



## IMPACT OF INFLATION AND MONEY SUPPLY ON ECONOMIC GROWTH OF WEST AFRICAN MONETARY ZONE WAMZ) MEMBER COUNTRIES (1999-2020)

Usman Salihu Usman  
[uskeh419@gmail.com](mailto:uskeh419@gmail.com)

Hassan Abdulwahab Yusuf, *Ph.D*  
Federal University, Kashere,  
Faculty of Social Sciences,  
Department of Economics &  
Development Studies  
[yabdulwahab@fukashere.edu.ng](mailto:yabdulwahab@fukashere.edu.ng)

### ABSTRACT

This study examined the impact of inflation and money supply on economic growth of West African Monetary Zone (WAMZ) Member Countries (Gambia, Ghana, Guinea, Nigeria, Liberia and Sierra Leone). Specifically, with aim of determine the effects of money supply and inflation on economic growth of WAMZ member countries. To achieve this objective, the study applies a range of econometric techniques, including, panel cointegration technique, pooled ordinary least Square (Pooled OLS). The study found a negative relationship between economic growth and inflation in WAMZ countries this suggest that growth does not always lead to higher inflation as influenced by factors like supply-side dynamics, effective monetary policies, and low inflation environments. The study also found a positive relationship between money supply and economic growth in WAMZ countries which indicates that increasing the money supply stimulates demand and investment, boosting economic growth. Therefore, the study recommends that WAMZ countries should focus on implementing effective supply-side policies and maintaining sound monetary policies to sustain economic growth without triggering inflationary pressures. This could involve improving productivity, investing in infrastructure, and ensuring price stability to create a low-inflation environment conducive to growth. Secondly, WAMZ countries should also consider adopting policies that responsibly increase the money supply to stimulate demand and investment, Lastly, policymakers should focus on controlling inflation and ensuring an adequate money supply to foster sustainable long-term growth.

**KEYWORDS:** WAMZ member countries, Inflation, Money supply, Economic growth, Pooled OLS

### 1. INTRODUCTION

Monetary policy is one of the key drivers of economic growth through its impact on economic variables. The growing importance of monetary policy has made its effectiveness in influencing economic growth a priority to most governments. However, various empirical literatures examine how monetary policy work and the extent to which monetary policies instruments influence economic growth among economies, there are strong evidence that economic

**\*Corresponding author:**  
Hassan Abdulwahab Yusuf, *Ph.D*  
Federal University, Kashere,  
Faculty of Social Sciences,  
Department of Economics &  
Development Studies  
[yabdulwahab@fukashere.edu.ng](mailto:yabdulwahab@fukashere.edu.ng)

growth is influenced by the magnitude of monetary policies (Mesagan and Yusuf, 2019). Apex banks across the globe have been saddled with the responsibility of regulating the supply and cost of money supply as well as the direction of credit in their various countries. Similarly, in Nigeria monetary policy has been in use since the Central Bank Act of 1958 saddled the apex bank with the responsibility of formulating and implementing monetary policies. This role has facilitated the emergence of an active money market where treasury bills, a financial instrument used for Open Market Operations and raising debt for government has grown in volume and value becoming a prominent earning asset for investors and source of balancing liquidity in the market (Mesagan et al., 2018).

The formal establishment of the West African Monetary Zone (WAMZ) was in 2000. This monetary zone comprised of The Gambia, Ghana, Guinea, Liberia, Nigeria and Sierra Leone. It was expected that the formation of WAMZ would propel the creation of a monetary union (That is a zone where a single monetary policy prevails and introduction of common currency referred to as (ECO) or the existing currencies of the member's nations can be fully convertible at immutably fixed exchange rates circulate freely, alongside a common central bank and a single currency called "ECO", meant to replace the existing national currencies of the six member countries. The desire to fasten the process of the monetary integration of the African sub-region was indicated by the 15-member countries of the ECOWAS in 2000.

Economic growth in WAMZ are primarily premised on developments in agriculture and extractive sectors. However, low investments in extractive sectors and the lack of commercialization in agriculture limits the potentials of these sectors. This has led the member states' economies to accumulate more foreign reserves in order to tackle external vulnerabilities, such as high import bills, currency fluctuations and unfavorable commodity prices. Economic growth in The Gambia had increased to 6.6% in 2018 compared to 4.6% in 2017; the growth was mainly attributed to the rebound in tourism and trade following the political impasse in 2016. Ghana's economy grew by 6.3% in 2018, lower than the 8.1% in 2017. The decline in growth was due to the moderation in the growth of the oil and gas sector. Growth slowed in Guinea to 8.7% compared to 13.4% in 2017. The drop in growth was mainly due to underperforming agriculture and extractive sectors. Liberia's growth was estimated at 1.2% in 2018 compared to 2.5% recorded in 2017, which is a result of slowdown in the secondary sector (industrial gold production and manufacturing), and the tertiary sector (services). Output grew by 1.9% in Nigeria, compared to the growth of 0.8% recorded in 2017. The growth was largely driven by the recovery in crude oil prices and the support of real sector activity through the various interventions by the Central Bank of Nigeria (CBN). Growth in Sierra Leone declined, and real GDP grew by 3.5% in 2018, relative to the 3.8% recorded in 2017. The low performance was due to lower

commodity prices globally, high operational costs of the main iron ore mining company as well as slower activities in the manufacturing sector (Olorunsola et al., 2022).

