

CONVERGENCE EFFECTS OF THE MONETARY UNION IN WEST AFRICA MONETARY ZONE.

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ABSTRACT

This study examines the convergence effect of monetary union in the West African Monetary Zone (WAMZ). This research examines the economic convergence criteria and obstacles to achieving them for the six Zone economies of Nigeria, The Gambia, Guinea, Sierraleone, Ghana, and Liberia. The study examines economic convergence and discovers no evidence of a WAMZ-induced convergence increase across the board, though there are instance of increased convergence among some WAMZ member countries – notably Nigeria, Sierra Leone and Ghana. The study uses panel and time series data for a 63-year period from 1960 -2022, and uses OLS regression, fixed effects, cointegration and the Vector Error Correction Model (VECM) for empirical analysis. Our results reveal weak policy co-ordination in all WAMZ countries, high inflation, high fiscal deficit e.t.c during the period and these contribute to non-compliance in meeting primary and secondary convergence criteria. This study is unique because it tests the convergence rate of WAMZ, pre and post WAMZ, uses an updated data and contributes to the literature on monetary integration in West Africa through adding value to the previous studies but arrives at a different conclusion. WAMZ have not realized some of the objectives of integration into a monetary union because of trade barriers, unstable exchange rate and limitations on intra-regional trade in ECOWAS. Additionally, the results corroborate the assertion that exchange rates do not influence intra-WAMZ exports and should not be an instrument of bilateral stimulation but can be useful for balance of payment adjustment. There is a need for fiscal integration before the introduction of the single currency (ECO) after satisfying the secondary and primary criteria. This paper argues for a need for convergence of core macroeconomic instruments of monetary, fiscal and exchange rate policies to be attained before the achievement of common monetary and economic union for the West African States. This paper recommends formation of currency union, more infrastructure development, fiscal discipline and strengthening of fiscal, monetary and exchange rate policies.

Keywords: *Exchange rate, fiscal policy, monetary policy, fiscal deficit, WAMZ, EMU*

I. INTRODUCTION

The objective of this study is to show the Economic effects of the monetary union in the West African Monetary Zone. This research is posed with some research problems and the research question is:

- 1) Based on the “Convergence, Stability, Growth and Solidarity Pact” which was adopted by all the WAMZ countries, they were required to meet all the secondary and primary criteria by December, 2002. Given that the West African Monetary Institute (WAMI) role is monitoring macroeconomic development, ensuring a single currency (ECO) and have a common monetary and fiscal policy by member countries of WAMZ from 2004. The questions this research poses are why have the primary and secondary criteria not been satisfied? Why has the economic convergence not been achieved?

The monetary union of the West African Monetary Zone (WAMZ) was largely driven from emulation of the European Economic and Monetary Union (EMU). The enhancement of capital flows emanating from accelerated trade and financial transactions which guarantee improved trade flows with and between component states and the rest of the world. “The main objective of WAMZ is to foster the rapid integration of the six economies with a view to ultimately integrate with the West African Economic and Monetary Union (WAEMU), a group of Francophone ECOWAS members. Thus, the WAMZ is a strategy to realize the broader ECOWAS goal of a region -wide monetary union”. Nwokoye and Kalu (2016). The fundamentals of various sizes of countries, resource endowment and the level of economic development of member countries and their ability to meet the convergence criteria play an important role for all the zones who want to form monetary union. Itsede (2003) argues that unless the fundamentals and convergence of core macroeconomic variables are met, there is no possibility of achieving a common monetary union for the West African countries in the form of WAMZ. However, the motivation for regional cooperation and integration has dominated concerns about dissimilarities of the shocks that accrue to the economies and the adjustment after they respond to the shocks.

Further, understanding monetary issues such as nominal exchange rate determination are entirely under regimes where the government peg the nominal money supply and is of finite importance if government do not specify the monetary policy using monetary aggregate. Two motivations for understanding the nominal price and exchange rate in a multi-country are:

- 1). The stable demand function for money has resulted in formulating monetary policy based on nominal money supply rule and quantity theory of money with recorded success. However, the volatility of nominal exchange rate remains a complicated models for some government who specify monetary policy in terms of money stock.
- 2). The development of monetary union in Europe with a single central bank and currency prevents individual countries from accomplishing good monetary policy by controlling money stock. The motivation in line with this is to ascertain if a country can have its monetary policy and give up control of the money supply.

Additionally, the implications of fiscal policy for the determination of nominal exchange rate stems from continuous time open economy version of the overlapping generation model. Aiyagari and Gertler (1985) and Blanchard (1985). The AiYagari-Blanchard model provides a framework for analyzing the effects of fiscal policy in an economy especially in the implied redistribution of wealth across

generations and studying the effects of fiscal policies have on real economic variables present in open economy.

Moreover, variations in the interest rates can easily communicate the influence of monetary policy actions on the larger economy. Studies show that financial policy changes that result in positive real interest rate as occurred in the 1980s would increase financial savings and impact financial market depth. "The usage of exchange rate policy is another price-based method. The exchange rate channel has been proven to be especially effective in an economy with a shallow money market but a deep foreign exchange market" (Adeoye and Saibu, 2014). According to Nnana (2001), monetary policy provides an attempt to govern the economy through managing the quantity of money and access to credit. It is designed to govern the scope, pricing and directing of credit to achieve stated economic objectives, especially exchange rate stability.

BACKGROUND INFORMATION

After the establishment of Economic Community of West African States (ECOWAS) in May 1975, there was a quest for monetary union in West Africa. The ECOWAS comprises 15 member countries including the six member countries of WAMZ namely Ghana, Guinea, The Gambia, Nigeria, Sierra Leone and Liberia. Prior to the establishment of ECOWAS, there was one monetary zone known as West African Economic and Monetary Union (WAEMU) which comprises Francophone West African countries and member countries use The CFA franc as their currency. The WAMZ member countries are non-members of WAEMU whose mandate is to promote regional economic integration (Tsangarides & Qureshi, 2008). The WAEMU countries enjoy the same fiscal and monetary policies. The West African Monetary Zone is like the European Monetary Union especially in operational modalities. "The fundamentals of the varying sizes, resource endowment and the level of economic development of the integrating countries as well as member countries meeting the convergence criteria play a great role for all the zones who are attempting to form a monetary union" (Nwokoye and Kalu, 2016).

The West African Monetary Zone was established in December 2000, same time with the West African Monetary Institute (WAMI). WAMI was established to undertake all actions needed to form the West African Central Bank and introduce a common currency, **Eco**, as currency for the monetary zone. The common currency -Eco- is expected to boost inter-regional trade, capital flows, investment and raise growth and employment and increase the performance of the balance of payment. These ambitious targets were expected to have been met by January 2004, but still have not been met even today because of failure to meet the various primary and secondary convergence criteria.

According to WAMI (2002), the primary and secondary criteria are:

Primary Criteria

- 1). Attain and maintain price stability through achieving single digit inflation rate by 2003 and 5 percent by 2004.
- 2). Establish a sustainable government fiscal position by reducing the ratio of budget deficit to GDP to 4 percent throughout the period 2003 – 2005.
- 3). Regulate Central Bank financing of government budget deficit to 10 percent or less throughout the period 2003 – 2005.

4). Manage satisfactory level of gross official foreign exchange reserves of at least 3 months of import cover through the period 2003 – 2005.

Secondary Criteria

- 1). Restriction of new domestic areas and liquidation of current ones.
- 2). Tax revenue to GDP ratio should be greater than 20 percent.
- 3). Wage bills to tax revenue ratio should be less than or equal to 35 percent.
- 4). Public investment to tax revenue should be greater than or equal to 20 percent.
- 5). Manage real exchange rate stability.
- 6). The real interest rate should be positive.

Harvey and Cushing (2015) opine that the primary criteria would ensure that the member states economies converge in a way such that there are symmetric shocks while the secondary criteria economies would ensure fiscal convergence. From the period 2001 – 2009, only two countries, Gambia and Nigeria did satisfy all four primary criteria in 2007 and 2008 while The Gambia satisfied all the criteria in 2008 and 2009. However, in recent years none of the member countries have satisfied all the primary and secondary criteria which continues to doubt the possibility of introduction of a common currency, eco, in WAMZ.

Further, monetary, and fiscal policies are connected by government sector budget constraint, and this determines how a change in money stock tends to affect the equilibrium price level. Given the increase in stock of money by open market purchase, the reduction of interest-bearing government debt held by the public, this portends some implications for the future stream of taxes needed to finance the interest cost of government debt. “So an open market operation potentially has a fiscal side to it and this fact can lead to ambiguity in defining what one means by a change in monetary policy, holding fiscal policy constant”. Walsh (2010).

Studies have shown that monetary variables and equilibrium in international financial markets are crucial determinants of exchange rate dynamics in addition to the importance of fiscal variable and how it determines the time pattern of exchange rates. Annicchiarico (2005) posits that fiscal theory of price level (FTPL) has been extended to open economy models and it shows the implications for a common currency areas and exchange rate system. Canzoneri et al (2001a) show the difference between Richardian and non-Richardian regimes using the studies developed by the Woodford(1995). In the Richardian regime, the monetary policy provides the nominal anchor and the exchange rate is determined solely by monetary variables.

Furthermore, monetary and fiscal policy coordination can help monetary and fiscal policies achieve its objective of price stability and stable non-inflationary economic growth. Fiscal policies essentially determine government taxation and spending decisions while monetary policies envelop the decisions involving money supply and interest rate. Given the objective of fiscal policy as reducing unemployment and increase in output and then monetary policy as maintaining price and exchange rate stability through control of money supply. The overall objective of both fiscal and monetary policy is to boost the overall welfare of society by keeping inflation low and unemployment low as well.

The Exchange rate and interest rate serve as signs for international and domestic asset transactions. Changes in the exchange rate influence import demand through a process that communicates monetary development to the external sector. It has been very challenging to generate a stable exchange rate in WAMZ, whose countries strongly rely on export earnings from their natural resources such as gold, oil etc and imports of consumer and industry products. The floating and fixed exchange rate regimes have not given the WAMZ countries the best results.

This could be attributed to the economies being stamped by structural rigidities, bottlenecks and most of our imports and exports are defined by inelasticity on either the demand or supply side or both. (Ndubuisi, Uma and Obidike, 2017). The trend of the exchange rate movement partly depends on the movement of non-oil exports that each country has and generates. The growth recorded in non-oil exports shows that the domestic economy is diversifying and has generated enough output for production and for exports. However, for some of the WAMZ countries like Nigeria, they have experience below threshold level in non-oil exports and exhibiting high volatility, which have resulted in massive importation of important products, rise in demand for foreign exchange and subsequent currency depreciation.

Kohlscheen (2014) asserts that most emerging economies lack long track records with floating exchange rate regimes. The emerging economies allow the value of their currencies to be driven by market forces, which has increased and resulted in their currencies being at the fore of international policy debate in the global economy. Dornbush (1976) opines that an unexpected monetary contraction results in an immediate appreciation of the currency which creates the conditions for a subsequent depreciation at a rate equivalent to the interest rate differential.

The main focal point of the Central bank is then moved from price stability to debt stability. When the fiscal dominance regime is present, the fiscal authority is no longer interested in the increasing debt since it does not adjust it by cutting down expenditure or by increasing taxes to bring down level of debt stock, but the fiscal authority now expects the Central Bank financing to fund the fiscal deficit. McCallum(1984) and Hakkio and Rush (1991) assert that amassing debt that is not bargained for future expenditure creates room for government default. When the fiscal authority employs deficit financing, which is inflationary, the macroeconomic variables like the monetary aggregates that are under control of the monetary authority, could go out of control resulting in monetary policy being ineffective. Consequently, inflation and exchange rate pressures ensue due to amount of money in circulation.

Member countries of WAMZ and West African Economic Monetary Union (WAEMU) have convergence criteria such as debt to GDP ratio, limit fiscal deficit, inflation, exchange rate variation and a floor of reserves which were set prior to commencement. The IMF in addition recommended a set of rules known as Performance criteria and Indicative Target (PCIT). The goal is to maintain macroeconomic stability and enhance sustained economic growth in the zone. The domestic and external factors that have impugned the WAMZ countries have been an obstacle to their ability to meet the convergence and performance criteria. For example, Diallo and Mendy (2018) assert that The Gambia, Ghana, Sierra Leone met only one of the primary convergence criteria, while Guinea, Liberia and Nigeria met three of the criteria and missed one. Inflation was the most missed criterion in 2016 and 2017 except two countries who fulfilled the single deficit inflation. "Challenges of fiscal deficits increased central bank financing and rising inflation have been attributed to government spending outlays and absence of policy coordination" (WAMI, 2016).

