutional quality in moderating this relationship.

There has been conflicting evidence in empirical research about the relationship between fiscal deficits and inflation dynamics; some studies indicate a positive relationship, while others indicate the opposite. Hondroyannis and Papapetrou (1997) discovered that rising fiscal deficits had no direct impact on inflation in Greece after evaluating the direct and indirect effects of budget deficit on inflation during the years 1957–1993. Using an error correction mechanism for the same data set, Darrat (2000), in contrast, concludes that greater budget deficits had a substantial role in Greece's inflationary process.

Using a data set of 94 developed and developing nations from 1960 to 1995, Fischer and Easterly (2002) discovered that the relationship between fiscal deficits and inflation is weak in low-inflation countries and high-inflation countries during low-inflation episodes, but highly significant in high-inflation countries during high-inflation episodes. Helmy (2008) used annual data from 1981 to 2006 to investigate the effects of Egypt's budget deficit and how finance affects inflation. The study used Johansen co-integration analysis and the vector error correction model (VECM). The outcome showed that Egypt's inflation is significantly influenced by the budget deficit and the sources of funding for it (Helmy, 2008).

Anfofum *et al.* (2015) used annual time series data to investigate the 42-year link between inflation and fiscal deficits in Nigeria. The findings indicated that there was a long-term equilibrium relationship between budget deficits and inflation. In Ghana, Dadson (2015) found a unidirectional causal relationship from fiscal deficits to inflation as well as a long-term positive relationship between inflation and deficits.

Additional empirical research has demonstrated the long- and short-term relationships between budget deficits and inflation (Ahmad and Aworinde, 2019; Kaur, 2019; Nguyen, 2015). However, Dadson's work did not account for an important factor that influences inflation: the size of the money supply, which this study argues may have had an impact on the findings. At a 10% level of significance, Dadson (2015) finds that a percentage point rise (reduction) in the budget deficit, while maintaining the same values for all other variables, causes a proportional increase (decrease) in the inflation rate by 0.0031. However, the outcome indicates that Ghana's fiscal deficits have a negligible effect on inflation.

Because factors such as money supply, public debt, GDP growth rate, exchange rate, and institutional factors may help explain the causes of inflation, this study aims to include them to empirically investigate the relationship between budget deficits and inflation in the Zone. The effect of fiscal deficit changes on inflation in the WAMZ is also examined in the current study.

#### **4.0 Methodology and data description**

In this section, we present the methodology and the data used to explore the threshold effects of fiscal deficit on the inflation rate in the West African Monetary Zone (WAMZ). Our analysis relies on the Panel Smooth Threshold Regression model, a type of regime-switching model found in the literature.

##### **4.1 Model specification and estimation technique**

To describe changes in the dynamic behaviour of inflation with respect to fiscal deficit, we use a particular regime-switching model that captures nonlinearities and heterogeneity among member states in the WAMZ. Regime-switching models are time-series models in which parameters are allowed to take on different values in each of some fixed number of “regimes”. A stochastic process assumed to have generated the regime shifts is included as part of the model, which allows for model-based forecasts that incorporate the possibility of future regime shifts. The transition mechanism uses an observable transition variable, a threshold and a transition function. Regime-switching models can be divided into two different categories: sharp transition models (PTR: Panel Threshold Regression model) developed by Hansen (1999) where the transition from one regime to another occurs abruptly, or smooth transition models (PSTR: Panel Smooth Threshold Regression model) developed by Gonzalez *et al.* (2005), where the transition from one regime to another occurs gradually.

In examining the effect of fiscal deficit on inflation, this paper builds on the Panel Smooth Threshold Regression (PSTR) approach developed by Gonzalez *et. al.* (2005). This methodology has been applied extensively in empirical research to investigate possible nonlinear relationships. Instead of having the regression coefficients move sharply from one regime to another, this model allows for a smooth transition or gradual change depending on the threshold variable (Seo and Shin, 2016). In doing so, the PSTR model allows us to exploit the heterogeneity in fiscal deficit across countries and detect possible nonlinearity through the variations in its effect on inflation. By allowing for such variations in the parameter estimates, the PSTR model offers a suitable framework to tackle the problem of structural breaks (Olowofeso, 2021). It ensures the endogenous determination of the fiscal deficit threshold parameter that will be in line with the inflation rate, above which high fiscal deficit can possibly be detrimental to inflation in the region.

### 1.1.1 PSTR model

To examine the nonlinear relationship between inflation and fiscal deficit, we follow WAMI (2021) and Gonzalez *et. al.* (2005) and consider a PSTR model associated with one threshold parameter or two regimes of fiscal deficit, reflecting the low and high regimes with a single transition function as specified in equation (1):

$$\pi_{it} = \alpha_i + \beta_0'x_{it} + \beta_1'x_{it}g(q_{it}; \gamma, \vartheta) + \varepsilon_{it} \quad (1)$$

where  $\pi_{it}$  is the inflation rate,  $i = 1, \dots, N$  represents the individual country in six (6) cross-sectional units (The Gambia, Ghana, Guinea, Liberia, Nigeria, and Sierra Leone),  $t = 1, \dots, T$ , the time dimension (2002-2023).  $x_{it}$  is the vector of time-varying explanatory variables, comprising the independent variable of interest (fiscal deficit) and control variables used in the standard growth literature, such as the real GDP growth rate, public debt to GDP ratio, nominal exchange rate changes, broad money to GDP ratio, and institutional quality proxied by the control of corruption index. Further,  $q_{it}$  designates the threshold variable for fiscal deficit,  $\mu_i$  is the country's fixed effects and  $\varepsilon_{it}$  is the error term.

