Demand for Broad Money and Implication of Monetary Policy Instruments on Inflation Control: Evidence from WAMZ Countries

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ABSTRACT

Inflation is a major problem facing the West Africa Monetary Zone (WAMZ). This economic menace requires stability in broad money demand and appropriate monetary policy instruments to control. Thus, this study focused on exploring the demand for broad money and implications of monetary policy instruments on inflation control in the West Africa Monetary Zone (WAMZ) using time series and panel data. The objectives of this study are to examine the impact of demand for broad money (m2) on inflation in the WAMZ countries, and also to examine the implication of monetary policy instrument on inflation control in the WAMZ countries. The study covered the period of 1980 to 2023 and employed the Augumented Dickey – Futher unit root test (ADF), Johansen's co-integration test and the error correction model (ECM) to estimate the long-run relationship between real broad money (m2) and inflation. The variables include: real broad money (M2), interest rate on short term deposit, yield on the WAMZ treasury bills, expected inflation, expected depreciation of WAMZ currencies against the US dollar, yield on US treasury bills and foreign interest rate. Results from the long-run coefficient estimation shows that real gross domestic product (scale variable in %) positively and significantly imparted on broad money demand both in the long and short run while other explanatory variables has insignificant impact on broad money demand in the WAMZ. There appears to be a long-run relationship for demand for real M2 but the relationship is not stable. Exogenous output shocks, financial innovations, changes in income velocity, and inadequate data quality contributed to the instability. The authorities may need to apply the monetary targeting regime in the overall objective of preserving price stability. A possible option for the WAMZ is to abduct an inflation target lite framework.

Keywords: Broad money, Monetary Policy Instruments, Inflation, WAMZ

INTRODUCTION

Demand for money plays a major role in macroeconomic analysis, especially in selecting appropriate monetary policy mix. Monetary policy is the summation of the economic measures designed by regulatory authorities in charge of regulating or managing the dynamic economic variables that affect changes in the prices of goods and services and hence the value of money. These economic variables are grouped as short-term macroeconomic factors and include instruments such as demand and supply of money, interest/discount rate, volume of credits, and size of deposit money institutions. These instruments are so volatile that their regulation and management have direct impacts on the price stability goal of macroeconomic institutions. There appears to be a long-run relationship for demand for broad money in real terms explained by real GDP, interest rates on deposits at commercial banks, yields on treasury bills and expected inflations, but the relationship is not stable. Therefore the use of broad money as the intermediate target has its limitation in the WAMZ countries. However, developments in broad money can be use as one of the policy instrument to help design monetary policy conduct on inflation control in the WAMZ region.

As the debate on the role of supply of and demand for money in the control of inflation, rages on between classical, Keynesian and neoclassical economists, managing inflation among policy makers in emerging economies are tending towards a combination of various policy options in managing inflation with focus on

inflation targeting as a guiding framework of monetary policy action (Mukherjee & Bhatta, 2016). Inflation is a persistent increase in the overall level of prices of goods and services in an economy over a period of time. (Gharty, 2017). It is a situation where the economy is awash with liquidity due to a significant increase in the supply of money without a corresponding increase in the production of goods and services. When the general price level rises, a unit of currency buys fewer goods and services, thereby eroding savings, discourages investment, stimulates capital flights (as domestic investors put their funds into foreign assets, precious stones and real estate), inhibits growth, makes economic planning a nightmare and in its extreme form, promote social and political unrest.

Undoubtedly, one of the macroeconomic goals which the government strives to achieve is the maintenance of stable domestic price level (Bakhtar, 2014; Sriram & Knell, 2015). This goal is pursued in order to avoid cost of inflation or deflation and the uncertainty that follows where there is instability in the price system (Salam, et al, 2013). Policy makers in most emerging economies have not been able to keep inflation at desired level due to their inability to determine the predictors of inflation and it degree. Due to these reasons, policies prescriptions that have been administered as an antidote had been ineffective since wrong diagnoses of the problems have been made.

However, policy makers have tried to adopt appropriate policy mix that can combat inflation and ensure price stability (Nuhu & Adedeji, 2015). Since the level of money supply and the stock of goods and services are two crucial factors that determine the level of inflation in an economy, the duo becomes the primary targets polices. An excess or shortage in the supply of money could either induce excess aggregate demand resulting in higher inflation rate or reduce stagnation thus retarding economic growth and development. While fiscal policy proves helpful in combating inflationary pressure, monetary policy has been the major tool often employed by the central banks to ensure price stability. While it is not arguable that monetary authorities have formulated various policy measures as an attempt to curbing inflationary menace, the effectiveness of policy pursuit to curb inflationary environments is questionable as most economies, particularly developing ones still experience inflationary challenges.

