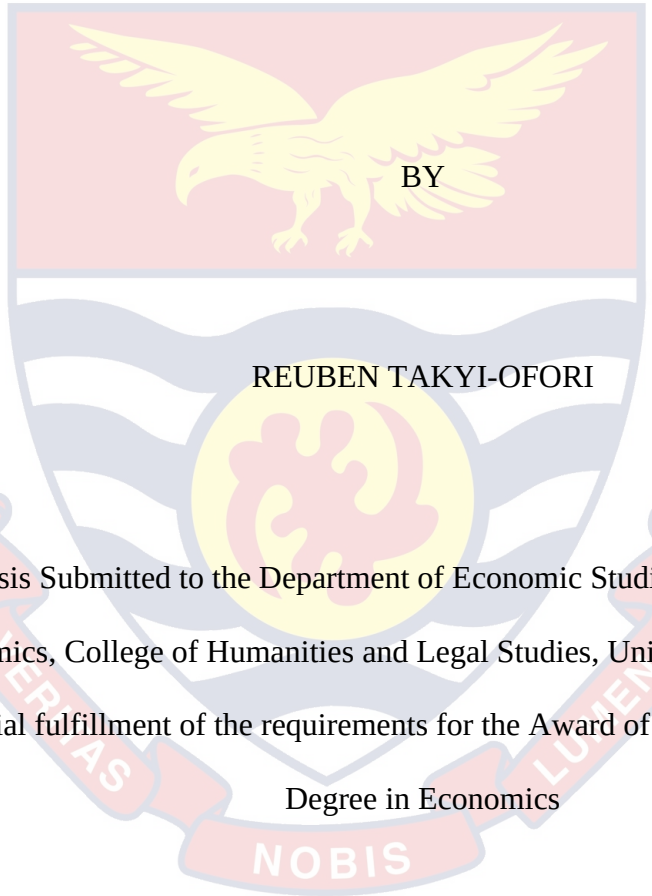
UNIVERSITY OF CAPE COAST

EFFECTS OF FISCAL AND MONETARY POLICIES ON ECONOMIC GROWTH IN THE WEST AFRICAN MONETARY ZONE (WAMZ)



BY

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Thesis Submitted to the Department of Economic Studies of the School of Economics, College of Humanities and Legal Studies, University of Cape Coast, in partial fulfillment of the requirements for the Award of Master of Philosophy Degree in Economics

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DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature ……. Date ……

Name: Reuben Takyi-Ofori

Supervisors' Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

Principal Supervisor's Signature: ..... Date: .....

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ABSTRACT

The study sought to investigate both the linear and asymmetric effects of fiscal and monetary policies on economic growth in the West African Monetary Zone by employing the linear and non-linear Autoregressive Distributed Lag model (ARDL). Secondary data from 1990 to 2016, gathered from World Development indicators (WDI), the IMF international financial statistics was used. The study found that, linearly, in the case of WAMZ and member countries like Ghana, Gambia, Guinea, Nigeria but not Sierra Leone, economic growth is positively influenced by government expenditure, money supply and real exchange rate while negatively influenced by real interest rate, inflation rate and tax revenue. Asymmetrically, growth respond more to an upward shift in government expenditure and real interest rate for the zone, Sierra Leone, Gambia and Nigeria; and respond more to positive changes in tax revenue and money supply in Ghana and Sierra Leone but not WAMZ. Also, the economic growth of all the member countries respond more to an increase in inflation. It is therefore recommended that, WAMZ as well as countries such as Ghana, Gambia, Guinea, and Nigeria should implement suitable measures tailored towards expanding government expenditures. Finally, it is recommended that, both policies should be coordinated effectively for WAMZ and its members as well to ensure sustainable growth

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DEDICATION

To my family

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LIST OF ABBREVIATIONS

ADF	Augmented Dicky-Fuller
AIC	The Akaike Information Criterion
APF	Aggregate Production Function
ARDL	Autoregressive Distributed Lag Model
BAP	Banjul Action Plan
BCEAO	Banque Centrale des Etats de l'Afrique de l'Ouest
BCRG	Banque Centrale de la Republique de Guinea
BOT	Build-operate- and-transfer
BSL	Bank of Sierra Leone
CAPA	Capital accumulation
CBG	Central Bank of Gambia
CBN	Central Bank of Nigeria
CUSUM	Cumulative Sum of Recursive Residuals
CUSUMQ	Cumulative Sum of Squared Recursive Residuals
DMO	Debt Management Office
DSA	Debt Sustainability Analysis
DW	Durbin-Watson
ECM	Error Correction Model
ECOWAS	Economic Community of West Africa States
ECT	Error Correction Term
EMCP	ECOWAS Monetary Cooperation Programme

EXR	Exchange Rate
FEC	Federal Executive Council
FIRS	Federal Inland Revenue Service
GDP	Gross Domestic Product
GDPPC	Gross Domestic Product Per Capita
GE	Government Expenditure
GMM	General Method of Moment
HIPC	Heavily Indebted Poor Counties
IMF	International Monetary Fund
INFL	Inflation Rate
IPS	Im, Pesaran, and Shin
LABF	Labour Force Participation Rate
LCC	Levin Lin and Chu
LR	Liquidity Ratio
MG	Mean Group
MPC	Monetary Policy Committee
MPR	Monetary Policy Rate
MS	Money Supply
MTDS	Medium Term Debt Management Strategy
NARDL	Nonlinear Autoregressive Distributed Lag Model
NCS	Nigerian Customs Service
NOP	Net Open Position Limit

OECD	Organization for Economic Cooperation and Development
OLS	Ordinary Least Square
OMO	Open Market Operation
PMG	Pooled Mean Group
PP	Phillips-Perron
PPP	Public-Private Partnership
PSBR	Purchasing Power Parity
RGDP	Public Sector Borrowing Requirement
RIR	Real Interest Rate
RTGS	Real Time Gross Settlement
SCF	Stabilization and Cooperation Fund
SIC	Schwarz Information Criterion
SSA	Sub-Saharan Africa
STA	Set Theoretic Approach
TAXR	Tax Revenue
VAR	Vector Autoregressive
WACB	West African Central Bank
WACH	West African Clearing House
WAEMU	West African Economic and Monetary Union
WAMA	West African Monetary Agency
WAMI	West Africa Monetary Institute
WAMZ	West Africa Monetary Zone

WDI	World Development Indicator

CHAPTER ONE

INTRODUCTION

This chapter encompasses the background, problem statement, research objectives, hypothesis as well as the study's organisation and significance.

Background to the study

Among the several objectives which countries strive to achieve through the implementation of various policies, economic growth is vital. Unfortunately, in Africa, the achievement of this objective appears to be a major challenge. Hence, several mechanisms have been put in place by most nations to address the impediments to economic growth. Among the many factors hindering the growth of Africa as well as other low-income countries is the inefficient regulation or implementation of macroeconomic policies which encapsulate fiscal and monetary policies (Havi & Enu, 2014). Africa's poor economic performance is also attributed to inadequate social and capital infrastructure, distorted product and credit market as well as the poor public service (Collier & Gunning, 1999).

According to Abata, Kehinde and Bolarinwa (2012), macroeconomic policy basically foster sustainable growth for countries. Fiscal policy is basically made up of taxes and government spending while monetary policy comprises primarily rate of interest and money supply decisions in an economy. However, economic growth has to do with a country's ability to produce more economic products (Matthiesan & Wall, 1982). Boyes and Melvin (2004) argue that, a country's achievement is measured by its economic growth and hence basically refers to the increase in a country's ability to supply more and various products to its people.

Economic growth therefore holds that, the more the economy grows, so does the well-being of its populace. Fiscal policy has its main aim as being a policy geared towards decreasing unemployment by ensuring that resources in the country are employed while the objective of monetary policy is to stabilize exchange rate and price by regulating the supply of money such that it corresponds to macroeconomic conditions. (Havi & Enu, 2014). Hence, there is a potential game-theoretic of fiscal policy with monetary. This interaction indicates that both types of policies have an impact on economic growth. (Tarawalie, Sissoho, Conte & Ahortor, 2013).

However, over the years, several literature has been produced on the discourse, all with the view of achieving macroeconomic objectives including growth, deployment among others (Georgantopoulos & Tsamis, 2011). Interestingly, researchers still argue on the basic dilemma, whether the effects of these two policies are non-linear (whether economic growth respond to changes in fiscal and monetary measures differently). Hence, investigating this non-linear effect is vital for policymakers because policies implemented based on linear effects might not give the intended results. On one hand, Barro (1990) suggested an endogenous growth model and showed that growth is indeed influenced by government expenditure-to-GDP. Bertola and Drazen (1993) later insisted this relationship as being asymmetric.

Keynesians believe that, in the short run, fiscal stabilization which means expansion in budget lead to economic growth. Thus, spending should be increased

while taxes decreased for countries operating below their potential outputs so as to curtail erratic changes in demand.

However, in the short run, the "non-Keynesian fiscal policy effects" such as public finance as well as economic activities could be increased owing to fiscal interventions as argued by recent works. This means that economic growth is affected by fiscal policy in a non-linear manner. (Vladimirov & Neycheva, 2009). Economic theories and concepts such as the theory of non-Keynesian effects, the theory of the credibility effect as well as the supply-side channel all explain the asymmetric effects of fiscal policy. For instance, empirically as well as a reduction in fiscal policy, the non-Keynesians assert that its effects on growth is dependent on fiscal impulse size and persistency, accompanying monetary stance among others.

On another hand, there are several theoretical underpinnings for the non-linear monetary policy effects. First and foremost, different monetary situations influence the attitudes of borrowers and lenders. When policy rate is increased by the central bank then banks should also increase their market rates. However, interest rates can only be increased by banks to a specific level as increasing it further could lead to a higher risk of defaulters. Contrary to this, there is no assurance that private borrowing and expenditure will expand when interest rate is decreased. Also, with negative and positive changes, monetary interventions tend to be neutral and non-neutral respectively according to the New-Keynesian theory (Cover, 1992). Credit restrict models states that in the event of a reduction in monetary policy, banks tend to be careful in advancing credits and thus will try

increasing interest rates. Also, the menu cost models evidently shows that firms are encouraged to alter the prices of their final goods in the event of higher inflation levels while the opposite is also true. Hence, in summary, fiscal and monetary policy effects are non-linear in nature and hence contrary to the findings of researchers including Mahmood and Sial (2012); Evans *et. al* (2018); Macek and Janku (2015) among others.

More so, the debate surrounding the effects of these two policies are rooted via traditional views of monetarists and Keynesians. For years scholars have recognized the role the importance of both policies towards achieving growth. Since the beginning of the twentieth century, monetary policy has occupied an important place in economic analysis. It lost its relative importance as an economic policy instrument after the great depression of the 1930s and following the Keynesian revolution gave way to the pursuit of fiscal policy to raise employment and output in the economy (Vaish, 2005). Consequently, in the 1940s and 1950s, economists considered the monetary policy as relatively ineffective (Gordon, 1981). However, the realization of how monetary policy is potent was seen in middle of the twentieth 20th century. Through the contribution of Friedman and other economists, monetary theory regained its place in economic literature. The debate between Keynesians and Monetarists was initiated and fiscal and monetary policies were often seen as two instruments that significantly influence economic activities (Javed and Sahinoz, 2005). In the past two decades, fiscal policy occupied an inferior position to monetary policy in both developed and developing countries.

Government's focus was rather on fiscal prudence, fiscal rules and debt sustainability (Blanchard *et al*, 2010).

Over time, member States of the West Africa Monetary Union (WAMZ); Ghana, Guinea, Gambia, Liberia, Sierra Leone, and Nigeria have adopted several macroeconomic policies with the motive or desire of achieving rapid and sustainable growth in their various economies. Some of these fiscal and monetary policies include Public-private partnership schemes and inflation targeting in the case of Ghana; revenue mobilization strategy and broad money growth for Guinea; monetary targeting for Gambia; the expansion of socio-economic opportunities to its populace and price stability, reserve money operating targeting and broad money targeting in the case of Sierra Leone and finally fiscal policy coordination and monetary targeting in the case of Nigeria ((Tarawalie, Sissoho, Conte & Ahortor, 2013).

In spite of the efforts to attain high growth for the zone and its member countries through the adoption of various fiscal and monetary policies, growth rate within the zone has been slow over the years. The West Africa Monetary Institute (WAMI) reports that the average GDP growth rate for WAMZ stood as low as -2.7% in 2016. Therefore, investigating the effects of these two policies in a monetary zone such as the WAMZ is deemed vital as it would bring to light the magnitude of effects of these policies on economic growth as well as sensitize policymakers on how to regulate these policies towards achieving rapid and sustainable growth within the zone.

Statement of the problem

Fiscal and monetary policies constituting the fundamental components of macroeconomic policy have long been considered as an important mechanism through which economic stability consequently leading to growth is achieved. On the other hand, Anyanwu (2003) states that, monetary integration enhance growth, investments as well as the region's ability to trade on the international market.

The region however, is faced with several difficulties including, reduction in growth and global demand; increased inflation levels, capital flows restrictions, increased exchange rate volatility, high levels of debt as well as reduction in external reserves (Amankwah-Amoah, Osabutey, & Egbetokun, 2018).

Hence, faced with these difficulties and in bid to achieve sustained growth of member countries, efforts have been made through the adoption of various policies such as maintaining real exchange rate stability, reduction of the ratio of budget deficit to GDP to 4% among others through proactive combination of these two policies but all to no avail. Hence to better regulate and adopt fiscal and monetary policies, it necessitates this study.

In determining how economic growth for group beneficiaries such as WAMZ respond to changes in fiscal and monetary policies, researchers including Tarawalie *et al.* (2013), ignore the joint effects and the non-linear effects of these two policies. However, Abdelsalam (2018), Bertolat and Drazen (1993) as well as Cover (1992) have emphasized that indeed, growth for countries respond to fiscal and monetary policies asymmetrically. Hence, to them, investigating this asymmetry effect is vital. This is because policies implemented on the bases of

having linear effects might produce misleading results. The joint effects, however, indicate whether economic growth (dependent variable) is being influenced by both policies and hence able to ascertain which of them has a greater effect. On the other hand, the extent to which macroeconomic variable(s) can influence economic growth is ascertained through the non-linear effect. Hence, the above-stated gaps are addressed in this study by analyzing the joint effects as well as the asymmetric effects of fiscal and monetary policies on economic growth in WAMZ.

Also, though several authors have attempted over the years to interrogate these macroeconomic policy effects on regions such as ECOWAS, WAEMU among others, it may be misleading when results from the region are generalized for each individual country. In other words, the true effect cannot be ascertained when results from the particular region are used to inform decisions or policy for the respective countries. This may, however, be so, because of the presence of noise introduced by some influential countries within the region. For example, in the works of Abdoulkader (2014), growth within the zone was influenced by both policies while it revealed as well that in attaining effective growth, monetary policy is powerful as compared to fiscal policy. This may be misleading in the sense that; this result may not hold for the specific countries within the zone.

Empirical studies by several authors including Havi and Enu (2014); Tarawalie, Sissoho, Conte, and Ahortor (2013) among others neglect the effect of tax as a vital component of fiscal policy while others make the use of government expenditure or recurrent expenditure as the sole measure of fiscal policy in their analysis. Fiscal policy is a demand policy, made up of government spending and

taxes which is used by the government in an attempt to influence macro-economic variables to achieve sustainable growth in an economy (Gandolfo, 2002). This, therefore, implies that, by the exclusion of this measure (tax), fiscal policy's actual effect is not ascertained. Hence, as this study is directed towards addressing this flaw, it will provide a more reliable result while expounding the real effects of fiscal policy for the zone.

Objectives of the Study

The overall objective of this study is to investigate the effects of fiscal and monetary policies on economic growth in the WAMZ. Specifically, the study aims at achieving the following objectives:

1. To estimate the effects of fiscal and monetary policies on economic growth in WAMZ as well as each member country.
2. To estimate the joint effects of fiscal and monetary policies on economic growth in WAMZ as well as each member country.
3. To determine the asymmetric effects of fiscal and monetary policies on economic growth in WAMZ and each member country as well.

Hypothesis of the Study

1. H_0: There is no significant effect of fiscal and monetary policy on economic growth for WAMZ as well as each member country.

   H_1: There is a significant effect of fiscal and monetary policy on economic growth in WAMZ as well as each member country.
2. H_0 *:* There is no significant joint effect of fiscal and monetary policy on economic growth in WAMZ as well as each member country.

H_1 : There is a significant joint effect of fiscal and monetary policy on economic growth for WAMZ as well as each member country.

3. H_0 : There is no significant asymmetric effect of fiscal and monetary policy on economic growth in WAMZ as well as each member country.

   H_1 : There is a significant asymmetric effect of fiscal and monetary policy on economic growth in WAMZ as well as each member country.

Significance of the Study

A number of studies including that of Mahmood and Sial (2012), Havi and Enu (2014) among others have been interrogating how economic growth changes to some components of these two macroeconomic policies using country or cross-country data but without much emphasis particularly on the West African Monetary Zone as well as its members. Literature on the effects of these two policy variables are mainly done in the developed countries and as such, these findings cannot be directly applied because it may not efficiently reflect the developing countries setting. The study will therefore, contribute to the debate by bringing to bear the magnitude of the effects of these two policies on growth in WAMZ to help policymakers make sound and informed decisions.

This work will illuminate the non-linear effects too so policymakers will be enlightened on the magnitude of which these macroeconomic policies should be increased or decreased. Hence, regulation, as well as the implementation of these policies, will foster rapid and sustainable growth in countries within the zone.