Following Gonzalez *et. al.* (2005), the transition function  $g(q_{i,t}; \gamma, \vartheta)$  is a continuous logistic function of the fiscal deficit threshold variable ( $q_{i,t}$ ), normalised to be bounded between 0 and 1 and these extreme values are associated with the coefficients  $\beta_0$  and  $(\beta_0 + \beta_1)$ .

$$g(q_{it}, \gamma, \vartheta) = \left( 1 + \exp \left( -\gamma \prod_{j=1}^m (q_{it} - \vartheta_j) \right) \right)^{-1} \quad (2)$$

with  $\vartheta = (\vartheta_1, \vartheta_2, \dots, \vartheta_m)$  is an  $m$ -dimensional vector of locations or threshold parameters and  $\vartheta_1 \leq \vartheta_2 \leq \dots \leq \vartheta_m$ . Therefore, for  $m = 1$  (model with one threshold), the model has two extreme regimes separating low and high values of fiscal deficit ( $q_{it}$ ) with a single monotonic

transition of the coefficients from  $\beta_0$  to  $(\beta_0 + \beta_1)$  as  $q_{it}$  increases.  $\gamma > 0$  is a slope parameter, which determines the smoothness of the transition function. A higher value of  $\gamma$  leads to a rougher transition and when  $\gamma \rightarrow +\infty$ , the transition function becomes an indicator function:

$$g(q_{it}, \vartheta) = \mathbb{I}_{(q_{it} > \vartheta)} \quad (3)$$

Such that:

$$g(q_{it}, \vartheta) = \begin{cases} 1 & \text{if } q_{it} > \vartheta \\ 0 & \text{Otherwise} \end{cases} \quad (4)$$

For any value of  $m$ , the transition function  $g(q_{it}, \gamma, \vartheta)$  is a constant when  $\gamma$  is close to zero. In that special case, Equation (1) becomes a linear panel regression model with fixed effects.

### 1.1.2 Specification tests and estimation procedure

The specification and estimation procedure proposed by Gonzalez *et al.* (2005) for the PSTR model is as follows: a) Test the linearity against the PSTR model; b) Parameter estimation; and c) Test for the number of transition functions.

#### a. Testing for linearity

To determine whether there is a nonlinear relationship between inflation and fiscal deficit in the WAMZ, we perform a linearity test against a PSTR model. This test implies testing the null hypothesis of homogeneity  $H_0: \gamma = 0$  or  $H_0: \beta_0 = \beta_1$  against the alternative hypothesis of the PSTR model. From Equation (1), the authors, following Luukkonen *et al.* (1988), replaced the transition function  $g(q_{i,t}; \gamma, \vartheta)$  by its first-order Taylor expansion around  $\gamma = 0$  and obtain this auxiliary regression:

$$\pi_{it} = \alpha_i + \beta_0 x_{it} + \beta_1^* x_{it} q_{it} + \dots + \beta_m^* x_{it} q_{it}^m + \varepsilon'_{it} \quad (5)$$

Where the parameter vectors  $(\beta_1^*, \dots, \beta_m^*)$  are multiples of  $\gamma$  and  $\varepsilon'_{it} = \varepsilon_{it} + R_m \beta_1^* x_{it}$ , with  $R_m$  being the remainder of the Taylor expansion. Thus, testing  $H_0$  in Equation (1) is equivalent to testing the hypothesis  $H_0^*: \beta_1^* = \dots = \beta_m^* = 0$  in Equation (5). We then evaluate based on the probability values of the Wald (LM), Fisher (LMF) and Likelihood ratio test (LRT) statistics. The rejection of the null hypothesis of linearity implies that the relationship is nonlinear.

#### b. Parameter estimation

The estimation of the parameters  $(\beta_0', \beta_1', \gamma, \vartheta)$  procedure from Equation (1) requires first eliminating the individual effects by country-specific demeaning, and in the second time applying nonlinear least squares (NLS) to the transformed data. The elasticities derived from the estimation of the PSTR model vary across countries and time and depend on the transition function. Therefore, the elasticity of inflation with respect to the fiscal deficit can be obtained

from an expanded version of Equation (1) as the weighted average of the parameters  $\beta_0$  and  $\beta_1$ :

$$\pi_{it} = \alpha_i + \beta_0 FD_{it} + \beta_1 FD_{it} g(q_{it}; \gamma, \vartheta) + \beta'_{01} K_{i,t} + \beta'_{11} K_{i,t} g(q_{i,t}; \gamma, \vartheta) + \varepsilon_{it} \quad (6)$$

$$\frac{\partial \pi_{i,t}}{\partial FD_{i,t}} = \beta_0 + \beta_1 * g(q_{i,t}; \gamma, \vartheta) \quad (7)$$

Where  $\pi_{it}$  is the inflation rate,  $FD_{it}$  is the fiscal deficit,  $K_{i,t}$  is a vector of the control variables and  $g(q_{i,t}; \gamma, \vartheta)$  is the transition function.