Statement of the Problem

The quest for international cooperation and integration has resulted in the formation of regional blocks, economic integration and monetary union. This increased regional cooperation has brought about new dimension in the implementation of monetary policy by individual member countries in such blocks. In this wise, the formation of the West Africa Monetary Zone (WAMZ) has created a new paradigm shift in the formation and implementation of WAMZ member countries (Adi & Riti, 2021). Unarguably, the relationship between the demand for broad money (M2) and its influence in controlling inflation is usually seen as a crucial foundation in macroeconomic theories and as important component in the formulation of monetary policy (Goldfield, 2022). Thus, investigating the determinants of demand for broad money (M2) and its stability can aid in the setting of monetary policy targets. Normally, a good understanding of the stability and determinants of the demand for broad money (M2) is at the centre in the implementation of the monetary policy as it enable a policy driven change in monetary aggregates to exert predictable effects on aggregate output, interest rate and above all the price level through money transmission mechanism (Haliciogo & Ugua, 2019; Nanchega, 2021).

One of the primary macroeconomic objective in WAMZ is price stability. But despite the various monetary regimes that have been adopted by the central banks across the WAMZ countries over the years, inflation still remains a major threat to the region's economic growth. Although, the inflation rate has been relatively kept low in recent years, WAMZ's experience of inflation has been in a deplorable state. Bakare & Aremu, (2020) traced the history of inflation in WAMZ countries to the 1970's when cheap monetary policies were adopted to stimulate development. Since then, there have been several episodes of high inflation in excess of 35 percent (CBN, 2016). The growth of money was often in excess of real economic growth. However, preceding the growth in the money supply some factors reflecting the structural characteristics of the region are observable. Some of these are supply shocks, arising from factors such as famine, currency devaluation and changes in terms of trade (Ezeanyeji et al, 2021).

In addition, structural factors have proven to be important in the inflation spiral as reduction in oil revenue in the WAMZ countries had led to a reduction in real income with serious distributional implications. As fixed income earners pushed for higher normal wages, while producers increased mark-ups on cost, an inflationary spiral followed. In addition to these factors, the WAMZ countries governments also had transfers problems in order to meet debt obligations. However, monetary policy reforms and inflation menace remains WAMZ problems. Upon these efforts in various policy reforms over a long period of time, yet inflation outweighs per capita income. WAMZ countries attempts towards it's citizenry maximization of utility, which is, achieving greatest happiness for the greatest number, is still undermine. According to Abadebo and Mohammed (2015), increasing the extend at which monetary policy reforms has controlled inflation is still uncertain following its direction of casuality, hence, the need for a bearable limit of inflation that can match the WAMZ economies situation whose half population is living in extreme poverty and unemployment. However, Gbadebo and Mohammed (2015) concluded that inflation causes poverty as most fixed income earners at their prevailing wage rate could not save for investment.

Consequently, considerable theoretical and empirical works has been undertaken in the WAMZZ region to analyzed the determinants and stability of demand for money. This study estimates the long-run demand for M2 in the WAMZ economies from 1980 to 2023 and evaluates factors that adjust in response to temporary disequilibrium. The analysis could help improve the region's monetary policy design because of the central banks monetary targeting regimes of using broad money (M2) as the intermediate target and reserve money as the operating target. So far, little work has been done to evaluate the stability and long run determinants of demand for broad money in the WAMZ region. Previous studies on the stability of demand for money focused on the demand for M_1 alone.

The main thrust of this study is to explore the impact of demand for broad money and implications of monetary policy instruments on inflation control: evidence from WAMZ countries. However, the following specific objectives would also be achieved.

1. To examine the impact of demand for broad money (M2) on inflation in the WAMZ countries

2. To examine the implication of monetary policy instruments on inflation control in the WAMZ countries

REVIEW OF RELATED LITERATURE

Conceptual Framework

Broad money is a category for measuring the amount of money circulating in an economy. It is defined as the most inconclusive method of calculating a given country's money supply and includes narrow money along with other assets that can be converted into cash to buy goods and services. Broad money is the most flexible method for measuring an economy's money supply, accounting for cash and other assets easily converted into currency. Because cash can be exchanged for many kinds of financial instruments, it is not a simple task to define how much money is circulating in the economy. Money supply is measured in different ways. Economists use the capital letter "M" followed by a number to refer to the measurement they are using in a given context. The formula for calculating the money supply varies from country to country. Broad money is the broadest measure encompassing narrow money (such as cash and cheakable deposits) along with less liquid assets such as certificates of deposit, foreign currencies, money market accounts, marketable securities, treasury bills, and anything else that can be easily converted into cash. Central banks keep tabs on broad money to help forecast inflation.