II. LITERATURE REVIEW

COUNTRIES OF THE WEST AFRICAN MONETARY ZONE (WAMZ)

The countries of the West African Monetary Zone are six namely: The Gambia; Nigeria; Ghana; Sierra Leone; Guinea; and Liberia. In 2000, WAMZ was formed with some Central banks, and they proposed the need for economic integration and improved prosperity, enhancing benefits of trade through improving the welfare of member states. In 2004, the convergence criteria were set for eligibility of countries to join ECOWAS monetary union. According to Nnanna (2002), the primary criteria consist of four pillars namely:

Inflation; overall budget deficit to GDP; Central bank financing of budget deficit; and floor on the foreign exchange reserves: West African Monetary Institute (WAMI) is responsible for monitoring macroeconomic developments in the member states and responsible for the introduction of the single currency (ECO) and the establishment of a common Central Bank. "The proposed single currency is expected to stimulate intra-regional trade, capital flows and investments, increase growth and employment and improve balance of payments performance. In addition, monetary integration they argued would enhance economic efficiency and strengthen the capacity of the region to compete internationally". Adam, Gyamji and Agyapong (2012).

One of the major objectives of creating WAMZ is to promote trade among member countries. In addition to single currency agenda, programs for the removal of tariff and non-tariff barriers to trade especially through implementation of ECOWAS Trade Liberalisation Scheme (ELTS), Implementation of Interstate Road Transit Convention by member states, adoption of common external tariff etc

The Gambia

The Gambian currency of dalasi was pegged to the pound sterling in a fixed exchange rate system between 1965 and 1985. During the Structural Adjustment Programme of 1986 to 1993, the government introduced the inter-bank floating exchange rate system in 1986, which largely caused the depreciation of the currency and then appreciation. The inter-bank foreign exchange system was later introduced, the foreign exchange bureau also, and they both contributed largely to the deepening of the foreign exchange market.

The main objective of monetary policy of the Central Bank of The Gambia is price stability. Also, the Central bank promotes and maintains the stability of the local currency (dalasi), regulates the financial system, and utilize the resources for economic development efficiently. Although the Central Bank does not have complete independence, it has significant operational independence.

Additionally, the fiscal policy of Gambia is controlled by the Ministry of Finance and Economic Affairs (MFEA) which defines the government macroeconomic policy objectives and framework in line with the pursuit of public and private sector investment which support high economic growth given the fiscal consolidation. Tarawalie and Ahortor (2012) assert that the MFEA has the exclusive responsibility of budget formulation and implementation and the domestic debt policy of government.

Ghana

The exchange rate system used in Ghana was fixed exchange rate between 1970 and 1985. The Ghanaian currency (cedi) was pegged to the British pound and American dollar. In 1986, Ghana adopted the managed floating exchange rate system and the auction market approach for use in the adjustment of the exchange rate and achieve the trade liberalization objective which allows the market forces (demand and supply) determine the cedi-dollar rates.

The monetary policy of Ghana is controlled by the Central bank, and it has the objective of the price stability (low inflation) which supports growth and employment. The Bank of Ghana uses inflation targeting monetary framework for conduct and communication. The goal of inflation targeting is to have inflation below 10 percent and the rate of inflation is measured by the Consumer Price Index (CPI). The Bank of Ghana (BOG) uses some monetary policy instruments such as monetary policy rate, reserve money, required reserve ratio and open market operations.

Similarly, the fiscal policy goals are to allocate and manage financial resources efficiently, improve fiscal resources, reduce debt burden etc. The fiscal policy framework ensures macroeconomic stability for sustained economic growth and development. The Ministry of Finance co-ordinate the fiscal policy and with collaboration of the Economic Management team, Monetary policy committee, Treasury committee, et.c and they review macroeconomic fundamentals to achieve the government growth and inflation objectives.

Guinea

After Independence in 1958, Guinea adopted the fixed exchange rate system, the government pegged their currency (Guinean Syli) with the Special Drawing Right (SDR). Following the subsequent overvaluation of the Guinea Syli (GS) in the mid-1980s, it exceeded the SDR in the parallel market. Hence, the currency was changed to Guinean franc (GF) and pegged with the US dollar. In the 1990s, the Guinea government adopted the flexible exchange rate and introduced the forex exchange interbank market. The currency was pegged against the US dollar and then liberalized the foreign exchange market.

The monetary policy objective of price stability seeks to support economic growth by implementing a monetary-targeting framework. The Central bank objective focuses on the goal of low inflation and broad money supply growth. The monetary policy instrument used includes monetary policy rate, required reserves and Open market Operations (OMO).

Similarly, the fiscal policy objective is macroeconomic stability, boosting economic growth and reducing fiscal deficit. The features of the fiscal policy seek to ensure increase in revenue mobilization, expenditure management and poverty reduction.

Liberia

Liberia has two currency regimes using both the Liberian dollar and the United States dollar. Just like many other West African countries, they had used fixed exchange rate system initially and pegged the Liberian dollar to the United States dollar in the 1981 to 1997. In 1998, the exchange rate system changed, and the Liberian dollar freely floated against other foreign currencies. A few years later, the Central Bank adopted the managed float exchange rate regime.

Monetary policy focus in Liberia is price stability. “The Central Bank of Liberia’s monetary policy framework is an exchange rate targeting regime which aims at containing volatility in the exchange rate targeting regime which aims at containing volatility in the exchange rate while building up foreign exchange reserves” Ahoritor and Tarawalie (2013). The monetary policy tools include the periodic foreign exchange auction and the treasury bill market which widen the monetary policy space in the highly dollarized and cash based, with a dual currency system of Liberia.

Fiscal policy focus is achieving strong, robust, and sustained economic growth, poverty reduction, efficient service delivery e.t.c. The main fiscal policy instruments present are taxes, expenditure, deficit financing, grants, contingency funding etc.

Nigeria

Nigeria had used fixed exchange rate system until the Structural Adjustment System (SAP) of 1986. The Nigerian currency (Naira) was pegged to major international currencies including the US dollar, and then returned to fixed exchange rate after SAP. In the mid-1990s, the Central Bank of Nigeria (CBN) introduced a liberalized system of Autonomous Foreign Exchange Market (AFEM) where the Central bank sold foreign exchange to authorized dealers at a market exchange rate. Nigeria later moved to interbank foreign exchange Market and then Wholesale Dutch Auction System (WDAS) in 2006. The managed float exchange is the exchange rate system used now.

The monetary policy is controlled by the central bank of Nigeria (CBN) with the main objectives of ensuring optimal supply of liquidity to achieve price stability and sustained economic growth. The CBN tightens the monetary policy stance by raising the monetary policy rate (MPR) in a bid to control inflation when inflation rise poses a threat. The CBN uses monetary targeting regime that is anchored on monitoring monetary aggregates, inflation development, managing liquidity and fiscal-monetary co-ordination and clear communication with public. Also, the monetary policy instruments used in Nigeria are Open Market operation, monetary policy rate, liquidity ratio, net open position etc.

Additionally, the core of fiscal policy in Nigeria lies in encouraging investment in specific sectors of the economy, advance public sector revenue, take advantage of public sector funding of infrastructure through public-private partnership and reduced burrowing. The Federal Ministry of Finance is responsible for Fiscal policy management. The main fiscal policy instruments are taxation and government expenditure.

Sierra Leone

Sierra Leone adopted fixed exchange rate until the middle 1980s during the Structural Adjustment Programme. The currency (Leone) was pegged against the US dollar. In the wake of the Structural Adjustment programme (SAP), the country adopted the floating exchange rate regime. The goal of adopting the floating exchange rate was to increase the competitiveness of their exports and maintain a stable exchange rate with minimal volatility in place.

The monetary policy of Sierra Leone is controlled by the Bank of Sierra Leone (BSL) with the goal of achieving and maintaining price stability. The Bank of Sierra Leone monetary policy is operated using monetary targeting framework, uses reserve money as the operating target, broad money as intermediate target. The Bank of Sierra Leone also uses Open market operation (OMO) to conduct

monetary policy, deepen interbank market and maintain interest rate at levels that achieve low and stable inflation.

The Fiscal policy has its main goals of achieving sustained economic growth, job creation, increase economic and social opportunities to the increasing population. The government has taken steps to achieve these goals especially through establishing cash management committee (CMC), monitoring and intensifying co-ordination between fiscal and monetary policy, continued negotiation of payment arrangement with project contractors and fiscal tightening of expenditure especially non-priority spending.

CURRENCY AREA: Optimum Currency Area (OCA) theory is pioneered by Mundel (1961) and Mckinnon (1963), Kenen (1969) and Krugman (1990). The OCA theory is used to make comparisons of cost and benefits of countries that participate in currency union. The currency union offers benefits such as: lowered transaction costs; price stabilization; improved efficiency of resources allocations; increased product factor and financial market access. The cost of currency union includes loss of sovereignty for maintaining country's monetary and exchange rate policies. Monetary integration involves enacting a single monetary zone that possesses a high degree of monetary stability in the progression of economic integration. The currencies in a monetary zone must be completely convertible at an immutable exchange rate, hence creating a single currency effectively. (Itsede, 2003). Monetary integration can be seen as a continuum of optimum currency area.

MACROECONOMIC CONVERGENCE: Macroeconomic convergence can be described as a catch up effect where the poorer economies per capita incomes will tend to grow at a faster rate than the richer economies. Dollar and Wolff (1999) posit that the philosophy that underpins the concept of catch-up convergence is associated with diminishing returns to capital. Their rationale is that as capital gets larger, the marginal productivity declines. The catch-up convergence theory opines that as the migration of labour to the richer countries in search of employment opportunities, there is a fall in the productivity of rich countries due to the decline in capital labour ratio. Consequently, there is sluggish growth in richer countries, and they have productivity declines because poorer countries tend to catch up with the richer ones. The convergence machine 2.0 should focus on convergence of opportunities for people and firms across WAMZ and should support the capabilities of people (through skills) and firms (through innovation and technology adoption). Also, the convergence machine 2.0 should provide a level playing field for people and firms through the provision of flexible labour markets and social protection of workers and an enabling business environment. Convergence requires the transfer of resources from one country to another and implementation of certain regulatory rules across the countries. Each country can find its own development model and drivers, and the two factors important for ensuring long term convergence are quality of institutions and education.

Empirical studies of Meliciani and Peracchi (2004) examine convergence in GDP per capita across European region for the period 1980 – 2000 using median unbiased estimators of the rate of convergence to the steady state growth path and they find the lower mean rate of convergence to be zero for most regions. Busetti et al (2006) investigate inflation convergence in the European Monetary union over the period 1980 – 2006. The study period was divided into before and after the use of Euro. They apply unit root tests on inflation differential for the first sample (before the use of Euro) and they discover inflation convergence for the period 1980 – 1997. Applying stationarity test for the second sample (after the use of Euro), they find two separate clusters of diverging inflation behaviour. Countries

namely Austria, Belgium, Germany, France and Finland belong to a lower inflation group while countries namely Portugal, Ireland, Netherland and Greece belong to the higher inflation group.

Sani (2004) took a survey of economies of WAMZ highlighting economic features such as population of WAMZ highlighting economic features such as population of WAMZ, the Gross Domestic Product (GDP), GDP growth rates, per capita GDP, Inflation rates, external trade, External Debt, foreign resources, Human and Income poverty levels. The study reveals that balance of payment difficulties in prominent in the WAMZ countries due to periodic adverse shifts in terms of trade, huge public debt, capital flights or low level of inward investment due to unconducive environment. Discoveries from the study using the Human Development Index reveal the presence of high level of poverty, low level of literacy and lack of sufficient good drinking among other in the WAMZ countries (Ude, 2022).

Overall, the analysis of socioeconomic performances of the zone reveal that member countries should improve on their current socioeconomic policy reforms and accentuate their political commitments in meeting -up the requirements of convergence criteria to facilitate the integration program.

EUROPEAN MONETARY UNION: The Heads of State of meeting of December 1991 in Maastricht approved the treaty on European union and were resolved to achieve the strengthening and convergence of their economies, hence establishing an economic and monetary union in accordance with the provisions of this Treaty especially having a single and stable currency (European Union, 2015).

At the Cannes European council in June 1995, it was confirmed that in the year 1999, the Economic and Monetary Union leaders at the Madrid European council named **euro** as the European currency. On January 1, 2002, the euro became the legal tender for many European countries. However, European leaders meeting in December 1996 proposed a Stability and Growth Pact which would ensure convergence obligations are met after member states joined the euro area.