### c. Test for the number of transition functions

When the linearity hypothesis is rejected in the PSTR framework, we further test for the number of transition functions, equivalent to testing the null hypothesis of no remaining nonlinearity in the transition function. Gonzalez et. al. (2005) proposed a sequential approach, similar to testing the linearity, as we test whether there is one transition function ( $H_0: r = 1$ ) against the alternative of at least two transition functions ( $H_1: r = 2$ ). Also using the Wald (LM), Fisher (LMF) and Likelihood ratio test (LRT) statistics, we ensure that there are no remaining nonlinearities in the underlying relationship.

## 4.2 Data description

To analyse the effect of fiscal deficit on inflation in the WAMZ, we use annual panel data for all variables spanning from 2002 to 2023 (sample size of 22 time series), covering all six member states (The Gambia, Ghana, Guinea, Liberia, Nigeria, and Sierra Leone). The choice of the period is determined by available data for all the countries. This study employed the inflation rate ( $\pi_{it}$ ) as the percentage change in the consumer price index to be the dependent variable, while fiscal deficit ( $FD_{it}$ ) as a percentage of GDP is used as the threshold (independent) variable. The deficit <sup>1</sup> consists of the net lending (+)/net borrowing (-) (in opposite sign) and represents a summary measure indicating the extent to which the government is either putting financial resources at the disposal of other sectors in the economy or abroad, or utilising the financial resources generated by other sectors in the economy or from abroad.

The description and the sources of the control variables (real GDP growth, public debt to GDP ratio, broad money to GDP ratio, nominal exchange rate change, and control of corruption) are displayed in Table 3 below. Money supply is included in the model to capture the effect of monetary policy on inflation. As for the exchange rate in our specification, it is to control the impact of external factors on the price level. We proxied the institutional quality by adding the control of corruption, which is a normalised index to range from approximately -2.5 (weak) to

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<sup>1</sup> See Government Finance Statistic Manual 2014.

2.5 (strong) governance performance. While the variables inflation rate, fiscal deficit and public debt to GDP ratio are extracted from the World Economic Outlook (WEO) of the IMF's database, real GDP growth rate and broad money are collected from the World Development Indicators (WDI) of the World Bank. Further, the exchange rate change and the control of corruption are provided by WAMI's database and the World Bank's Governance Indicators, respectively. Following WAMI (2022), the exchange rate change is obtained as the annual variation of the nominal exchange rates in terms of the units of the local currency to the US dollar.

The descriptive statistics below show heterogeneity in the variables used in the regression between 2002 and 2023 and among WAMZ member states. As depicted in Table 3, the dependent variable (inflation rate) varies from 0.12 percent in Sierra Leone in 2002 to 47.72 percent, also in Sierra Leone in 2023. As for the data on the fiscal balance to GDP ratio, the variation goes from a minimum of -17.44 percent (deficit) in Ghana in 2020, to a maximum of 23.23 percent (surplus) in Guinea in 2012. On average, the inflation rate in the zone is 12.08 percent, compared to a fiscal deficit ratio of -3.10 percent during the period under study.

**Table 3: Descriptive statistics and data sources**

Variable	Notation	Obs.	Mean	Std. dev.	Min	Max	Source
Inflation rate (%)	$\pi$	132	12.08	7.19	0.12	47.72	WEO Database - IMF
Fiscal deficit ratio (% GDP)	$FD$	132	-3.10	4.60	-17.44	23.23	WEO Database - IMF
Real GDP Growth rate (%)	$GDPGR$	132	4.49	5.61	-30.15	26.52	WDI - World Bank
Public Debt (% GDP)	$DEBT$	132	74.97	96.90	7.28	600.12	WEO Database - IMF
Broad Money (% GDP)	$M2$	132	23.86	8.91	5.21	57.02	WDI - World Bank
Exchange rate change (LCU/USD)	$EXCH$	132	-7.40	10.34	-44.70	22.65	WAMI's database
Control of corruption	$CORR$	132	-0.75	0.37	-1.50	0.04	World Bank's Governance Indicators

**Source:** Author computation.

**Note:** Data on exchange rate variation is computed as the annual change in the nominal exchange rate of national currencies against the US dollar for all WAMZ member States.