Monetary policy on the other hand refers to specific actions taken by the central banks to regulates the value, supply and cost of money in the economy with a view to achieving desired macroeconomic objectives. Some of these objectives include; balance of payment equilibrium, employment generation, economic growth, price stabilization etc (Adesoye, et al, 2016). However, Adi & Riti (2021) noted that one of the objectives of monetary policy, which is the attainment of full employment does not mean zero unemployment since there is always a certain amount of frictional, voluntary or seasonal unemployment.

Inflation on the other hand refers to the continuous rise in the general price level of goods and services in an economy, manifesting in the forms of decline in the value of money. The effect of high inflation are generally considered to be harmful on the economy. That is why the achievement of price stability has always been one of the fundamental objectives of macroeconomic policy in both developed and emerging economies (Orubu, 2019). Inflation is a disease that must be eradicated if a country must experience growth. It arbitrarily redistributes income, wipe out saving, erodes the income of fixed income earners, leads to distortion of prices and brings about misallocation of economic resources

Theoretical Review

Quantity Theory of Money

The quantity theory of money was first developed by Irving fisher in the inter-war years, and is a basic theoretical explanation for the link between money and the general price level (Geoff, 2012). Fisher (1932), in his quantity theory of money, opine that like other classical writers the short-run monetary control was dictated by interest rates which were sticky but in the long-run the demand for money was real cash balance. Fisher further assumed that the rise in commodity prices would precedes the increased in interest rate which was regarded as the main channel of the firms' operation cost (Jelilov, 2016).

The quantity theory of money states the relationship between money, prices, and output which can be presented quantitatively as: MV= PY

The equation above is the quantity theory equation that links the price level and the level of output to the money stock. The quantity theory equation transformed to classical quantity theory of money when it was argued that both the income velocity of money (V), and the level of output (Y), were fixed. Real output was taken to be fixed because the economy was at full employment, and changes in velocity were assumed to be negligible. If both velocity of money and level of output are fixed, it follows that the price level is proportional to the money stock. The classical quantity theory is of the view that the price level is proportional to the money stock.

Keynesian Liquidity Preference Theory

Keynes (1936) developed the liquidity preference theory in his famous book, 'The general theory of Employment, Interest, and Money'. He studied both the transaction and asset theories of money demand. Keynes distinguished three motives of holding money- the [1]'transaction motive', [2]'precautionary motive' and [3]'speculative motive'. The speculative demand for money is Keynes's most important innovation. According to this theory, demand for money is negatively related to interest rate. The implication of the theory is that the demand for speculative money balances depends on both the observable market nominal interest rates and people's expectation concerning the rate of interest in the future.

Keynes identified some factors that determines people's decision either to hold bonds or money. If interest rates are above the normal value, people will expect them to fall, bond prices would rise and capital gains would be realized. In such a case, people will hold wealth in terms of bonds and the demand for money will fall. If the converse holds, bond prices would fall and capital losses are realized. People will demand to hold wealth in terms of money causing high demand for money.

Cost – Push Theory of Inflation

The cost- push theory defines inflation arising from the supply side. It is often caused by the rising cost of production. This occurs when production costs increase and impact on the prices of the final products (Otto & Nenbee, 2011). The cost push inflation can also be called the 'market power inflation' because the increase in the prices of goods and services originates from the supply side of the economy. These increases may arise from increased wage rates or a fall in productivity, which also increases cost of labour output. It may also arise out of other factors of production or cost of inputs such as power supply, transport or raw materials (Otto & Nenbee, 2011). These and other factors cumulatively influence the cost structure of products and determine the

prices of the final output. Producers would react to a rise in input prices by increasing prices of output including their profits margins, since these are usually set at fixed percentage of cost of production. Cost- push inflation may also arise as a result of profit motives of producers in monopolistic and Oligopolistic industries (Otto, 2011). Since there is a state of imperfection in such industries, the producers could administer their prices through price discrimination techniques.