The findings of the study will make contributions to the ultimate goal of ECOWAS in achieving both monetary and fiscal integration for all 15 countries.

Its contribution stems from the fact that both the study's results and also policy recommendations will go a long way to smoothen the activities and operations of the incoming unions. The study will further add to the existing literature for future research works around this area.

Delimitation of the Study

The West African Monetary Zone is a six-member country made up of Ghana, Sierra Leone, Guinea, Gambia, Nigeria, and Liberia but due to unavailability data, five countries excluding Liberia were included in this study. The focal point of this work is on the economic growth of WAMZ and dwells on annual data from 1990 to 2016. The data set contains the following variables: GDP per capita, government expenditure, tax revenue (fiscal policy measures), real interest rate, money supply, real exchange rate, rate of inflation (monetary policy measures), gross fixed capital formation and labor force participation rate (control variables).

Limitations of the Study

One major issue the study encountered has to do with unavailability of data, which has always been a major challenge confronting previous works, particularly in developing countries. As a result, Liberia which is part of the WAMZ was excluded in this study.

Also, some of the variables suggested by literature to influence economic growth were not obtained due to unavailability and missing values of data. This led to the exclusion of some variables in the empirical model though the findings ae still valid.

The effects of a rise or fall in exchange rate was analyzed assuming the Marshall-Lerner condition holds. This condition asserts that currency depreciation results in a decline in imports but it leads to an upsurge in exports. The net effect of the currency depreciation is, therefore, a rise in net exports. This situation improves national output, hence enhancing the growth rate of the economy.

Organisation of the study

The entire work is structured in six chapters. Chapter one deal with the background, statement of the problem, objectives and the significance of the study. The second chapter give the trend of GDP growth in WAMZ, provide both theoretical and empirical literature on the discourse over the years. The third chapter reveal the research design, the model and the methods employed in the study and finally the description of data and their sources. In the fourth chapter, descriptive statistics and results of the estimations regarding the study are presented. The fifth and last chapter summarize, concludes and presents policy recommendations and also directions for further works.

CHAPTER TWO

LITERATURE REVIEW

Introduction

This chapter is divided into three sections namely, the trend of GDP growth in the West Africa Monetary Zone, theoretical and empirical review. The theoretical review consists of theories, themes or issues in which the study is embedded while the empirical review, on the other hand, deals with reviewing information taken into consideration the methodology of other works that will justify the outcome of this research.

Trend in WAMZ GDP Growth

In table 1 below, the highest growth rate recorded in WAMZ from the above was 10.3% in 2005 while its lowest growth rate was -2.7% in 2016.

Table1: Trends in Average Real GDP Growth Rate for WAMZ

YEARS	GAMBIA %	GHANA %	NIGERIA %	GUINEA %	SIERRA LEON %	WAMZ %
1990	5.8	2.4	5.7	2.3	5.1	4.2
1991	6.5	2.6	5.6	2.2	5.2	4.4
1992	6.5	2.3	5.7	2.1	5.2	4.3
1993	6.6	2.6	5.0	2.3	5.3	4.3
1994	6.4	2.5	5.1	2.2	5.6	4.3
1995	6.6	2.5	5.5	2.2	5.4	4.4

1996	6.7	2.4	5.7	2.2	5.5	4.5
1997	6.3	2.5	5.8	2.3	5.4	4.4
1998	6.6	2.5	5.6	2.2	5.2	4.3
1999	6.5	2.3	5.7	2.2	5.2	4.4
2000	6.5	2.5	5.4	2.4	5.1	4.4
2001	2.4	3.7	5.3	2.5	6.6	4.1
2002	2.6	4	4.4	3.7	-7.1	1.5
2003	-6.3	4.5	3.7	5.2	26.3	6.7
2004	3.5	5.2	10.4	1.2	9.3	5.9
2005	3.6	5.6	33.7	2.3	6.4	10.3
2006	-4.1	5.9	3.4	2.9	4.3	2.5
2007	-2.1	6.4	8.2	2.5	5.5	4.1
2008	0.3	4.3	6.8	1.8	8.1	4.3
2009	2.4	9.1	6.3	4.9	5.3	5.6
2010	3.1	4.8	6.9	-0.3	4.6	3.8
2011	3.1	7.9	7.8	1.9	5.3	5.2
2012	-7.4	14.1	4.9	3.9	6.3	4.3
2013	2.5	9.3	4.3	3.9	15.0	7.0
2014	1.4	7.3	5.4	2.3	20.4	7.4
2015	-2.3	3.9	6.3	0.4	4.5	2.6
2016	0.2	3.9	2.7	0.09	-20.3	-2.7

Source: Takyi-Ofori (2021)

Theoretical Review

Governments are responsible for the regulation of macroeconomic policies which influence the growth of their economies. Over the last decade and with regards to the growth effect of fiscal policy, a greater number of literature has been produced. Invariably, in macroeconomic management, fiscal and monetary policies work together. Thus, developments in a sector affects the other.

Undoubtedly, the disposable incomes of citizens as well as businesses is affected by how government tax and spends. Hence, buttressing how fiscal policy is needed as a measure of the health of any economy.

However, it is the belief of the monetarist school that economic activities are greatly affected by monetary policy. Thus, output is influenced by an unanticipated change in stock of money. In fact, they believe that, crowding out of the private sector would exist resulting from an increase in government expenditure. (Adefeso & Mobolaji, 2011). In recent times, the desire to achieve sustainable growth by countries warrants the use of both policies.

Theory of monetary integration

Monetary integration is the monetary unification of participating member countries in an economic union and involves the adoption of a common currency, coordinated exchange rate policies, and harmonization of fiscal and monetary policies. Corden (1972) emphasizes that the concept of monetary integration essentially involves the following:

i) An exchange rate union, i.e. an area within which exchange rates bear a permanently fixed relationship to each other even though the rates may, in unison, vary relative to non-union currencies; and

ii) ii) Convertibility – the permanent absence of all exchange controls, whether for current or capital transactions, within the area.

The optimum currency area theory

It was propanded by Mundell (1961), again completed by McKinnon (1963) and further by Kenen (1969). The response to a question on for instance under which circumstances does a country benefits from membership in a currency union is what the theory seeks to address.

The theory has it that, a country considering membership in a particular currency union has to have a balance of stability in the economy (thus the loss of national monetary policy) against gains in the monetary efficiency (thus gains in competitiveness due to the stimulated aggregate demand, a fall in the general price levels and enhanced export) of a common currency. If poorly integrated, member states of a common currency union encounter an asymmetric macroeconomic shock owing to the loss of sovereignty in economic monetary policy (Baldwin & Wyplosz, 2009). An asymmetric economic shock refers to the situation in which a shock hits only one part of a currency union while the other part is not affected or a situation in which the impacts of shocks differs widely among member states of a currency union. Thus, there will be disequilibrium if some member states of a currency union experience a positive (negative) demand shock, this is because prices and outputs in the countries in question would be too high (low). The central bank of the union on this note will then have to intervene by increasing the supply of money so as to enable countries to improve the economic strength but this is done at the cost of inflation.

Optimum currency area criteria

The sustainability of member states in a currency union is guided by a set of criteria offered by the Optimum Currency Area theory. Broadly, these criteria can be grouped into two.

The first category refers to the set of criteria that aims at decreasing the member states exposure to asymmetric shock. Openness or interregional trade, similarities in economic structure among member states and a low degree of specialization appears to be the elements found in the first group.

The second group also refers to a set of criteria that aims at facilitating the adjustment to the asymmetric shock. They include the mobility of factor, homogeneity of preferences and the transfer payments.

With respect to the first category, Baldwin and Wyplosz (2009) argued on the significance of the similarities in the economic structure of the member states. Asymmetric economic shocks to a particular currency union are minimized if differences among countries in the economic structure are small. This is because, the rate at which participant countries respond to economic shocks are comparable therefore a monetary policy implemented by the central bank will benefit all members equally.

Baldwin and Wyplosz described the openness criterion which also known as the McKinnon criterion. They argued that participant counties will not lose their policy autonomy when they are so open for international trade.

There is the thought that having trade within a region (intraregional trade) within a particular monetary union will boost the product markets integration and therefore lead to economic integration through the closer trade links created. Again, the Kenen's criterion which refers to the low degree of specialization suggests that there is a small impact of sector-specific shocks given that countries in question produce a wide variety of goods.

In considering the second category of criteria of the Optimum Currency Area, the homogeneity of preferences for the member states is seen as a very important qualification so as to guarantee efficient management of the crisis. An agreement on how to address the asymmetric shocks appears to be an important measure for monetary policy that aims at serving as a one-size-fits-all method for the whole currency union. Mobility of factor embodies the ability of labour and capital to move freely. Mundell pointed out that populace of not endowed areas can move to places where prosperity is being felt.

Concept of monetary union

An area where exchange rates are related to each other is basically referred to as monetary union. However, for several currencies to achieve integration through a permanently fixed exchange rate and consequently create a single currency, their currencies must be convertible into one another. A common currency, monetary and fiscal policies, central bank among others are some of the features of a monetary union.

Monetary union theorists have contended that countries engaged in international trade are better of with fixed exchange rates vis-à-vis their trading

partners. At full employment level and also a decrease in the export of a country, equilibrium is re-established when traded products are produced more than the non-traded one. Also, how fiscal policy is managed by participant countries is very vital. Other participant members are influenced greatly by the actions or inactions of fiscal policy within the union (Itsede, 2001).

Fiscal and monetary policy debate

The debate on fiscal and monetary policies is deemed old in economic literature. In economic history, there exist various theories backing different views concerning the matter of the debate. The disagreement about the importance of these two policies as economic policy instruments is the consequence of different assumptions made by the various schools of thoughts.

Classical theory

Prior to the Keynesians revolution, economic theory was based on the classical economic theory and monetary policy was considered as an important tool to achieve stability and full employment in the economy (Vaish, 2005). The classical model assumes perfect competition, flexible prices, and full information. It has its foundation in Say's law stipulating "supply creates its own demand". This law assumes that workers receive income from labor so as to purchase output. Therefore, producing output generates income for its consumption. The law "supply creates its own demand" implies that aggregate expenditure must be equal to output, meaning that market forces do not bring about prolonged aggregate demand and unemployment decrement (Snowdon & Vane, 2005).

Based on this law, economists in this school of thought argued that the economy will return to its full-employment level. This implies that there is a self-correcting mechanism and left alone, the economy will move towards full employment. Consumption, investment and savings in the classical model are functions of interest rate. Households do not spend all their income. When interest rate is high, they will be willing to replace present consumption with future consumption by saving more. Thus, households' consumption responds negatively to interest rate. Savings are positively related to interest rate while investment, is negatively related to interest rate. At the equilibrium, households' savings equal the capital investment. The classical model is therefore based on the idea that the paradox of thrift and the marginal productivity of capital determines investment.

According to this school of thought, output level is not determined by aggregate demand. The classical aggregate supply curve is perfectly inelastic. This implies that real output and employment are supply-determined and therefore affected by population, technology and capital formation. If the supply of money expands, households will spend the excess money balances therefore leading to a rise in demand while price rises. According to classical economists, the quantity of money is neutral in the long run. Consequently, expansionary monetary policy is completely ineffectual (Snowdon & Vane, 2005). However, monetary policy is quite important in the classical system because it prevents the fluctuation of wages and prices. Classical economists believe that unemployment is due to wage rigidity. Thus, in order to prevent shifts in savings propensities or investment prospects from requiring wage and price changes, the money supply should be kept stable (Ackley,

1961). On the other hand, from classical views, government intervention will bring distortions in the economy even though it has an important role in providing a legal framework and sustaining national defense.

Keynesian Theory

After the great depression of the 1930s, throughout 1940s and 1950s, fiscal policy became the major macroeconomic policy instrument. This development in economic theory and policy brought on the book "*The General Theory of Employment, interest and money*" in 1936. This theory showed the ineffectiveness of monetary policy to remedy depression or unemployment and advocated the use of fiscal policy (government's tax and spending policies) (Vaish, 2005). Keynesian theory, unlike the classical model, is based on the assumptions that prices and wages are inflexible. Investment decisions are seen to be independent of savings decisions and interest rate is not influenced by the paradox of thrift and marginal productivity of capital but is a monetary phenomenon (Snowdon & Vane, 2005).

Therefore, how monetary policy influence output in the Keynesian model is indirect. A shift in money supply bring on a shift in interest rate altering investment. The shift in investment then affects nominal GDP. As a result and in the Keynesian view, the economy is influenced only by monetary policy through the interest rate. Keynesian economists believe that even though money is important as it determines income level as well as unemployment, monetary policy is more ineffective, the more interest-elastic demand for speculative cash balance is. In the Keynesian system, monetary policy is not recognised as important in terms of stimulating activities as against the positive role of fiscal policy and hence

rejecting the idea that a balanced budget was always desirable for the government (Landreth, 1976).

Monetarist School

In the mid- 1950's, Keynes' theory based on the results from empirical research was questioned by supporters of this school of thought. The revival of monetary policy was made possible through the contributions of various economists. Led by Milton Friedman, the monetarist school showed that "money does matter" (Vaish, 2005). Monetarism has its origins in classical economics. The monetarist school believes that changes in interest rate determines demand for money. Hence, changes in money supply directly bring on changes in aggregate demand which affect nominal GDP. Therefore, monetarists believe in a more direct monetary transmission mechanism. On the contrary, rate of interest rises resulting in a reduction of investment by as much as government spending increased if the government decides to increase government spending by selling bonds to the public. Hence according to the monetarists, in the short run, output, employment and consequently growth is affected by shifts in the supply of money.

New Classical School

The high inflation and unemployment of the 1970s in the west brought on a new development in economic theory named the new classical economics. Economists in this school criticized the Keynesians and the monetarists' assumptions concerning price expectations. The new classical model, unlike the classical model, is based on the assumption of imperfect information and on the rational expectation hypothesis which entails using all available relevant information concerning the variable being predicted. The New classical believe that

output is not influenced by aggregate demand in the short run. Aggregate demand shifts does not affect real output because they are predictable. Thus, only unanticipated aggregate demand shifts because of unanticipated monetary and fiscal policy actions or policy actions that are not fully anticipated, have short run effects on real output and unemployment.

Modern Macroeconomic Theory

From modern macroeconomic theory, both fiscal and monetary policies play important roles as stabilization policy tools. Robert Mundell in 1971 insisted a coordination between these two policies so as to achieve macroeconomic stability and growth. According to Mundell, monetary policy should aim at external objectives while fiscal policy aims at preserving internal stability. Also, in his work "Monetary- Fiscal policies and growth objectives", Schlesinger (1960, p. 277) stated that "Although some economists may prefer on the basis of value judgments to emphasize fiscal policy, while others would prefer monetary policy, the connection between the two instruments can be ignored by none. Fiscal policy operates on how it affects monetary conditions, while the tone of monetary policy is determined by the fiscal situation.

Economic Growth

Throughout literature, economic growth has been viewed as a vital objective with researchers attempting to assess ways in which this objective can be realised (Fadare, 2010).Labour and capital greatly affect economic growth according to Khosravi and Karimi (2010). Other factors which affect economic growth has been questioned by researchers because of the existence of endogenous

growth theory. (Bogdanov, 2010). According to Slavin (2005), the yearly percentage change of gross domestic product is referred to as economic growth.

The National Council on Economic Education defines economic growth "as an increase in the capacity of an economy to produce goods and services, compared from one period of time to another. Economic growth can be measured in nominal terms, which include inflation, or in real terms, which are adjusted for inflation". Hence, an increase in an economy's potential output basically refers to economic growth. Thus, expansionary tax interventions can increase a country's growth rate (Olopade & Olopade, 2010).

The reason why countries grow at different rates over a period is provided by economic growth while it also influences government's decisions with regards to taxes and spending so as to bring about growth.

Fiscal policy and Growth

During the great depression era, The Keynesian School of thoughts argued that the huge decrease in income and employment was as a result of lower aggregate spending in the country (Kaldor, 2015; Tily, 2016). In recessions, Keynesian economists called on governments to restore growth through the expansion of public expenditure and/or lowering taxes (Klein, 1947).

A country's budget serves as a medium through which fiscal policy is implemented. Thus, a country's economic life is being shaped by the kind of budget it prepares. Most importantly, a public budget serves as a way through which an economy is managed. (Omitogun & Ayinla, 2007). Government's spending decisions as well as tax levies with the intention of influencing macro-economic

variables make up what is referred to as fiscal policy. The goal of this policy is principally to quicken socioeconomic improvement by adopting a policy action which brings about coordination among tax, spending and borrowing and hence fosters growth. (Quashigah, Ofori-Abebrese & Pickson, 2016). Fiscal policy sees to government planned interventions which deals with spending and taxation directed towards macro-economic activities in a desired direction consequently stabilizing the economy. Dornbusch and Fischer (1990) posits that, countries are able to recover in the event of recession when expansionary fiscal policy is adopted while contractionary fiscal policy affect their economies adversely.

Fiscal policy involves the ability of government to use available resources and spending capability to accomplish achieve stated goals (Medee & Nembee, 2011). It basically involves using government spending and taxes in an attempt to affect economic growth. This policy basically has to do with reconciling the modifications in taxes and spending done by government. (Hottz-Eakin, Lovely & Tosin, 2004). Anyanwu (1993) argued that, in order to ensure that government interventions and it accompanied economic stability are consistent, conducive environments which facilitate growth of businesses are brought about by fiscal policy. Hence, smooth business cycles as well as economic growth will be achieved if fiscal policy together with other measures are used cautiously.