WEO: World Economic Outlook, WDI: World Development Indicators

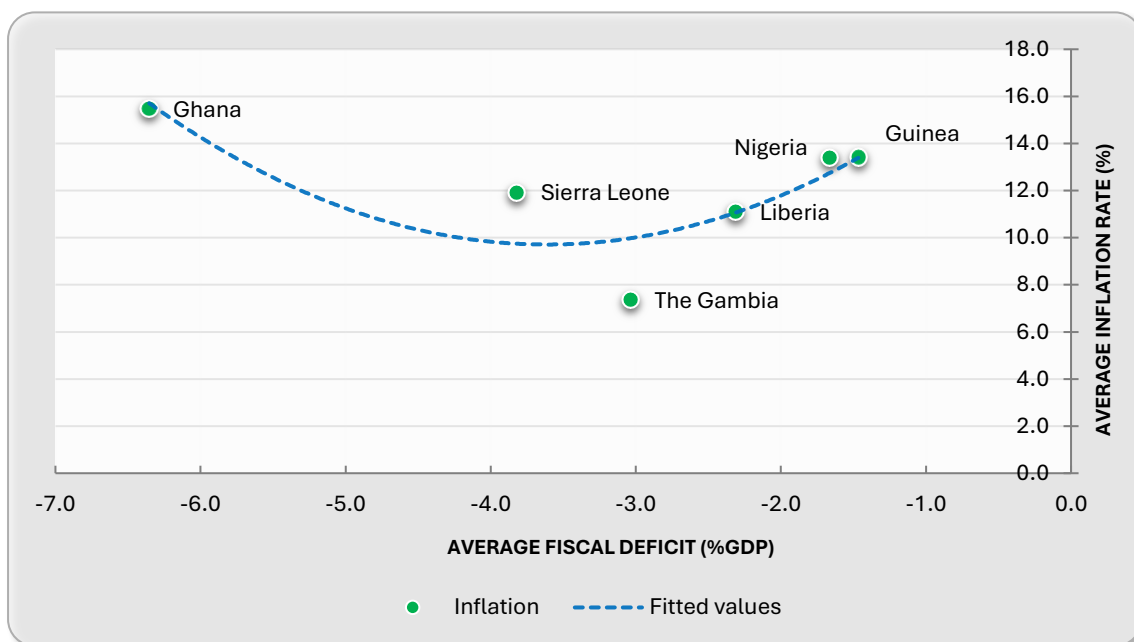
## 5.0 Empirical Results and Discussions

In this section, we present and discuss the results of the empirical analysis to evaluate whether there are threshold effects of fiscal deficit on inflation in the WAMZ. We begin with specification tests, including linearity tests and no remaining heterogeneity tests. Then, we estimate the threshold and transition parameters to assess the nexus between inflation and fiscal deficit.

## 5.1 Model selection and linearity tests

The study starts by analysing the linear specification against a specification with a nonlinear fiscal deficit effect on inflation in WAMZ. Figure 7 shows how inflation and deficit are compared over the period 2002-2023. Using a quadratic plot of the average inflation rate and fiscal deficit to GDP ratio for each country during the period, we provide some preliminary insight into how the dependent variable can potentially affect inflation. As we can see, there is a potential nonlinear association between deficit and inflation in the WAMZ. This is interesting, as it reinforces our presumption of using a nonlinear model to exploit such heterogeneity in our variables across member States and over time.

**Figure 7: Inflation rate and Fiscal deficit ratio to GDP in the WAMZ:2002-2023**



Source: WAMI Staff estimates

We further apply the linearity test, described above and consisting of a test of homogeneity between inflation rate and fiscal deficit ratio for the WAMZ member states. If the linearity hypothesis is rejected, it will be essential to determine the number of transition functions required to capture all the heterogeneity of the parameters of the inflation equation. This implies checking the order  $m$  in Equation 1 (through Equation 2), with a null hypothesis of homogeneity ( $m = 0$ ) between the two variables against the PSTR model ( $m = 1$ ). That is to determine whether the inflation effect of fiscal deficit is the same across countries or varies across countries over time. The results from the Wald (LM), Fisher (LMF) and Likelihood ratio test (LRT) statistics (16.58, 2.87 and 17.72) and their respective p-values (0.011, 0.012 and 0.007), displayed in Table 4, indicate the rejection of the linearity at one percent significance level. From the probability values of all tests, it is reasonable to use a nonlinear model to capture the fiscal deficit effect on inflation in the WAMZ.

To assess whether there is any remaining nonlinearity in the data, we further evaluate the null hypothesis of a PSTR model of one transition function ( $H_0: r = 1$ ) or two extreme regimes model against an alternative PSTR model of at least two thresholds or three regimes model ( $H_1: r = 2$ ). In Table 4, the probabilities of the three statistic tests, that are the Wald (LM), the Likelihood Ratio (LR), and the Lagrange multiplier -Fischer (LMF) tests (5.63, 0.80 and 5.76 respectively) and their respective p-values (0.465, 0.570 and 0.451 respectively) suggest that we cannot reject the null hypothesis of a PSTR model of one threshold value or two extreme regimes. We thus employ the estimation of a nonlinear inflation model by using the PSTR with one transition function or two extreme regimes (low and high fiscal deficit ).

**Table 4: Homogeneity and no remaining heterogeneity tests**

Hypothesis	Test	Statistics	P-value
$H_0: (r = 0); H_1: (r = 1)$	Wald Test (LM)	16.584	0.011
	Fisher Test (LMF)	2.874	0.012
	LRT Tests (LRT)	17.722	0.007
$H_0: (r = 1); H_1: (r = 2)$	Wald Test (LM)	5.634	0.465
	Fisher Test (LMF)	0.802	0.570
	LRT Tests (LRT)	5.757	0.451

Lagrange multiplier-Wald (LM); Lagrange multiplier -Fischer (LMF); and likelihood ratio (LR) tests.

The null hypothesis of linearity  $H_0$ : linear model;  $H_1$ : PSTR model with at least one threshold.