The Demand Pull Theory of Inflation

Demand – pull theories of inflation define inflation situations where aggregate demand for goods and services exceed aggregate supply, thereby leading to a general rise in price levels (Gbanador, 2007). Usually, this situation create competition on the side of demand for the few available products leading to some kind of informal bidding for available items. The aggregate demand for these goods and services includes the private demand for consumers' good, business firms and government for final output and inputs (Gbanador, 2007). The demand – pull inflation can also be called surplus demand inflation because it arises from too much money chasing few goods. More often it occurs where there is full employment so that the excess pressure on the factors of production leads to higher prices for the factors, ultimately leading to rise in the cost of production. It could also be a short run phenomenon where demand dynamics were not well anticipated. When there are production constraints, demand beyond the possible output level could also create inflation (Otto, 2011).

Demand – pull inflation may occur during cyclical booms during or immediately after war, this explains its high rates in Nigeria during 1969 to 1970 Nigerian civil war, Liberia during the Liberia civil war of 1992 to 1996. The rate of inflation during the war was very high. The demand pull inflation may be explained using the old or new quantity theory of money or the Keynesian theory. The quantity theory of money attempts to explain the link between money and the general price levels.

Empirical Literature

Asuamah et al (2015) used ARDL approach to estimate a money demand function for WAMZ. They found an unstable long-run relationship between M2, inflation, exchange rate, and real income. It was established that both exchange rate elasticity coefficient and inflation are positive and significant in the long run for M2.

Darlami et al (2016) adopted the bounds testing procedure to examine the stability of WAMZ money demand function over the period 2000 to 2015. The main determinants of their money demand function were real income, domestic and foreign interest rate, as well as nominal effective exchange rate. Using broad money aggregate inclusive of foreign currency deposits ($M2^+$), the financial variables failed to produce statistically significant estimates in the money demand function. Consequently, they reported on a model $M2^+$, real income and nominal effective exchange rate. They found strong evidence for the presence of a stable, well identified long-run money demand during a period of substantial changes in the financial markets. They asserted that the empirical evidence points to complex dynamics between money demand and it's determinants while suggesting that derivation from the equilibrium are rather short-lived.

Mannah-Blankson et al (2016) examined the impact of financial innovation on real money demand in Ghana, Nigeria and Sierra Leone using quarterly data from 20001 to 2015. The key determinants in their money demand function were inflation, exchange rate, domestic interest rate, real income and financial innovation were used: the first measure was the ratio of broad money excluding foreign currency deposits (M2) to narrow money (M1), reflecting greater array of money substitutes; and the second proxy employed was the volume of cash card transactions used in the economy to capture technological advancements in the payment system. They find finance, all innovation to have a long run positive impact on both the narrow and broad money demand in Nigeria, Ghana and Sierra Leone and also established a stable, money demand function during the period under study. Using quarterly data from 2010 to 2020, Amoah & Ismail (2021) concluded that structural reforms and the deregulation of the financial sector have resulted in parameter instability in WAMZ demand for broad money in the period under review and that money no longer provide useful information for predicting future inflation and output.

The role of financial innovation or technological changes in the demand for money is also considered in the empirical study of the demand for broad money (m2). For instance, Drama & Ghatak (2016) Dagha & Kovnen, (2017) assert that the quantity of money demand in any economy and indeed the sets of assets that have monetary status are dependent upon the prevailing institutions and technology. In a study of ten developing economies which included the WAMZ countries economies. Bitrus et al (2016) argued that failure to model financial innovation in money demand function has the tendency to yield an unstable and mis-specified function.

A notably theoretical open economy framework is by Bahmani – Oskooee & Barry (2020) who examined the demand for the Nigerian Naira, Ghanian Cedi, Sierra Leonean Leone, Guinean France, Gambia dalasi and the Liberian dollar using a cash-in-advanced) model provides a more general specification which includes the foreign interest rate and exchange rate as well as real income and domestic interest rate in the money demand function. The model also does not assume perfect interest rate arbitrage condition in the derivation of money demand function. They finds the Naira, Cedi, Leone, France, Dalasi and Dollar, demand for money to be positively affected by real income and foreign interest rate but negatively influenced by domestic interest rate. In addition, income elasticity was found to be larger than interest elasticity in the case of Nigeria, Ghana, Sierra Leone, Gambia, Guinea and Liberia.