The economic growth trend in WAMZ countries, shows that Nigeria-NGA has a highest economic growth rate among the WAMZ countries. Despite economy turmoil, the WAMZ countries continue to record an increase in economic growth. The WAMZ economies rely on exported goods (majority primary products) and the economy measured by a combined nominal GDP of \$1,192.6 billion (PPP). This represents about 73.3 per cent of ECOWAS GDP put together. Although the zone is relatively large within the ECOWAS sub-region, it is a small open economy globally, accounting for less than one per cent of the global GDP (UNECA, 2015). The trend and behavior of inflation among WAMZ members countries using 100 index as a base year for 2010. The inflationary in WAMZ reveal that there is persistence increase in inflation among WAMZ countries. The highest recoded inflation among WAMZ countries is Ghana-GHA with 305.9 in 2020. The monetary authority in WAMZ countries are generally noted for excessive liquidity creation. For instance, Ghana, Guinea, Nigeria and Liberia recorded very high broad money supply growth rates of 39.8 percent, 38.3 percent, 57.8 percent and 41.4 percent respectively in 2008. The Gambia has been able to control the growth rates in broad money supply in recent years. However, the contribution to liquidity accelerated from 6.7 percent to 18.4 percent in 2008 (Olorunsola et al., 2022). This performance originated mainly from a significant increase in net credit to government which represented 17.8 percent of the expansion in broad money supply. Again, the trend of broad money supply among WAMZ member's countries in their respective local currency continues growth over the cause of the study. The highest money supply is Nigeria-NGA with highest money supply of 3.8 trillion Naira in supply, the lowest money in circulation is recoded in 699billion Naira in 1999.

Most of the WAMZ member's countries including Nigeria have had generally weak economic performance resulting from economic mismanagement, fiscal indiscipline, unproductive public spending, persistent exchange rate overvaluation, and over regulation. Structural reforms during 1986 - 1990 resulted in substantial growth, but policy weakening and reversals afterward brought about stagflation. The economic activity among (WAMZ) members countries begin to decline in the late 1970s especially in Gambia, Liberia and pervasive government control and intervention in Sierra Leone, exchange rate pegged to the pound sterling, became increasingly overvalued. Oil price shocks, low world market prices for groundnuts, and a long drought in the Sahel contributed to the economic decline as did excessive domestic borrowing and money creation to finance the fiscal deficit. However, despite various efforts by the monetary authorities in the (WAMZ) members

countries through reform program including liberalization of the exchange rate system and transitioning of market economy during 1985 to 1995, the exchange rate continue to become a greater challenge that causes distortions in the economies of (WAMZ) which in turn affect economic growth of the member countries. Furthermore, many studies have been carried out on the link between monetary policy variables and economic growth. However, the review of past empirical literature revealed a lack of consensus in the study findings of previous scholars. Following a wide empirical reviews, the study observed a lack of consensus among studies like that of Balogun, (2007); Olorunsola et al., (2022); Mesagan and Shobande, (2016) and that of Mesagan and Yusuf, (2019), this leaves a research gap which indicated that more studies are required on this subject. This study therefore examined the impact of monetary policy variables which are inflation and broad money supply on economic growth of West African Monetary Zone. Various studies over year examine the relationship between economic growth inflation and money supply among (WAMZ) countries.

## **2. LITERATURE REVIEW**

### **2.1 Concept of Economic Growth**

Economic growth signifies the progress of an economy under the stimulus of certain favourable circumstances, e.g., the progress achieved by the United Kingdom during the Industrial Revolution, the raising of income levels is generally called economic growth in rich countries and in poor ones it is called economic development (Maddison, 1982) in Hardwick et al., (1994) have defined economic growth as an increase in a country's productive capacity, identifiable by a sustained rise in real national income. It is considered as the rate of change in national output or income in a given period. It is the increase of per capita gross domestic product or aggregate income, often measured as the rate of change in real gross domestic product (Etale and Oweibi, 2019). Economic growth is an essential ingredient for sustainable development. Economic growth in a country is proxy by GDP. Thus, in this study, it is conceptualized as the monetary value of all goods and services produced in an economy over a specified period usually one year.

### **2.2 Concept of Inflation**

Inflation can be defined as the increase in the general price level of goods and services, and it is usually measured by the Consumer Price Index (CPI) which is traditionally used as a proxy to determine the amount of inflation affecting various economies and it can be defined as a measure of the average change over time in the prices paid by consumers for a market basket of consumer goods and services. This basket of goods and

services includes: Food and Beverages, Housing, Clothing, Transportation, Medical Care, Recreation, Education and Communication and Other Goods and Services (Bayo, 2015). Fitsum et al., (2016) explained that inflation is a sustained rise in general price level which is in line with the definition of Kremer et al., (2018). However, they added that this phenomenon occurs when the aggregate demand in normal value is greater than the real productive capacity of the economic which is also in line with the definition of Keynes. The structuralists argue that inflation is crucial for economic growth while the monetarists posit that inflation is harmful to economic growth (Doguwa, 2015).