In principle, provided the amount of government debt held by its citizens has a limit and fiscal policy and monetary policies are set independently, fiscal dominance can be achieved. Hence, magnetizing fiscal deficits would therefore lead to the inter-temporal budget constraint being satisfied. In fact, a country's central bank would

have no option than to do this (magnetize deficits) if relatively, its financial system is small compared to its fiscal deficits. Fiscal dominance is promoted or achieved through efficient monetary control instruments. Therefore, government's security markets coupled with central banks' inability to accumulate enough tangible assets in low-income countries results in not achieving fiscal dominance (Oyejide, 2003).

Monetary Policy and Growth

The monetary theory indicate that, monetary policy regulates the supply of money and rate of interest so as to achieve the goals of the country which ultimately has to do with growth (Shoaib, 2010). Monetary policy basically involves the mechanism by the supply of money is managed in a country which mostly entails interest rate targeting in order to achieve economic growth. Government can engage in either an expansionary or contractionary monetary policy. Studies depict that, there is the need for stakeholders, decision makers, governments etc to grasp the process by which the economy is affected by monetary policy in order to accurately determine monetary policy with regards to its magnitude and duration. (Nwaogwugwu & Evans, 2016; Stojanović & Stojanović, 2017; Hamza & Saadaoui, 2018; Lin &Ye, 2018).

How monetary policy variables are related to the monetary authority outcomes are given by monetary policy and as such this serves as a medium through which monetary circulation is regulated. The goal is to achieve stabilization of the internal and external value of the currency. So as to achieve the desired economic objectives, government through discretionary ways control the supply of money within an economy as that is essentially what monetary policy is about. Thus,

because governments have the notion that their growth rate influences the inflation rate, they tend to attempt to regulate money in circulation. It therefore follows that, the monetary sector of a nation is influenced by the actions of policymakers. Hence, the use of monetary instruments by monetary authorities example the central bank can be termed as monetary policy. These instruments can however be either direct or indirect depending on the objectives of that said economy.

When economies have adequate money and financial markets like the developed countries, monetary policies are mostly effective. This is where shifts in several monetary variables are affected by a change in one monetary variable. Hence, government's effort in managing the money circulation so as to achieve particular economic goals is referred to as monetary policy (Ogunjimi, 1997). Hence, demand for product would expand with a rise in price and consequently deteriorate the balance of payment.

Over the years, the monetary authority has been tasked with managing monetary policy, a task they are committed to effectively controlling the supply of money. However, in recent times moderate inflation has been recorded coupled with increase in the growth of output all owing to the performance of monetary policy. There is a need for the development of confidence in the inter-bank market and the necessary financial market infrastructure as well as appropriate collaboration with the fiscal authorities in order to sustain this effort.

Non-Linear Effects of Fiscal and Monetary Policy

Fiscal policy

The traditional Keynesian School posits that, countries reap lower GDP growth when they levy higher taxes or reduce government spending in an attempt to achieve fiscal consolidation. However, other views contrary to this assertion stipulate that output in the short run is affected by an expansionary budget consolidation. How output react in an economy as a result of discretionary budgetary policies is dependent on the budget adjustment make-up, size and persistency of the fiscal impulse.

Furthermore, through the demand or supply-side, output is influenced by fiscal policy as stipulated by the non-Keynesian effect theory. The wealth effect on consumption essentially explains the demand-side non-Keynesian posits (Giavazzi & Pagano, 2000, Alesina & Perotti, 1996, Perotti, 1999). Private consumption and consequently output is increased as a result of restrictive budget policy which has to do with reduction in future taxes as well as increased present value of household income. As opposed to the traditional view, the process by which due to a reduction in spending leads to an expansion in consumption is termed the wealth effect and hence depicted as the expectation view of the fiscal policy. However, when changes in fiscal interventions are seen as permanent, this effect is much stronger. Also, the debt-to-GDP ratio basically influences a positive wealth effect presence. Hence, taxes are likely to increase when a certain high level of this ratio is recorded. The likelihood of an upsurge in taxes becomes lower when measures such as fiscal restrictions employed.

Moreover, the credibility effect on interest rate explains expansionary fiscal contractions (Alesina et al. 1992). Thus, in the event of fiscal stress, this effect is efficient with high debt/GDP ratio. Due to inflation, businesses may be confronted with an interest rate premium resulting from high public debt levels. Crowding-in private investments may occur when there is a reduction in risk premium leading to further interest rate reduction all owing to fiscal consolidation.

Also, the supply-side channel is considered (Alesina & Ardagna, 1998). The process where an economy is about attaining full employment level, private sector employment would increase as a result of reduction in government employment is referred to as labour market. Also, when government sector salaries increase, so does labour cost per unit and wages in the business sector. Companies' competitiveness and net export increase in the event of fiscal restrictions resulting from labor cost reduction in open economies with a flexible exchange rate system.

The supply-side channel operates in both competitive and unionized labor markets (Ardagna, 2004). Employment in the private sector reduces as a result of an expansion of public employment. The resultant effect therefore is that, profits, investments and output decrease while real wage expands. When public employment increases which means a raise in the wages of people who are engaged in the public sector, it increases the union's wage claims in the private sector, increases wages and hence profits and capital decline. This therefore emphasizes the fact that in the short run, spending and GDP growth are inversely related.

Monetary Policy

There are several theoretical underpinnings for the non-linear monetary policy effects. First and foremost, different monetary situations influence the attitudes of borrowers and lenders. When policy rate is increased by the central bank then banks should also increase their market rates. However, interest rates can only be increased by banks for a specific level as increasing it further could lead to a higher risk defaulters. Contrarily, there is no assurance that private borrowing and expenditure will expand when interest rate is decreased by the monetary authority because economic situations can have adversely effect on it.

Moving on, in the event of negative shifts, monetary actions are neutral while it is non-neutral for positive shifts according to the New-Keynesian theory. (Cover, 1992). Credit restrict models states that banks tend to be careful in advancing credits while trying to increase interest rates during contractionary monetary policy. Also, the menu cost models evidently shows that firms are encouraged to change the prices of their final products in the event of higher inflation levels while the opposite is also true.

Empirical Literature Review

This section focuses on the results or findings of other researchers. However, several years down the line, fiscal and monetary policies effect has brought about divergent views and theories among authors resulting from different results. Below are some of the different results;

Fiscal, Monetary policy and growth

Firstly, Tarawalie et al. (2013) investigated how fiscal and monetary authorities in WAMZ countries are coordinated and how it affects meeting the

inflation and fiscal deficit criteria. In order to estimate the degree of policy coordination within WAMZ, this study employed the Set-Theoretic Approach (STA) and the vector autoregressive (VAR) modeling. This work used data from 1980 to 2011. Findings indicated participant countries had a weak policy coordination, hence, emphasizing them not meeting the inflation and fiscal deficit criteria. The results of the set-theoretic models show that explicit policy coordination scores in the WAMZ countries are less than 50.0 percent, with The Gambia obtaining a coordination score of 46.6 percent, Ghana (34.5), Guinea (31.8), Liberia (37.9), Nigeria (46.6) and Sierra Leone (41.3). The impulse response results indicate a weak response to changes induced by different variables.

However, Evans *et al.* (2018) studied the relative effect of monetary and fiscal policy on economic development in Africa from 1995 to2016 using the St. Louis equation and the general method of moments (GMM) approach. The study reveals that money supply and interest rate have positive and negative but significant relationship with GDP per capita respectively. Also, public expenditure and tax have negative and positive relationship with GDP per capita respectively.

Mahmood and Sial (2012) studied the role of monetary and fiscal policy in the economic growth of Pakistan using time series data from 1973 to 2008. Using the augmented Dickey-Fuller unit root procedure and Autoregressive Distributed Lag Model technique. GDP and Government Current Expenditure (GCE) was negatively related while, positively for Currency in Circulation (CIR) and Government Development Expenditure (GDE).

In addition, Havi and Enu (2014) employed the Ordinary Least Squares (OLS) to assess the relative importance of monetary and fiscal policies on economic growth in Ghana from 1980 to 2012. The study aimed at examining potency of these two macroeconomic policies towards enhancing Ghana's growth. The researchers found that both policies positively affect the Ghanaian economy. Meanwhile, the results indicated that economic growth in the country is improved by monetary policy as it is more potent. It was therefore suggested that in order to achieve economic growth with it accompanied economic stability, Bank of Ghana through interest rates, lending rates, inflation rates and exchange rates stabilization should put in place favorable environment for investments

Also, Noman and Khudri (2015) studied the impact of fiscal and monetary policies on economic growth in Bangladesh. Line diagram, correlation matrix, multiple linear regression models and trend analysis was employed. The work sought to evaluate the trends in policy variables and examine the impact of these two policies on economic growth (RGDP). The results indicated that RGDP is negatively affected by inflation rate and the interest rate on deposit. Also, during the period of investigation, the trend of interest rate and inflation fluctuate and narrow money decreased between the year 1999-00 and 2001-02.

Moreover, through their study of the relative effectiveness of the fiscal and monetary policy, Dahalan and Jayaraman (2006) through the use of the Granger causality tests confirmed the results from the bounds-testing approach of the cointegration between Fiji's economic growth and the two policies and exports.

Thus, government expenditure is found to greatly affect Fiji's GDP than monetary policy and exports. Hence, growth is affected by fiscal policy and exports.

Fiscal policy and growth

Also, Srithongrung and Sanchez-Juarez (2015) investigated the effects of fiscal policies on sub-national economic growth in Mexico. This work used subnational government finance data during the period of 1993 to 2011 which were drawn from thirty-two (32) the Mexican States. Using the budget constraint model together with Error Correction Model (ECM), the results suggested that taxes negatively relate to economic growth in transitory and permanent manners. In consonant with economic theory, the study showed that investment which is positive, significantly and directly influence subnational growth. Generally, findings of this work implied that appropriate fiscal policy must be instituted to enhance economic growth in Mexico.

Furthermore, Osuala and Ebieri (2014) applied the General- to-specific approach to Autoregressive Distributed Lag (ARDL) model to analyze the impact of fiscal policy on economic growth for the periods of 1986 to 2010. The results indicated that fiscal growth and economic growth in Nigeria were related. The study disclosed that government recurrent and capital expenditures positively affect growth, whereas non-oil taxes and government total debts have an insignificant effect on economic growth. The researchers suggested to the government to channel its debts towards the provision of critical infrastructure.

Notwithstanding, the impact of fiscal policy variables on South Africa's economic growth from 1990-2004 was studied by Ocran (2009). It was found that

government consumption expenditure, gross fixed capital formation and tax receipts positively affect on economic growth. The size of the deficit had no significant impact on growth outcomes.

Additionally, Igwe, Edeh, and Ukpere (2019) through their study titled "Impact of Fiscal Policy Variables on Economic Growth in Nigeria", used Johansen cointegration and vector error correction model to assess the effects of capital expenditure, recurrent expenditure, and direct income tax on economic growth for the periods of 1970 to 2012. The empirical results suggested that in the long-run, Nigeria's economic growth was affected significantly and positively by capital and recurrent expenditures while negatively by direct income tax. The study, therefore, suggested that tax which is growth enhancing should be adopted.

In the study carried out by Macek and Janku (2015), methods and tests of panel regression were used to examine the impact of fiscal policy on economic growth depending on institutional conditions in the OECD countries from 2000 and 2012. It was obvious from the results that government spending was positively related to economic growth for countries with lower fiscal transparency, while negative for countries with higher fiscal transparency. Results revealed that taxation and economic growth in countries with worse institutional conditions are inversely related.

Monetary policy and growth

Using available data, Balolgun (2007) also investigated the economic and monetary performance of WAMZ countries. The null hypothesis of independent monetary and exchange rate policies was tested. Results from the study showed that

real domestic outputs of these countries are adversely affected by changes in domestic monetary policy. It also showed that real output is affected by monetary policy which is however in two quarters. Findings depicts that although inflation decreased because of domestic output expansion, the fueling effects of past inflation was not affected.

More so, Ridhwan, de Groot, Henri, Nijkamp and Rietveld (2010) studied the impact of monetary policy on economic growth and development in some economies using vector autoregressive (VAR) models and found that capital intensity financial deepening, the inflation rate model types used and economic size are important in explaining the variation in outcomes across regions and over time.

Non-linear effect of fiscal, monetary policy and growth

Abdelsalam (2018), studied the asymmetric effect of monetary policy in emerging countries through the use of non-linear ARDL model. Subsequently to emphasize the existing relationship, the Wald test was used. Empirically, the findings showed that inflation and real production were affected by only small changes or shocks considerably with regards to the policy size while only positive shocks affect both variables with regards to the direction of the policy.

Again, Slimani *et al,* (2016), investigated the relationship between fiscal policy and economic growth for a panel of 40 developing countries from 1990 to 2012 with a focus on a comparative analysis between Morocco and the panel. The results showed that, first, economic growth is influenced adversely when exceeding a budget deficit level of 4.8% of GDP or a fiscal surplus level of 3.2% of GDP, economic growth was negatively affected. Also, total investment conditions the

sign and how budget deficit is related to economic growth. However, from Morocco's perspective, analysis of threshold effects suggested that above 4.8% of the budget deficit, average growth rate falls by 2.1%, while median growth falls by 1.5%.

Also, Mohsen & Mohsen (2015) examined the nonlinear effects of fiscal and monetary policies on inflation from 1990 to 2013 based on threshold model. First lag of the liquidity growth was recognized as the threshold variable with threshold value estimated at 6.37 percent. In low liquidity growth, the results indicated that inflation expectations and the lagged liquidity growth were the most important determinants of inflation. In high liquidity growth, effects of the variables including liquidity, development and con-current expenditure, exchange rate, budget deficit, and inflationary expectations were much stronger than a low one. Based on results, it seems that liquidity growth can be considered as the most important factor.

Conclusion

From the theoretical point of view, each school of thought or theory assesses the fiscal and monetary policy effects particularly on its underpinnings or principles. The classical and the monetarists believe that only monetary policy essentially determines the output level and that government intervention is ineffectual on one hand while the new classical argue that only unanticipated monetary and fiscal policies affect output. Empirically, studies have investigated the growth-effects of these two policies using various econometric models ending up with different results but without much emphasis on the West African Monetary

Zone as well as the magnitude of effects for each member countries. One vital component of the fiscal policy which tax revenue is omitted by several studies and hence underestimating the magnitude and the effect that fiscal policy exert on economic growth.

Again, studies have attempted to look at the non-linear effect as well as the joint effects of these policies, especially in WAMZ. Last but not least, the estimation techniques employed by authors failed to measure both the long and short run effects of these policies on economic growth and as such to address this, the ARDL model is used in this study. Therefore, this study will contribute to the existing literature as it attempts to bridge the gaps identified.

CHAPTER THREE

RESEARCH METHODS

Introduction

The chapter deals with the econometric methods employed to attain the main objectives on which this study is built. Consequently, this chapter discusses the research design as well as the theoretical model for the empirical analysis, variable description and expected sign, the estimation techniques and finally the data type and source for this study.

Research Design

It refers to the composition of research and thus, the "Glue" binding a research project together. Owing to the overall objective of this study as well as the benefits of quantitative research design such as being more reliable, objective, having high levels of applicability and generalizability, the quantitative research design is employed to estimate this study's objectives.

Theoretical and empirical model specification

On this discourse, the theoretical framework asserts that monetary and fiscal policies explicate real business cycle and contends that these policies influence growth and as such the study employed the neoclassical production function The use of the model below which is related to total factor productivity of growth conforms to previous studies by Ahmad and Malik (2009), and Akanni and Osinowo (2013**)**. Aggregate Production Function (APF) which relates capacity output to the volume of the various inputs used in production can be expressed below:

$$Y_t = f(T_t K_t^{\beta 1} L_t^{\beta 2}) \quad \text{..... (1)}$$

Where Y_t indicates the aggregate output, which is proxied by gross GDP per capita (GDPPC), K_t represents capital accumulation (CAPA) measured by gross fixed capital formation a share of GDP, L_t connotes labor, T_t presents total factor productivity while "$\beta 1$" and "$\beta 2$" are the elasticities for capital and labour. Total Factor Productivity which takes into consideration the other factors which affect output other than labour and capital can be represented as:

$$TFP = \int (GE, TAXR, MS, RIR, EXR, INFL) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

In modelling output to be a function of labour, capital and the factors under total factor productivity, the second function is substituted into the first function to obtain the third function as:

$$GDPPC =$$

$$f\left(GE^{\beta 1} TAXR^{\beta 2} MS^{\beta 3} RIR^{\beta 4} EXR^{\beta 5} INFL^{\beta 6} CAPA^{\beta 7} LABF_t^{\beta 8}\right)\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

The above function (3) is modeled and linearized by logging each variable to obtain the econometric model in the form:

$$LnGDPPC_{it} = \beta_0 + \beta_1 LnGE_{it} + \beta_2 LnTAXR_{it} + \beta_3 LnMS_{it} + \beta_4 LnRIR_{it} + \beta_5 LnEXR_{it} + \beta_6 LnINFL_{it} + \beta_7 LnCAPA_{it} + \beta_8 LnLABF_{it} + e_{it} \ldots\ldots\ldots\ldots\ldots (4)$$

To achieve the objective of estimating the third research objective, equation (4) is modified to include the interaction terms of government expenditure and money supply. These variables serve as proxies for both fiscal and monetary policies as well as consistent with Noman and Khudri (2015) and the current

policies adopted by WAMZ. The econometric form is therefore given in equation (5) as:

$$LnGDPPC_{it} = \beta_0 + \beta_1 LnGE_{it} + \beta_2 LnTAXR_{it} + \beta_3 LnMS_{it} + \beta_4 LnRIR_{it} + \beta_5 LnEXR_{it} + \beta_6 LnINFL_{it} + \beta_7 LnCAPA_{it} + \beta_8 LnLABF_{it} + \beta_9 LnGE * MS_{it} + \beta_{10} LnTAXR * INFL_{it} + \beta_{11} LnGE * INFL_{it} + \beta_{12} LnTAXR * MS_{it} + \varepsilon_{it} \ldots\ldots\ldots (5)$$

Where $GDPPC$ represents GDP per capita, GE represents general government final consumption expenditure, $TAXR$ connotes tax revenue, MS represents broad money supply, RIR represents real interest rate, EXR represents real exchange rate, $INFL$ is the rate of inflation, $CAPA$ represents gross fixed capital formation and $LABF$ represents labor force participation rate. Meanwhile, β_1 - β_{12} are the coefficients of the independent variables, β_0 is the constant term, Ln stands for natural logarithm, i and t represent country and time respectively and ε_t is the error term.