Based on the Maastricht criteria that established the European Union (EU), the five conditions to admit countries into the monetary union are as follows:

- 1) The inflation rate of not higher than 1.5percentage points and should be above the rate of the three countries with the lowest inflation rate. It ensures price stability.
- 2) The long-term nominal interest rates should not be higher than two percentage points for the three countries with the lowest inflation rates.
- 3) There should be no exchange rate realignment for at least two years. And the country should participate in exchange rate mechanism (ERM II) for at least two years without strong deviations of devaluation.
- 4) The country should have a debt to GDP ratio that is not more than 60 percent.
- 5) The country should not be under any excessive deficit procedure and the government budget deficit of not more than 3 percent of each country's GDP. (Nwokoye and Kalu, 2016)

EMPIRICAL LITERATURE

There is a plethora of empirical literature on the determinants of economic integration. Barro & Sala -I-Martin (1995) posits that if public infrastructure is included in the production function as an input, the increase in public infrastructure leads to a rise in marginal product of capital, then rise in capital accumulation and growth. The works of Barro & Sala -I-Martin (1995) neoclassical framework suggests that such supply side policy will accelerate the convergence process especially as the marginal product

of private capital tends to increase with the availability of public capital. The question about how regional economic integration brings about growth convergence among members can be explained by the linkages of regional grouping among trade in goods, services, technology, investment, human resources, and infrastructure.

Cappelen, Fagerberg & Verspagen (2001) discovered that for European Union (EU), the regional integration and financial support have succeeded in improving the EU's regional policy of providing growth for poorer regions and then contribute to greater equality in productivity and income in Europe. Study on the effect of European integration on long-term growth of EU member states was conducted using panel data techniques and the study reveal a significant positive effect of the length of EU membership on economic growth. This is relatively higher for poorer countries (Crespo -Cuaresma, Dimitz & Ritzberger- Grunwald, 2002).

Onwuka (2004) conducted a comparative analysis on trading system and growth process in ASEAN -5 using panel data effect and endogenous growth model and discovered that although regional and multilateral trading system showed positive effects on growth and FDI, regional trading system recorded small contributions compared with the multilateral trading system. This result was ascribed to the reality that regional openness and regional exchange rate were insufficient to attract more FDI to enhance growth. The study reveals a negative coefficient for convergence effect for trading system as it was believed to be an expected sign. Studies by Kelegama & Mukherji (2006) portray that trade creating joint ventures are better positioned to take advantage of regional free trade agreements. Cross country investment flows help goad vertical integration and horizontal specialization in a regional grouping and these strengthen trade-investment linkages. This involves the distribution of different stages of production in a particular industry based on region in an integrated manner. Das (2004) suggested focusing on vertical integration and horizontal integration.

Tsangarides & Qureshi (2008) study on Monetary union membership using cluster analysis discover considerable dissimilarities in the economic characteristics of West African countries in terms of economic development, growth, labour mobility, region, culture, transportation, language barriers etc. They posit that there is a significant lack of homogeneity while Nigeria and Ghana appear as independent singletons. Sunde, Chidoko & Zivanomoyo (2009) examined the determinants of intra industry trade between Zimbabwe and Southern African Development Community (SADC) regional trade partners. The study utilized the ordinary least square method on a gravity model equation including intra-industry trade (IIT) index as one of the explanatory variables. The study discovered that per capita income, trade intensity, distance, exchange rate and gross domestic product are the major reason for the explanation of international trade between Zimbabwe and its SADC trading partners. Also, the study reveals that most countries in SADC traded basically same goods, and this was a function of past development these countries experienced during the colonial era which gave rise to the establishment of similar economic structures and per capita incomes that were the same. Naveh, Torosyan & Jalae (2012) examined the effect of regional integration on long term economic growth of Iran and Northern countries using time series and cross-sectional data for the period 1995 -2009. The result shows that increased trade exchanges among the studied countries and creation of regional integration exerted long term economic integration effects.

Harvey & Cushing (2015) assert that the variance decomposition of structural vector autoregressive model reveal that ECOWAS zone does not have common sources of shock, this is not surprising because

of the presence of diverse economic structures of WAMZ member countries. The correlation of the structural shocks portrays that the countries respond asymmetrically to common supply, while the demand and monetary shocks will respond differently to a common monetary policy. They concluded that it is not advisable for individual countries to go into a monetary union now or in the proximate future unless the economies of these countries converge further.

Debrum et al, (2003) investigate the justification for establishing regional currency unions in West Africa and draw a conclusion that monetary unification will be beneficial for some member states of the ECOWAS despite the prevailing economic, political, and historical differences between two regions in the community. They suggest that the costs of these countries losing their monetary autonomy are largely overcome by the gains emanating from the partial separation of monetary and fiscal powers. They further state that large countries like Nigeria would no longer be attractive partners because they would now be expected to exert pressure on the common central bank, create excessive inflation in the entire union. Hence, they conclude that the desirability and sustainability of a currency union within ECOWAS largely depends on fiscal discipline displayed by its members and a robust fiscal surveillance procedure followed in the transition phase and after the establishment of the union.

CONTRIBUTIONS OF THE STUDY

This research measures the level of integration achieved by countries who participate, especially in terms of their response to common shocks. Contrary to the methodology of previous studies, this study involves direct measurement of supply, demand, and monetary shocks to the economies of the different countries and their common response to shock. Successful convergence will inform policy that will lead to adoption of common current known as eco.

Several policies such as monetary policy, fiscal policy, exchange rate policy, trade policy e.t.c are important for the macroeconomic management. These policies are organized toward achieving sustainable economic growth, price stability, full employment, and positive balance of payments (Khan et al, 2002). The highest monetary authority of the state -Central Bank – is charged with the job of formulating sound monetary policy stance that drives desired macroeconomic objective and goals. This is achieved by differing policy tools such as open market operation, bank rate policy, minimum reserves requirement and qualitative tools such as moral suasion. From the fiscal side, the operations are assisted by government by using revenue and expenditure tools such as taxation, spending, public debt et.c . to put into action set down macroeconomic objectives. Fiscal policy exerts impacts on exchange rate through changes in income, price, and interest rates because of expansionary and contractionary fiscal actions (Richard, 2007).

For countries in WAMZ especially Nigeria, they show preference for foreign commodities strengthened by their demands for foreign bills e.g dollars, pounds etc and these preferences leads to appreciation of the foreign currency then the depreciation of the local currency. When government spending grows, then inflation can occur if such expenditure is not followed by rapid domestic production activity. With the increase in domestic prices, there is an upturn with the price of local commodities in the international market (Nwosa, 2017). Given the low price of imported merchandise, there exist huge demand for foreign goods which causes more depreciation of the domestic currency to devalue more and then the foreign currency appreciates. Moreover, the massive inflows of foreign exchange earnings associated with rising oil prices provide a good foundation for a stable exchange rate through the effect on foreign reserves.

The monetary authorities apply discretionary ability in influencing money stock and interest rate. This makes money costlier or less expensive given the economic conditions and policy positions. Nnana (2001) asserts that monetary policy provides the opportunity to govern the economy through managing the quantity of money and availability of credit. Monetary policy provides governance in the availability, pricing, and direction of credit to achieve the stated economic objectives, especially exchange rate stability.

Furthermore, the depreciation of the currencies of Naira, dalasi, cedi, Leone and other WAMZ member countries currencies have heightened calls for more efforts to address the rapid exchange rate movement over the years. Since exchange rate stability can be achieved through monetary and fiscal policies, the monetary authorities have implemented exchange rate policy stance from fixed to floating exchange rate regimes. Monetary and fiscal policy stance have been influential in the movement of exchange rate in WAMZ member countries using some monetary and fiscal variables that tend to exert influences on exchange rate movement in WAMZ. These variables have appropriate levels that are sustainable in influencing exchange rate movement and cause exchange rate response to shocks in monetary and fiscal policy variables.

III. METHODOLOGY

Theoretical Framework

Neoclassical Growth Theory

The Neoclassical growth theory provides the model for the theoretical framework for the study of macroeconomic convergence given its role in capital accumulation. This model, initially constructed by Solow (1956) and Swan (1956) portray how macroeconomic policy can raise an economy's growth rate by encouraging people to save more. However, the increase in growth predicted by this model does not last and in the long run, the growth rate of the country will revert to the technological progress and show diminishing marginal productivity. The neoclassical theory is exogeneous and independent of economic forces (Ude, 2022).

This theory believes that the contributions of macroeconomic policy could lead to long run growth and the rate of technological progress is determined by internal forces in the economic system.

Technological process is driven by process of innovation which enables business firms to compete in a market economy and incentives needed for innovation depends on policies for competition, intellectual property, and international trade. Neoclassical model is useful in explaining how capital accumulation affects national income, real wages and real interest rate for a given state of technology when it is endogenous. Additionally, the neoclassical model has a stronger ability to predict the convergence in growth rates than other theories of convergence prediction levels. The model asserts that there should be convergence in growth rate for all countries that share in the same technology.

Baumol and Sala-i-Martin (1995) assert that the convergence philosophy of neoclassical growth theory predicts that poorer countries of the convergence club must catch up with richer countries if they have advantage to replicate the existing technological advancement without having to develop their own. Baumol (1986) applies cross-sectional regressions to state that countries and regions are converging or catching up because initial poorer economies were found to have grown faster than richer ones.

Sources of Data

The data used for the study is secondary data for the six WAMZ countries. Data for the variables were obtained from International Monetary Fund (IMF) International Financial Statistics (IFS) CD –ROM, the World Development Indicators (WDI) data base, Organization for Economic Co-operation and Development (OECD) data base and the data base of the West African Monetary Institute (WAMI).

The countries' local currencies are: The Gambia – dalasi; Ghana – cedi ; Guinea – franc; Liberia - Liberian dollar; Nigeria – Naira; and Sierra Leone – leone. The sample period covers a 62-year period from 1960 – 2022. This 63-year period is selected to know and assess how long the different economic effects of the monetary union have had on the WAMZ member countries.

Methodology

Convergence is present when a poor economy increases more rapidly than a rich economy and the poor economy catches up with the level of income per capita production of the rich economy. In literature, it is referred to as the β convergence (Barro and Sala-i-Martin, 1995) and Hall, Wickens and Robertson (1992). Using conditional convergence, we assume that WAMZ countries are identical especially in terms of references, technology, and economic policies. One economic policy that unites all WAMZ countries is the formation of a single currency by 2027. Neoclassical growth model (Solow,1956) predicts that an economy’s growth rate is positively correlated with the distance that separates it from its own stationarity.

Hall, Wickens, and Robertson (1992) assert that convergence involves relative long-run behaviour of some time series especially as economic time series are generally non-stationary. We observe that for convergence, difference between the time series do not drift indefinitely far apart. These researchers opine that cointegration of non-stationary time series is important, but not sufficient condition for convergence and thus economic convergence between two series is the approximation to a constant of the difference between the series. Hall et al (1992) assert that X and Y have converged if $\beta = 0$ and Y and Z have convergence if $\beta = 1$ in the model.

$$(\ln X_t - \ln Y_t) = a + b(\ln X_t - \ln Z_t) + \mu_t \dots\dots\dots(1)$$

Nevertheless, convergence is assumed to be a gradual and on-going process. Equation 1 is considered as a static model and will subsume structural stability and reject convergence if X and Y are still in the convergence process. Haldane and Hall (1991), Hall and Wickens (1992) propose the use of stochastically varying coefficients that permits dynamic structural change to model unobserved deterministic or stochastic factors that cause parameter changes. These changes allow the data to display the shifts or transitional dynamics in the estimated relationship (Datta, 2003).

Following Hall et al, (1992) Haldane & Hall (1991), Kendall (2000) and Jayaraman, Ward and Xu (2007) by formulating the following model which have time varying parameters.

$$(\ln Y_{ref} - \ln Y_{wamz}) = a(t) + b(t)(\ln Y_{ref} - \ln Y_{NG}) + \mu_t \dots\dots\dots(2)$$

Where Y_{ref} , Y_{WAMZ} and Y_{NG} represent the nominal exchange and inflation rates for the reference country, Nigeria and individual WAMZ countries.

To obtain estimates of $a(t)$ and $b(t)$ in equation (2), we formulate the following state space models:

$$(\ln Y_{ref} - \ln Y_{WAMZ}) = a(t) + b(t) (\ln Y_{ref} - \ln Y_{NG}) + \mu_t \dots\dots\dots(3)$$

$$a(t) = a(t)_{-1} + V_{1t} \dots\dots\dots(4)$$

$$b(t) = b(t)_{-1} + V_{2t}$$

Equation (3) represents the measurement or observation equation while equations (4) and (5) are the state or transition equations. Also, $\mu(t)$, V_{1t} and V_{2t} have the assumption of normally distributed error terms with zero mean and a constant variance. We assume that the error terms are serially uncorrelated and independent of each other.