### 2.3 Concept of Money Supply

Economic stability requires that the supply of money at any time should to be maintained at an optimum level. A pre-requisite for achieving this is to accurately estimate the stock of money supply on a regular basis and appropriately regulate it in accordance with the monetary requirements of the country. According to Afolabi, (1999), inflation is the result of excess demand and should be brought under control by removing the excessive demand through a reduction in the growth of money supply which automatically reduces the growth of prices and wages as well through monetary policy contractionary measures. Milton Friedman argued that the supply of money is independent of the demand for money. He observed that bearing the development of hyperinflation. Only wealth, is the variable likely to cause significant changes in velocity (Owoje, & Onofowora, 2007).

There are several measures of money supply, depends on the economy. The international financial statistics manual, provides commonly used guidelines for the treatment of government deposits and measure of currency within the economy.  $M1 = \text{currency held by public} + \text{demand deposits}$ .  $M2 = M1 + \text{savings and time deposits with licensed banks} + \text{NCDs issued by licensed banks and held by the public}$ .  $M3 = M2 + \text{deposits with restricted licensed banks and deposit taking companies} + \text{NCDs issued by restricted licensed banks and deposit taking companies and held by the public}$ . Although the Manual of Monetary and Financial Statistics (2000) provides commonly used guidelines for the treatment of government deposits. It does not offer a prescription for individual economy's definition of money. Nevertheless, it notes that "deposit holdings of the government are usually excluded from the monetary aggregates. It is argued, at least for some countries, that central government deposit holdings do not respond to macro-economic influences (i.e . changes in economic activity, interest rates, exchange rates, etc.) in the same way, or to the same degree as deposits of the money holding sectors (IMF, 2000).

## 2.4 Empirical Reviews

Balogun (2007) examined monetary policy and economic performance of West African Monetary Zone Countries (Gambia, Ghana, Guinea, Nigeria and Sierra Leone) from 1991 - 2004 using Vector Autoregressive and Distributed Lag Models, Granger Causality Test as the tools of analyzing the effectiveness of money supply, minimum rediscount rate, banking system credit to private sector, banking system credit to central government and exchange rate on real GDP. The findings of the study indicated that monetary policy variables were a source of stagnation as it hurts real domestic output of WAMZ member countries. In addition, WAMI (2016) carried out a basic statistical analysis of 15 ECOWAS nations from 2002 to 2008 to investigate the association between money supply and other macroeconomic indicators (GDP, exchange rate, inflation rate, etc.). The analysis showed that money supply has a positive influence on GDP depending on the structural circumstances, and that in all the 15 countries, percentage growth on money supply was greater than GDP. Again, Mesagan and Yusuf (2019) examined the impact of monetary and fiscal policy on economic performance and stabilization in some selected West African Monetary Zone (WAMZ) Countries (Gambia, Ghana and Nigeria) between 1980 and 2017. Base on the impact of monetary policy on economic performance and stabilization in Gambia, Ghana and Nigeria, the study employed Fully Modified Ordinary Least Square (FMOLS), Augmented Dickey Fuller (ADF) unit root test and Johansen-juleus co-integration test to find the impact of broad money supply, deficit finance, monetary policy rate and commercial banks credit to private sector on Gross Domestic Product (GDP). The study revealed that deficit finance had a negative significant effect on Real GDP in Nigeria and Ghana, while the Gambia's deficit finance had a positive significant effect on Real GDP. Broad money supply, credit to private sectors and monetary policy rate had positive insignificant effect on economic growth of Gambia and Nigeria, and in the case of Ghana's economic growth, the variables had positive significant effect.

Olorunsola et al., (2022) explored the relationship between inflation and economic growth, the existing literature on threshold effect of inflation on economic growth in the West African Monetary Zone (WAMZ) predominantly assumes a linear association, neglecting the possibility of nonlinearity. The study aims to fill the gap in the empirical literature by exploiting the variation in inflation rates across countries and over time to identify endogenously the threshold inflation level that affects economic growth in WAMZ countries over the period 2001-2019. Results reveal an inflation threshold of 10.3 per cent per annum for WAMZ countries, showing that achieving moderate inflation below this threshold will stimulate economic growth while high inflation above the threshold is detrimental to growth. The result provides strong empirical support for the

policy stance of WAMZ countries regarding the convergence criterion to contain inflation to a single-digit level. This finding highlights the importance of adopting moderate inflation target below the identified threshold of 10.3 percent to foster sustainable economic growth. It underscores the need for central banks to adopt more proactive approach to monetary policy by closely monitoring inflation levels and taking appropriate actions to keep inflation within this desired range. Another study by Ogu et al., (2020) examines the impact of inflation on economic growth in Nigeria, utilizing time series data sourced from CBN for the period spanning from 1999 to 2017. The study adopts the Ordinary Least Square (OLS) regression technique and established that inflation has positive but not significant impact on economic growth in Nigeria. The result also revealed that interest rate has negative and significant effect on economic growth in Nigeria.