In line with the neoclassical production function as well as achieving the objective of estimating the growth effects of these two policies for each member country, equation (5) is modified as given below:

$$LnGDPPC_t = \beta_0 + \beta_1 LnGE_t + \beta_2 LnTAXR_t + \beta_3 LnMS_t + \beta_4 LnRIR_t + \beta_5 LnEXR_t + \beta_6 LnINFL_t + \beta_7 LnCAPA_t + \beta_8 LnLABF_t + \beta_9 LnGE * MS_t + \beta_{10} LnTAXR * INFL_t + \beta_{11} LnGE * INFL_t + \beta_{12} LnTAXR * MS_t + \varepsilon_t \ldots\ldots\ldots (5)$$

Variable Description, Justification and Expected Sign

With regards to this study's objectives, it made use of gross GDP per capita (GDPPC) as the dependent variable as well as government expenditure (GE), tax

revenue (TAXR) real interest rate (IR), broad money supply (MS), real exchange rate (EXR) and Inflation rate (INFL) measuring fiscal and monetary policy respectively while capital accumulation (CAPA) and labor force participation rate (LABF) being the control variables, all as the independent variables.

Dependent Variable

Economic Growth (GDPPC)

In achieving this study's main objective, gross GDP per capita was used as the dependent variable. Liberia which is part of the WAMZ was excluded due to unavailability of data in this work. According to Boyes and Melvin (2004), an expansion in real GDP can be termed as economic growth. To Rutherford (2002), the growth in the total or per capita often measured by an increase in real GDP can be termed economic growth. Thus, as the volume of products increase, the GDP increases and people are able to consume more. GDPPC is the gross domestic product of the country measured in constant US dollars, spread over mid-year population. Economic growth is measured in this study with GDP per capita though economic growth can be proxied by variables like real output per capita etc. This variable was chosen because it is generally accepted to be a good measure of the economic value of a nation's output and hence the dependent variable in the model.

Independent Variables

Government Expenditure (GE)

Government expenditure is proxied by the general government final consumption expenditure. It embodies government current outgoings for procurements of products (including compensation of employees) as well as most outlay on national defense and security (WDI, 2016). Generally, a rise in government expenditure expands the aggregate demand of an economy and hence ultimately enhances growth (Mankiw and Scarth, 2008). Therefore, the expectation here is that government expenditure directly influence economic growth. This is in line with researchers including Macek and Janku (2015) and Igwe, Edeh, and Ukpere (2019).

Tax Revenue (TAXR)

Tax revenue refers to compulsory transfers to the central government for public purposes. Certain compulsory transfers such as fines, penalties, and most social security contributions are excluded. Tax is very important source of government revenue as it gives the needed reserve or money for funding government projects in an attempt to enhance economic growth and development. According to Ola (2001), the level of tax revenue adversely influences the economic behaviour of people (such as their choices in working, saving, and investing) in any country. A high tax regime drastically impacts the spending habits of consumers as it reduces the disposable income of the citizenry (Adereti *et al.*, 2011), and as such, a high tax burden has a significant adverse effect on a country's

growth. Hence, it is expected that economic growth will be adversely influenced by tax revenue.

Real Interest Rate (RIR)

It is the lending interest rate adjusted for inflation as measured by the GDP deflator. Thus, it is adjusted to remove inflation to reveal the real cost of funds to the borrower as well as returns to the investor. According to Abebrese (2008), interest rate basically reflect the cost of capital, meaning the price of money for a specific time frame. The loanable funds theory postulates an inverse relationship between interest rates and outputs. Thus, higher interest rates discourage economic agents including consumers, firms to take investment decisions consequently leading to lower outputs. Also, Evans *et al*, (2018), Noman and Khudri (2015) as well as Havi and Enu (2014) included real interest rate in their analysis while investigating the growth effects of fiscal and monetary policies. This study, therefore, expects the interest rate and economic growth to be inversely related.

Broad Money Supply (MS)

The sum of currency outside banks; demand deposits, time, savings, and foreign currency deposits of resident sectors other than the central government; bank and traveler's cheques; and other securities such as certificates of deposit and commercial paper is referred to as broad money (WDI, 2016). Ogunmuyiwa and Ekone (2010), Babatude and Shuaibu (2011) and Hussain and Haque (2017) argued that growth and money supply are positively related. Hence, supply of money rises, interest rates decreases bringing on greater consumption and lending/borrowing and consequently to more outputs. Hence, the same is expected in this study.

Exchange Rate (EXR)

Exchange rate influences a country's growth as it impacts on the number of products that are imported and exported in an economy. Real exchange rate is used corresponds to the nominal exchange rate which is a measure of the value of a currency against the weighted average of several foreign currencies divided by a price deflator or index of cost. The variable exchange rate (EXR) was included in the model because it is a transmission mechanism of monetary policy; hence it was imperative to explore how this affects economic growth. That is, it serves as a mechanism through which monetary policy is transmitted to the larger economy because of its effects on the value of domestic currency, domestic inflation etc. Also, the Marshall-Lerner condition holds if the currency depreciation of respective WAMZ countries results in a decline in imports but it leads to an upsurge in exports. The net effect of the currency depreciation of the WAMZ countries is, therefore, a rise in net exports. This situation improves national output, hence enhancing the growth. As a result of this situation, it is expected to positively influence economic growth.

Inflation (INFL)

The continuous and appreciable rise in the general price of products over a period of time (Shim J.K., 1995). In this study, inflation is an independent variable and it is measured by the consumer price index. The Consumer Price Index (CPI) depicts an average change in prices of a representative basket of goods bought by households yearly and in this case specifically in each WAMZ country. Inflation is a measure of macroeconomic instability. High inflation leads to the high cost of

borrowing which lowers investment and thereafter results in lower growth. However, this study expects inflation to affect economic growth negatively.

Capital Accumulation (CAPA)

Capital accumulation is also an independent variable and it is measured by gross fixed capital formation as a percentage of GDP. To Sundrum (1993), capital accumulation stimulates growth of income in an economy when more goods are consumed which usually moves in tandem with the growth of income. Gross fixed capital formation includes land improvements, plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings (WDI, 2016). Neo-classical and Marxist economic theory postulates capital accumulation as one of the two essential parameters in explaining the growth rate of an economy (Felipe & Fisher, 2003). In accordance with economic theory, capital accumulation is predicted to relate directly to economic growth in the model specified.

Labour Force (LABF)

Labour force (LABF) is another explanatory variable and it is measured by the labour force participation rate. It is therefore the proportion of the population ages 15 and older that is economically active. It consists of the employed and the unemployed. Hipple (2016) argued that labor force is key in the determination of a country's growth. In his study, he showed that higher labor force participation rates exert positive effects and vice versa. Theoretically, the classical growth model argue that the stock of productive labour is positively related to growth. According

to Todaro (2006), "the higher the labour force, the higher the supply of labour and the higher the output".

Estimation Techniques

Here, the various techniques used by the study in achieving the overall objective of the study are described. The study adopted the panel ARDL technique to estimate the magnitude of the linear effects, time series ARDL technique for the effects for each member country and finally the Non-linear ARDL technique for the asymmetric effects for both WAMZ and each member country.

Technique I (Panel Autoregressive Distributed Lag Model)

Panel unit root tests

A general feature of macroeconomic data is that variables might rise or less frequently decline over time in the event of economic shocks. Hither to the panel data analysis, the levels of stationarity for variables concerned were established to avoid a spurious regression problem. In this context, the Levin *et al.* (2002) and the Im *et al.* (2003) panel unit root tests were employed before panel data analysis was carried out.

The LLC panel unit root test involves computing the panel model specified as follows:

$$\Delta y_{it} = \mu_i + \rho y_{it} + \sum_{j=1}^{k} \beta_j \Delta y_{it} + X'_{it}\delta + \theta_t + \varepsilon_{it} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (6)$$

Where μ_i represents the unit-specific fixed effect, Δ is the first different operator, θ_t unit-specific time effect and k is the lag length. The H_0 to be verified is $H_0: \rho = 0$ as compared to the alternative hypothesis; $H_1: \rho < 0$. H_0 denotes the presence of

unit root while H_1 denotes otherwise. Here, ρ is supposed to be homogenous across cross-sections for the LLC test.

Given this framework, Im, Pesaran, and Shin (2003) came out with a new ADF regression that permits ρ to fluctuate across countries. Thus, expressed as follows:

$$\Delta y_{it} = \rho_i y_{it-1} + \sum_{j=1}^{k_i} \beta_j \Delta y_{it-j} + X'_{it}\delta + \varepsilon_{it} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (7)$$

Where y_{it} is the outcome variable for country *i* over period *t*, k_i is the number of lags in the ADF regression and ε_{it} indicates the random error terms for all i and t which are supposed to be normally and identically distributed with zero mean and constant variance. Both ρ_i and k_i in equation (6) are allowed to vary across countries.

The ensuing hypotheses can be verified or otherwise using this procedure:

$$H_0: \rho_i = 0 \ (i.e. there\ exists\ a\ unit\ root\ for\ some\ countries)$$

$$H_1: \rho_i < 0 (i.e. there\ exists\ no\ unit\ root\ for\ at\ least\ one\ country)$$

Im *et al.* (2003) suggested two steps for constructing the t-bar statistic. The mean of the individual ADF t −statistic for each country sampled is computed at the first stage as follows:

$$\bar{t}_{nT} = \frac{1}{n}\sum_{i=1}^{n} t_i T_i \ (k_i) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (8)$$

Where $t_i T_i(k_i)$ represents the estimated ADF t-statistic for each cross-section. The second stage involves the estimation of the standardized t-bar statistic as expressed below:

$$Z_{\bar{t}_{nT}} = \frac{\sqrt{n}\left[\bar{t}_{nT} - \frac{1}{n}\sum_{i=1}^{n} E(\bar{t}_{iT}(k_i))\right]}{\sqrt{\frac{1}{n}\sum_{i=1}^{n} var[\bar{t}_{iT}(k_i)]}} \sim N(0,1) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (9)$$

Where $E(\bar{t}_{iT}(k_i))$ and $var[\bar{t}_{iT}(k_i)]$ are the expected mean and variance of the ADF regression $t-$statistics respectively. Nevertheless, Im *et al.* (2003) showed when there is existence of dependence among cross-sections, it might be corrected by lessening.

Panel Autoregressive Distributed Lag (ARDL) Approach

The mean group (MG) and the pooled mean group (PMG) estimators for the ARDL model were adopted in this work. Under the assumption that constant slope are permitted to differ with countries, the mean group estimator is more consistent, whereas pooled group mean estimator requires that the long-run parameters are the same across all the member countries (Pesaran *et al*., 1999; Kim *et al*., 2010). Thus, the PGM estimator assumes only long-run slope homogeneity. According to Simões, (2011), the PMG is flexible enough to provide homogeneity of a long-run coefficient over a single subset of an independent variable and/or countries. Nonetheless, the Hausman test is employed to form a decision on the two estimators.

The panel ARDL was adopted by the study to detect the long and short-run effects of the two policies considered and also examine the tendency of

heterogeneous dynamic issues across the countries. Observing Loayza and Ranciere (2006), the autoregressive distributed lag framework was developed as follows:

$$Y_{it} = \sum_{j=1}^{m} \lambda_{ij}(Y_i)_{t-j} + \sum_{j=0}^{n} \delta_{ij}(Z_i)_{t-j} + \mu_i + \varepsilon_{it} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (10)$$

where Y_{it} is gross GDP per capita which is the outcome variable and its lagged values are including independent variables, whereas Z_{it} is vector of independent variables such as labour force, capital accumulation, government expenditure, tax revenue, real interest rate, money supply, exchange rate, and inflation. Also, λ_{ij} represents scalars, δ_{ij} indicates the coefficient vectors, μ_i indicates the group-specific effect and ε_{it} is white noise error term.

Theoretically, the panel may be unbalanced, and also m and n can change across countries. Therefore, the short and long run dynamics can be captured through an unrestricted error correction model system given below:

$$\Delta Y_{it} = \varphi_i\left(Y_{i,t-1} - \Omega_i Z_{t-1}\right) + \sum_{j=1}^{m-1} \lambda_{ij}\Delta(Y_i)_{t-j} + \sum_{j=0}^{n-1} \delta_{ij}\Delta(Z_i)_{t-j} + \mu_i + \varepsilon_{it} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (11)$$

Where Ω_i represents the long-run coefficients and φ_i shows the error correction term coefficient. Besides λ_i and δ_i indicate the short-run coefficients of the regressand and regressors respectively.

Technique II (Time Series/ Linear Autoregressive Distributed Lag Model)

The Linear Autoregressive Distributed Lag (ARDL) estimation method is employed to help estimate the study's second objective. The estimation procedure, therefore, involved the following steps: Firstly and with use of the Augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) tests, the study assessed the stationarity of the variable for the study using the Secondly, with the use of the bounds test, cointegration was tested and therefore further estimations done.

Stationarity Test (Unit Root Test)

Before starting the estimation, assessment of the stationarity was done using the Augmented Dickey-Fuller test (ADF) (1979) and Phillips-Perron (PP) test (1988). According to Naceur and Ghazouni (2007), many macroeconomic time series contain unit roots, which tend to be dominated by stochastic trends. Therefore, estimating variables with non-stationary properties often lead to spurious regression (Tang, 2006).

Therefore, to enhance confidence in the results of the estimation, the stationarity property of the variables was needed to be investigated first. When the mean, variance, covariance and autocorrelation functions are time-dependent, a series is classified as being not-stationary. This, therefore violates the constant means and variances axiom. It is worthy to also note that, the stationarity status of all the variables was investigated to ensure that the variables were stationary at most at first difference. This was to enable to study proceed to employing the ARDL model. A variable can be classified as being integrated of order one, if it is stationary after first difference, or of order two, if stationary after second difference.

A variable is however described as being integrated of order zero, if stationary without differencing.

The ARDL cointegration technique was used in determining the long-run relationship between series with a different order of integration, that is, I (0) and I (1) only (Pesaran et al. 2001). The model is not applicable when the order of integration of a variable is above one and therefore, it was imperative for the unit root test to be carried out. Durbin-Watson (DW) test, Dickey-Fuller test (1979) (DF), Augmented Dickey-Fuller (1981) (ADF) test, Philip- Perron (1988) (PP) test, among others are some of the techniques in stationarity testing. The adopted techniques were the Augmented Dickey-Fuller (ADF) test and Philip- Perron (PP) because they are considered reliable and therefore accepted by many in econometric analysis.

The two selected tests have several similarities but differ in how autocorrelation in the residuals is corrected. The PP non-parametric test simplifies the ADF procedure and allows for less restrictive assumptions. The Akaike Information Criterion (AIC) and Schwarz Information Criterion (SIC) are used for selecting the lag lengths in both the ADF and PP test. The ADF is specified as follows

$$\Delta X_t = a + \delta_t + \rho X_{t-1} + \sum \beta i \Delta X_{t-i} + vt\ p \quad \text{.....(12)}$$

Where Xt denotes the time series at time t, Δ denotes difference, a, δ, ρ, β, are parameters to be estimated and v is the stochastic random disturbance term with properties of white noise.

Both the ADF and PP methodology test hypothesis as follows:

H_0: series contains unit root (series not stationary)

H_1: series has no unit root (series are stationary).

By rejecting the null hypothesis, stationarity is established and this occurs when the critical value is greater than the statistic. If stationarity is not achieved at level, the series is then differenced. But if stationarity is not achieved after the first difference, differencing continues until stationarity is achieved. But to justify the use of ARDL, variables need to be I (0) or I (1).

The PP test is considered as being superior to ADF for the following reasons: First, the problem of heteroskedasticity and non-normality which are mostly present in time series data are not taken into consideration using the ADF test. More so, in the event of high degree of autocorrelation, discrimination between stationary and non-stationary

The ARDL Bounds Test Approach to Cointegration

The study further tested for cointegration among the variables of interest. To achieve the second objective and for that matter for each member country, the ARDL bounds test for cointegration (Pesaran *et al*., 2001) was adopted.