The null hypothesis of no remaining non-linearity  $H_0$ : PSTR model with one threshold;  $H_1$ : PSTR model with at least two thresholds.

Source: WAMI Staff estimates using MATLAB

## 5.2 Estimation of threshold and transition parameters

The empirical results from the Panel Smooth Threshold Regression model show a nonlinear relationship between inflation and fiscal deficit in the WAMZ, with two distinct regimes. These regimes comprise a linear part (Regime I) and a non-linear part (Regime II), with fiscal deficit funding as the threshold variable alongside key inflation drivers.

As displayed in Table 5, the estimation of the model coefficients smoothly switches from linear to non-linear forms, with an optimal fiscal deficit threshold of 6.16 percent per annum in the zone. The findings indicate that there is a negative relationship between inflation rate and fiscal deficit, with a coefficient of 0.80, statistically significant at 5 percent level, representing a strong impact on inflation in the low regime when deficit funding levels are moderate. In other words, below a threshold of 6.16 percent, a 1 percent increase in fiscal deficit (decrease in deficit) leads to an increase in inflation of 0.8 percent, ceteris paribus. As a rise in net borrowing (net lending) is similar to a decline in the financing of the deficit, we conclude that a 1 percent increase in the fiscal deficit financing leads to a 0.8 percent decrease in inflation and therefore mitigates the welfare losses in the WAMZ.

However, above this threshold, its coefficient becomes negative and statistically significant at the 5 percent level of significance, suggesting that achieving a level of deficit funding above

the threshold would be detrimental to the inflation rate, thus leading to potential welfare losses due to the inflation tax. The elasticity of inflation with respect to fiscal deficit in the high regime is 0.55 percent. Thus, the effects of fiscal deficit on inflation are positive and negative in low and high deficit regimes, respectively.

The negative effect of fiscal deficit on inflation in the high regime (the nonlinear part) can be explained by several reasons. First, in WAMZ member states, there exist episodes of imprudent fiscal policies, largely due to countries' responses to macroeconomic shocks (both internal and external). Government borrowing, especially from the financial system to finance the deficit, would fuel the monetary expansion and thus increase inflation (Kaur, 2019). Second, when a fiscal policy is more oriented in favour of consumer spending over productive investments, high fiscal deficits are more likely to increase inflation. By generating income to meet rising debt repayment obligations, these investments may alleviate worries about inflation brought on by increased demand and monetary expansion (Khundrakpam and Pattanaik, 2010 and Olasunkanmi, 2015). Furthermore, the crowding out of private investment can explain the link between a rise in fiscal deficit and inflation, due to higher interest rates (Chakraborty, 2012).

**Table 5: PSTR Model Estimation of Fiscal Deficit – Inflation Relationship**

<i>Variables</i>	<i>Coefficients</i>	<i>t-statistics</i>	<i>p-values</i>
<b>Model PSTR regime I (Linear Part)</b>			
<i>Fiscal deficit to GDP ratio</i>	0.8002 **	2.4085	0.0160
<i>GDP growth</i>	- 0.3593	-0.5863	0.5577
<i>Debt to GDP ratio</i>	0.3928 ***	3.6993	0.0002
<i>M2 to GDP ratio</i>	- 0.7047 *	-1.9510	0.0511
<i>Exchange rate variation</i>	- 0.5152 ***	-2.8681	0.0041
<i>Corruption Index</i>	1.0452	0.2993	0.7647
<b>Model PSTR regime II (Non-Linear Part)</b>			
<i>Fiscal deficit to GDP ratio</i>	- 0.5486 **	-1.5924	0.0113
<i>GDP growth</i>	0.2403	0.3892	0.6971
<i>Debt to GDP ratio</i>	- 0.3951 ***	-3.7003	0.0002
<i>M2 to GDP ratio</i>	0.7514 **	2.0889	0.0367
<i>Exchange rate variation</i>	0.2161 *	1.0972	0.0725
<i>Corruption Index</i>	- 1.7649	-0.5142	0.6071
<b>Transition parameters</b>			
<i>Location (<math>\theta</math>)</i>	- 6.1645		
<i>Slope (<math>\gamma</math>)</i>	3.4353		

Note: \*\*\*, \*\*, \* denote 1%, 5% and 10 % statistically significance, respectively. Dependent variable – Inflation rate.  
Source: WAMI Staff estimates using MATLAB.

Regarding the control variables, the coefficients of the debt-to-GDP ratio and corruption index are all positive in the low fiscal deficit regime. But only the coefficient of the debt ratio is statistically significant at one percent level. On the other hand, an increase in GDP growth, money supply ratio and exchange rate variation leads to a fall in the inflation rate. From Table