## 2.5 Theoretical Framework

The relationship between inflation and economic growth has been examined by several economic theories, the Keynesian and Neo-Keynesian theorists offer a more complex model using the aggregate supply-aggregate demand (AS-AD) framework, where inflation and growth can be positively linked in the short run. According to this framework, the short-run aggregate supply curve is upward sloping, meaning that changes in aggregate demand affect both output and prices. This implies that inflation can lead to higher economic growth in the short term, as firms increase production in response to rising prices, unaware that overall price levels in the economy have also increased (Gatawa et al., 2017). Various factors such as expectations, fiscal and monetary policy, and input prices can influence this short-run relationship. As the economy moves toward the long run, these factors are assumed to balance out, allowing the economy to reach its steady state (Dornbusch et al., 1996).

Some theorists, such as Vikesh and Sabrina (2004), further support the idea that inflation may have a positive impact on growth through contractual agreements that allow firms to supply goods at previously agreed-upon prices, even as general prices rise. Similarly, Tobin (1972) suggested that inflation encourages individuals to move from holding liquid assets to investing in interest-bearing assets, which can increase capital accumulation and promote economic growth. This effect, known as the "Tobin effect," posits that inflation can facilitate economic growth by enabling relative price adjustments during periods of expansion, particularly through upward price movements without immediate downward pressure on wages and input costs.

## 3. METHODOLOGY

This study employed descriptive statistics, correlation matrix, panel ordinary least square model, fixed-effect model, random-effect model and Hausman test for the analysis of the panel data. The descriptive statistics is used to summarize the data of all the variables in the study. The descriptive statistics are broken down into measures of central tendency including mean, standard deviation, minimum and maximum variables.

### 3.1 Model Specification

In order to achieve the objectives of the study, an econometrics model of multiple regression analysis was used in the study. The mathematical model used in this study in order to examine the effect of monetary policy on economic growth of WAMZ member countries. In the model, money supply (M2) and inflation rate (INF) were taken as the independent variable while real gross domestic product (RGDP) was taken as the dependent variable. However, this functional relationship can be represented below following the transformation of the data.

$$\text{LogRGDP}_{it} = \lambda + \lambda_1 \text{LogMS2}_{it} + \lambda_2 \text{LogINF}_{it} + \mu_{it} \quad (1)$$

Where: RGDP = Real Gross Domestic Product, MS2 = Broad Money Supply, INF = Inflation Rate, i = cross-section, t = time period and  $\mu$  = error term.

The priori expectation:  $\lambda_1 > 0$ ;  $\lambda_2 < 0$

### 3.2 Unit Root Test

#### The Levin, Lin & Chu (LL) test for unit root

This panel unit root test was created by Levin, Lin & Chu (2002). Levin and Lin adopted a test that can literally be viewed as an extension of the DF test. The model form is as follows.

$$\Delta Y_{i,t} = \alpha_i + \rho Y_{i,t-1} + \sum_{k=1}^n \varphi_k \Delta Y_{i,t-k} + \delta_{it} + \phi_t + \mu_{it} \quad (2)$$

The model permits for two way fixed effects which makes both unit-specific fixed effects and unit specific time trends. The Unit specific fixed effects are very crucial component due to the permit for heterogeneity because the coefficient of the lagged  $Y_i$  is deprived to be homogeneous over all units of the panel. The LLC test also assumes that the individual processes are independent in cross sectional data. The null hypothesis of this test states that:  $H_0: \rho = 0$

#### The IPS test for Unit Root



The Im, Pesaran, and Shin (2003) test is an alternative to the LLC test. It tests for individual unit root processes as against assuming a common unit root process like the LLC. This in effect tests for all cross-sections to be stationary. The IPS test averages all the individual ADF test statistics. The null hypothesis, in this case, is that each series contains a unit root for all  $i$  cross-sections. The IPS test in effect follows the model below:

$$\Delta y_{it} = \alpha_i + \rho_i y_{i,t-j} + \sum p_{ij} = 1\beta_{ij}\Delta y_{it-j} + \varepsilon_{it} \quad (3)$$

Where:  $i=1, \dots, N$  and  $t=1, \dots, T$

The main difference between these tests is that while one assumes a common unit root, the other assumes an individual unit root.

### 3.3 Panel Cointegration Tests

Following the unit root test and the order of integration has been defined, that is if the two or more non-stationary time series are said to be cointegrated if there exists a linear combination of them that is stationary. The aim is to help identify long-term relationships between variables that are otherwise non-stationary.