Bassey & Onwioduokit (2016) investigated the determinants of inflation in Nigeria and Ghana using OLS techniques and co-integration analysis test data collected for the period 2007 to 2014, the econometric model regressed inflation as a function of money supply, treasury bill rate, monetary policy rate and exchange rate. The study found that money supply and exchange rate influenced inflation, while treasury bill and monetary policy rate did not. Similarly, Iya et al (2018) investigated the determinants of inflation in Sierra Leone between 1980 to 2012 using the OLS method. The result revealed that money supply and interest rate influenced inflation positively, while government expenditure and exchange rate influenced inflation negatively. They suggested that for a good performance of the economy in terms of price stability may be achieved by reducing money supply and interest rate and also increase government expenditure and exchange rate, in the economy. In the same vain, Opoke & Owoye (2014) examined the determinants of inflation using data from 1990 to 2010 for Gambia, Guinea and Liberia using the OLS method. The empirical result showed that money supply, interest rate positively and significantly impacted inflation. The result also indicated that narrow money and fiscal deficit significantly and negatively impacted on inflation rate.

Identified Research Gap

Empirical evidence on the stability of demand for broad money in the context of WAMZ remain inconclusive. It is also worth while to note that existing literatures on the demand for broad money and the implications of monetary policy instruments are conflicting facts of whether inflation can be curbed, control or managed, but has failed to analyze explicitly the implication of the various monetary policy reforms on inflation in the WAMZ region. Furthermore, existing literature reviewed ignored the effect of foreign interest rate on money demand function (m2) despite the recent pace of financial globalization. Another country specific feature that has equally been neglected in the literatures is the effect of dollarization of domestic money demand as some entities quote prices of their goods and services in foreign currency, largely the US dollar. Hence, this study attempts to improve upon past studies by including non-monetary sources of inflation and also captures the effect of foreign interest rate on inflation control in the WAMZ region.

This study span the period of 1980 to 2023 covering the period of recent monetary policy framework in the WAMZ region.

METHODOLOGY OF THE STUDY

Model Specification

The choice of variables for this study is informed by the theoretical framework on which the study is premised. The study presented the control of inflation and the stability of money demand as the major benefits of monetary policy. This study therefore introduce yield on us treasury bill and foreign interest rate into the

model to examine the long-run demand for real M2 and the implications of monetary policy instruments in curbing inflation in WAMZ. The explanatory variables of this study include:

- Scale variable (% of RGDP)

- Interest rate on short term deposit

- Yield on treasury bills

- Expected inflation

- Expected rate of depreciation of the WAMZ currencies against the US dollar

- Yield on US treasury bill

- Foreign interest rate

On the other hand, the dependent variable is the long run demand for broad money (M2) which is calculated as M2/CP1 for the WAMZ countries. (Nigeria, Ghana, Guinea, Gambia, Sierra Leone and Liberia). The model is specified in line with the model of Sriram (2015). While Siriram's model is specified as shown in equation 1, the model of this study is specified in equation 2.

$$\frac{M2}{CP1} = f(RGDP, intDD, intTB, expINF, expRD, \quad - \quad - \quad - \quad - \quad - \quad - \quad (1)$$

Where

$\frac{-M2}{CP1}$ = M2 in nominal terms proxy by consumer price index (CPI)

RGDP = Real Gross Domestic Product

- intDD = Interest rate on short term deposits

- intTB = yield on treasury bills

- expINF = Expected inflation

- expRD = Expected yield on depreciation

The model for this study is specified thus to include yield on US treasury bill and foreign interest rate

$$\frac{M}{CP1} = f(RGDP, intDD, intTB, expINF, expRD, intUSTB; fnINT) \quad - \quad \quad - \quad - \quad (2)$$

Where

- $\frac{m}{P}$ = M2 in nominal terms proxy by consumer price index (CPI)

- S = Scale variable (% of RGDP)

- intDD = Interest rate on short term deposits

- intTB = yield on treasury bills

- expINF = Expected inflation

- expRD = Expected yield on depreciation

- intUSTB = Yield on US Treasury bill

- fnINT = Foreign interest rate

The stochastic form of this model is written as:

$$LRBM = a_0 + a_1LRGDPA + a_2 DDR + a_3TB + a_4INF + a_5RD + a_6USTB + a_7FNINT + \mu \quad - \quad - (3)$$

Where

LRBM = real M2 (M2/CP1)

LRGDP = real GDP

DDR = Interest rate on short term deposits

TBR = Yield on the WAMZ treasury bills

EXPINF = Expected inflation

RD = Expected depreciation of WAMZ's currencies against the US dollar

USTB = Yield on US treasury bills.

FNINT = Foreign interest rate

a_0 = Constant

a_1, a_2, a_3, a_4, a_5, and a_6 = Parameters

μ = Error term

It is expected that $a_1 > 0$, $a_2 > 0$, $a_3 > 0$, $a_4 > 0$, $a_5 > 0$, and $a_6 > a_7 > 0$.