Hall et al (1992) posit that $b(t)$ would move to zero in the limit if the Y_{ref} and Y_{WAMZ} have converged.

Alternatively, if Y_{WAMZ} and Y_{NG} have converged, then this parameter would move towards one.

Nevertheless, the convergence of $b(t)$ to zero is considered a necessary but not sufficient condition for the convergence between Y_{ref} and Y_{WAMZ} . We believe that for convergence, $a(t)$ must tend to a constant and $b(t)$ must tend towards zero.

Model

$$(G_{ref} - G_{NG}) = \alpha_0 + \beta_1 INF_{it} + \beta_2 RER_{it} + \beta_3 FD_{it} + \beta_4 DIR_{it} + \beta_5 GDPC_{it} + D_{95} + \delta_i + \gamma_i + \mu_{it}$$

Where :

The dependent variable $G_{ref} - G_{NGit}$ represent the difference in growth rate. The dependent variable is the growth gap with Nigeria growth rate.

GDPC : The per capita GDP

FD: Fiscal Deficit

DIR : Deposit interest rate

RER : real effective exchange rate

INF: Inflation

D_{95} : Dummy variable

δ_i :countryfixed effect

α_i :timefixedeffect

μ_{it} :errorterm

Using Time Series for countries

For Ghana

$$GR_G - GR_{NGt} = c + GDPC_t + FD_t + DIR_t + RER_t + INF_t + \mu_t$$

For Guinea

$$GR_G - GR_{NGt} = c + GDPC_t + FD_t + DIR_t + RER_t + INF_t + \mu_t$$

For The Gambia

$$GR_{TG} - GR_{NGt} = c + GDPC_t + FD_t + INTR_t + RER_t + INF_t + \mu_t$$

For Nigeria

$$GR_t = c + GDPC_t + FD_t + INTR_t + RER_t + INF_t + \mu_t$$

For Sierra Leone

$$GR_S - GR_{NGt} = c + GDPC_t + FD_t + INR_t + RER_t + INF_t + \mu_t$$

For Liberia

$$GR_L - G_{NGt} = c + GDPCP_t + FD_t + INR_t + RER_t + INF_t + \mu_t$$

The model will be used to explain convergence especially how the catch-up effect works on how the poor economies will tend to grow at a faster rate to catch up with richer economies and the relationship between various determinants of growth. All the variables chosen will help us capture the individual effect or contributions of the variable to the catch-up effect required for convergence. When countries with lower levels of GDP per capital catch-up with countries with higher levels of GDP per capita, then convergence has taken place. The convergence model can explain how high- and low-income countries increase their investment in physical and human capital with the aim of increasing the GDP.

Further, one of the strengths of this model is that it emerges directly from the neoclassical economic growth model and suggests that per capita income gaps across economies globally will shrink as the economies converge. Another strength is that the model in the countries used are underdeveloped countries and tend to experience more rapid growth because they can copy or reproduce the production methods, technologies and institutions of developed countries and use them effectively for their countries. Thus, they are considered as second mover advantage. These WAMZ countries have access to the technological know-how of the advanced nations which they tend to use to help them experience rapid rates of growth.

However, the weakness of the model is lack of adequate capital. There is insufficient data on the availability of different types of capital that can enable the WAMZ to secure adequate capital needed to efficiently increase economic productivity needed for catch-up effect on a global scale.

The variables to be used in this model are growth rate, inflation, real exchange rate, deposit interest rate, fiscal deficit, GDP per capita and dummy variable.

Growth gap: The dependent variable of growth gap is the difference in the growth rate of each country vs the growth rate of Nigeria. Nigeria has about 85 percent of the GDP of the entire WAMZ countries. Generally, underdeveloped economies tend to grow more rapidly than wealthier economies and the underdeveloped or smaller economies will catch up to the wealthier economies. In WAMZ, any of the countries is considered small and with difference in growth rate and convergence, we expect them to catch-up with Nigeria, which is the wealthier economy. Also, in WAMZ, the wealthy economy is Nigeria, and it can enhance catch up effect by opening up its economy to free trade and ability to absorb new technology to attract capital and participate in global market.

Inflation: Inflation affects many aspects of the economy especially consumer spending, business investment, employment rates, tax policies, et.c. Inflation is measured by Consumer Price Index (CPI) in percentage. Inflation convergence can be realized when the means and variances of the inflation differentials for these WAMZ countries diminish in successive time periods. The convergence for inflation means that inflation rate fluctuates around the equilibrium value and then returns to the mean when in the long run. The inflation in the convergence model will explain how different inflation rates of the WAMZ countries will converge to the equilibrium state and the possible way inflation will prevent

Estimation technique:

The research uses panel data in the estimation and the OLS regression analysis will be done using STATA and Eviews. The panel data captures the six countries of WAMZ. From the panel data, the analysis would capture the fixed effect and Random effect and correct for endogeneity.

Also, the Eviews will be used to analyze the data for the individual countries of the WAMZ. Further analysis includes the Dynamic GMM, Cointegration, Impulse response, Granger causality and Structural VAR for the supply and demand shocks.

IV: ANALYSIS AND INTERPRETAION OF RESULTS

Growth of countries in WAMZ

Descriptive statistics of countries' growth rate

	GHANA	GUINEA	LIBERIA	NIGERIA	SIERRALEONE	THEGAMBIA
Mean	3.711477	3.440609	2.068709	3.677690	2.740326	3.920795
Median	4.405974	2.503061	1.876900	4.195924	3.349998	4.426549
Maximum	14.04712	10.82063	9.535275	25.00724	26.41732	12.39343
Minimum	-12.43163	-1.122642	-30.14513	-15.74363	-20.59877	-8.130444
Std Deviation	4.232399	1.963156	4.749531	6.885896	6.870696	3.513869
Skewness	-1.199665	1.506408	-4.860501	0.171798	-0.262918	-0.624517
Kurtosis	5.882048	6.752031	35.05522	5.321109	7.440397	4.251713
Jarque-Bera	36.91534	60.78134	2945.342	14.45221	52.48328	8.208032
Probability	0.000000	0.000000	0.000000	0.000727	0.000000	0.016506
Sum	233.8231	216.7584	130.3287	231.6945	172.6405	247.0101
Sum. Sq Dev	1110.619	238.9468	1398.599	2939.765	2926.800	765.5310
Observation	63	63	63	63	63	63

The statistics show that the mean growth rate for the 63 -year period hovers around 2 percent for Liberia to 3.9 percent for The Gambia. All the countries had minimum growth rates that were negative, while Sierraleone growth was mostly volatile ranging from a minimum of -20.6percent to a maximum of 26 percent. The least volatile growth was Guinea, from a minimum growth of -1.12percent to a maximum of 10.8 percent during the period. In general, these countries experienced a slow growth rate and the growth rates were driven by non-oil exports. The relative size of the WAMZ countries in the real aggregate demand was another important source of asymmetry. Our data shows that Nigeria accounts for 85 percent of the entire GDP of WAMZ and the dominant economic output of WAMZ and the largest economy in Africa with the highest population of about 220 million people.

The pre-WAMZ period is between the year 1960 and 2000 while the post WAMZ period is between the year 2001 and 2022.

Pre-WAMZ average growth rate

Time	1960	1961	1962	1963	1964	1965	1966	1967
Average Growth rate	2.5154	2.5802	3.8006	4.1225	3.9826	3.9141	0.5403	-1.4260

Time	1968	1969	1970	1971	1972	1973	1974	1975
Average growth rate	2.4654	7.5401	8.9302	4.4883	1.0157	3.9767	5.2446	0.0799

Time	1976	1977	1978	1979	1980	1981	1982	1983
Average growth rate	2.7484	2.6434	2.5851	1.9172	3.3110	-1.05862	-0.93899	-0.43858

Time	1984	1985	1986	1987	1988	1989	1990	1991
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Average growth rate	3.206023	1.492823	2.443854	3.809577	3.090673	3.251892	4.702591	2.59825
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Time	1992	1993	1994	1995	1996	1997	1998	1999	2000
Average growth rate	-0.329	2.354	0.923	0.568	3.186	2.202	3.015	2.516	4.286

Post WAMZ Average growth

Time	2001	2002	2003	2004	2005	2006	2007	2008	2009
Average growth rate	2.658	8.654	-0.028	5.576	3.795	4.227	6.399	6.475	4.486

Time	2010	2011	2012	2013	2014	2015	2016	2017	2018
Average growth rate	6.346	5.225	7.976	8.368	2.786	-1.327	3.170	5.118	4.390

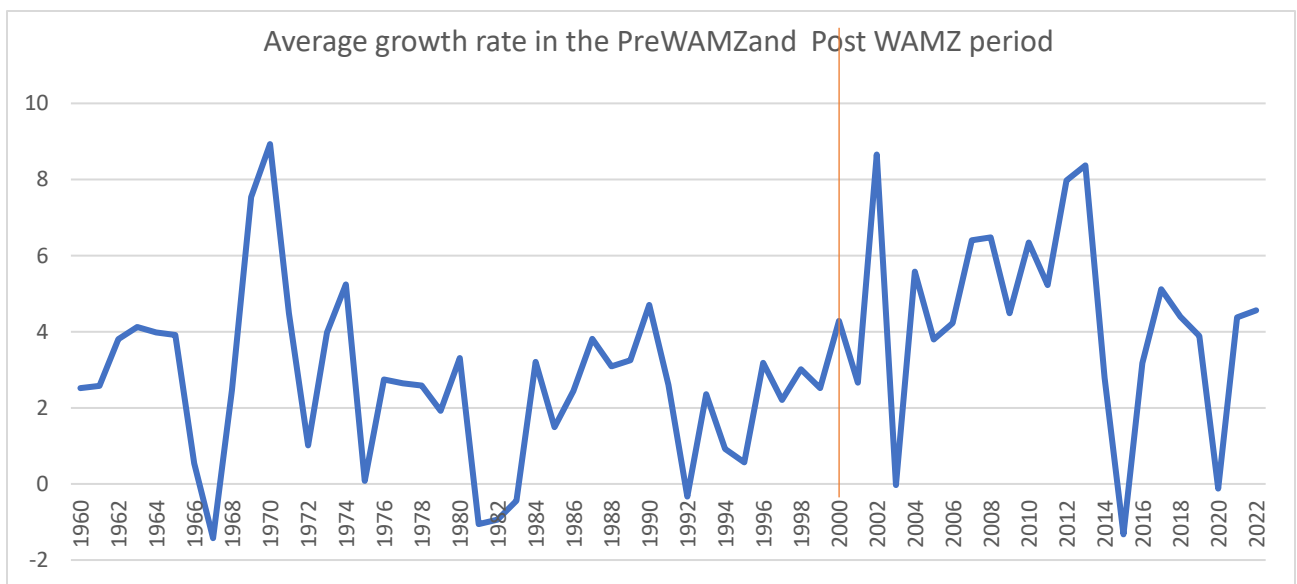
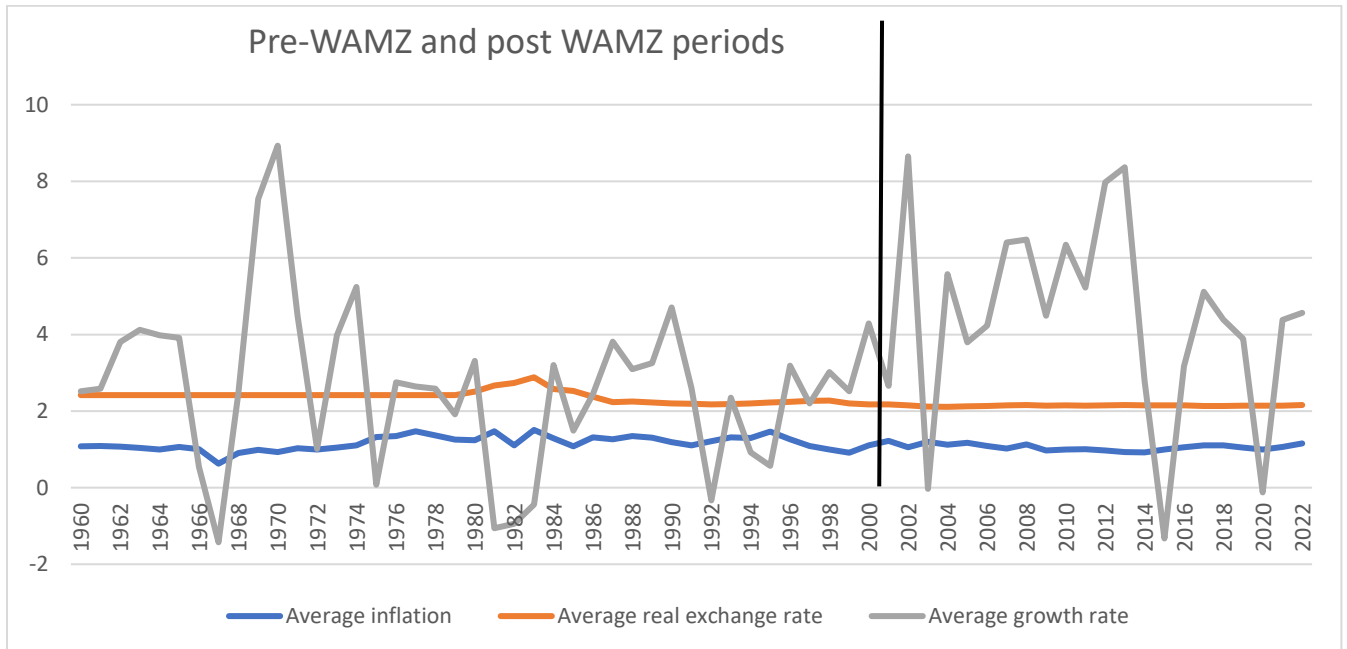
Time	2019	2020	2021	2022
Average growth rate	3.890	-0.120	4.377	4.561