#### Pedroni Panel Cointegration Tests

The study apply Pedroni's cointegration test methodology. Indeed, like the IPS test, the heterogeneous panel cointegration test advanced by Pedroni (1999, 2004) allows for cross-section interdependence with different individual effects. The empirical model of Pedroni's cointegration test is based on the following equation:

$$Y_{it} = \eta_i + \delta_i t + \beta_{1i} \ln f_{it} + \beta_{2i} MS_{it} + \varepsilon_{it} \quad (4)$$

Where:  $i = 1, \dots, N$  for each country in the panel  $t = 1, \dots, T$  refers to the time period;  $Y$ ,  $\ln f$ ,  $MS$ , and  $EX$  are the natural logarithms of real GDP, Inflation and Money supply respectively.  $\eta_i$  and  $\delta_i$  are country and time fixed effects, respectively.  $\varepsilon_{it}$  denotes the estimated residuals which represent deviations from the long-run relationship.

The structure of estimated residuals is the following:

### The Kao Test for Panel Co-integration

The Kao (1999) revealed Dicker Fuller and Augmented Dicker Fuller type tests for co-integration in panel data. According to Kao, the residual based co-integration test can be adopted.

$$\mu_{it} = e\mu_{it-1} + v_{it} \quad (6)$$

### 3.4 Pooled Ordinary Least Square (Pooled OLS) Model

The Pooled Ordinary Least Squares (OLS) model is a type of regression analysis used to estimate the relationship between independent variables and a dependent variable when the data is pooled across different entities, such as individuals, firms, or countries. This approach assumes that there are no significant differences between the entities being analyzed, and it treats them as a single group. The model has the following assumptions that: The Pooled (OLS) model for the study is specified below:

$$GDP_{it} = \alpha_i + \beta_1 INF_{it} + \beta_2 MS2_{it} + \mu_i \quad (7)$$

GDP is the dependent variable,  $\alpha_i$  is the model intercept, the coefficient  $\beta$  are Inflation and Money Supply as independents, the  $\mu_i$  is the error term.

### Fixed Effect Model

A fixed effects model is a statistical model in which the model parameters are fixed or non-random, which differs from a random effects model and a mixed model in which all or some of the parameters are random (Umunna et al., 2022). By using the fixed effect estimator, it is possible to correct some endogenous effects resulting from the regression coefficients correlating with individual specific effects, although, the regressors are still assumed not to be correlating with the idiosyncratic error  $\mu_{it}$ .

$$Y_{it} = \alpha_i + \beta_1 X_{it} + \beta_2 X_{2it} + \dots + \beta_k X_{kit} + \varepsilon_{it} \quad (8)$$

### Random Effect Model

Assuming that the fixed effects are uncorrelated with the explanatory variables, random effects are created, which results in strict limitations in the treatment of panel data. Random effects models assume that countries diverge in their error terms, and they also include a non-measurable stochastic variable that distinguishes individuals (Fofanah, 2020).

$$Y_{it} = \alpha_i + \beta_1 X_{1it} + \beta_2 X_{2it} + \dots + \beta_k X_{kit} + \mu_i + \varepsilon_{it} \tag{9}$$

**Hausman Test**

Essentially, the Hausman test allows you to choose between fixed effects and random effects. For the panel data, the suitable choice connecting the fixed effects and the random effects methods examines if the regressors have a correlation with the individual (unobserved in most cases) effect, the Hausman statistical test could be viewed as a distance test between H0, i.e., that random effects are consistent and efficient, and H1, i.e., that random effects are inconsistent (fixed effects will be consistent) (Umunna *et al.*, 2022). Hausman adopts the following test statistics:

$$H = (\hat{\beta}^{FE} - \hat{\beta}^{RE}) [Var(\hat{\beta}^{FE}) - Var(\hat{\beta}^{RE})]^{-1} (\hat{\beta}^{FE} - \hat{\beta}^{RE}) \sim \chi^2(k) \tag{10}$$

**4. RESULT AND DISCUSSION**

**4.1 Panel Unit Root Result**

The unit root result is presented for economic growth, inflation and money supply, the result includes four different statistical results which include; Im, Pesaran and Shin W- statistics, ADF - Fisher Chi-square statistics and PP - Fisher Chi-square statistics are based on the Null hypothesis that Unit root (assumes individual unit root process). On the other hand, the Levin, Lin & Chu t statistics is based on the Null hypothesis that Unit root (assumes common unit root process).

**Table 1: The IPS test for Unit Root**

Statistics	RGDP Statistics	(INF) Statistics	(MS) Statistics	ORDER
Im, Pesaran and Shin W-stat	-6.26002***	-6.62014***	-5.88704***	I(1)
ADF - Fisher Chi-square	58.0659***	62.1026***	55.2241***	I(1)
PP - Fisher Chi-square	65.8515***	56.8589***	59.5458***	I(1)
Levin, Lin & Chu t*	-6.58990***	-6.49849***	-6.31867***	I(1)

Author’s Computation, (2024)

The result revealed that all the variables (economic growth, money supply and inflation) are integrated series. Therefore, to examine the relationship between inflation, money supply and economic growth, the study

estimate panel cointegration techniques in order evaluate the magnitude of the relationship between the variables among WAMZ member countries, that is the presence of long run or short run relationship would be determine with the help of cointegration test.

#### 4.2 Panel Cointegration Analysis

To examine the magnitude of the relationship between economic growth, inflation and money supply among WAMZ member countries. Various panel cointegration techniques can be adopted, this study adopts Pedroni, (1999) Panel Cointegration test which examines cointegration in panel data by checking the residuals of a panel regression for stationarity.