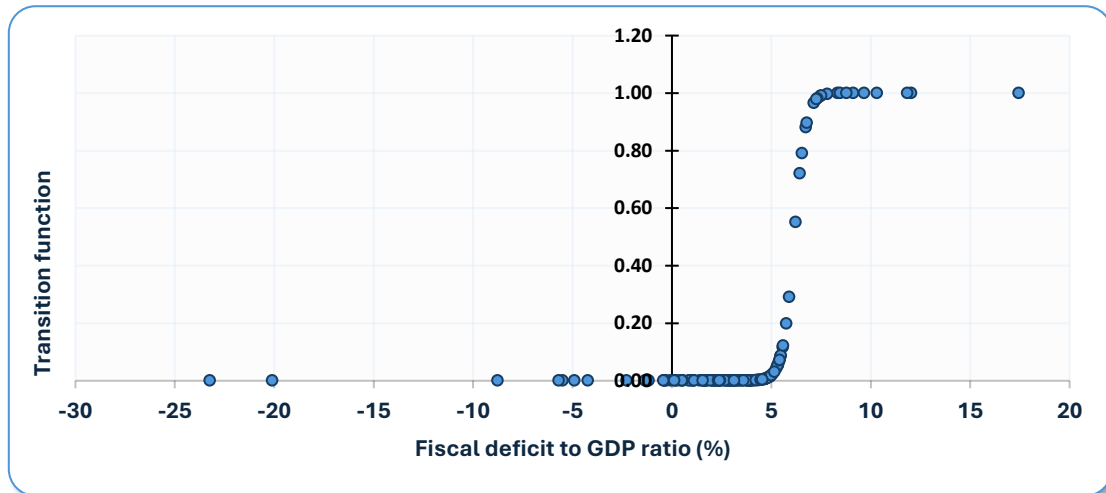
5, the coefficients of the broad money to GDP ratio and exchange rate variation are significant at the 10 percent and one percent level, respectively, and the study does not find evidence of significant GDP growth rate in the WAMZ in this regime. Above the fiscal deficit threshold, an increase in inflation is explained on one side by an expansion of GDP growth rate (not statistically significant), money supply ratio (with a t-statistic of 2.09, significant at the 5 percent level), and exchange rate variation (with a t-statistic of 1.10, marginally significant at the 10 percent level). On the other side, a high inflation rate is related to negative coefficients of debt to GDP ratio (significant at the one percent level), as the corruption index is statistically insignificant in this regime.

The effect of the public debt ratio on inflation is found to be a channel through which fiscal deficit influences the inflation rates in the zone. According to the fiscal theory of the price level, increased government debt adds to household wealth and, therefore, to demand for goods and services, leading to price pressures. For Jose and Kerry (2017), Buiter (1999), and Gordon and Leeper (2002), the larger size of the debt also results in higher sovereign risk premiums being charged by government creditors, which can increase interest rates in the economy as a whole and unleash the well-known crowding out effect with its accompanying impact on macroeconomic stability. According to the IMF (2023), the positive link between exchange rate variation and inflation can be partly explained by the member countries being highly dependent on imports, with an important share of them invoiced in foreign currencies (US dollar for most). Also, the exchange rate appreciation is most likely to boost the export performance, causing a demand-pull inflation through improvement in domestic income and demand. The result is in line with Tariq *et al.* (2024) in India and Asad *et al.* (2012) in Pakistan, who also found a positive relationship between inflation and exchange rate. The response of inflation to money supply in high fiscal deficit is aligned with the seminal work of Sargent and Wallace (1981), which underlines the importance of monetary and fiscal policy coordination in managing inflation. According to the authors, monetary policy tightening leads to an increase in inflation, especially in a period of high fiscal deficit stance. This is because, given a certain level of government borrowing and assuming any changes to future fiscal policy, part of the government's liabilities would eventually need to be serviced by seigniorage (Jose *et al.*, 2017).

Figure 8 shows the transition function depicting the elasticity of inflation with respect to the fiscal deficit to GDP ratio. The value of the slope parameter ( $\gamma$ ) determines the smoothness of the transitions (Gonzalez et al., 2005), indicating a smooth transition between the two regimes when it is less than one. Thus, the transition between the lower fiscal deficit regime to the higher regime is relatively smooth if the value of the slope parameter is very low. By contrast, the larger the size of the slope, the sharper the transition is from one regime to another. The estimated slope parameter of the transition function ( $\gamma = 3.4353$ ) demonstrates a relatively gradual change in the inflation effect of fiscal deficit when transitioning from a low to a high

fiscal deficit regime. The figure shows a relatively low elasticity of inflation to fiscal deficit funding below the threshold of 6.16 percent, but a gradually rising elasticity when the level of fiscal deficit exceeds this threshold. Indeed, this plot reinforces our argument about the existence of a nonlinear effect of fiscal deficit on inflation in the WAMZ.

**Figure 8: Transition function of elasticity of inflation and fiscal deficit**



Source: WAMI Staff estimates

## 6.0 Conclusion and recommendations

The primary aim of the study was to examine the relationship between fiscal deficit and inflation dynamics in the West African Monetary Zone over the period 2002 to 2023. Employing the Panel Smooth Threshold Regression model, the study evaluates whether there are threshold effects of fiscal deficit on inflation in the WAMZ. Findings revealed a nonlinear relationship between inflation and fiscal deficit in the Zone, with two distinct regimes. These regimes comprise a linear part (Regime I) and a non-linear part (Regime II), with fiscal deficit as the threshold variable alongside key inflation drivers. The estimation of the model coefficients smoothly switches from linear to non-linear forms, with an optimal fiscal deficit threshold of 6.16 percent per annum. This indicates that there is a negative relationship between the inflation rate and fiscal deficit, with a coefficient of -0.33, which is statistically significant at a 5 percent level, representing a strong impact on inflation in the low regime when deficit funding levels are moderate. However, above this threshold, its coefficient becomes positive and statistically significant at the 5 percent level of significance, suggesting that achieving a level of deficit funding above the threshold would affect the inflation rate negatively, thus leading to potential welfare losses due to inflation tax. The elasticity of inflation with respect to fiscal deficit in the high regime is 0.55 percent. Thus, the effects of fiscal deficit on inflation are positive and negative in low and high deficit regimes, respectively.