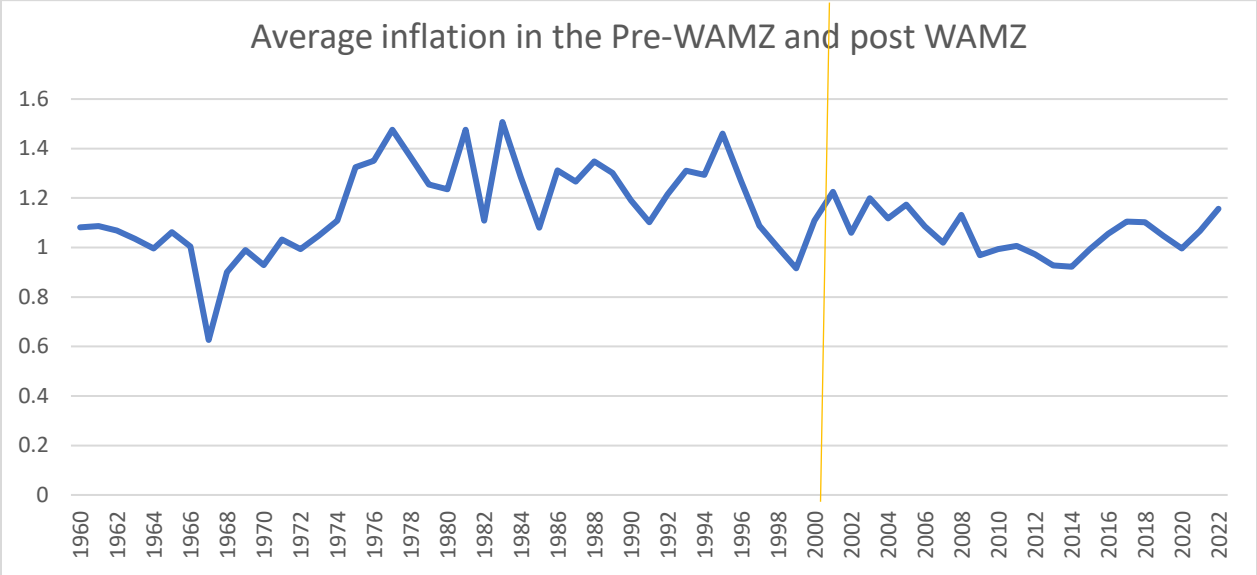
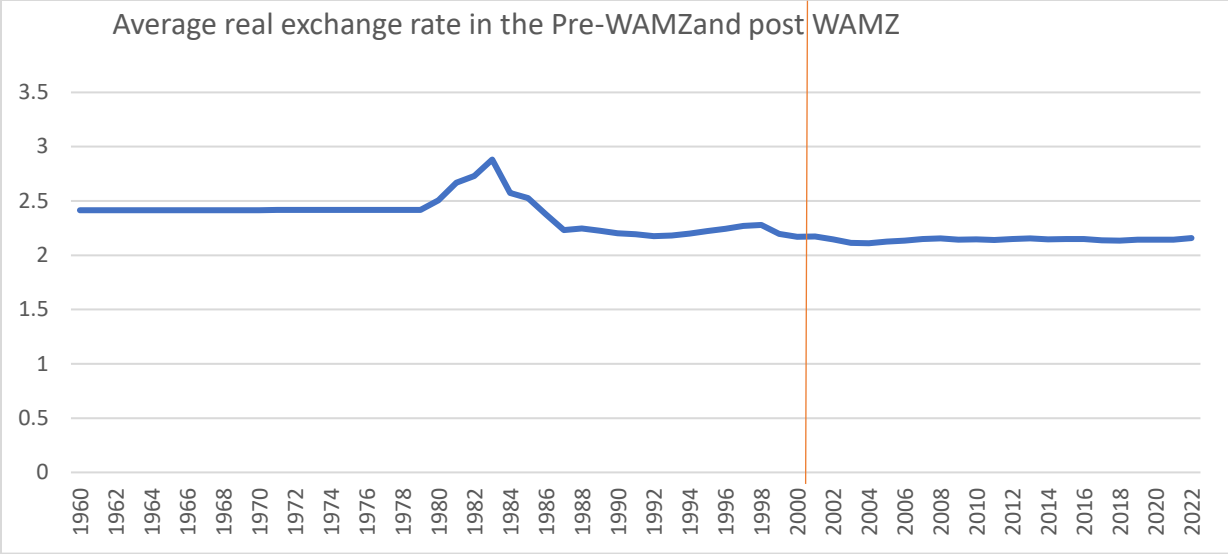
	Pre-WAMZ	Post WAMZ
Average growth	2.631	4.409
Sierra Leone	1.331	5.367
Ghana	2.554	5.869
Nigeria	2.937	5.059
Guinea	2.839	4.561
The Gambia	4.376	3.072
Liberia	1.888	2.405

The average growth of the WAMZ countries increased after the formation of WAMZ in 2001. All the six countries, except The Gambia recorded an increase in their average growth rate after the formation of WAMZ compared to their average growth rate before WAMZ. Even though none of the WAMZ countries is among the top five fastest growing African economies, the post WAMZ average growth rate of 4.4 percent is higher than West Africa average growth rate of 3.6 percent in 2022. West Africa is expected to grow at 3.8 percent in 2023, according to African Development Bank. The overall growth performance of Sub-Saharan Africa is backsliding and lower than the average performance of the largest countries of the continent. Additionally, the West African economic growth decelerated in 2020 and 2021, attributed to the resurgence of shocks emanating from Covid-19 pandemic especially as China is a major trade partner for the region's countries. In the post WAMZ period, the increased growth rate has been driven by increased participation in trade, growth of the non-oil sectors, growth of the service sectors,

mobilization of private sector financing for Climate and green growth in West Africa etc. The historical difference in the average growth rate between the pre-WAMZ and post WAMZ period is small.

Albeit the Nigerian economic output is massive compared to other WAMZ member countries, it does not have the highest growth rate. Ghana and Sierra Leone have special experience because they grew above Nigeria post WAMZ while Liberia, The Gambia and Guinea grew below Nigeria in the post WAMZ period. Sierra Leone and Ghana achieved convergence because they grew above Nigeria in the post WAMZ period. Liberia, The Gambia, and Guinea did not achieve convergence because they did not grow above Nigeria.





In addition to growth, two important components of the convergence issues are inflation and exchange rate convergence. Given that Inflation and exchange rate have experienced volatility across the zone and the vulnerability of WAMZ countries to external shocks, inflation and exchange rate issues are arguably the most critical issues facing the region as they move towards monetary integration. Inflation has not been single digit, inflation and growth have been cyclical over the 63-year period, pre WAMZ and post WAMZ. The average real exchange rate has been relatively stable in the period. Since the real exchange rate have not recorded sufficient appreciation in value, this has contributed to the unstable inflationary environment. Meanwhile, some of the WAMZ countries experienced a long decline in value of their currencies post WAMZ from 2001. The Gambian Dalasi recorded steep decline till 2003, the Ghanaian Cedi recorded a downward trend until 2015 when it rose slightly before declining again. The SierraLeonan Leone started with a downward trend at the beginning of the period and then became stable between 2005 and 2008. It later began to rise steadily until 2015 and then hit a steep decline in 2017 which caused a lot of fatalities in the Freetown (capital city) mudslides. The inflation and growth

instability have been driven by poor fiscal and monetary policies, rising debt, high prices, less production and export, excessive spending, corruption e.t.c. Several efforts at macroeconomic price stabilization around the desired target inflation have not been achieved.

Further, from the plot of average growth, we can suggest the presence of a strong business cycles asymmetry. The average growth vacillated very widely with some of the WAMZ countries recording negative growth in some months and years, and declining growth as well. High growth numbers, declining growth numbers and negative growth numbers were recorded in both the pre-WAMZ and post WAMZ period.

Panel Data Regression Results

$$\text{Growth gap} = \alpha + \beta \text{Dummy} + \epsilon_{it}$$

Where $\beta < 0$ and if $G_{\text{Nigeria}} > G_{\text{reference country}}$

H_0 : no convergence

H_1 : increased convergence

$$\text{Grt} - \text{Gng} : -0.503148 + \beta 0.003867 + \epsilon_{it} \dots\dots\dots(1)$$

Dummy variable is the only independent variable in the first regression. It is used to show if there is any categorical effect that may be expected to shift the outcome of the growth gap. It shows the effect of one category of explanatory variable, and it is not statistically significant, which implies that there is no convergence and we fail to reject the null hypothesis. The effect of any variable on growth gap is larger by 0.003867. The difference in slope value of factors that promote growth gap and factors that do not promote growth gap is higher by 0.003867.

Variable	Coefficient(Standard Error)	P-value
Dependent variable: Growth gap		
Dummy	0.003867 (0.871291)	0.9965
Constant	-0.503148	
R- squared	0.00000	
Prob(F-statistic)	0.996462	

$$\text{Grt} - \text{Gng} : \alpha + D + \beta_1 X_1 + \beta_2 X_2 + \epsilon$$

$$\text{Grt} - \text{Gng} : -0.577245 + -0.038883 + \beta 10.010092 - \beta_2 0.000298 + \epsilon \dots\dots\dots(2)$$

Variable	Coefficient (Standard Error)	P - value
Dependent variable : Growth gap		
Dummy	-0.038883 (0.888095)	0.9651
Inflation	0.010092 (0.034655)	0.7711
Real Effective Exchange rate	-0.000298 (0.002298)	0.8969
Constant	-0.577245	

R-squared	0.000274	
Prob(F-statistic)	0.993536	

The dummy variable is one of the independent variables to explain the growth gap. This shows that one category of the explanatory variable has an effect on the growth gap and it is smaller by 0.038883 while holding other variables constant. Economic theory posits that the rate of economic growth causes a downward pressure on inflation rate. There is a positive relationship between GDP growth and inflation because if the economy grows, then it causes inflation, but the increase in inflation may be controlled through several ways. The rapid rise in inflation leads to lower purchasing power, higher interest rate and then slower economic growth. In the result, the positive relationship between growth gap and inflation is positive and in consonance with economic theory. This means that if the inflation increases by one unit, then the growth gap in WAMZ increases by 0.010092 while holding other variables constant. The negative result of the relationship between the real effective exchange rate and the growth gap is in consonance with economic theory. For an economy, an increase in real effective exchange rate makes the export more expensive and income cheaper which leads to a loss in trade competitiveness, hence a decline in economic growth. In the result, if the real effective exchange rate increases by one unit, then we see a decrease in growth rate gap by 0.000298 while holding other variables constant. The dummy variable, inflation and real exchange rate are not statistically significant, which implies that there is no convergence among the variables. Hence, we fail to reject the null hypothesis.

$$Grt - Gng = \alpha + D + \beta_1 \text{Fiscal deficit} + \beta_2 \text{GDP per cap} + \beta_3 \text{Deposit Int rate} + \epsilon_{it}$$

$$Grt - Gng = -1.610168 + 0.210469 + \beta_1 1.21E-12 + \beta_2 0.002762 + \beta_3 -0.027042 + \epsilon_{it} \dots \dots \dots (3)$$

Variable	Coefficient (Standard Error)	P -value
Dependent variable : Growth gap		
Dummy	0.210469 (0.873306)	0.8097
Fiscal deficit	1.21E -12 (3.34E -12)	0.7167
GDP per Capita	0.002762 (0.001128)	0.0149
Deposit Interest rate	-0.027042 (0.068846)	0.6947
Constant	-1.610168	
R -squared	0.020579	
Prob (F-statistic)	0.168221	

From our result, only the GDP per capita is statistically significant in explaining the growth gap in WAMZ. This means that a one unit increase in the GDP per capita will make the growth gap increase by 0.002762 units while holding other variables constant. Hence, we reject the null hypothesis and conclude that there is convergence in the GDP per capita.