The long-run relationship will be examined using co-integration techniques, but first the variables are tested for stationary by applying unit root tests. PCGive 10 was used for the entire analysis.

Method of Estimation

The estimation method used in this study was drawn from developments in the co-integration theory. This has been developed to specifically overcome the problems of spurious correlation often associated with non-stationary time series data.

Unit Root Test

As a first step we check the stationarity properties of the variable used for the study. The order of integration for each variable is determined using Augmented Dickey – Fuller (ADF) unit root tests consists of running a regression of the first difference of series against the series of lagged once, lagged difference terms and optionally a constant time trend. The investigation of non-stationarity properties of time, series is the basic test in empirical investigation in order to avoid spurious results. This is conducted by including both constant variable and a trend variable. Seasonal dummies are also used because the time series are not seasonally adjusted. This test began with 12 lagged difference terms in order to broaden the residual. The Akaike information criterion (AIC) is applied to choose the maximum number of Lags. The regression result indicates that the variables LRBM, LRGDP, DDR, TBR, EXPINF, RD, USTBR and FNINT are non-stationary. All variables are integrated to the order 1, that is 1(1), confirmed by the fact that the first difference of all these variables are 1(0).

Table 1. Unit Root Test Results

	Test Statistic Lag			Test Statistic Lag	
LRBM	-1.439	1	*dLRBM*	-16.540 0 **	
LRGDP	-2.053	1	*dLRGDP*	-14.450	0 **
DDR	-2.155	0	*dDDR*	-14.840	0 **
TBR	-3.314	10	*dTBR*	-9.685	0 **
EXPINF	-2.675	0	*dINF*	-13.560	0 **
RD	-12.110	0 **	*dDEPR*	-23.740	0 **
USTBR	-1.419	4	*dNEER*	-10.980	0 **
FNINT	-3.384 8		*dUSTBR4M*	-9.562 0 **	

Note: ** indicates the rejection of unit roots at 1 percent significance level.

Cointegration Test

After the test for the order of integration, the next step is to test for co-integration. This test is used to check if long run relationship exists among the variables in the model.

Since all the variables are 1(1), the Johansen – Juselius (1990) multivariate cointegration technique is applied to examine the existence of a cointegration relationship between LRBM and its determinants as shown in the equation 3 above. (see table 2). The model included a trend, constant and seasonal dummies, 12 Lags, and an impulse dummy of D300301 to account for many financial innovations measures introduced. The AIC is applied to choose the maximum lag length.

Table 2. Cointegration and Weak-Exogeneity Tests

Cointegration test								
Eigenvalues	0.1760	0.1186	0.0621	0.0272	0.0226	0.0236	0.1123	0.0236
Null hypotheses 1/	r = 0	r <= 1	r <= 2	r <= 3	r <= 4	r <= 5	r <= 6	r <= 7
λ trace 2/	101.6500 **	56.3600	25.6700	11.8100	5.3500	32.2310	5.0234	12.3542
Adjusted for degrees of freedom	97.3000 **	53.9500	25.6700	11.3000	5.1200	26.270	16.2102	5.2102
P-values	0.0090	0.2580	0.7560	0.8530	0.5870	0.0070	0.2342	0.2102
λ max 2/	45.2800 **	29.5500	15.0000	6.4600	5.3500			
Adjusted for degrees of freedom	43.3500 **	28.2900	14.3600	6.1800	5.1200	4.3321	5.2010	6.0150
P-values	0.0090	0.1390	0.6980	0.9360	0.5880	0.6370	0.1234	0.5320

Standardized Eigenvectors β'

LRBM	LRGDP	DDR	TBR	EXPINF	RD	USTBR	FNINT	Trend
1.000	-1.264	-0.402	0.223	-0.227	-0.321	-0.102	-2.321	-0.022
-0.598	1.000	-0.071	0.008	0.010	0.040	0.006	0.261	-0.001
-2.537	59.665	1.000	0.161	-0.006	-0.007	0.072	-0.005	-0.165
-202. 620	890.550	2.975	1.000	-1.010	-0.912			
-4.380	-540.050	-8.227	5.938	1.000	1.930			