**Table 2: Pedroni Residual Cointegration Test**

	Panel v-Statistic	Panel rho-Statistic	Panel PP-Statistic	Panel ADF-Statistic	Group rho-Statistic	Group PP-Statistic	Group ADF-Statistic
<b>Statistics</b>	1.23492	-0.4573	-1.1145	-1.07241			
<b>Prob.</b>	0.1084	0.3237	0.1325	0.1418			
<b>Statistics</b>	0.735176	-0.6708	-1.6228	-1.72961	0.527119	-0.93532	-1.316487
<b>Prob.</b>	0.2311	0.2512	0.0523	0.0418	0.7009	0.1748	0.0940

Author’s Computation, (2024)

The first four statistics tests of Panel v-Statistic, Panel rho-Statistic, Panel PP-Statistic and Panel ADF-Statistic test is based on the alternative hypothesis that the common autoregressive coefficients which are (GDP, inflation and money supply) are (within-dimension) that is 5% significant level. on the other hand, the third statistics test of rho, PP and ADF test are based on alternative hypothesis that individual autoregressive coefficients are between dimension. The null hypothesis for the Pedroni Residual Cointegration Test is that the variable (GDP, INFLATION and Money Supply) have no cointegration. Based on the result there is no evidence of long run relationship between economic growth, inflation and money supply.

**Table 3: Kao Residual Cointegration Test**

	t-Statistic	Prob.
ADF	-0.788695	0.2151

Residual variance	0.025534
HAC variance	0.018903

**Author’s Computation, (2024)**

From the probability value of ADF test, in Kao test which is greater than 5%, the result further justified the Pedroni’s cointegration test result that reveals no presence of long run relationship between inflation, money supply and economic growth across various statistics. The result is supported by Kao cointegration test of no evidence of long run relationship between economic growth, inflation and money supply.

### 4.3 Panel OLS Analysis

**Table 4: Pooled Ordinary Least Square Regressive Model**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	16.03111	0.925976	17.31266	0.0000
INF	0.353544	0.974050	0.362963	0.7172
MS2	0.261466	0.035822	7.299121	0.0000

**Researcher’s Computation, (2024)**

From the pooled OLS model it is observed that inflation and money supply positively influences economic growth in WAMZ member countries meaning that one percent increase in inflation leads to 0.353544 increase in economic growth and gain one percent increase in money supply leads to 0.261466 economic growth. However, by estimating direct pooled ordinary least square regressive model, the result has neglect the time series and cross section of data, because the model does not distinguish between the countries in WAMZ member’s states, combining these countries by pooling it deny the heterogeneity or individual existence between the WAMZ member countries. Therefore, the study estimates the fixed effect model.

**Table 5: The Fixed Effect Model Result**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	10.89726	0.389753	27.95941	0.0000
Inflation	-0.383529	0.134036	-2.861396	0.0050
Money Supply	0.468633	0.015188	30.85572	0.0000

**Researcher’s Computation, (2024)**

From the fixed effect model in table 10, the study found that inflation negatively influence economic growth in WAMZ countries, that one percent increase in inflation the economic growth decrease by 0.383529 and the result is statistically significant at 5% significance level. on the other hand, the money supply positively

influence economic growth in WAMZ countries that one percent increase in money supply leads to 0.468633 increase in economic growth and the result is statistically significant having the probability value less than 5% significance level.

**Table 6: The Random Effect Model Result**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	10.92331	0.953633	11.45441	0.0000
Inflation	-0.384253	0.134028	-2.866961	0.0048
Money Supply	0.467613	0.015153	30.85853	0.0000

Researcher’s Computation, (2024)

The result from the random effect model as depict in table 11, the study found that inflation negatively influence economic growth in WAMZ countries, that one percent increase in inflation the economic growth decrease by 0.384253 and the result is statistically significant at 5% significance level. Furthermore, the coefficient of money supply is positive and statistically significant having the probability value less than 5% significance level, the finding revealed that money supply increase economic growth by 0.467613 among WAMZ countries. To choose the appropriate model between fixed effect model and random effect model, the study employed Hausman test statistics as depict in table 12 below.

**Table 7: The Hausman Test Result**

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.	
Cross-section random	1.432353	2	0.4886	
Cross-section random effects test comparisons:				
Variable	Fixed	Random	Var(Diff.)	Prob.
INF	-0.383529	-0.384253	0.000002	0.6180
MS2	0.468633	0.467613	0.000001	0.3185

Researcher’s Computation, (2024)

Table 7 above gives the result for Hausman test statistics, the null hypothesis stated that the random effect model has appropriate result, the probability value is large which is greater than 5% significant level, therefore the study falls to reject the null hypothesis and concludes that the Random Effects model is appropriate because there is no evidence of correlation between the individual-specific effects and the explanatory variables.