Firstly and generally, the ARDL model specified to represent each of the member countries (namely Ghana, Sierra Leon, Gambia, Guinea, and Nigeria) and as well used to achieve the second objective is stated in equation 14;

$$\Delta lnGDPPC$$
$$= C_0 + C_1 lnGDPPC_{t-1} + C_2 lnGE_{t-1} + C_3 lnTAXR_{t-1} + C_4 lnMS_{t-1}$$
$$+ C_5 lnRIR_{t-1} + C_6 lnEXR_{t-1} + C_7 + lnINFL_{t-1} + C_8 lnCAPA_{t-1}$$
$$+ C_9 lnLABF_{t-1} + C_{10} lnGE * MS_{t-1} + C_{11} lnTAXR * MS_{t-1}$$
$$+ C_{12} lnGE * INFL_{t-1} + C_{13} lnTAXR * MS_{t-1}$$
$$+ \sum^{p} \theta_{1i} \Delta lnGDPPC_{t-i} + \sum_{1=0}^{p} \theta_{2i} \Delta lnGE_{t-i} + \sum_{1=0}^{p} \theta_{3i} \Delta lnTAXR_{t-i}$$
$$+ \sum_{1=0}^{p} \theta_{4i} \Delta lnMS_{t-i} + \sum_{1=0}^{p} \theta_{5i} \Delta lnRIR_{t-i} + \sum_{1=0}^{p} \theta_{6i} \Delta lnEXR_{t-i}$$
$$+ \sum_{1=0}^{p} \theta_{7i} \Delta lnINFL_{t-i} + \sum_{1=0}^{p} \theta_{8i} \Delta lnCAPA_{t-i}$$
$$+ \sum_{1=0}^{p} \theta_{9i} \Delta lnLABF_{t-i}$$
$$+ \sum_{1=0}^{p} \theta_{10i} \Delta lnGE * MS_{t-i}$$
$$+ \sum_{1=0}^{p} \theta_{11i} \Delta lnTAXR * INFL_{t-i}$$
$$+ \sum_{1=0}^{p} \theta_{12i} \Delta lnGE * INFL_{t-i} + \sum_{1=0}^{p} \theta_{13i} \Delta lnTAXR * MS_{t-i}$$
$$+ \varepsilon_t \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (13)$$

Where P denotes optimal lags selections based on the AIC and SIC criteria

Δ denotes the difference operator

i = 0, 1, 2...

C_0 denotes constant

$C_1 – C_{13}$ is the long-run parameters while $\theta_1 – \theta_{11}$ are the parameters representing short-run dynamic coefficients of the underlying ARDL model ε_t is the white noise error term for the model. All other variables remain as defined earlier.

Secondly, after the long run relationship has been established, the conditional ARDL long-run model for estimating the effects of fiscal and monetary policies on economic growth for each member country was estimated as illustrated in equation 15 below

$$lnGDPPC = C_0 + C_1 lnGDPPC_{t-1} + C_2 lnGE_{t-1} + C_3 lnTAXR_{t-1} + C_4 lnMS_{t-1} + C_5 lnRIR_{t-1} + C_6 lnEXR_{t-1} + C_7 + lnINFL_{t-1} + C_8 lnCAPA_{t-1} + C_9 lnLABF_{t-1} + C_{10} lnGE * MS_{t-1} + C_{11} lnTAXR * INFL_{t-1} + C_{12} lnGE * INFL_{t-1} + C_{13} lnTAXR * MS_{t-1} + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (14)$$

Where all variables were as previously defined.

Finally, the short-run dynamic estimates are is obtained from the error correction model specified in equations 16 for the member countries.

$$\Delta lnGDPPC = \theta_0 + \sum_{1=0}^{p} \theta_{1i}\Delta lnGDPPC_{t-i} + \sum_{1=0}^{p} \theta_{2i}\Delta lnGE_{t-i} + \sum_{1=0}^{p} \theta_{3i}\Delta lnTAXR_{t-i} + \sum_{1=0}^{p} \theta_{4i}\Delta lnMS_{t-i} + \sum_{1=0}^{p} \theta_{5i}\Delta lnRIR_{t-i} + \sum_{1=0}^{p} \theta_{6i}\Delta lnEXR_{t-i} + \sum_{1=0}^{p} \theta_{7i}\Delta lnINFL_{t-i} + \sum_{1=0}^{p} \theta_{8i}\Delta lnCAPA_{t-i} + \sum_{1=0}^{p} \theta_{9i}\Delta lnLABF_{t-i} + \sum_{1=0}^{p} \theta_{10i}\Delta lnGE * MS_{t-i} + \sum_{1=0}^{p} \theta_{11i}\Delta lnTAXR * INFL_{t-i} + \sum_{1=0}^{p} \theta_{12i}\Delta lnGE * INFL_{t-i} + \sum_{1=0}^{p} \theta_{13i}\Delta lnTAXR * MS_{t-i} + \gamma ECT_{t-1} + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots (15)$$

Where, γ is the speed of adjustment parameter and ECT is the error correction term. All other variables were as previously defined.

The study adopted the ARDL Bounds Test Approach. The reasons for the selection of this technique were as follows:

First, the ARDL technique avoids the order of integration problems normally associated with other methodologies such as the Johanson Likelihood

Methodology. The ARDL is useful irrespective of the stationary properties of the variables (Pesaran and Pesaran, 1997).

Finally, this technique is strong enough to cater to the sample bias created by other conventional cointegration techniques which becomes only useful in large sample size. The sample bias is catered for since this model is useful in a small sample (Pesaran *et al*., 2001) as it is for this work with data points being 31. Also, in the ARDL model, short and long-run estimates are given in a single estimation and this helps in achieving the objective of the study.

Technique III (Non-Linear Autoregressive Distributed Lag Model)

The presence of asymmetries in macroeconomic policies necessitated the need to use the non-linear ARDL model to determine the short and long run asymmetric effects. For instance, changes in the two policies affect economic growth both positively and negatively. Thus, in both cases, economic growth may react either positively or negatively to the changes in fiscal and monetary policies. But the question is, are the magnitudes of reactions the same in both cases? Maybe not; maybe economic growth responds more to positive changes in fiscal and monetary policies than negative changes. A time-series regression specification with a constant parameter will tell us that, the reaction is the same in both directions. Here comes the NARDL which explicitly distinguishes the reaction of both directions.

While the standard ARDL model enables evaluation of the long-run analysis, it only assumes linear relations between them. As such, the NARDL approach, which was developed by Shin and Greenwood (2014) was adopted.

Both short and long run asymmetries in a particular variable is established from the use of this model. The problem of over estimation is addressed through systematic analysis when using the NARDL technique. The NARDL test is applicable if all variables have flexible order of integration. This flexibility of integrating order is vital in the event of asymmetries (Hoang et al. 2016). Selecting the right lag length, multicollinearity is solved while using this technique (Shin & Greenwood, 2014).

The Asymmetric Panel ARDL

Following Salifu, Isa and Ademuyiwa (2017), the Shin and Greenwood (2014) panel nonlinear ARDL model is constructed. Thus, unlike the symmetric panel ARDL given by equation 10, this version captures the non-linear changes of the two policies on economic growth. Thus, positive and negative changes in the two policies are not expected to have the same effects on economic growth. Thus, to achieve the third objective, the nonlinear ARDL model is given below:

$$Y_{it} = \sum_{j=1}^{m} \lambda_{ij}(Y_i)_{t-j} + \sum_{j=0}^{n} [\delta_{ij}^{+}(Z_i^{+})_{t-j} + \delta_{ij}^{-}(Z_i^{+})_{t-j}] + \mu_i + \varepsilon_{it} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.. (16)$$

WhereZ_{it} is a vector of the explanatory variables of interest (government expenditure, tax revenue, money supply, real interest rate, real exchange rate, and inflation rate), Z_i^{+} and Z_i^{-} denote the positive and negative fiscal and monetary policy changes. These shocks calculated as positive and negative partial sum decompositions of fiscal and monetary policy defined below:

$$Z_t^+ = \sum_{j=1}^{t} \Delta Z_j^+ = \sum_{j=1}^{t} (max\, \Delta Z_j, 0) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (17)$$

$$Z^- = \sum_{j=1}^{t} \Delta Z_j^- = \sum_{j=1}^{t} (min\, \Delta Z_j, 0) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (18)$$

The associated error correction version of Eqn (11) is given below:

$$\Delta Y_{it} = \varphi_i \left(Y_{i,t-1} - \Omega_i Z_{t-1}\right) + \sum_{j=1}^{m-1} \lambda_{ij} \Delta(Y_i)_{t-j} + \sum_{j=0}^{n-1} [\delta_{ij}^{+} \Delta(Z_i^{+})_{t-j} + \delta_{ij}^{-} \Delta(Z_i^{+})_{t-j}] + \mu_i + \varepsilon_{it} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (19)$$

Where φi is the speed of adjustment term that measures how long it takes the system to converge to its long-run equilibrium in the presence of a shock.

However, following Shahbaz *et al*. (2017) and Akinlo and Jemiluyi, (2018), equation (20) below was specified based on the non-linear ARDL for each member country;

$$\Delta LNGDPPC_t = \alpha_0 + \rho LNGDPPC_{t-1} + \vartheta_{1i}^{+} LNGE_{t-1}^{+} + \vartheta_{2i}^{-} LNGE_{t-1}^{-}$$
$$+ \vartheta_{3i}^{+} LNTAXR_{t-1}^{+} + \vartheta_{4i}^{-} LNTAXR_{t-1}^{-} + \vartheta_{5i}^{+} LNMS_{t-1}^{+}$$
$$+ \vartheta_{6i}^{-} LNMS_{t-1}^{-} + \vartheta_{7i}^{+} LNRIR_{t-1}^{+} + \vartheta_{8i}^{-} LNRIR_{t-1}^{-} + \vartheta_{9i}^{+} LNEXR_{t-1}^{+}$$
$$+ \vartheta_{10i}^{-} LNEXR_{t-1}^{-} + \vartheta_{1i1}^{+} LNINFL_{t-1}^{+} + \vartheta_{12i}^{-} LNINFL_{t-1}^{-}$$
$$+ \vartheta_{13i} LNCAPA_{t-1} + \vartheta_{14i} LNLABF_{t-1} + \vartheta_{15i} LNGE * MS_{t-1}$$
$$+ \vartheta_{16i} LNTAXR * INFL_{t-1} + \vartheta_{17i} LNGE * INFL_{t-1}$$
$$+ \vartheta_{18i} LNTAXR * MS_{t-1} + \sum_{i=0}^{q} \delta_{1i} \Delta LNGDPPC_{t-i}$$
$$+ \sum_{i=0}^{q} \delta_{2i}^{+} \Delta LNGE_{t-i}^{+} + \sum_{i=0}^{q} \delta_{3i}^{-} \Delta LNGE_{t-i}^{-} + \sum_{i=0}^{q} \delta_{4i}^{+} \Delta LNTAXR_{t-i}^{+}$$
$$+ \sum_{i=0}^{q} \delta_{5i}^{-} \Delta LNTAXR_{t-i}^{-} + \sum_{i=0}^{q} \delta_{6i}^{+} \Delta LNMS_{t-i}^{+} + \sum_{i=0}^{q} \delta_{7i}^{-} \Delta LNMS_{t-i}^{-}$$
$$+ \sum_{i=0}^{q} \delta_{8i}^{+} \Delta LNRIR_{t-i}^{+} + \sum_{i=0}^{q} \delta_{9i}^{-} \Delta LNRIR_{t-i}^{-} + \sum_{i=0}^{q} \delta_{10i}^{+} \Delta LNEXR_{t-i}^{+}$$
$$+ \sum_{i=0}^{q} \delta_{11i}^{-} \Delta LNEXR_{t-i}^{-}$$
$$+ \sum_{i=0}^{q} \delta_{12i}^{+} \Delta LNINFL_{t-i}^{+} + \sum_{i=0}^{q} \delta_{13i}^{-} \Delta LNINFL_{t-i}^{-}$$
$$+ \sum_{i=0}^{q} \delta_{14i} \Delta LNCAPA_{t-1} + \sum_{i=0}^{q} \delta_{15i} \Delta LNLABF_{t-1}$$
$$+ \sum_{i=0}^{q} \delta_{16i} \Delta LNGE * MS_{t-1} + \sum_{i=0}^{q} \delta_{17i} \Delta LNTAXR * INFL_{t-1}$$

$$+ \sum_{i=0}^{q} \delta_{18i} \Delta LNGE * INFL_{t-1}$$

$$+ \sum_{i=0}^{q} \delta_{19i} \Delta LNTAXR * MS_{t-1} \quad \varepsilon_t \ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 20$$

Where, ϑ_i denotes the short-run estimates in equation (20) and long-run estimates are shown by δ_i with i = 1...19. The immediate effects of the independent variables on the dependent variable are assessed with this approach. On the other hand, through long run analysis, time reaction and speed of adjustment is measured. p and q denotes the optimal lag length for both the dependent and independent variables. The independent variables are decomposed into positive and negative partial sums given by equations 21 and 22 as follows:

$$x_t^+ = \sum_{j=1}^{t} \Delta x_j^+ = \sum_{j=1}^{t} (max\, \Delta x_j, 0) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (21)$$

$$x^- = \sum_{j=1}^{t} \Delta x_j^- = \sum_{j=1}^{t} (min\, \Delta x_j, 0) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (22)$$

With x_t indicating the explanatory variables.

To test whether the variables are cointegrated while accommodating asymmetries, the NARDL bounds testing technique by Shin and Greenwood (2014) is used. F-statistic originated by Pesaran *et al*. (2001) were used. F-statistic follows the null hypothesis: $\delta^+ = \delta^- = \delta = 0$. When the null hypothesis is rejected, it shows that the variables and economic growth are cointegrated and vice versa. Non-linear estimates for the long run are specified as; $L_{mi^+} = \frac{\delta^+}{\rho}$ and$L_{mi^-} = \frac{\delta^-}{\rho}$. Below therefore gives the non-linear dynamic multiplier effects;

$$m_h^+ = \sum_{j=0}^{h} \frac{\partial GDPPC_{t+j}}{\partial GE_t^+}, m_h^- = \sum_{j=0}^{h} \frac{\partial GDPPC_{t+j}}{\partial GE_t^-}, \quad m_h^+ = \sum_{j=0}^{h} \frac{\partial GDPPC_{t+j}}{\partial TAXR_t^+}, \; m_h^- = \sum_{j=0}^{h} \frac{\partial GDPPC_{t+j}}{\partial TAXR_t^-}, \; m_h^+ = \sum_{j=0}^{h} \frac{\partial GDPPC_{t+j}}{\partial MS_t^+}, \; m_h^- = \sum_{j=0}^{h} \frac{\partial GDPPC_{t+j}}{\partial MS_t^-}, \; m_h^+ = \sum_{j=0}^{h} \frac{\partial GDPPC_{t+j}}{\partial RIR_t^+}, \; m_h^- = \sum_{j=0}^{h} \frac{\partial GDPPC_{t+j}}{\partial RIR_t^-}, \; m_h^+ = \sum_{j=0}^{h} \frac{\partial GDPPC_{t+j}}{\partial EXR_t^+}, \; m_h^- = \sum_{j=0}^{h} \frac{\partial GDPPC_{t+j}}{\partial EXR_t^-}, \; m_h^+ = \sum_{j=0}^{h} \frac{\partial GDPPC_{t+j}}{\partial INFL_t^+}, \; m_h^- = \sum_{j=0}^{h} \frac{\partial GDPPC_{t+j}}{\partial INFL_t^-}, \text{ for } h = 1,2 \ldots$$

Where, if h $\rightarrow$(then $m_h^+ \rightarrow L_{mi^+}$ and $m_h^- \rightarrow L_{mi^-}$)

The dynamic multiplier depicts how economic growth respond in a non-linear way to shifts in the independent variables.

After asymmetric cointegration has been established short-run dynamic parameters are obtained using the NARDL model as specified in equation 20.

$$\Delta LNGDPPC_t = \alpha_0 + \sum_{i=0}^{q} \delta_{1i} \Delta LNGDPPC_{t-i} + \sum_{i=0}^{q} \delta_{2i}^+ \Delta LNGE_{t-i}^+ + \sum_{i=0}^{q} \delta_{3i}^- \Delta LNGE_{t-i}^- + \sum_{i=0}^{q} \delta_{4i}^+ \Delta LNTAXR_{t-i}^+ + \sum_{i=0}^{q} \delta_{5i}^- \Delta LNTAXR_{t-i}^- + \sum_{i=0}^{q} \delta_{6i}^+ \Delta LNMS_{t-i}^+ + \sum_{i=0}^{q} \delta_{7i}^- \Delta LNMS_{t-i}^- + \sum_{i=0}^{q} \delta_{8i}^+ \Delta LNRIR_{t-i}^+ + \sum_{i=0}^{q} \delta_{9i}^- \Delta LNRIR_{t-i}^- + \sum_{i=0}^{q} \delta_{10i}^+ \Delta LNEXR_{t-i}^+ + \sum_{i=0}^{q} \delta_{11i}^- \Delta LNEXR_{t-i}^- + \sum_{i=0}^{q} \delta_{12i}^+ \Delta LNINFL_{t-i}^+ + \sum_{i=0}^{q} \delta_{13i}^- \Delta LNINFL_{t-i}^- + \sum_{i=0}^{q} \delta_{14i} \Delta LNCAPA_{t-1} + \sum_{i=0}^{q} \delta_{15i} \Delta LNLABF_{t-1} + \sum_{i=0}^{q} \delta_{16i} \Delta LNGE * MS_{t-1} + \sum_{i=0}^{q} \delta_{17i} \Delta LNTAXR *$$

$$INFL_{t-1} + \sum_{i=0}^{q} \delta_{18i} \Delta LNGE * INFL_{t-1} + \sum_{i=0}^{q} \delta_{19i} \Delta LNTAXR * MS_{t-1} + \omega ECT_{t-1} + \varepsilon_t \quad \ldots\ldots 23$$

Where ω the speed of adjustment parameter and ECT is the error correction term.