The positive relationship between the GDP per capita and the GDP growth gap is in consonance with economic theory. The growth in GDP per capita and growth in GDP are considered good measures of economic growth. The GDP per capita tells us the measure of the value of output per person and sustained economic growth is attained when we have an increase in average incomes and this is strongly

linked to poverty reduction. The variable of fiscal deficit has a coefficient of 1.21E -12 and it is positively related to the growth gap. This means that if the fiscal deficit increases by one unit, then the growth gap will increase by 1.21E -12 units while holding other variables constant. Fiscal deficit tells us how the federal budget is linked to how well the WAMZ countries' economies perform. A faster rate of growth of the economy leads to a raise in tax revenues which lowers spending on social safety net and less poverty. A smaller fiscal or primary deficit with corresponding lower interest rates will lead to growth of GDP and fall in the debt-to-GDP ratio. Also, the dummy variable coefficient of 0.210469 tells us that the effect on growth gap is larger by 0.210469. The difference in slope value of non-promoter of growth gap and the promoters of growth gap is higher by 0.210469. The deposit interest rate coefficient of -0.027042 tells us that we have a negative relationship between the deposit interest rate and the growth gap. This means that if the deposit interest rate increases by one unit, then we experience a reduction in the growth gap by 0.027042 while holding other variables constant. The deposit interest set by banks are used to guide borrowing costs and the pace of economic growth. The lower rates spur economic growth while a higher deposit rate will restrain spending, investment and stock market valuations and then economic growth.

$$Grt - Gng = \alpha + D + \beta_1 \text{Fiscal deficit} + \beta_2 \text{GDP per cap} + \beta_3 \text{Deposit Int rate} + \beta_4 \text{Inflation} + \beta_5 \text{Real effective exchange rate} + \epsilon_{it}$$

$$Grt - Gng = -1.863369 + 0.144048 + \beta_1 9.56E-13 + \beta_2 0.002855 + \beta_3 -0.029600 + \beta_4 0.009403 + \beta_5 0.000607 + \epsilon_{it} \dots\dots\dots(4)$$

Variable	Coefficient(Standard Error)	P-value
Dependent variable : Growth gap		
Dummy	0.144048 (0.890769)	0.8716
Fiscal Deficit	9.56E-13 (3.54E-12)	0.7871
GDP Per capita	0.002855 (0.001154)	0.0139
Deposit interest rate	-0.029600 (0.073189)	0.6862
Inflation	0.009403 (0.038310)	0.8063
Real Effective Exchange rate	0.000607 (0.002442)	0.8040
Constant	-1.863369	
R-squared	0.021464	
Prob (F-statistic)	0.349051	

All the variables are now put together in this model and we see some changes compared to the previous models. The real exchange rate now showed a positive relationship with the growth gap compared to the negative relationship it showed in the previous model. Among the five independent variables and the dummy, only the GDP per capita was statistically significant. This means that we reject the null hypothesis and conclude that there is convergence in the GDP per capita. If the GDP per capita increases by one unit, then the growth gap will increase by 0.002855 while holding other variables constant. Given the convergence in the GDP per capita, this means that countries with lower level of GDP per capita will catch up to countries with higher levels of GDP per capita. High- and low-income countries decision to

increase investment in physical and human capital with the objective of growing GDP will lead to convergence.

Fixed Effect Regression results

$Grt - Gng = \alpha + D + \beta_1 \text{Fiscal deficit} + \beta_2 \text{GDP per cap} + \beta_3 \text{Deposit Int rate} + \beta_4 \text{Inflation} + \beta_5 \text{Real effective exchange rate} + \epsilon_{it}$

$Grt - Gng = -2.190643 + 0.052409 + \beta_1 7.01E-12 + \beta_2 0.002904 + \beta_3 -0.047340 + \beta_4 0.024821 + \beta_5 0.000356 + \epsilon_{it}$

Variable	Coefficient (Standard Error)	P -value
Dummy	0.052409 (0.900078)	0.9536
Fiscal Deficit	7.01E -12 (1.32E -11)	0.5957
GDP Per Capita	0.002904 (0.001336)	0.0306
Deposit Interest rate	-0.047340 (0.080785)	0.5583
Inflation	0.024821 (0.041968)	0.5547
Real Effective Exchange rate	0.000356 (0.002518)	0.8875
Constant	-2.190643	
R-squared	0.029242	
Prob (F-statistic)	0.521636	

In the fixed effect regression model, the group means are fixed. The fixed effect model is used to make a conditional inference about the average outcome of the variables included. This fixed effect regression model enables us to control for all variables that fluctuate over cross sectional unit, but are constant overtime.

The fixed effect model addresses endogeneity concerns and control for endogeneity. Fixed effect shows the causal relationship and controls for omitted variables and endogeneity.

$$\text{Cov}(\epsilon_{it}, X_{it}) \neq 0$$

$$\text{Cov}(\epsilon_{is}, \epsilon_{it}) \neq 0$$

$$Y_{it} = X_{it}^1 \beta + \mu_{it} + \alpha_i$$

Y_t is the dependent variable observed for country i at time t . X_{it} is the independent variable observed for i and t . β is the slope coefficient and α_i is an intercept coefficient for country i and μ_{it} is an Idiosyncratic error term.

Fixed effect estimates tend to be unbiased but may be subject to high sample dependence. The fixed effect assumes that individual group and time have different intercept in the regression equation.

H_0 : There is no fixed effect

H_1 : There is fixed effect

From the result, the dummy variable has a coefficient of 0.052409 and the interaction effect is not statistically significant. The effect of the explanatory variable on the growth gap is larger by 0.052409. The difference in the value of the non-promoter of growth and promoter of growth for people is higher by 0.052409. The variable of the fiscal deficit is not statistically significant; hence we fail to reject the null hypothesis and infer that there is no fixed effect. This means that the effect of the fiscal deficit predictor is assumed to be different across all groups and any change will cause differences in the individual effect. Also, the variable of GDP per capita is statistically significant and we reject the null hypothesis and conclude that there is fixed effect in the GDP per capita. This means that the effect of the variable is assumed to be identical across all groups and any change will make the cause to the individual variable the same.

The variables of deposit interest rate is not statistical significant, hence it does not have a fixed effect and we fail to reject the null hypothesis. The effect of each of the variables of deposit interest rate is assumed to be different across all groups and any change will cause the effect to be different. The variable of inflation is not statistically significant; hence we fail to reject the null hypothesis and conclude that there is no fixed effect present. The variable of Inflation is not statistically significant; hence we fail to reject the null hypothesis and I conclude there is no fixed effect in the inflation variable. The variable of real effective exchange rate is not statistically significant, hence we say that the real effective exchange rate does not have fixed effect on the variables. The effect of each real exchange rate variable is assumed to be different across all groups and any change will make the cause to an individual variable to be different.

Unit root test

The presence of unit root causes a spike in output which leads to higher levels of output being higher than the past trend. Unit root measurement tells us how much stationarity a time series model has.

ADF test – Augmented Dickey Fuller test

$$\Delta Y_t = \alpha + \gamma Y_{t-1} + \delta_1 \Delta Y_{t-1} + \dots + \delta_p \Delta Y_{t-p} + \epsilon_t$$

$$\Delta Y_t = \alpha + \beta Y_{t-1} - Y_{t-1} + \epsilon_t$$

H₀ : The residuals have unit root

H₁: There is no unit root in the residuals.

Method	Statistic	Probability
Null: Levin, Lin & Chu	-6.50167	0.00000
Lm, Pesaran and Shin W-stat	-6.49838	0.00000
ADF – Fisher Chi- square	61.5886	0.00000
PP- Fisher Chi -square	122.494	0.00000

The unit root test was only done at levels. We did not do any differencing or ADF further tests because all the variables were statistically significant at the first level. Therefore, we reject the null hypothesis and conclude that the variables have no unit root. The variables are stationary. The stationary variables enable the variables to faithfully reflect the underlying patterns in the data and give correct findings.

Granger Causality

The Granger causality test is important as a statistical hypothesis test because it helps us examine the causal relationship present between variables and how useful it is in forecasting another. The test is done for both short and long run. This test tells us whether the lagged values of a predictor in any of the five models used help in the prediction of an outcome when controlling the lagged values of the outcome itself. The presence of Granger causality for both variables in both directions does not necessarily imply that the series will be co-integrated.

$$Y_t = \alpha + \beta Y_{t-1} + \epsilon_t$$

The Granger causality test explains causations and the relationship between the two variables showing how the past values of one variable gives predictive information about the future values of another variable, more than the information contained in its own past values. This Granger causality test is important for deciding if a single equation model of Y and X variables has a right- hand side variable will be necessary for forecasting purposes. Granger causality test shows how to ascertain the usefulness of one variable to forecast another variable.

$H_0 : \theta = 0$ No Granger Causality

The coefficient of past values in the regression is equal to zero

$H_1 : \theta \neq 0$ There is Granger Causality

The coefficient of past values is not equal to zero.

Null Hypothesis	Observation	P-value
GDP per capita does not Granger cause Grt_Gng Inference: We fail to reject the null hypothesis and conclude that there is no Granger causality	305	0.2258
Fiscal Deficit does not Granger Causes Grt_Gng Inference: We fail to reject the null hypothesis and conclude that there is no Granger Causality	305	0.8989
Dummy does not Granger cause Grt_Gng Inference : We fail to reject the null hypothesis and conclude that there is no Granger Causality	305	0.8236
Deposit Interest rate does not Granger cause Grt_Gng Inference: We fail to reject the null hypothesis and conclude that there is no Granger Causality	302	0.9214
Inflation does not Granger cause Grt_Gng Inference: We fail to reject the null hypothesis and conclude that there is no Granger Causality	305	0.6780
Real Effective Exchange rate does not Granger Cause Grt_Gng Inference: We fail to reject the null hypothesis and conclude that there is no Granger Causality	305	0.9800
Fiscal Deficit does not Granger cause GDP per capita Inference: We fail to reject the null hypothesis and conclude that there is no Granger Causality	305	0.9934
Dummy does not Granger cause GDP per Capita Inference : We fail to reject the null hypothesis and conclude that there is no Granger Causality	305	0.8327
Deposit interest rate does not Granger cause GDP per Capita Inference: We fail to reject the null hypothesis and conclude that there is no Granger Causality	302	0.9201
Inflation does not Granger GDP per capita Inference: We fail to reject the null hypothesis and conclude that there is no Granger Causality	305	0.9530
Real Effective Exchange rate does not Granger cause GDP per Capita Inference: We fail to reject the null hypothesis and conclude that there is no Granger Causality	305	0.6785
Dummy does not Granger cause Fiscal deficit Inference: We fail to reject the null hypothesis and conclude that there is no Granger causality	305	0.9354
Deposit interest rate does not Granger cause Fiscal deficit Inference: We fail to reject the null hypothesis and conclude that there is no Granger causality	302	0.3967

Inflation does not Granger cause Fiscal deficit Inference: We fail to reject the null hypothesis and conclude that there is no Granger causality	305	0.8317
Real Effective Exchange rate does not Granger cause Fiscal Deficit Inference: We fail to reject the null hypothesis and conclude that there is no Granger causality	305	0.9923
Deposit Interest rate does not Granger cause Dummy Inference: We fail to reject the null hypothesis and conclude that there is no Granger causality	302	0.6293
Inflation does not Granger Cause Dummy Inference: We fail to reject the null hypothesis and conclude that there is no Granger causality	305	0.4920
Real Effective Exchange rate does not Granger cause Dummy Inference: We fail to reject the null hypothesis and conclude that there is no Granger causality	305	0.8334
Inflation does not Granger cause Deposit interest rate Inference: We fail to reject the null hypothesis and conclude that there is no Granger causality	302	0.1755
Real Effective Exchange rate does not Granger cause Deposit Interest rate Inference: We fail to reject the null hypothesis and conclude that there is no Granger causality	302	0.7496
Real Effective Exchange rate does not Granger cause Inflation Inference: We reject the null hypothesis and conclude that there is Granger causality because it is statistically significant	305	0.0002

Among the joint variables used for the test, all of them are NOT statistically significant with the exception on the last joint variable of real effective exchange rate and inflation which are statistically significant. Among the non- statistically significant joint variables, we conclude that they do not have Granger causality. While the joint variables of real effective exchange rate and inflation are statistically significant, hence we say that there is Granger causality between real effective exchange rate and inflation. Real effective exchange rate Granger causes inflation. This means that one variable will be useful in forecasting the other. The Real effective exchange rate will be useful in forecasting inflation and the inflation will also be useful in forecasting real exchange rate.