A negative relationship between economic growth and inflation among WAMZ countries indicates that economic growth does not always lead to higher inflation, which can occur due to supply-side factors, global

competition, effective monetary policy, well-anchored inflation expectations, or existing low inflation environments. The result shows that inflation and economic growth are negatively correlated in WAMZ countries and the result is in conformity with the finding of Onyemaechi and Raji (2014). The negative relationship between inflation and economic growth among WAMZ member’s countries is in line with monetarists positions that inflation detrimental to growth. The result further given credence to the empirical studies evidence of Ndoricimpa et al., (2016). Therefore, understanding this relationship by the monetary authorities in WAMZ countries helps in crafting appropriate economic policies, business strategies, and investment decisions, reflecting the complex dynamics of modern economies.

However, the positive relationship associate with money supply and economic growth among WAMZ countries, revealed that increasing the money supply can boost economic growth by stimulating demand and investment, the finding is in conformity with the result of Balogun, (2007) and that of Mesagan and Yusuf, (2019) by examining broad money supply to the economic growth of WAMZ member’s countries and found positive relationship. Moreover, a positive relationship between money supply and economic growth suggests that increases in money supply can stimulate economic activity, leading to higher economic growth among WAMZ countries.

**4.4 Post Estimation Diagnostics**

**Table 8: Diagnostics Results**

Test	Statistic	D.F.	Prob.
<b>Residual Cross-Section Dependence Test</b>			
Breusch-Pagan LM	25.83772	15	0.0901
Pesaran scaled LM	5.447598		0.2530
Pesaran CD	0.480478		0.6309
<b>Normality Test: Kurtosis/ Skewness/ Jarque-Bera</b>			
	1.6687/0.3945/13.17210		0.0013
Heteroskedasticity	1.131858	6	0.9801
Autocorrelation	1.35017		0.4214

**Researcher’s Computation, (2024)**

From the cross section dependence test has a null hypothesis that states; the residuals are independently distributed across cross-sections. The Breusch-Pagan LM Test: state that, under the null hypothesis of no cross-sectional dependence, follows a chi-squared distribution. Also, the Pesaran's CD Test: It provides a test statistic that, under the null hypothesis, follows a standard normal distribution. The p-value is greater than5%,

it indicates that there is not enough evidence to reject the null hypothesis, it concluded that residuals are likely independent across cross-sections. The normality diagnostic test shows that Kurtosis is 1.668737, and the Skeweness is 0.394546 with the Jarque-Bera of 13.17210, having their probability value less than 5% its concluded that the data are not normally distributed which may be attribute to the longitudinal nature of the data. The heteroscedasticity 1.131858 with probability value of 0.98010 which is greater than 5% it's concluded that the model is homoscedastic. Durbin-Watson Test: Tests for autocorrelation in the residuals from a regression analysis. Values close to 2 suggest no autocorrelation, values below 2 suggest positive autocorrelation, and values above 2 suggest negative autocorrelation. The Wooldridge test for autocorrelation is been carried out by computing the average residuals for each time period and then use to test for serial correlation, the result shows that the Wooldridge test the null hypothesis is no first-order serial correlation. From the test Statistic of 1.35017 and p-value of 0.4214 there is no evidence of serial correlation in the model.

## 5. CONCLUSION AND RECOMMENDATIONS

This paper aimed at examining the relationship between inflation and money supply on economic growth in WAMZ member countries for the period of 1999 to 2020. The study employed Pedroni (1999) panel cointegration test and further supported by Kao panel cointegration test. Both result reveled the evidence no long run relationship in the model. Therefore, the pooled ordinary least square was estimate for the results and choosen among the fixed and random effect model, the study selected random effect model as the appropriate model which revealed that money supply has positive and statistically significant impact on economic growth. Therefore, to attain it fundamental value, monetary policy among Wamz member's countries with aim at systematic policy to mitigate the money supply and to minimize it distortion, there is need for constant targeting and evaluating the trend because of the fluctuation can affect economic growth. Again, the positive relationship between increase in money supply and economic growth among Wamz member's states shows that action of monetary authorities in Wamz member's state in targeting economic growth through increase in supply of money require more consideration due the variation in currency values among the Wamz member's counties. Inflation rate has a negative and significant impact on economic growth.

However, inflation rate has a negative and statistically significant impact on economic growth, the inflationary pressure reduces economic growth which is inline and consistence with economic theory and adding inflation targeting policies by the monetary authorities in Wamz member's countries to stabilize the economic growth as well as adopting other measures through adjusting other macroeconomic variables and attraction of foreign



direct investment or favorable interest rate and enhancing human capital among the Wamz member's countries. Moreover, the result is further supported by various diagnostics on the estimated models.