Post Estimation/Diagnostic Tests

Post estimation tests were carried out to ascertain the robustness the model adopted for the study. The study carried out a serial correlation test, so as to validate that the estimates obtained from the model are efficient. The study employed Test of Breusch and Godfrey (1978) test to address the issue of serial correlation or otherwise. Again, the study applied the Regression Specification Error Test (RESET) suggested by Ramsey (1969) to verify whether the functional form of the model is correctly specified. Moreover, to be able to establish the normality properties of the error term, the study used the Kurtosis test of normality. Furthermore, heteroscedasticity test was conducted to confirm that the estimated coefficients are efficient.

Finally, this work employed the cumulative sum of recursive residuals (CUSUM) and cumulative sum of squared recursive residuals (CUSUMSQ) tests suggested by Pesaran and Pesaran (1997) to check the stability of the estimates. This test was important because a movement of the CUSUM and CUSUMSQ residuals outside the critical lines was an indication that the estimated co-efficient was unstable over the sample period.

Data Analysis

Both descriptive and quantitative analysis was adopted. Tables are used to assist in the descriptive analysis. The STATA 14.0 and E-views package software was used for these exercises.

Data Type and Source

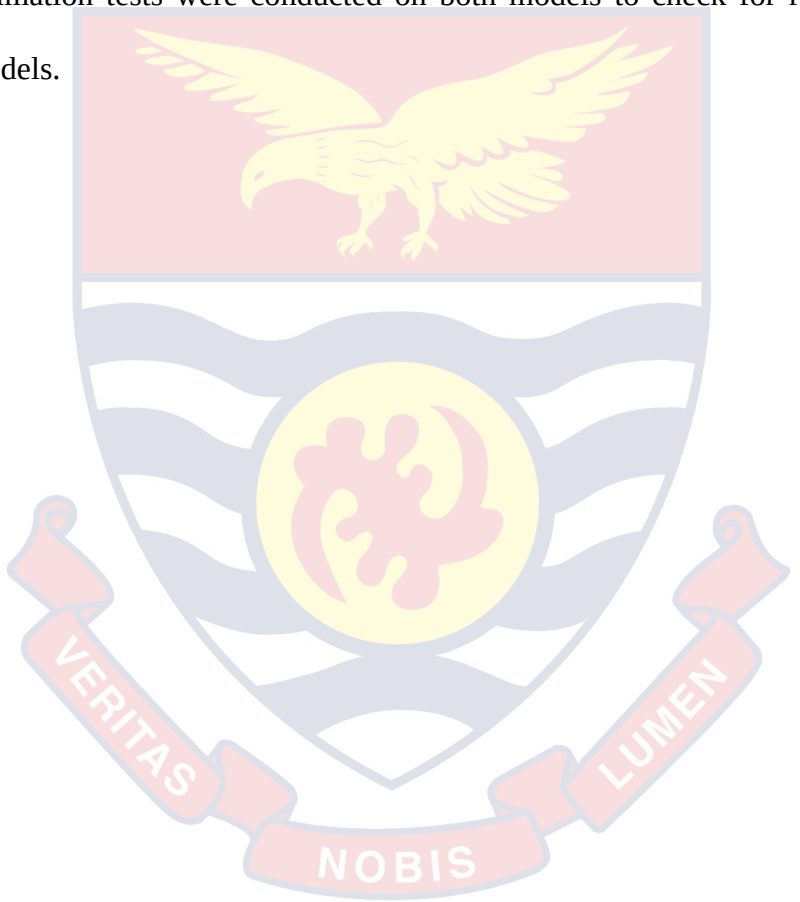
The study employed both panel and time series dataset covering the period 1990-2016 for the WAMZ member countries including Gambia, Ghana, Guinea, Nigeria, and Sierra Leone mainly due to unavailability of data for 2017-2019. The study used gross GDP per capita as a measure of economic growth; government expenditure and tax revenue as measures of fiscal policy; real interest rate, money supply, real exchange rate, and inflation rate as the indicators of monetary policy; whereas gross fixed capital formation as a share of GDP was used as a measure of capital accumulation as well as labour force participation rate were used as control variables. Data on GDP per capita, government expenditure, tax revenue, money supply, real interest rate and inflation rate were sourced from the World Development Indicators database (WDI) while data on real exchange rate was sourced from the IMF international financial statistics.

Conclusion

The methodological framework suitable for conducting the study was presented in this chapter. From the neoclassical production function, the study's model was specified. Annual data on both the outcome and independent variables from 1990-2016 using first panel ARDL model for estimating effects of fiscal and monetary policies on economic growth for WAMZ, secondly time series ARDL for

each member country and lastly non-linear ARDL for estimating the asymmetric effects of variables of interest.

Also, a stationary test was conducted using LLC, IPS, ADF and PP tests to ensure that the variables were not integrated in higher order than one to avoid spurious regression and hence cointegration confirmed. Finally, a number of post estimation tests were conducted on both models to check for robustness of the models.



CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

Here, the study's results are presented and thereof discussed accordingly. The descriptive statistic results are presented in the first section. Secondly, the results of the stationarity status of the variables, using the Levin Lin and Chu, Im, Pesaran, and Shin, Augmented Dickey-Fuller and Phillips-Perron (PP) tests are presented. Also, the linear and asymmetric effects are presented and discussed accordingly. Finally, the NARDL results as generated by STATA 14.0 were rearranged into positive and negative, analyzed and interpreted to give meaning to the results and to facilitate understanding.

Descriptive Statistics

This aspect discusses the features of the data used. Hence, the basic statistical properties (including, the means, minimum, maximum, and standard deviation) of the variables used in the model for the period 1990 to 2016 are described briefly and therefore shown in Table 2

Table 2: Summary Statistics of Variables (WAMZ), 1990 to 2016

Variable	Mean	Std. Dev.	Min.	Max.
GDPPC	628.6572	557.9691	153.0757	3203.244
GE	3.14e+09	7.66e+09	4.15e+07	4.19e+10
TAXR	11.47597	3.355983	3.671852	21.75211
RIR	25.01937	7.075884	15.47983	62.83333
MS	22.62095	10.46579	8.676755	55.01001
EXR	1132.448	1839.088	.0326156	7485.517
INFL	15.66080	17.87507	-35.83668	110.9458
CAPA	15.76213	7.685672	-2.424358	40.93961
LABF	69.07237	7.384884	54.7	77.7

Note: Std. Dev. represents Standard Deviation

Source: Takyi-Ofori (2021)

Table 2 reveals that the GDP per capita of WAMZ member countries is averaged about $629. The maximum value is approximately $3,203 with a minimum value of $153 respectively. Also, the total government expenditure of WAMZ member countries have a mean value of approximately 3.2 billion US dollars, a maximum value of about 42 billion US dollars and a minimum value of about 4.2 million US dollars. In addition, the tax revenue (% of GDP) of WAMZ member countries on the average is 11.5% with maximum and minimum values as 21.8 % and 3.7% respectively. Furthermore, the interest rate of WAMZ member countries has a mean of 25%, a maximum and minimum value of 62.8% and 15.5% respectively.

Finally, on the average, broad money supply and lending interest rate of WAMZ member countries is 25% and 22.6% respectively whiles their maximum values were 55% and 62.7%. Their minimum values are 8.7% and 15.5%. Dispersion of the variables from their means are measured by the standard deviations.

Empirical results and discussions

Here, the panel ARDL was employed in assessing the growth effects of fiscal and monetary policies for WAMZ.

Unit Root test

Before applying the ARDL model, unit root test was done using the Levin Lin and Chu (LLC), Im, Pesaran and Shin (IPS) Augmented Dickey-Fuller (ADF) and the Philips Perron (PP) Test. This was done to further confirm that all variables at either I(0) or I(1). The decision on the optimal number of lags was done using the Schwartz Bayesian (SBC) and Akaike Information Criteria (AIC) and used the P-values for making the unit root decision. The LLC and IPS unit roots test results for both at levels and at first difference, showing also their corresponding order of integration are given below in Tables 3 and 4

Table 3: Levin Lin & Chu unit root test

Variable	Intercept only	Prob. Value	Decision @ 5%	Intercept and trend	Prob. Value	Decision @ 5%
LnGDPPC	-4.4037	0.0000	I(1)	-3.8136	0.0001	I(1)
LnGE	-2.8704	0.0020	I(1)	-2.1639	0.0152	I(1)
LnTAXR	-6.9049	0.0000	I(1)	-5.3614	0.0000	I(1)
LnMS	-2.0137	0.0220	I(1)	-1.3943	0.0316	I(1)
LnRIR	-3.6323	0.0001	I(0)	-3.4662	0.0003	I(0)
LnEXR	-3.0133	0.0013	I(0)	0.0633	0.0500	I(1)
LnINFL	-2.12610	0.0167	I(1)	-1.19003	0.0170	I(1)
LnCAPA	-1.72590	0.0339	I(1)	-6.09091	0.0000	I(1)
LnLABF	-6.60977	0.0000	I(1)	4.70593	0.0004	I(1)

Source: Takyi-Ofori (2021)

Table 4: Im Pesaran and Shin Panel Unit Root test

Variable	Intercept only	Prob. Value	Decision @ 5%	Intercept and trend	Prob. Value	Decision @ 5%
LnGDPPC	-2.8331	0.0023	I(1)	-4.2692	0.0000	I(1)
LnGE	-2.1763	0.0148	I(1)	-4.4412	0.0000	I(1)
LnTAXR	-2.2695	0.0116	I(0)	-1.9550	0.0253	I(0)
LnMS	-4.8237	0.0000	I(1)	-7.5397	0.0000	I(1)
LnRIR	-2.9957	0.0014	I(0)	-2.1660	0.0152	I(0)
LnEXR	-2.2843	0.0112	I(1)	-5.0405	0.0000	I(1)
LnINFL	-2.5693	0.0051	I(0)	-2.5648	0.0052	I(0)
LnCAPA	-8.5584	0.0000	I(1)	-9.5732	0.0000	I(1)
LnLABF	-2.9149	0.0000	I(1)	--5.3068	0.0000	I(1)

Source: Takyi-Ofori (2021)

From Tables 3 and 4 above, the Levin Lin & Chu and Im-Pesaran-Shin unit-root test depict that the variables are stationary and hence rejecting the null hypothesis of both tests. At 5 percent as well as with intercept only or intercept and constant, the variables are stationary at either I (0) or I (1). The presence of I (0) and I (1) shows the presence of cointegration.

Long and short run Estimations Results

Appendix A shows the results of the Hausman test which fails to reject the null hypothesis of slope homogeneity (pooled mean group is most efficient) and thus rendering the mean group estimator as inefficient. As such, the study reports on the parameter estimates derived under the PMG estimator. The results as shown in Tables 5 and 6 were derived using the panel ARDL model.

Table 5: Long run results for WAMZ

Variable	Coefficient	Std. Error
LNGE	0.683095***	(0.032344)
LNTAXR	-0.165679***	(0.036563)
LNMS	0.328927***	(0.069454)
LNRIR	-0.126031***	(0.044079)
LNEXR	0.294239***	(0.070172)
LNINFL	-0.260317***	(0.045612)
LNCAPA	0.146780**	(0.066623)
LNLABF	0.029932	(0.031361)
LNGE*MS	0.708321**	(0.12903)
LNTAXR*INFL	0.426028	(0.303671)
C	6.891988***	(1.076323)

Source: Takyi-Ofori (2021)

Note: ***p< 0.01; **p<0.05; p*< 0.1

From Table 5 above, it can be realized that in the long run, government expenditure (GE), tax revenue (TAXR), money supply (MS), real interest rate (RIR), rate of inflation (INFL), capital formation (CAPA), real exchange rate (EXR) and both fiscal and monetary policy proxied by (GE*MS) influence economic growth (GDPPC).

Firstly, government expenditure which is statistically significant at 1 percent positively affect economic growth within the zone. A percentage increase in government expenditure would cause expansion in economic growth to by about 0.68 percent. Keynes (1963) argues that public spending boosts economic activities and also help in the stabilization of erratic changes in the economy. Thus, through an increase in government expenditure, in this case, is necessary to stimulate demand for economic products and put the unemployed back to work. This, therefore, implies that an upward shift in government expenditure is directly proportional to that of economic growth. Thus, through the multiplier effect, the implication here is that an injection into the economy through a rise in government expenditure leads to the expansion of real outputs and consequently to higher growth. This finding is consistent with other researchers' including Enache (2009), Benos (2005), Al-Khasawneh *et al*. (2012) and Dinca and Dinca (2013).

Secondly, tax revenue negatively affect economic growth within the zone and as well as significant at 1 percent. Thus, a percentage increase in tax revenue would cause economic growth to contract by approximately 0.17 percent of all things being equal. Tax is a very important source of government revenue because it serves as a measure by which government projects and programmes are funded

in an attempt to enhancing economic growth and development. According to Ola (2001), the level of tax revenue adversely influences the economic behavior of people (such as their choices in working, saving, and investing) in any country. A high tax regime drastically impacts the spending habits of consumers as it reduces the disposable income of the citizenry (Adereti *et al*., 2011), and as such, a high tax significantly and adversely affect member countries' growth. However, this result is in line with that of researchers including Twumasi (2012), Srithongrung and Sanchez-Juarez (2015) and Babalola (2015).

Thirdly, Table 5 above indicates that money supply and economic growth are positively related. Thus, a percentage increase in money supply will cause the economy of member countries in the zone to expand by approximately 0.33 percent. The implication here is that if the zone embarks or adopt various expansionary monetary policies such that it increases the supply of money, it would help businesses, outputs expand and hence promote growth in WAMZ member countries. This confirms Friedman and Meiselman's (1963) posits of how money is directionally related to output. Also, confirms the results of Ogunmuyiwa and Ekone (2010), Nouri and Samimi (2011) and Mohammad *et al.* (2009).

Again, interest rate negatively influence economic growth within the zone. Ceteris paribus, a percentage increase in real interest rate would cause a downward shift in economic growth by about 0.13 percent. The implication here is that a rise in interest rate encourages citizens to save more which causes the economy to contract as disposable income declines. On the other hand, for businesses or investors, higher interest rates serve as a disincentive to them and consequently lead

to low investment decisions or activities which intend lead to low outputs. This result is confirmed by that of Evans *et al.* (2018), Noman and Khudri (2015) as well as Havi and Enu (2014).

Furthermore, the real exchange rate is statistically significant at 5 percent and positively affect economic growth for WAMZ. All things being equal, a percentage increase in the real exchange rate expands economic growth for the zone by about 0.3 percent. Theoretically, an expansion in the exchange rate (depreciation of the domestic currency) causes rapid growth because of a rise in net exports (increased injection) and a fall in the demand for imports (a reduced leakage in the circular flow). Thus, the implication for a higher exchange rate for member countries in the zone is that, outputs would increase, which may consequently bring about higher growth. Hence, the multiplier effect of a higher exchange rate on the economic is direct. This finding is in line with that of Noman and Khudri (2015).

Also, the coefficient of inflation rate is negative and significant at 5 percent. Thus, a percentage increase in the inflation rate within the zone would lead to about a 0.3 percent fall in the economic growth of member countries. Inflation relate to growth inversely and particularly, growth, investments as well as productivity are inversely related to inflation. The implication is inflation rate expansion could bring about more uncertainty amongst businesses and hence affecting investment negatively. For instance, inflation expansion could cause the cost of raw materials to rise. Workers, on the other hand, could demand more wages to cope with the higher cost of living and as such may cause greater volatility and uncertainty. Consequently, firms may cut back on investments and hence lead to a reduction in

output. This finding is consistent with a study conducted by Evans, *et al* (2018); Havi and Enu (2014).

In addition, capital accumulation which is significant at 1 percent has a positive effect on economic growth within the zone. Thus, a percentage increase in capital accumulation would bring about 0.09 percent increase in economic growth. Empirically, this finding favors that of Sundrum (1993) who argued that capital accumulation stimulates the growth of income in an economy when an increase in the consumption of goods usually moves in tandem with the growth of income.

Moreover, the joint effects of government expenditure and money supply is also positive and statistically significant at 1 percent. From the net effect calculations, as shown in Appendix B, a percentage increase in money supply given government expenditure within an economy will improve economic growth approximately by 0.178 percent within zone. It implies, the net effect of money supply on growth, given government expenditure is growth-enhancing. Intuitively, the result indicates that money supply and government expenditure have been jointly utilized as a tool to promote economic growth. This is because an upward shift in money supply causes interest rate to deteriorate, which serves as an incentive for consumers or individuals to borrow more to supplement their activities and engage in private investments while firms or businesses also undertake more investment decisions resulting in employing more workers (reducing the unemployment rates) which consequently fosters growth. This positive effect from an increase in money supply to a large extent can be achieved given, for example, the government spends in the provision infrastructural amenities such as road,

communication, power among others so as to afford economic agents the opportunity to engage in the stated economic activities. Therefore, no wonder, the combined effects of the two variables is higher than their singular effects on economic growth.

Similarly, from the net calculations, as shown in Appendix C, a percentage increase in government expenditure given money supply within the economy will improve economic growth by about 2.5 percent. Keynesian economics states that, an outward shift in government expenditure boost aggregate demand and production as well as reduce unemployment. By implication, higher levels of economic growth brought about by an increase in aggregate demand can be realized given well-regulated money supply. This is because, in the event of increasing levels of government expenditures, tight monetary interventions like decreasing money supply would help curb instances of inflation in the economy. As shown and argued by Gafa (2013), and Havi and Enu (2014), both fiscal and monetary jointly influence economic growth.