Cointegration

Cointegration tests are used to test the presence of correlation between two or more non-stationary time series in the long run for a specified period, long run parameters for two or more variables are identified.

$$\sum Y_i Y_{it} = \mu_t$$

The presence of cointegration signifies the existence of long run equilibrium relationship between the variables highlighted.

Johanssen cointegration test was performed to ascertain if cointegration exists or not.

H₀: There is no cointegration

H₁: There is co-integration.

Cointegration involves modelling the variables to I(0) and it is a linear combination of those variables that have lower order of integration.

	Statistic	Prob	Weighted Statistic	Prob
Panel v-Statistic	-1.702987	0.9557	-2.331184	0.9901
Panel rho-Statistic	0.545782	0.7074	0.506053	0.6936
Panel PP-Statistic	-0.491814	0.3114	-1.076325	0.1409
Panel ADF-Statistic	-1.072290	0.1418	-2.602526	0.0046

For the 63-year period of study, the cointegration shows that one of the variables is statistically significant while the remaining three variables are not statistically significant. For the Panel ADF Statistic, being significant means that we reject the null hypothesis and conclude that it has cointegration, while the other three variables do not have cointegration. The variable (Panel ADF-Statistic) shows a long run relationship among variables while the other variables do not have a long run relationship. For the stationary variable, the coefficient estimate of Y_{t-1} is now consistent and then converges to zero. This means that the stationary variable has asymptotic distribution of the F-statistic, and it remains the same. The series does not itself change over time and the statistical properties of a process which generates the time series do not change over time while the other three variables are not the same.

Also, convergence can mean along run equilibrium relationship between or among non-stationary variables. Convergence is similar with cointegration or long-run co-movement between stationary variables or short run co-movements.

Cointegration Pre-WAMZ

Null Hypothesis, H_0 : There is no cointegration

Alternative Hypothesis, H_1 : There is cointegration.

	Statistic	Prob	Weighted Statistic	Prob
Panel v-Statistic	-1.218929	0.8886	-1.070520	0.8578
Panel rho-Statistic	1.562101	0.9409	1.548403	0.9392
Panel PP-Statistic	1.546343	0.9390	1.616290	0.9470
Panel ADF Statistic	0.974087	0.8350	1.058752	0.8551

The 41-year period (1960 -2000) prior to the establishment of WAMZ was marked by checkered economic development in WAMZ. From the cointegration result, all the variables were NOT statistically significant, hence we fail to reject the null hypothesis and conclude that there is no cointegration in the Pre-WAMZ period. There is no cointegration and the variables are non-stationary. This shows that there is no long-term linear relationship among the time series variables. The variables are non-stationary, and this implies that the statistical properties change over time and the time series has trend or seasonality.

Cointegration Post WAMZ

Null Hypothesis, H_0 : There is no cointegration.

Alternative Hypothesis, H_1 : There is cointegration.

	Statistic	Prob	Weighted Statistic	Prob
Panel v-Statistic	1.023831	0.1530	0.564477	0.2862
Panel rho-Statistic	0.280266	0.6104	0.458440	0.6767
Panel PP-Statistic	-4.330129	0.0000	-3.393364	0.0003
Panel ADF Statistic	-1.048041	0.1473	-0.873793	0.1911

Following the commencement -WAMZ in 2001, the economy was set to prosper and converge using some sets of criteria (primary and secondary criteria) which were set to drive growth and economic development. The cointegration test will enable us to see the relationship (long run or short run) present among the variables. The result shows some differences in the cointegration between the Pre-

WAMZ and post WAMZ period. While the pre-WAMZ did not have any significant variable in the result, the post-WAMZ period recorded one significant variable. From the result, three of the variables are not statistically significant, hence we fail to reject the null hypothesis and conclude that there is no cointegration present. One of the variables (Panel PP-Statistic) has statistically significant p-values, thus we reject the null hypothesis and conclude that there is cointegration. It has long run equilibrium relationship among variables.

Cointegration emphasizes whether the long-term linear relationship between two time series variables is stationary even if the linear relationship does not exist or is present in the short term. The variable with cointegration can be stationary or even non-stationary. Finally, this cointegration tests and analysis did uncover casual relations among variables and determine if the stochastic trends in a group of variables are shared by the series or not shared. The cointegration results do not show strong effect on convergence.

Vector Error Correction Model and Estimates (VECM)

$$Y_t = \phi + \phi Y_{t-1} + \epsilon_t$$

The Vector Error Correction Model (VECM) is useful in analyzing co-integrated variables and relationships; this provides a mechanism to understand the long-run and short -run behavior of the variables in the system. VECM can help identify the presence of long run equilibrium interrelationships among non-stationary variables. It is a cointegrated VAR model.

$$\Delta Y_t = \phi + \alpha \beta^1 Y_{t-1} + \epsilon_t$$

The cointegrating equation from VECM shows a trend present and the use of restricted trend.

The VECM is an error correction model which is a dynamic model which shows the movement of a variable in any period relates to the previous period's gap from the long -run equilibrium. VECM portrays the short run relationship present among the series.

H0: $\Pi = 0$ The variables are stationary and co-integrated

H1: $\Pi = 1$ The variables are not stationary and not cointegrated

Rank = 0

Rank =1

Variable	Cointegrating Coefficient
Grt_Gng (-1)	1.00000
GDP per Capita (-1)	-0.001214 (0.00121) [-1.00536]
Fiscal Deficit (-1)	2.92E-12 (4.0E -12) [0.73473]
Dummy (-1)	-1.743170 (1.30495) [-1.33581]
Deposit Interest rate (-1)	0.241080 (0.10240) [2.35432]

Inflation (-1)	-0.133682 (0.05457) [-2.44965]
Real Effective Exchange rate (-1)	0.004628 (0.00369) [1.25251]

From the result, the deposit interest rate and the inflation are statistically significant while the growth gap, fiscal deficit, Dummy and Real effective exchange rates are not statistically significant. For the deposit interest rate and inflation, they are statistically significant and hence we reject the null hypothesis and conclude that the variables of deposit interest rate and inflation are not stationary and not cointegrated. On the other hand, the variables of growth gap, GDP per capita, fiscal deficit, Dummy and the real exchange rate are not statistically significant, hence we fail to reject the null hypothesis. We can infer that the variables of growth gap, GDP per capital, fiscal deficit, Dummy and real effective exchange rate are stationary and cointegrated.

The variables of deposit interest rate and inflation have cointegrating trends that are non-stationary and we can use restricted constant specification for the variables because they are not around a constant mean. The restricted constant specification for these variables is useful in modelling multivariate time series. Also, the variables of growth gap, GDP per capita, Fiscal deficit, Dummy and Real effective exchange rate cointegrating trend are stationary and no restriction is used.

Overall, VECM helps us interpret long term and short-term equations and determine the number of cointegrating relationships. VECM has more efficient coefficient estimates. However, when the variables are not stationary then the number of cointegrating equations are reduced.

Countries' Time Series Regression Result

Guinea

Variable	Coefficient (Standard Error)	P -value
Dependent variable: Growth gap		
Dummy	-2.088319 (1.834581)	0.2594
Constant	0.889949	
R -squared	0.020800	
Prob(F-statistic)	0.259443	

Variable	Coefficient	P-value
Dependent variable: Growth gap		
Inflation	-0.293024 (0.252205)	0.2500
Real Effective Exchange rate	-0.133591 (0.196620)	0.4995
Dummy	-1.736681 (1.857712)	0.3537
Constant	35.71016	
R-squared	0.050376	
Prob (F-statistic)	0.380169	

Variable	Coefficient	P-value
Dependent variable: Growth gap		
GDP per capita	0.005279 (0.005695)	0.3578
Fiscal Deficit	2.53E -12 (1.52E -11)	0.8685
Dummy	-1.945847 (1.916462)	0.3142
Deposit Interest rate	0.010000 (0.220963)	0.9641
Constant	-2.662172	
R-squared	0.053295	
Prob (F-statistic)	0.520010	

In the first model, Dummy variable is the only exogeneous variable and the coefficient is -2.088319. This means that the effect on growth gap for Guinea is smaller by 2.088319. The difference in the value of the promoters and non-promoters of this variable for growth gap is smaller by 2.088319. Since the value is not significant, we fail to reject the null hypothesis and conclude that there is no convergence. For the second regression, the three explanatory variables of inflation, real exchange rate and Dummy are not statistically significant, hence we fail to reject the null hypothesis. We conclude that there is no convergence. For the third regression output, there are four explanatory variables namely GDP per capita, Fiscal deficit, Dummy, and deposit interest rate. They are all not statistically significant hence we fail to reject the null hypothesis. Thus, we can see that there is no convergence among these variables for Guinea.

Liberia

Variable	Coefficient (Standard Error)	P-value
Dependent variable: Growth gap		
Dummy	-0.095000 (2.116509)	0.9643
Constant	-1.563743	
R-squared	0.0000033	
Prob (F-Statistic)	0.964345	

Variable	Coefficient (Standard Error)	P -value
Dependent variable: Growth gap		
Inflation	0.001051 (0.356717)	0.9977
Real Effective Exchange rate	-0.075190 (0.175862)	0.6705
Dummy	-0.159591 (2.297610)	
Constant	15.1806	
R-squared	0.003137	
Prob (F-Statistic)	0.979672	

Variable	Coefficient(Standard Error)	P-value
Dependent variable: Growth gap		
GDP per Capita	0.020616 (0.014351)	0.1563

Fiscal Deficit	-2.68E-09 (4.45E -09)	0.5489
Dummy	-0.145806 (2.148159)	0.9461
Deposit Interest rate	0.759143 (0.552327)	0.1747
Constant	-16.86413	
R-squared	0.054106	
Prob (F-statistic)	0.520825	

The first regression output explain the effect of dummy variable as an exogeneous variable. The dummy variable of -0.095000 is not statistically significant. The effect of an explanatory variable on the growth gap is smaller by 0.095000 . The difference in slope value of non promoters of growth and the promoters of growth is smaller by 0.09500. Since the Dummy variable is not statistically significant, we conclude that there is no convergence. For the second regression, the independent variables are inflation, real effective exchange rate and the dummy variable. None of the three variables is statistically significant, hence we reject the null hypothesis and conclude that there is no convergence among these variables. If the inflation increases by one unit, the growth gap increased by 0.001051 while holding other variables constant. When the real effective exchange rate increases by one unit, then the growth gap will decrease by 0.075190. For the third regression, the variables are GDP per capita, Fiscal deficit, deposit interest rate and Dummy. The four variables are all not statistically significant, hence we fail to reject the hypothesis and conclude that there is no convergence.

Nigeria

Variable	Coefficient (Standard Error)	P-value
Dependent variable :Growth gap		
Dummy	2.059780 (1.729475)	0.2383
Constant	2.631452	
R-squared	0.022725	
Prob (F-statistic)	0.238273	

Variable	Coefficient (Standard Error)	P-value
Dependent variable : Growth gap		
Inflation	-0.070096 (0.060208)	0.2490
Real Effective Exchange rate	-0.017534 (0.008867)	0.0527
Dummy	2.617277 (1.759296)	0.1422
Constant	6.420019	
R-squared	0.092006	
Prob (F-statistic)	0.124857	

Variables	Coefficient (Standard Error)	P-value
Dependent variable: Growth gap		
GDP Per Capita	-0.003746	0.0957

	(0.002212)	
Fiscal Deficit	-2.05E – 11 (1.43E-11)	0.1573
Dummy	2.125014 (1.756589)	0.2313
Deposit Interest rate	0.214099 (0.229431)	0.3546
Constant	0.771503	
R-squared	0.069369	
Prob(F-statistic)	0.374421	

In the first regression result, the Dummy variable is the only explanatory variable. The coefficient of the Dummy is 2.059780 which means that the effect on growth gap is larger by 2.059780. It is not statistically significant and hence we fail to reject the null hypothesis and conclude that there is no convergence. For the second regression, the variables are the Dummy, inflation, and real effective exchange rate. The inflation is not statistically significant; hence we fail to reject the null hypothesis and conclude that there is no convergence. If inflation increases by one unit, then the growth gap decreases by 0.070096 while holding other variables constant. The real effective exchange rate is statistically significant, hence we reject the null hypothesis. We conclude that there is convergence in the real effective exchange rate. If the real exchange rate increases by one unit, then the growth gap reduces by 0.017534 while holding other variables constant. Also, for the third regression, the variables are GDP per capita, Fiscal deficit, Dummy, and deposit interest rate. GDP per capita is statistically significant while the other three are not significant. For the GDP per capita, a one-unit increase will result to a reduction in the growth gap by 0.003746 while holding other variables constant. We reject the null hypothesis and conclude that there is convergence in the GDP per capita for Nigeria. The Dummy, fiscal deficit and deposit interest rate are not statistically significant; hence we fail to reject the null hypothesis and conclude that there is no convergence among these variables for Nigeria.