Standardized Adjustment Coefficients α

	LRBM	LRGDP	DDR	TBR	EXPINF	RD	USTBR	FNINT
ΔLRBM	-0.0066	0.0219	-0.0001	-0.0644	0.0298	0.0123	0.0002	-0.0021
ΔLRGDPA	0.0008	-0.0099	-0.0009	-0.0201	0.0142	0.0132	-0.0101	-0.0101
ΔDDR	0.0134	1.4580	-0.0290	0.0002	0.0004	0-0.003	0.0102	0.0003
ΔTBRA	-0.2828	0.1355	-0.0415	-0.0010	0.0009	-0.0041	0.0032	0.0010
ΔINFA	0.2167	-6.2224	-0.1075	0.0008	0.0040	-0.0041	-0.0031	0.0201

Weak-exogeneity test 3/

Variables	ΔLRBM	ΔLRGDPA	ΔDDR	ΔTBRA	ΔEXPINF	ΔRD	ΔUSTBR	ΔFNINT
$\alpha_1 = 0$	$\chi^2(1) = 6.4371\ [0.0112]^*$							
$\alpha_2 = 0$	$\chi^2(1) = 0.97973\ [0.3223]$							
$\alpha_3 = 0$	$\chi^2(1) = 0.10742\ [0.7431]$							
$\alpha_4 = 0$	$\chi^2(1) = 15.659\ [0.0001]^{**}$							
$\alpha_5 = 0$	$\chi^2(1) = 1.2776\ [0.2583]$							
$\alpha_2 = 0$; $\alpha 3 = 0$; $\alpha 5 = 0$	$\chi^2(3) = 2.4117\ [0.4915]$							

Note: The system includes 2 lags for each variable, a constant, trend, seasonal dummies, and the dummy variable *D2003m1* . The estimation period is 1980-2023

From table 2 above, it is evident that the conintegrating equations in the series at 1 percent level of significance for both trace statistics and maximal Eigen value respectively thereby confirming the existence of a long run equilibrium relationship between the variables and denotes rejection of zero in favour of at least one cointegration vector. The results are significant at the 1 percent level, even when the critical values are adjusted for degrees of freedom. Based on the signs and magnitudes of the estimated coefficients, the unique cointegration vector can be interpreted as the long-run demand for real M2. The standard errors presented within percentages indicates that all coefficients except LRGDP are significant.

Long Run Estimates Using Normalized Cointegration

Table 3 below shows the result of the normalized cointegration coefficients of the variables for the case of a cointegrated equation with respect to the standard error and t-statistic result associated with each variable. The value of the t-statistic is used to indicate the significance or otherwise of the independent variable in the long run. Generally using the rule of greater than two, the variable is considered to be significant but if otherwise, it is insignificant.

Table 3: Long Run Estimates

Normalized Cointegrating Coefficient (Standard Error Parentheses)							
D(M2)	D(RGDP)	D(DDR)	D(TBR)	D(IND)	D(DEPR)	D(USTBR)	D(FNINT)
2000.00	-89.7702	-20.78882	2.942212	7.289206	8.237202	-10.792022	11.045324
	99.10232)	(14.76241)	(13.9354)	(2.3452)	(7.6234)	(11.6624)	(5.4029)
	[9.10641]	[2.23631]	[1.02346]	[2.64621]	[5.62421]	[5.32421]	[1.34474]

Source: Author's compilation using E.view 9

Note: Standard error and t-statistics are stated in parenthesis ( ) and [ ] respectively.

A close examination of the individual coefficients of the explanatory variables of the long run estimates in table 3 above shows that real gross domestic product (scale variable in %) is found to have a significant long run relationship with broad money demand at 5 percent level of significance. A percentage change in RGDP indicates 89.77 percent changes in inflation rate to the lagged impact of the variation in RGDP is seen to be strongly elastic.

Furthermore, the estimated results show insignificant relationship between broad money demand (M2), treasury bill rate (IBR), interest rate on short term deposits DDR) and expected inflation rate (INF) at 5 percent level of significance and reveals that a percentage change in expected inflation rate treasury bill rate and demand deposit rate results to a corresponding estimated 20.78, 7.94 and 7.28 percent change in broad money demand holding other variables at a constant. In the same vain, the elasticity estimate reveals that the degree of responsiveness of inflation rate to the change in broad money demand are higher than one and therefore elastic.