The study concluded that, over time, fiscal deficits have a large and nonlinear negative impact on the rate of inflation. Thus, it recommends a fiscal strategy with an inherent threshold based of 6.16 percent for fiscal deficit in the Zone, to prevent the adverse effect of inflation. Also, the study recommends fiscal consolidation, which will help to rein in external imbalances and contain the increase in debt related to currency depreciation. Furthermore, it is essential to reassess the fiscal deficit limits stipulated in the Convergence Criteria, to allow member states to adjust fiscal expansion without exacerbating inflation risk. Member states are encouraged to align their deficit level according to this optimal threshold. In addition, authorities are encouraged to channel borrowed funds towards productive investments rather than recurrent activities. Inflation risks in the Zone should be countered by adopting effective management of capital flows and interest rates.

It is noteworthy that this study employs annual data to undertake the analysis, given the fact that higher frequency data are not available for some member States. Exploring higher frequency data, like quarterly or monthly data, could be undertaken to provide further insight into the dynamics. Also, disaggregating the sources of financing the deficit, to explore the impact of respective sources on inflation dynamics could be undertaken.

## References

- Acquah-Sam, E. (2017), Influencers of inflation in Ghana. *European Scientific Journal*, 13(7), 140.
- Adam, C. S., O'Connell, S. A., & Buffie, E. F. (2021). Fiscal Deficits, Inflation, and Monetary Policy in Africa. *African Development Review*, 33(1), 87-101.
- Ahmad, A.H., Aworinde, O.B. (2019). Are fiscal deficits inflationary in African countries? A new evidence from an asymmetric cointegration analysis. *The North American Journal of Economics and Finance*, 50, 100999.
- Aiyagari, R., & Christiano, L. M. (1992). The output, employment and interest rate effects of government consumption. *Journal of Monetary Economics*, 30, 73-86.
- Akpan, U. F. (2016). Fiscal Deficits and Inflation in Nigeria: An Analysis of Causal Relationships. *Journal of Monetary and Economic Integration*, 10(2), 35-54.
- Anfofum, A.A., Yahaya, A.O., Suleman, T. (2015), Empirical investigation of fiscal deficits and inflation in Nigeria. *International Journal of Fiscal Deficit and Inflation*, 7, 1905.
- Asad, I., Ahmad, N. and Hussain, Z. (2012), "Impact of real effective exchange rate on inflation in Pakistan", *Asian Economic and Financial Review*, Vol. 2 No. 8, p. 983.
- Buiter, Willem H. (1999), *The Fallacy of the Fiscal Theory of the Price Level*, NBER Working Paper, No. 7302, National Bureau of Economic Research, Cambridge, Massachusetts, <doi:10.3386/w7302>.
- Carlstrom, C. & Fuerst, T. (1999). "Optimal Monetary Policy in a Small Open Economy: A General Equilibrium Analysis," Working Papers Central Bank of Chile 70, Central Bank of Chile.
- Chakraborty, L. (2012), "Determination of interest rate in India: empirical evidence on fiscal deficit interest links and financial crowding out", NIPFP Working Paper No. 112, NIPFP, New Delhi.
- Dadson, Y.A. (2015), *Examining the Effects of Fiscal Deficits on Inflation in Ghana* [University of Ghana]. Available from: <https://ugspace.ug.edu.gh>
- Darrat, A.F. (2000), Are budget deficits inflationary? A reconsideration of Economics, Finance and Administrative Science, 20, 49-53.
- Dornbusch, R., (1996). "Does Inflationary Finance Cause Currency Depreciation?" *Journal of International Economics*.
- Farmer, R. E., & Zabczyk, P. (2019). A Requiem for the Fiscal Theory of Price Level. IMF Working Paper(WP/19/219).
- Fischer, S., Easterly, W. (2002), The economics of the government budget constraint. *The World Bank Research Observer*, 5(2), 127-142.
- Global Business Review*, 22(6), 1553-1573.
- Gonzalez, A., Terasvirta, T. and van Dijk, D. (2005). Panel Smooth Transition Regression Models. SSE/EFI Working Paper Series in Economics and Finance, No. 604.
- Gordon, David, and Eric M. Leeper (2002), *The Price Level, The Quantity Theory of Money, and The Fiscal Theory of the Price Level*, NBER Working Paper, No. 9084, National Bureau of Economic Research, Cambridge, Massachusetts, <doi: 10.3386/w9084>.