Sierra Leone

Variables	Coefficient (Standard Error)	P -value
Dependent variable: Growth gap		
Dummy	-0.424696 (2.206234)	0.8480
Constant	-0.714904	
R -squared	0.000607	
Prob (F-statistics)	0.847991	

Variable	Coefficient (Standard Error)	P-value
Dependent variable: Growth gap		
Inflation	0.120924 (0.384153)	0.7540
Real Effective Exchange Rate	0.004742 (0.011462)	0.6806
Dummy	-0.301649 (2.254143)	0.8940
Constant	-2.884662	
R -squared	0.004670	
Prob (F-statistic)	0.964024	

Variable	Coefficient (Standard Error)	P-value
Dependent variable: Growth gap		
GDP per Capita	0.034565 (0.020898)	0.1035
Fiscal Deficit	2.17E-09 (1.93E – 09)	0.2637
Dummy	0.556393 (2.242552)	0.8049
Deposit Interest rate	-0.108161 (0.128161)	0.4022
Constant	-6.430359	0.1063
R-squared	0.080824	
Prob (F-statistic)	0.290279	

For the first regression, the Dummy variable is the only explanatory variable in the regression. It is not statistically significant; hence we fail to reject the null hypothesis. We conclude that there is no convergence in the Dummy variable. The effect of the explanatory on growth gap is smaller by 0.424696. For the second regression, the explanatory variables are inflation, real effective exchange rate and Dummy variable and they are not statistically significant. Hence, we fail to reject the null hypothesis and conclude that there is no convergence among the variables of inflation, exchange rate and the Dummy variable. For the third regression, the explanatory variables are GDP per capita, fiscal deficit, Dummy and deposit interest rate are not statistically significant. Hence, we fail to reject the null hypothesis and conclude that there is no convergence among the variables in Sierra Leone.

Ghana

Variable	Coefficient (Standard Error)	P-value
Dependent variable: Growth gap		
Dummy	1.993389 (1.751697)	0.2596
Constant	-0.978728	
R-squared	0.020788	
Prob (F-statistics)	0.259581	

Variable	Coefficient(Standard Error)	P-value
Dependent variable: Growth gap		
Inflation	0.015141 (0.043035)	0.7262
Dummy	1.986941 (1.822345)	0.2800
Real Effective Exchange rate	-0.001590 (0.002337)	0.4990
Constant	-0.839141	
R-squared	0.028431	
Prob (F-statistic)	0.633378	

Variables	Coefficient(Standard Error)	P-value
Dependent Variable: Growth gap		
GDP per capita	0.002008 (0.002418)	0.4097
Fiscal Deficit	-2.62E -11	0.8606

	(1.48E -10)	
Dummy	1.787955 (1.795472)	0.3235
Deposit interest rate	0.043283 (0.145593)	0.7673
Constant	-3.201114	
R-squared	0.073935	
Prob (F-statistic)	0.338924	

For the first regression, the Dummy variable is the only explanatory variable, and it is not statistically significant. Hence, we fail to reject the null hypothesis and conclude that there is no convergence. The effect of the explanatory variable on growth gap is larger by 1.993389. For the second regression, the independent variables are inflation, Dummy, and real effective exchange rate. The three variables are not statistically significant. Hence, we conclude that inflation, dummy, and real effective exchange have no convergence. For the third regression, the explanatory variables are GDP per capita, fiscal deficit, Dummy, and deposit interest rate. These variables are not statistically significant, hence we fail to reject the null hypothesis and conclude that there is no convergence among these variables in Ghana.

The Gambia

Variable	Coefficient (Standard Error)	P-value
Dependent variable: Growth gap		
Dummy	1.987738 (1.855975)	0.2884
Constant	-0.924296	
R-squared	0.018457	
Prob (F-statistic)	0.288391	

Variable	Coefficient (Standard Error)	P -value
Dependent variable: Growth gap		
Inflation	0.034980 (0.107939)	0.7470
Dummy	2.293663 (1.844743)	0.2187
Real Effective Exchange rate	0.031501 (0.014972)	0.0397
Constant	-6.914495	
R-squared	0.090455	
Prob (F-statistic)	0.130472	

Variable	Coefficient (Standard Error)	P -value
GDP per capita	-0.002108 (0.008884)	0.8133
Fiscal Deficit	-2.45E -10 (3.22E -09)	0.9397
Dummy	2.327299 (1.982419)	0.2452
Deposit Interest rate	-0.253800 (0.359882)	0.4835
Constant	2.620222	
R-squared	0.038534	
Prob (F-statistic)	0.677496	

In the first regression result, the only explanatory variable is the Dummy variable. The Dummy variable is not statistically significant; hence we fail to reject the null hypothesis. We conclude that there is no convergence for this variable in The Gambia. The effect of the explanatory on the growth gap is larger by 1.987738. In the second regression, the explanatory variables inflation, dummy variable, and real effective exchange rate. The dummy variable and the inflation are not statistically significant; hence we fail to reject the null hypothesis and conclude that inflation and dummy variable have no convergence. On the other hand, the real effective exchange rate is statistically significant at 5% level. Therefore, we reject the null hypothesis and conclude that there is convergence in the real effective exchange rate in The Gambia. In the third regression, the explanatory variables are GDP per capita, Fiscal deficit, Dummy, and Deposit interest rate. They are all not statistically significant, thus we fail to reject the null hypothesis. We conclude that the variables of GDP per capita, fiscal deficit, Dummy and deposit interest rate have no convergence in The Gambia.

Furthermore, with increased convergence with the WAMZ, the growth gap would become narrower and the historical difference in growth pre-WAMZ and post WAMZ will be small. From the average growth Pre-WAMZ and Post WAMZ, Sierra Leone and Ghana moved above Nigeria in the post WAMZ period. Thus, Sierra Leone and Ghana achieved convergence because they grew above Nigeria. How was it achieved?

First, there was more conscious efforts of each of the countries- Sierraleone and Ghana- by their fiscal and monetary authorities towards adopting sustainable policies and efforts at synchronization of such policies with regional target (monetary policy target for inflation and output) set for each of the endeavors. Second, Sierraleone and Ghana have shown narrow divergence compared to other WAMZ member countries with respect to average outcomes of price stabilization efforts and better independent monetary policy pursuits. Third, Sierraleone and Ghana utilized more monetary policy instruments and determinants of less inflation divergence in the pursuit of well represented interest rates and some contractionary monetary policies which increased credit and diminished output supply/demand gaps.

Convergence and Divergence

The convergence and divergence in WAMZ are examined by smoothed regime in the Pre and Post WAMZ formation. The convergence of these six countries reflects the co-movements of the member states during the entire period and Nigeria took the lead from the beginning given its large economy and bear market regime. The criteria set by WAMZ for achieving convergence has its origin in the traditional Optimum Currency Area (OCA) theory which opines that countries that are exposed to similar symmetric shocks, business cycles and asymmetric shocks find it optimal to adopt a common currency.

Frankel and Rose (1998) posit that the inter-relationships between these countries for potential OCA focuses on four factors:

- 1) The extent of trade
- 2) The similarity of the shocks and cycles
- 3) The degree of labour mobility
- 4) System of fiscal transfers.

These countries and the four inter-relationship criteria have a greater linkage with the need for common currency (Balogun, 2008). Although the primary and secondary criteria set up by WAMZ have been used as the criteria, these four factors are already encapsulated in the primary and secondary criteria.

Meeting of the convergence criteria has not been consistent among member countries. Some of the countries met some of the primary or secondary criteria but fell short of meeting the same criteria ten years later due to inconsistencies, weak institutions, and poor leadership.

The prospect for macroeconomic convergence appears slim largely due to limited trade relations among WAMZ member countries and the Sub-Saharan African countries. Balogun (2008) assert that the low level of trade relations is caused using multiple inconvertible currencies within the zone, the narrow state of tradeable products in member countries, presence of tariff and non-tariff barriers to trade, multiple borders that exist among the countries, poor regional transportation infrastructure e.t.c

Regional integration through the monetary union is very important to stimulate trade relations. Ab initio, WAMZ was created to promote trade among member countries in addition to other reasons for WAMZ. Adoption of single currency agenda; implementation of ECOWAS Trade liberalization Scheme (ETLS) and adoption of a Common External Tariff (CET) can quickly drive us towards increased volume of trade and macroeconomic convergence. Efforts at macroeconomic stabilization have shown wide divergence among participants with large disproportionate weight given to Nigeria which now appears like an outlier in the proposed convergence club. The pursuit of optimal macroeconomic stabilization policy has resulted in negative spillover effects on the efforts towards convergence.

V: CONCLUSION

More broadly, this study considers the effects of different monetary and fiscal policies of the monetary union in West African Monetary Zone (WAMZ). Monetary union involves some costs and benefits for integrating countries following the real experience of European Monetary Union (EMU). An economic union promotes regional growth and stability which is needed for economic convergence among member states. A monetary union formation involves having optimum currency area (OCA) and WAMZ following the experience of EMU has the objective of ensuring rapid integration of the six economies of West African countries into a formidable monetary union. A strong monetary union requires the presence of intra-regional trade, adoption of a single currency for member and prospective members, high degree of mobility with the union, wage, and price flexibility e.t.c

Thus, utilizing data for a 63-year period spanning 1960 -2022, this study investigates the economic effects and reasons why economic convergence have not been achieved in WAMZ. This study draws evidence from six countries who are members of WAMZ namely: Ghana; Guinea; Nigeria; The Gambia; Sierra Leone and Liberia. Studies show that policy co-ordination in WAMZ has been weak in the last decade, but it appeared strong in the first 10 years between 2001 and 2011.

In all, three main results can be discerned from this study. First, for bilateral trade, even though a partner's exchange rate is important and positively influences the collective export of the two countries to the rest of the world, our results tend to validate our assertion that exchange rate does not matter as such in the intra WAMZ exports to warrant its use as an instrument of bilateral trade stimulation. However, it can be potentially useful as a common tool for balance of payment adjustment against the rest of the world. We can infer that the maintenance of an independent flexible exchange rate policy by either country in the bilateral trade makes no difference in export performance.

Second, monetary integration and success of monetary union have been stymied by lack of economic convergence. Lack of policy co-ordination and economic convergence have made it difficult to achieve monetary integration. Inflation and exchange rate issues have prevented convergence, especially given the vulnerability of WAMZ countries to external shocks and the experience of volatile inflation and exchange rates across the zone. The shocks emanating from COVID -19 pandemic have not been fully recovered.

Third, WAMZ member countries experience divergent real exchange rates prior to the creation of WAMZ in 2001. The real exchange rate post WAMZ shows an improvement in convergence among Nigeria, Sierra Leone, Gambia and Liberia. This implies that there are high possibilities for the Central Banks of Nigeria, Sierra Leone, The Gambia, Liberia to have unification albeit less harmonious movement at some points. The minimal convergence observed among four countries out of six implies that the journey is still long as some member states appear more convergent than others. Ghana and Sierraleone achieved convergence from their average growth. Also, we reveal an improvement when compared to pre- WAMZ statistics, which then suggests that the zone is moving in the right direction if they can execute more policies that will enhance integration.

For the success of the monetary union based on this study, we recommend the following:

- 1) Strengthening of fiscal, exchange rate and monetary policies performances through the integration of WAMZ countries, promote trade and inter country business collaboration by restricting travel ban and having visa free travels, enforce various regional agreements especially the ECOWAS trade liberalization scheme.
- 2) Adoption of common set of monetary, fiscal and exchange rate policies for dealing with regular external and internal shocks which are rife in the economy and expected to impact countries. Strong and effective coordination of fiscal and monetary policy to ensure exchange rate stability can support these buffers.
- 3) WAMZ member countries should ensure that fiscal integration should precede the introduction of the single currency (ECO) after satisfying the primary and secondary criteria needed for convergence.
- 4) The government of WAMZ countries should collaborate more and form currency union. This can foster trade interactions, policy harmonization and the removal of barriers to factor mobility. Massive investment in infrastructure is necessary to allow free movement of people and goods, hence increasing foreign investment which can quickly drive the currency union.

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