## REFERENCES

- Afolabi, O.L. (1999). *Monetary Economics*. Heinemann Educational Book Plc.
- Balogun, E. D. (2007) Monetary policy and economic performance of west African Monetary Zone Countries (MPRA Paper No. 4308) University of Lagos.
- Bayo, F. (2015). Determinants of inflation in Sierra Leone: An empirical analysis. *International Journal of Humanities and Social Science*, 1(18), 262-271.
- Doguwa, S. I. (2015). Inflation and economic growth in Sierra Leone: Detecting the threshold level. *CBSL Journal of Applied Statistics*, 3(2), 99-124.
- Dornbusch, R., Fisher, S., & Kearny, C. (1996). *Macroeconomics theory*. The McGraw-Hill Companies, Inc.
- Etale, L. M., & Oweibi, G.T. (2019). Monetary policy and economic growth nexus: Further evidence from Nigeria. *Global Journal of Arts, Humanities and Social Science*, 7(8), 24 – 37.
- Fitsum, S. D., Yilkal, W. A., & Teshome, A. R. (2016). The relationship between inflation, money supply, and economic growth in Ethiopia: Co-integration and causality analysis. *Global Journal of Economics*, 6(1), 556-565.
- Fofanah, P. (2020). Effects of exchange rate volatility on trade: Evidence from West Africa. *Journal of Economics and Behavioral Studies*, 12(3), 32-52.
- Gatawa, N. M., Akinola A., & Muftau, O. O. (2017). Impact of money supply and inflation on economic growth in Nigeria (1973-2013). *IOSR Journal of Economics and Finance*, 8(3), 26-37.
- Hardwick, P., Khan, B., & Langmead, J. (1994). *An introduction to modern economics* (4th ed.). Longman Group Ltd.
- Im, K. S., Pesaran, M. H., & Shin, Y. (2003). Testing for unit roots in heterogeneous panels. *Journal of Econometrics*, 115(1), 53-74.
- International Monetary Fund. (2000). *Monetary and financial statistics manual*, International Monetary Fund, Publication Services. <https://www.imf.org/en/Publications/Manuals/Issues/2020/02/04/Monetary-and-Financial-Statistics-Manual-48881>
- Kao, C., (1999). Spurious regression and residual-based tests for cointegration in panel data. *Journal of Econometrics*, 90(1), 1-44.
- Levin, A., Lin, C. F., & Chu, C. S. J. (2002). Unit root tests in panel data: Asymptotic and finite-sample properties. *Journal of Econometrics*, 108(1), 1-24.
- Mesagan, E. P., & Shobande, O. A. (2016). Role of apex banks: The case of Nigerian economy. *Journal of Economics and Business Research*, 22(2), 171-186.
- Mesagan, E. P., & Yusuf, I. A. (2019). Economic stabilization and performance in West Africa: The role of fiscal and monetary policy. *European Extra Mile Center of African Studies Working Paper/19/097*, 01-24.

- Mesagan, E. P., Alim, O. Y., & Yusuf, I. A. (2018). Macroeconomic implications of exchange rate depreciation: The Nigerian experience. *International Research Journal*, 16(3), 235-258.
- Ndoricimpa, A., Osoro, N. & Kidane, A., (2016). "[Threshold effects of inflation on economic growth in selected African regional economic communities: Evidence from a dynamic panel threshold modeling](#)," *Applied Econometrics*, Russian Presidential Academy of National Economy and Public Administration (RANEPA), 41, 5-23.
- Ogu M., Akwe, A. I. H. & Abdulsalam A. U., (2020). Impact of inflation on economic growth in Nigeria 1999-2017. *UMYU Journal of Counselling and Educational Foundations*, 1(1), 1-15.
- Olorunsola, E. O., John-Sowe, M. M. K., Adegoke, I. A., Joseph R. Y., & Yaya, C. (2022). Threshold effect of inflation on economic growth in the West African monetary zone. *WAMI Occasional Paper Series No. 26*
- Onyemaechi, J. O. & Raji, R.O., (2014). Impact of Inflation on Corporate Investment in the Sub-Saharan African Countries: An Empirical Analysis of the West-African Monetary Zone. *International Journal of Business and Social Science*, 5(8). 189-199.
- Owoje, O., & Onofowora, A.O. (2007). M2 Targeting, money demand, and real GDP growth in Nigeria. *Journal of Business and public Affairs*, 6(12), 25-34.
- Pedroni, P. (1999). Critical values for cointegration tests in heterogeneous panels with multiple regressors. *Oxford Bulletin of Economics and Statistics* 61, 653-670.
- Pedroni, P. (2004). Panel cointegration: Asymptotic and finite sample properties of pooled time series test with an application to the PPP hypothesis: New results. *Econometric Theory*, 20(3), 597-627.
- Tobin, J. (1972). A proposal for international monetary reform. *Eastern Economic Journal*, 4(3), 153-159.
- Umunna, G. N., Chika, P. I., Chinwe, A. A., & Amos, J. N. (2022). Real interest rate, investment and economic growth: Panel evidence from West African Monetary Zone. *Journal of Advanced Research in Economics and Administrative Sciences*. 3(4).
- United nation economic commission for African UNECA. (2015) economic report outlook. Retrieved from <https://repository.uneca.org/>
- Vikesh, G., & Sabrina, H. (2004). Relationship between inflation and economic growth of Fiji. *Economics Department Working Paper 2004/4*. Reserve Bank of Fiji, Suva, Fiji.
- WAMI. (2016). Quoting and trading in WAMZ national currencies: Issues, challenges and the way forward. Accra, Ghana: West African Monetary Institute