Short-run results for WAMZ

Once the long-run cointegration has been estimated, we then model the short-run dynamic parameter within the panel ARDL model which is shown in Table 6 below;

Table 6: Parsimonious Error Correction Model

Variable	Coefficient	Std. Error
C	5.584701***	(0.954696)
D (GDPPC(-1))	0.542258***	(0.091748)
D(LNGE)	0.407349***	(0.117237)
D(LNTAXR(-1))	0.229332*	(0.105355)
D(LNMS)	0.323837**	(0.127895)
D(LNRIR)	-0.120595**	(0.052141)
D(LNEXR	0.531915***	(0.107919)
D(LNINFL(-1))	-0.394697***	(0.068629)
D(LNCAPA(-1))	0.331187***	(0.099693)
D(LNLABF)	0.416041	(0.300528)
D(LNGE*MS(-1))	0.754967***	(0.054380)
D(LNTAXR*INFL)	0.670019	(0.444531)
ECM(-1)	-0.742473***	(0.168653)
R-square	0.635615	
Adj. R-squared	0.581499	
F-statistic	90.21	
Prob(F-statistic)	0.0000	
Durbin-Watson	1.892198	

Source: Takyi-Ofori (2021)

The short-run analysis is carried out taking into consideration their lagged differences. The results in Table 6 shows that both previous and current year's values of gross domestic product per capita D (LNGDPPC (-1)), government expenditure D (LnGE), tax revenue D (LnTAXR(-1)), money supply D (LnMS), real interest rate D (LnRIR), real exchange rate D(LnEXR(-1)), rate of inflation D(LNINFL(-1)), capital accumulation D(LnCAPA(-1)) and the interaction term D(LnGE*MS) significantly influence growth. Notwithstanding, the net calculations as shown in Appendix C reveals that, a percentage increase in money supply given government expenditure would expand the economies of member countries within the zone by about 17.8 percent while a percentage increase in government expenditure given money supply increases economic growth by about 2.90 percent.

The result further indicates that, the estimated coefficient of the error correction term is -0.742473, clearly having the expected sign as well as significant and hence means that the speed of adjustment is approximately 74 percent per year. Observing the coefficient of the ECM reveals the variables being cointegrated.

Country-Specific Effects

Results from the individual countries are estimated using the ARDL model in order to ascertain the actual magnitude and its intended effects of the two policies for each member country in the West African Monetary Zone.

Unit Root Tests

Table 7: ADF unit root test: Results for Ghana

Variable	Intercept only	Prob. Value	Decision @ 5%	Intercept and trend	Prob. Value	Decision @ 5%
LnGDPPC	-2.879	0.0278	I(1)	-2.730	0.0240	I(1)
LnGE	-2.259	0.0285	I(1)	-2.250	0.0413	I(1)
LnTAXR	-6.003	0.0000	I(1)	-5.869	0.0000	I(1)
LnMS	-2.997	0.0352	I(0)	-5.142	0.0001	I(1)
LnRIR	-5.486	0.0000	I(1)	-5.511	0.0000	I(1)
LnEXR	-3.828	0.0026	I(1)	-5.149	0.0001	I(1)
LnINFL	-3.042	0.0311	I(0)	-5.549	0.0000	I(1)
LnCAPA	-3.386	0.0115	I(0)	-3.699	0.0224	I(0)
LnLABF	-6.522	0.0000	I(0)	-8.6765	0.000	I(0)

Source: Takyi-Ofori (2021)

Note: I(0) denotes stationarity at levels and I(1) means stationarity at first difference.

Table 8: ADF unit root test: Results for Sierra Leone

Variable	Intercept only	Prob. Value	Decision @ 5%	Intercept and trend	Prob. Value	Decision @ 5%
LnGDPPC	-2.808	0.0271	I(1)	-2.304	0.0438	I(1)
LnGE	-3.757	0.0034	I(1)	-3.676	0.0240	I(1)
LnTAXR	-3.334	0.0134	I(0)	-4.043	0.0076	I(1)
LnMS	-5.304	0.0000	I(1)	-4.975	0.0002	I(1)
LnRIR	-3.884	0.0022	I(1)	-4.264	0.0036	I(1)
LEXR	-4.366	0.0003	I(0)	-3.600	0.0299	I(1)
LnINFL	-4.583	0.0001	I(1)	-4.715	0.0007	I(1)
LnCAPA	-6.047	0.0000	I(1)	-5.929	0.0000	I(1)
LnLABF	-6.7598	0.000	I(0)	-5.3902	0.0001	I(1)

Source: Takyi-Ofori (2021)

Note: I(0) denotes stationarity at levels and I(1) means stationarity at first difference.

Table 9: ADF unit root test: Results for the Gambia

Variable	Intercept only	Prob. Value	Decision @ 5%	Intercept and trend	Prob. Value	Decision @ 5%
LnGDPPC	-7.496	0.0000	I(1)	-7.194	0.0000	I(1)
LnGE	-5.057	0.0000	I(1)	-4.813	0.0004	I(1)
LnTAXR	-5.149	0.0000	I(1)	-5.038	0.0002	I(1)
LnMS	-6.187	0.0000	I(1)	-6.427	0.0000	I(1)
LnRIR	-3.121	0.0251	I(0)	-3.537	0.0355	I(0)
LnEXR	-4.438	0.0003	I(1)	-4.574	0.0011	I(1)
LnINFL	-3.737	0.0036	I(0)	-3.731	0.0204	I(0)
LnCAPA	-4.7001	0.0004	I(1)	-4.9311	0.0000	I(1)
LnLABF	-5.293	0.0000	I(1)	-5.236	0.0001	I(1)

Source: Takyi-Ofori (2021)

Note: I(0) denotes stationarity at levels and I(1) means stationarity at first difference.

Table 10: ADF unit root test: Results for Guinea

Variable	Intercept only	Prob. Value	Decision @ 5%	Intercept and trend	Prob. Value	Decision @ 5%
LnGDPPC	-3.495	0.0081	I(1)	-3.398	0.0057	I(1)
LnGE	-2.720	0.0306	I(1)	-2.524	0.0218	I(1)
LnTAXR	-4.396	0.0003	I(1)	-4.302	0.0031	I(1)
LnMS	-4.610	0.0001	I(1)	-4.410	0.0021	I(1)
LnRIR	-2.872	0.0487	I(0)	-4.843	0.0004	I(1)
LnEXR	-2.032	0.0323	I(1)	-2.163	0.0407	I(1)
LnINFL	-3.012	0.0338	I(0)	-5.812	0.0000	I(1)
LnCAPA	-2.982	0.0366	I(0)	-4.196	0.0045	I(0)
LnLABF	-5.7629	0.0000	I(1)	-3.4890	0.00059	I(1)

Source: Takyi-Ofori (2021)

Note: I(0) denotes stationarity at levels and I(1) means stationarity at first difference.

Table 11: ADF unit root test: Results for Nigeria

Variable	Intercept only	Prob. Value	Decision @ 5%	Intercept and trend	Prob. Value	Decision @ 5%
LnGDPPC	-3.484	0.0084	I(1)	-3.249	0.0150	I(1)
LnGE	-5.954	0.0000	I(1)	-6.094	0.0000	I(1)
LnTAXR	-3.524	0.0074	I(0)	-3.591	0.0306	I(0)
LnMS	-4.167	0.0007	I(1)	-4.0076	0.0068	I(1)
LnRIR	-5.940	0.0000	I(1)	-5.818	0.0000	I(1)
LnEXR	-4.250	0.0005	I(1)	-4.841	0.0004	I(1)
LnINFL	-4.049	0.0012	I(1)	-3.892	0.0124	I(1)
LnCAPA	-4.922	0.0000	I(1)	-4.893	0.0003	I(0)
LnLABF	-3.4566	0.0242	I(1)	-2.3265	0.0231	I(1)

Source: Takyi-Ofori (2021)

Note: I(0) denotes stationarity at levels and I(1) means stationarity at first difference.

Tables 7 to 11 show the ADF results for the individual member countries in the zone. Careful examinations of the results indicate that, the null hypothesis of the existence of unit root for each of the countries is rejected at 5 percent and hence all the variables are stationary. However, with each of the countries as well as with intercept only or intercept and trend, the variables are either stationary at levels or at first difference

Philips-Perron Unit Root Test

Table 12: PP unit root test: Results for Ghana

Variable	Intercept only	Prob. Value	Decision @ 5%	Intercept and trend	Prob. Value	Decision @ 5%
LnGDPPC	-2.965	0.0383	I(1)	-2.804	0.0354	I(1)
LnGE	-2.355	0.0349	I(1)	-2.186	0.0279	I(1)
LNTAXR	-6.041	0.0000	I(1)	-5.906	0.0000	I(1)
LnMS	-3.110	0.0258	I(0)	-5.142	0.0001	I(1)
LnRIR	-2.867	0.0494	I(0)	-5.559	0.0000	I(1)
LnEXR	-3.833	0.0026	I(1)	-5.238	0.0001	I(1)
LnINFL	-3.147	0.0232	I(0)	-5.630	0.0000	I(1)
LnCAPA	-3.334	0.0134	I(0)	-3.599	0.0299	I(0)
LnLABF	2.221	0.0316	(1)	-2.906	0.0074	I(0)

Source: Takyi-Ofori (2021)

Note: I(0) denotes stationarity at levels and I(1) means stationarity at first difference.

Table 13: PP unit root test: Results for Sierra Leone

Variable	Intercept only	Prob. Value	Decision @ 5%	Intercept and trend	Prob. Value	Decision @ 5%
LnGDPPC	-2.579	0.0274	I(1)	-2.474	0.0213	I(1)
LnGE	-3.750	0.0037	I(1)	-3.668	0.0246	I(1)
LnTAXR	-3.320	0.0140	I(0)	-3.980	0.0094	I(1)
LnMS	-5.329	0.0000	I(1)	-4.956	0.0002	I(1)
LnRIR	-3.674	0.0045	I(1)	-4.088	0.0066	I(1)
LnEXR	-4.482	0.0002	I(0)	-3.255	0.0141	I(1)
LnINFL	-4.538	0.0002	I(1)	-4.697	0.0007	I(1)
LnCAPA	-6.137	0.000	I(1)	-6.013	0.0000	I(1)
LnLABF	-3.319	0.0027	I(1)	3.986	0.0259	I(0)

Source: Takyi-Ofori (2021)

Note: I(0) denotes stationarity at levels and I(1) means stationarity at first difference.

Table 14: PP unit root test: Results for Gambia

Variable	Intercept only	Prob. Value	Decision @ 5%	Intercept and trend	Prob. Value	Decision @ 5%
LnGDPPC	-2.984	0.0364	I(0)	-3.893	0.0124	I(0)
LnGE	-5.041	0.0000	I(1)	-4.840	0.0064	I(1)
LnTAXR	-5.148	0.0000	I(1)	-5.038	0.0002	I(1)
LnMS	-6.053	0.0000	I(1)	-6.471	0.0000	I(1)
LnRIR	-3.112	0.0257	I(0)	-3.520	0.0373	I(0)
LnEXR	-4.437	0.0003	I(1)	-4.573	0.0011	I(1)
LnINFL	-3.773	0.0032	I(0)	-3.740	0.0198	I(0)
LnCAPA	-5.320	0.0000	I(1)	-5.262	0.0001	I(1)
LnLABF	2.599	0.0030	I(0)	-3.577	0.0007	I(0)

Source: Takyi-Ofori (2021)

Note: I(0) denotes stationarity at levels and I(1) means stationarity at first difference.

Table 15: PP unit root test: Results for Guinea

Variable	Intercept only	Prob. Value	Decision @ 5%	Intercept and trend	Prob. Value	Decision @ 5%
LnGDPPC	-3.351	0.0128	I(1)	-3.221	0.0183	I(1)
LnGE	-2.756	0.0249	I(1)	-2.561	0.0283	I(1)
LnTAXR	-4.377	0.0003	I(1)	-4.277	0.0034	I(1)
LnMS	-4.530	0.0002	I(1)	-4.318	0.0030	I(1)
LnRIR	-3.014	0.0336	I(0)	-3.414	0.0496	I(0)
LnEXR	-2.913	0.0302	I(1)	-2.056	0.0278	I(1)
LnINFL	-2.949	0.0399	I(0)	-6.113	0.0000	I(1)
LnCAPA	-6.780	0.0000	I(1)	-6.671	0.0000	I(1)
LnLABF	=2.587	0.0401	I(1)	-4.655	0.0068	I(1)

Source: Takyi-Ofori (2021)

Note: I(0) denotes stationarity at levels and I(1) means stationarity at first difference.

Table 16: PP unit root test: Results for Nigeria

Variable	Intercept only	Prob. Value	Decision @ 5%	Intercept and trend	Prob. Value	Decision @ 5%
LnGDPPC	-3.447	0.0095	I(1)	-3.187	0.0180	I(1)
LnGE	-5.919	0.0000	I(1)	-6.061	0.0000	I(1)
LnTAXR	-3.436	0.0098	I(0)	-3.515	0.0378	I(0)
LnMS	-4.135	0.0008	I(1)	-4.039	0.0077	I(1)
LnRIR	-6.019	0.0000	I(1)	-5.896	0.0000	I(1)
LnEXR	-4.221	0.0006	I(1)	-4.822	0.0004	I(1)
LnINFL	-3.976	0.0015	I(1)	-3.792	0.0170	I(1)
LnCAPA	-4.961	0.0000	I(1)	-4.942	0.0003	I(1)
LnLABF	-2.2.68	0.0294	I(1)	- 4.1.38	0.0007	(1)

Source: Takyi-Ofori (2021)

Note: I(0) denotes stationarity at levels and I(1) means stationarity at first difference.

From Tables 12 to 16, the Philip-Perron test confirms that of ADF test that, the variables in each of the individual countries are stationary. At 5 percent alpha level as well as with intercept only or intercept and constant, the variables are stationary at either level or at first difference. The presence of I (0) and I (1) means there is a possible cointegration and hence verified for Ghana, Sierra Leon, Gambia, Guinea, and Nigeria using the ARDL bounds testing approach.

ARDL Bounds Test

To achieve the overall objective as well as for each member country, it is imperative to investigate the long-run relationship between the variables for the study. The

Bounds test is carried out to ensure that the variables are cointegrated. The Bound test results are presented in Table 17

Table 17: The ARDL Bounds Testing Approach

K	Significance	Upper Bounds I(1)	Lower Bounds I(0)
8	1%	5.694	3.864
	5%	4.163	2.73
	10%	3.498	2.277

Country	F- statistic	Decision
Ghana	20.76597	Reject Ho
Sierra Leon	19.368263	Reject Ho
The Gambia	15.91991	Reject Ho
Guinea	18.078446	Reject Ho
Nigeria	16.136484	Reject Ho

Source: Takyi-Ofori (2021)

The results in table 17 depicts that the variables are cointegrated for all member countries under study. For each of the member countries, the F-statistic exceeds the upper bounds of critical value and therefore the null hypothesis of no long-run relationship is not accepted. As such, an error correction model is estimated accordingly.

Long Run Estimates

After establishing the cointegrating properties, the ARDL model is estimated to investigate the fiscal and monetary policy effects for each of the member countries.

Table 18, therefore, present the long run estimation results for all the individual member countries of WAMZ.

Table 18: Estimated Long Run Results for member countries

Country	Ghana	Sierra Leone	The Gambia	Guinea	Nigeria
Variable					
LNGE	0.624526***	-0.607699***	0.325969***	0.701444***	0.570409***
	(0.035027)	(0.089219)	(0.047366)	(0.068983)	(0.109279)
	[17.82999]	[-6.811312]	[6.881924]	[10.16842]	[5.219750]
LNTAXR	-0.169513***	0.237742**	-0.138573***	-0.369593***	-0.704252***
	(0.035828)	(0.095665)	(0.045983)	(0.116763)	(0.212228)
	[-4.731323]	[-2.485167]	[3.013570]	(-3.165318)	[-3.318370]
LNMS	0.740097***	0.370112***	0.180146***	0.485585***	0.657150**
	(0.196671)	(0.057278)	(0.060057)	(0.136433)	(0.300726)
	[3.763128]	[6.461678]	[2.999583]-	[3.559146]	[2.185211]
LNRIR	-0.506269***	-0.133339**	-0.213350**	-0.223157***	-0.321890
	(0.155288)	(0.052804)	(0.095865)	(0.041101)	(0.246903)

	[-3.260186]	[-2.525150]	[-2.225535]	[5.429478]	[-1.303710]
LNEXR	0.147013	0.141763	0.337435***	0.168126***	0.303621**
	(0.137719)	(0.136930)	(0.093005)	(0.040241)	(0.140958)
	[1.067487]	[1.035295]	[3.628138]	[4.177977]	[2.153979]
LNINFL	-0.372433**	-0.085751**	-0.030704***	-0.014676	-0.034290***
	(0.053683)	(0.036427)	(0.009090)	(0.172390)	(0.011851)
	[-6.937633]	[-2.354043]	[-3.377777]	[-0.085132]	[-2.893671]
LNCAPA	0.074466***	0.155468	0.107464***	0.339976	0.254826
	(0.015791)	(0.115213)	(0.037277)	(0.219138)	(0.212997)
	[4.715724]	[1.349396]	[2.882850]	[1.551424]	[1.196382]
LNLABF	0.324722	0.270956	0.887546	0.367615***	0.610721***
	(0.239025)	(0.107641)	(0.556036)	(0.119630)	(0.140661)
	[1.358527]	[2.517219]	[1.596202]	[3.072933]	[4.341793]
LNGE*MS	0.802160***	0.726031***	0.417013***	0.913042***	0.628948***
	(0.220860)	(0.134079)	(0.127719)	(0.154767)	(0.201804)

	[3.631984]	[5.414949]	[3.265081]	[5.899461]	[3.116628]
LNTAXR*INFL	0.420155***	0.602849**	0.590644***	0.631430***	0.820811***
	(0.084096)	(0.240497)	(0.172053)	(0.180288)	(0.230171)
	[4.996135]	[2.506679]	[3.432918]	[3.502340]	[3.566092]
C	2.679309***	6.021300***	1.838862**	9.045514***	3.784064***
	(0.315812)	(0.454899)	(0.786229)	(1.576740)	(0.836970)
	[8.483873]	[13.236564]	[2.338837]	[5.736844]	[4.521146]

Source: Takyi-Ofori (2021)

Note: ***p< 0.01; **p<0.05; p*< 0.1 and values in ( ) and [ ] denote standard errors and t-statistics respectively.