Similarly, expected inflation rate, expected depreciation of currencies, yields on US treasury bill and foreign interest rate are found to have an insignificant long run relationship with inflation rate at 5 percent level of significance. A percentage change in expected inflation rate of -7.28, percent treasury bill rate of -2.94 percent and demand deposit rate of -20.78 percent indicate 9.10 percent changes in broad money demand. The above evidence further implies that the degree of the responsiveness of inflation rate to the lagged effects to the change per time in DDR, TBR and INF are greater than one and therefore seen to be elastic. In line with this, error correction model is estimated in order to derive the short-run dynamics.\

ECM Regression Result

Table 4: Summary of ECM Regression Result: Dependent variable D(M2)

Variables	Coefficient	Std Error	t-statistic	Prob.
C	-0.210237	3.609568	-0.051413	0.9764
D(RGDP)	2.767214	041220	-0.051133	0.1001

D(DDR)	-1.223410	1.366623	1.697404	0.5429
D(TBR)	-0.012476	0.127010	-0757014	0.9562
D(INR)	-1.276346	0.542410	-0.234210	0.0366
D(DEPR)	-1.272631	0.172102	-2.187528	0.03721
D(USTBR)	-0.624872	0.174701	-3.9093010	0.4231
D(FNINT)	-0.680510	0.042371	-4.824721	0.0006
ECM(-1)	-0.762210	-0.170241	-4.921632	0.0005
	F stat =	R2 Adj =	Prob (f. start)	Durbin Watson start
R2 = 0.447231	4.705722	0.387312	= 0.018762	2.5402114

Source: Researcher's compilation using E.view 9

From the estimation on table 4 above, the coefficient, the constant C shows a value of -0.210237, implying that if all the explained variables are held constant or pegged at zero (0), the explained variable – broad money demand will decline by 12.2%. This shows that regardless of change in the explanatory variables, broad money demand will declined. The coefficient value of interest rate on short term deposits, yields on treasury bills and expected to result in a decline in broad money demand by 94.2, 0.80 and 129 percent respectively. However, the result of the regression estimate showed that real Gross Domestic Product had positive and significant impact on broad money demand in the WAMZ, thus indicating a one present increase in real gross domestic product is expected to burst broad money demand in WAMZ by 107.3 percent.

Results from the estimated t-statistic shows that only real gross domestic product (RGDP) has a positive and significant impact on broad money demand while other explanatory variables has insignificant impact on broad money demand in the WAMZ.
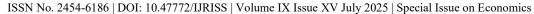
The result of the error correction models indicates that the error correction term ECM (-1) was well specified, and the diagnostic statistic are good. The ECM (-1) variable has the correct sign and is statistically significant. Therefore, from the result, the coefficient value of -0.762210 for the ECM shows that about 76 percent of the disequilibrium / discrepancies in the short run was corrected in the long run, thus showing a high speed of adjustment to long run equilibrium.

The coefficient of multiple determination (R^2) of 0.387312 indicates 38.7 percent of total variation in the dependent variable can be explained by the explanatory variables, other variables not included in the model explain the remaining 62.3 percent. Coincidentally, the goodness of fit of the regression remained too low after adjusting for the degree of freedom. The t-statistic shows a probability of 0.016762, which is below the 0.05 significance level indicating that the probability is significant and the model successful. Finally, the value of Durbin-Waston (DW) (2.54) reveals some degree of positive autocorrelation in the residual.

CONCLUSION AND POLICY RECOMMENDATIONS

The purpose of this study was to examine the impact of broad money demand and implication of monetary policy instruments on inflation control in the West Africa Monetary Zone. Several econometric techniques were applied on the dataset covering the period 1980-2023.

Our empirical results showed evidence of an unstable relationship between demand for broad money and inflation in the WAMZ region, corroborating with the findings of Sriram (2015) and Bahmani – Oskooee & Barry (2020). Notwithstanding, real gross domestic product, expected yield on depreciation, yield on treasury
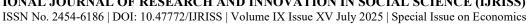
bills and expected inflation, tends to increase WAMZ demand for broad money, while using interest rates (both domestic and foreign) and dollarization however decrease broad money demand in the WAMZ. In addition, we found income elasticity to be greater than interest rate elasticity, which is consistent with economic theory. The study found that foreign interest rate is higher than that of the domestic interest rate elasticity, although the impact of both interest rate on WAMZ broad money demand seems to have waned in recent years.

Regarding the relevance of money, we observe a strong direct and positive impact of growth in broad money demand on inflation through growth in real gross domestic product. This suggest that monetary growth remain key-policy indicator for the successful implementation of the current inflation target framework in WAMZ. Our finding proffer key policy options to the monetary authorities, regarding the observed structural instabilities in broad money demand, the pass-through of monetary growth shock to inflation through the foreign interest rate necessitates a continuous monitoring of the monetary aggregates by the monetary authorities in order to control inflation in the West Africa Monetary Zone.
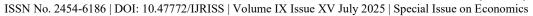
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