- Hansen, B. E., (1999): Threshold effects in non-dynamic panels: Estimation, testing and inference," *Journal of Econometrics*, 93, 345-368.
- Helmy, O. (2008), *The Impact of Budget Deficit on Inflation in Egypt* (ECES Working Paper No.141).
- Hondroyannis, G., Papapetrou, E. (1997), Cointegration, causality and the government budget-inflation. Relationship in Greece. *Applied Economics Letters*, 1, 204-206.
- IMF. (2019). *West African Economic Outlook: Promoting Fiscal Discipline for Economic Growth*. International Monetary Fund.
- International Monetary Fund. (2018), *World Economic Outlook: Cyclical Upswing, Structural Change*. Washington, DC: International Monetary Fund (IMF).
- Jallow, K. (2019). Fiscal Deficits and Inflation in The Gambia: An Empirical Analysis. *Journal of African Economies*, 28(3), 295-310.
- Kaur, G. (2019), "Inflation and fiscal deficit in India: An ARDL approach", *Global Business Review*, Vol. 22 No. 6, pp. 1553-1573.
- Khundrakpam, J.K. and Pattanaik, S. (2010), "Fiscal stimulus and potential inflationary risks: an empirical assessment of fiscal deficit and inflation relationship in India", *Journal of Economic Integration*, Vol. 25 No. 4, pp. 703-721, doi: 10.11130/jei.2010.25.4.703.
- Leeper, E. M. (1991). Equilibria under 'Active' and 'Passive' Monetary and Fiscal Policies. *Journal of Monetary Economics*, 27(1), 129-147.
- Masha, I. (2018). The Dynamics of Fiscal Deficits and Inflation in Nigeria: Evidence from Co-Integration and Error Correction Modeling. *Nigerian Journal of Economic and Social Studies*, 60(2), 45-68.
- Nguyen, T. (2018). Impact of Government Spending on Inflation in ASIAN Emerging Economies: Evidence from India, China, and Indonesia. *The Singapore Economic Review*, 63(1), 1-30.
- Nguyen, V.B. (2015), Effects of fiscal deficit and money M2 supply on of fiscal deficits and inflation in Nigeria. *International Journal of*
- Olasunkanmi, O.I. (2015), "Fiscal policy and inflation volatility in Nigeria", *Nigerian Journal of Economics and Social Studies*, Vol. 57, p. 1.
- Olorunleke, K. (2015). Fiscal Deficits and Inflation in Nigeria: A Vector Autoregressive Analysis. *West African Journal of Economic and Monetary Studies*, 12(2), 109-126.
- Olorunsola E. Olowofeso, Maimuna John-Sowe, Santigie M. Kargbo, Sani Bawa, Isatou Mendy, Kormay Adams, Adegoke I. Adeleke, Yaya Cham. *Fiscal Convergence In The West African Monetary Zone*. WAMI Occasional Paper Series No. 22 June 2021
- Osei, R. D., & Quartey, P. (2020). Fiscal Policy, Debt, and Inflation in Ghana: A Vector Error Correction Approach. *Economic Modelling*, 88, 209-221.
- Phelps, E.S., (1973). Inflation in the Theory of Public Finance. *The Swedish Journal of Economics*. Vol. 75, No. 1, Stabilization Policy (Mar. 1973), pp. 67-82 (16 pages)
- Romero, J. P. B., & Marín, K. L. (2017). Inflation and public debt. *Monetaria*, 5(1), 39-94.
- Sargent, T. J., & Wallace, N. (1981). Some Unpleasant Monetarist Arithmetic. *Federal Reserve Bank of Minneapolis Quarterly Review*, 5(3), 1-17.

- Sargent, T.J., Wallace, N. (1975), "Rational" expectations, the optimal monetary instrument, and the optimal money supply rule. *Journal of Political Economy*, 83(2), 241-254.
- Sesay, F. (2017). The Relationship between Fiscal Deficits and Inflation in Sierra Leone. *Sierra Leone Economic Journal*, 2(1), 76-92. the evidence. *Applied Economics Letters*, 7(10), 633-636. the government budget-inflation. Relationship in Greece. *Applied Economics Letters*, 1, 204-206. [ug.edu.gh](http://ug.edu.gh)
- Sunkel, O. (1958), National development policy and external dependence in Latin America. *The Journal of Development Studies*, 6(1), 23-48.
- Tariq, A., Bashir, S., and Amin, A. (2024). Beyond the basics: mapping the inflation response to fiscal deficit in India with smooth transition autoregressive model. *Journal of Economic Studies*.
- Tasos Stylianou, Rakia Nasir, Muhammad Waqas (2024). The relationship between money supply and inflation in Pakistan. Shazia Rehman, Second Xiangya Hospital, Central South University, China, *PLoS ONE* 19(3): e0301257. <https://doi.org/10.1371/journal.pone.0301257>
- Totonchi, J. (2011), *Macroeconomic Theories of Inflation*. Vol. 4. 2011 International Conference on Economics and Finance Research IPEDR.
- Ubong Effiong, Supper Okijie (2021). Fiscal Imbalance and Macroeconomic Instability in Nigeria: Implications for National Development. *Acta Universitatis Danubius* Vol. 17, No. 3, 2021
- West African Monetary Institute (2019). *Macroeconomic Convergence Report*. WAMI Publication, Accra, Ghana.
- IMF (2023). The Big Funding Squeeze. *REGIONAL ECONOMIC OUTLOOK*. South Saharan Africa.