The long-run results as shown in Table 18 above reveals that the economic growth of member countries of WAMZ is indeed influenced either positively or negatively by shifts in the two policies.

Government expenditure influences basically the economic growth of member countries. All things being equal, a percentage increase in government expenditure causes economic growth to increase by about 0.62 percent in Ghana, 0.33 percent in the Gambia, 0.70 percent in Guinea and 0.57 percent in Nigeria. The coefficients of government expenditure for these member countries as shown in Table 18 are positive and statistically significant at 1 percent. Among these countries, the economic growth of Guinea responds more to positive changes in government expenditure. This finding, therefore, conforms to that of Nurudeen and Usman (2010), Al-Yousif (2000), Dash and Sharma (2008), Enache (2009) and Cooray (2009) who argued that a rise in government expenditure on socio-economic activities brings on growth. By implication, expenditure on sectors such as health and education expands productivity and hence output while expenditure on infrastructural amenities such as road, communication, power among others help reduces production costs, raises firms' investment and profits and, hitherto fosters growth. However, with a coefficient of -0.607699 significant at 1 percent, a percentage increase in government expenditure leads to about 0.60 percent fall in the economic growth of Sierra Leone. Interestingly, the economic growth of Sierra Leon is affected adversely. This could be explained by the crowding-out effect usually associated with government spending or can also be as a result of increased

taxes and borrowings used to finance unproductive public expenditures. According to Evans *e. al,* (2018) when taxes are increased with the view of funding developmental projects in an economy, disposable incomes of consumers and firms decreases. As such, private sector flows may decrease in spite of expenditure on social or infrastructural development. This finding is in line with the study conducted by Twumasi (2012) and Akosa (2013).

Moving on, a percentage increase in tax revenue causes economic growth to fall by about 0.17 percent in Ghana, 0.14 percent in the Gambia, 0.37 percent in Guinea and 0.70 percent in Nigeria. Agreeing with Easterly and Rebelo (1990), the negative effect of tax revenue felt by these member countries is due to the distortions in choices of firms and consumers in the areas of savings and investments as a result of high tax regimes. Thus, instituting high tax regimes for example on incomes, investments among others in an effort to raise more revenue to finance other projects in the country adversely affect economic growth. From Table 18, the economic growth of Nigeria is greatly affected by the negative effect of tax revenue as compared to the other member countries. Empirically, this finding conforms to studies conducted by authors including Twumasi (2012), Ola (2001) and Adereti *et al,* (2011) who argued that tax revenue has an adverse growth-effect. However, for Sierra Leon, tax revenue and economic growth are positively. Thus, all things being equal, a percentage increase in tax revenue brings on about 0.24 percent outward shift in the economic growth of Sierra Leone. The implication here is that the level of tax revenue positively affects the economy of Sierra Leon with regards to government or policymakers engaging in productive activities such as

the provision of social infrastructures, creation, and expansion of employment opportunities among others through the acquisition of tax revenue. Ocran (2009), Ogbonna and Ebimobowei (2012) found tax revenue to be positively related growth and as such consistent with this study.

Furthermore, money supply significantly and positively influences the economic growth of all the member countries under study. Specifically, a percentage increase in money supply bring about an expansion of the economic growth by about 0.74 percent in Ghana, 0.37 percent in Sierra Leone, 0.18 percent in the Gambia, 0.49 percent in Guinea and 0.66 percent in Nigeria. The implication here is that an attempt of the bank of these countries to inject money into the economy (expansionary monetary policy) through various monetary tools such as open market operation, a decrease in the reserve requirement for commercial banks among others would bring about a rise in the growth rate of these countries. Ghana's economy is influenced most as compared to the other member countries from table 18 above. This finding is however in line with that of Hussain and Haque (2017), Ogunmuyiwa and Ekone (2010) and Babatude and Shuaibu (2011).

In addition, the real interest rate significantly influences the economic growth of Ghana, Sierra Leone, Gambia, Guinea but not Nigeria. Thus, ceteris paribus, a percentage increase in the real interest rate causes economic growth to fall by about 0.5 percent in Ghana, 0.13 percent in Sierra Leone, 0.21 percent in the Gambia and 0.2 percent in Guinea. According to Keynes (1936), Changes in interest rate greatly affect behaviors of households in terms of savings and consumption, firms' decisions and on the portfolio allocation of domestic and

foreign traders in the financial and exchange rate markets. By implication, high-interest rates expand the cost of borrowing, forcing firms and consumers to reduce their spending and hence lowering investment growth. This finding conforms to other studies including Havi and Enu (2014) and Noman and Khudri (2015).

Again, the real exchange rate is another determinant of economic growth with positive coefficients but statistically significant for only Gambia, Guinea, and Nigeria. Specifically, a percentage increase in real exchange rate results in approximately 0.34 percent, 0.17 percent and 0.30 percent increase in the economic growth of Gambia, Guinea, and Nigeria respectively. It can, however, be observed that among these countries, the economic growth of Gambia is greatly affected in this regard. This expansion in the economies of these countries could be explained through the Marshall-Lerner condition and also consistent with Noman and Khudri (2015) that, an increase in exchange rate (depreciation of the Gambian Dalasi, Guinean Franc and the Naira) causes rapid growth of the economy because of a rise in net exports and a fall in imports.

Also, the rate of inflation significantly and negatively influence the economic growth of Ghana, Gambia, and Nigeria but not Sierra Leone and Guinea. Thus, a percentage increase in inflation rate brings on a fall in the economic growth of Ghana, Gambia, and Nigeria by about 0.37 percent, 0.03 percent, and 0.3 percent respectively. According to Fisher (1993) and Barro (1996), inflation causes investment to reduce consequently slowing growth. Thus, prices become distorted as a result of inflation and therefore affecting the effective allocation of resources. By implication, an increase in the inflation rate could cause greater uncertainty

amongst consumers as well as firms leading to lower investment and consequently to low economic growth. This result supports that of Khan and Senhadji (2001) and Mubarik (2005). However, among these countries, Ghana's economy is severely affected by inflation rate.

More so, the coefficients of capital accumulation are positive and statistically significant for Ghana and Gambia. Specifically, a percentage increase in capital accumulation expands the economy of Ghana and Gambia by about 0.07 and 0.11 percent all things being equal. This, therefore, implies that improvements in lands, fences, ditches, equipment purchases as well as the construction of roads, railways, schools, offices, hospitals, among others contribute to economic growth given the economy of Ghana and Gambia. This finding is consistent with that of Felipe and Fisher (2003).

Moreover, the combined effects of fiscal and monetary policies measured by government expenditure and money supply interaction proved growth-inducing in all the member countries. Specifically, the net effect calculation as shown in Appendix B indicates that a percentage increase in money supply given that the government of each of the member countries spends more on infrastructural projects would induce economic growth to increase by about 18.23 percent in Ghana, 16.33 percent in Sierra Leone, 9.36 percent in the Gambia, 20.17 percent in Guinea and 14.4 percent in Nigeria ceteris paribus. It is evidently shown from table 18 that indeed both policies jointly influence the economic growth of member countries. Among the member countries, Guinea recorded the highest value in terms of the magnitude of the net effect of money supply while the Gambia

recorded the lowest value. Also, the long-run net effect of government expenditure calculated and shown in Appendix B indicates that, a percentage increase in government expenditure given money supply expands the economy of member countries by about 3.12 percent in Ghana, 1.67 percent in Sierra Leone, 1.63 percent in the Gambia, 3.51 percent in Guinea and 2.54 percent in Nigeria. The net effect of government expenditure given the money supply is greater in Guinea compared to the remaining member countries.

Finally, the joint effects of the interaction of tax revenue and inflation significantly influence member countries' growth. Thus, where too much demand is bidding up prices (given inflation), a percentage increase in tax revenue causes economic growth to increase by 0.27 percent in Ghana, 1.70 percent in Sierra Leone, 1.30 percent in the Gambia, 1.18 percent in Guinea and 1.30 percent in Nigeria and this can be inferred from the net effect calculations in appendix B. Here, the joint effects stems from the fact that all things being equal, when the economy is experiencing persistent and appreciable rise in general price levels of products, increases in tax will dampen the upward pressure on prices. This is because an increase in tax lowers disposable income resulting in a decrease in aggregate demand. It can, however, be observed that the intensity of the net effect of the interaction of tax revenue and inflation rate on the economic growth of Sierra Leone is greater as compared to the remaining member countries.

Short-run Estimates

Table 19: Parsimonious Error Correction Model

Country / Variable	Ghana	Sierra Leon	Gambia	Guinea	Nigeria
C	2.495281***	6.021300***	1.838862***	4.446568***	5.171430**
	(0.488146)	(1.454899)	(0.144632)	(1.046391)	(2.043567)
	[5.111751]	[4.138637]	[12.714074]	[4.249432]	[2.530589]
D(LNGDPPC(-1))	0.192459***	0.491177**	0.255591***	0.706340***	0.265683***
	(0.04321)	(0.208544)	(0.075879)	(0.188046)	(0.023258)
	[4.454038]	[2.355267]	[3.368402]	[3.756208]	[11.423295]
D(LNGE)	0.598290***		0.325969***	0.706340***	
	(0.077809)	-	(0.024281)	(0.188064)	-
	[7.689213]		[13.424858]	[3.755844]	
D(LNGE(-1))	0.491177**	0.294239***		0.346519***	0.344399**
	(0.208539)	(0.070172)	-	(0.097286)	(0.129774)
	[2.355322]	[4.193111]		[3.561858]	[2.653836]

D(LNTAXR)	-0.357910**	-0.151855***	0.140491***	-0.322402**	-
	(0.148609)	(0.047765)	(0.039293)	(0.146303)	
	[-2.408400]	[-3.179210]	[3.575471]	[-2.203659]	
D(LNTAXR(-1))	-0.180665***	-0.859831***	-	-	0.319355***
	(0.041420)	(0.279430)			(0.101664)
	[-4.361781]	[3.077089]			[3.141279]
D(LNMS)	0.737027***	0.169799***	-	0.344389**	0.283038**
	(0.224915)	(0.032581)		(0.149047)	(0.120274)
	[3.276913]	[5.211595]		[2.310598]	[2.353276]
D(LNMS(-1))	0.127678**	-	0.174881***	0.297286***	0.857740***
	(0.049952)		(0.046032)	(0.034659)	(0.254012)
	[2.556013]		[3.799118]	[8.577454]	[3.376769]

D(LNRIR)	-	-0.319355**	-	0.322402**	
	0.192459***	(0.115658)	0.032674***	(0.146301)	-
	(0.04321)	[-2.761195]	(0.00672)	[2.203688]	
	[-4.454038]		[-4.862202]		
D(LNRIR(-1))	-0.294834**		-0.151850**	0.380410***	0.290843***
	(0.114202)	-	(0.057765)	(0.087746)	(0.114347)
	[-2.581974]		[-2.628754]	[4.335354]	[2.543512]
D(LNEXR)		0.091993***	0.066162***		0.056451***
	-	(0.009559)	(0.008762)	-	0.006964
		[9.623705]	[7.551015]		8.106117
D(LNEXR(-1))	0.080028***	0.010035***	0.010770***	0.106100***	
	(0.010662)	(0.001551)	(0.001565)	(0.025990)	-
	[7.505908]	[6.471615]	[6.881789]	[4.082339]	
D(LNINFL)	-0.347465**	-	-	-0.107464**	0.386573***
	(0.135547)	0.206110***	0.519657***	(0.043327)	(0.084779)
	[-2.563428]	(0.070159)	(0.116948)	[-2.480300]	[4.559784]

		[-2.937755]	[-4.443487]		
D(LNCAPA)	0.366397**	0.338849**		0.690262***	
	(0.163184)	(0.073035)	-	(0.219884)	-
	[2.245298]	[2.502619]		[3.139209]	
D(LNCAPA(-1))	-	0.119303***	0.274045***		0.594625***
		(0.036703)	(0.032227)	-	(0.134871)
		[3.307252]	[8.503583]		[-4.408848]
D(LNGE*MS)	0.318974***	0.393170***	0.578473***	0.214752***	0.545552***
	(0.046160)	(0.046805)	(0.173284)	(0.046180)	(0.177109)
	[6.910132]	[8.400202]	[3.338286]	[4.650371]	[3.080317]
D(LNTAXR*INFL)	0.500132	0.130270**	0.460636***	0.590470*	0.600112*
	***	(0.052035)	(0.130110)	(0.271825)	(0.291970)
	(0.123087)	[2.503507]	[3.540358]	[2.172243]	[2.055389]
	[4.063239]				
ECM(-1)	-0.86004***	-0.76226***	-0.63041***	-0.75605***	-0.75497***

	(0.075083)	(0.057548)	(0.049992)	(0.055052)	(0.054380)
	-11.454483	-13.245603	[-12.61016]	[-13.73319]	[-13.88309]
R-square	0.577096	0.679948	0.885150	0.798662	0.899281
Adj. R-squared	0.488991	0.526605	0.676332	0.761166	0.881860
F-statistic	131.5714	119.4593	270.9720	263.5524	412.4966
Prob(F-statistic)	0.000000	0.000000	0.000000	0.000000	0.000000
DW	1.876362	1.997042	2.797736	1.871680	2.176811

Source: Takyi-Ofori (2021)

Note: ***p< 0.01; **p<0.05; p*< 0.1 and values in ( ) and [ ] denote standard errors and t-statistics respectively.

The short-run effects of these two policies are captured by both the lagged and current values. Table 19 reveals the previous year's as well as the current values of both the outcome and the explanatory variables which significantly affects the economic growth of Ghana, Sierra Leone, The Gambia, Guinea and Nigeria.

The result further shows that, the estimated coefficient of the error correction term (ECM) in each of the countries had its expected sign and significant. Thus, coefficient of the error correction term for Ghana is -0.860037 while that of Sierra Leon -0.762258 meaning that the speed of adjustment is approximately 86 and 76 percent per year respectively. In the case of Gambia, Guinea and Nigeria, the coefficient of the error correction term is -0.630407, -0.756045 and 0.754967 respectively and therefore means that the speed of adjustment is about 63 per year for Gambia, 76 percent per year for Guinea and 75 percent per year for Nigeria.

Observing the coefficient of the ECM reveals the variables are cointegrated. The size of the coefficient of the error correction term (ECM) denotes that about 86 percent (in the case of Ghana), about 76 percent (in the case of Sierra Leon), about 63 percent (in the case of Gambia), about 76 percent (in the case of Guinea) and about 75 percent (in the case of Nigeria) of the disequilibrium in the product market caused by previous years' shocks converges back to long run equilibrium in the current year

Diagnostic and Stability Tests

The following tests as given below were reported to check the robustness of the outcome.

Table 20: Diagnostic Tests

Country	Ghana	Sierra Leon	Gambia	Guinea	Nigeria	WAMZ
Tests	Statistic & P.value					
Serial correlation	0.196000	0.688938	0.176389	0.416295	0.246439	0.18676
	(0.8241)	(0.5209)	(0.6001)	(0.6669)	(0.7851)	(0.8002)
Heteroskedasticity	0.994543	0.198803	0.428103	0.968100	1.079622	0.519271
	(0.4742)	(0.9947)	(0.9240)	(0.4915)	(0.4328)	(0.7219)
Normality	3.143645	2.867930	2.081006	2.423532	1.675852	0.978989
	(0.207666)	(0.238362)	(0.353277)	(0.440285)	(0.432607)	(0.612936)
Functional form	0.947078	0.406194	1.777775	0.004229	0.139411	1.924281
	(0.3449)	(0.5350)	(0.2072)	(0.9490)	(0.7145)	(0.5028)

Source: Takyi-Ofori (2021)

From the results in table 20, the p-values of all the tests were insignificant at all the alpha levels. This implies that, the Breusch-Godfrey Serial Correlation LM test shows no serial correlation, the Breusch-Pagan-Godfrey Test for Heteroscedasticity also shows the absence of heteroscedasticity among the error terms, based on the Jacque-Bera normality test, the series in the model are normally distributed and the model is correctly specified according to the Ramsey-RESET stability test.

Stability Test

According to Brown et al. (1975), the stability test is based on the cumulative sum of the recursive residuals. Pesaran and Pesaran (1997) suggest that once the models have been estimated, it is necessary to apply the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) tests to assess the parameter constancy. This aims to check the stability of the parameters in the model for the sample period. From Appendices D to I, it can be observed that the parameters in the model are stable.

Non-linear / Asymmetric Effects of Fiscal and Monetary Policies

Here, the non-linear ARDL model is used to achieve the third objective of the study. Hence, the asymmetric effects of variables of interest were analyzed and discussed to aid policymakers implement effective macroeconomic policies to bring about rapid economic growth. However, the long run asymmetric cointegration among the variables is done using the bounds testing procedure explained earlier. The results are therefore given in Table 21

Table 21: Results of Bounds Test for the Existence of Asymmetric Cointegration

	Significance	Upper Bounds I(1)	Lower Bounds I(0)
	1%	4.684	3.27
	5%	3.676	2.31
	10%	3.351	2.169
Country	F- statistic	Decision	
Ghana	13.06168	Reject Ho	
Sierra Leon	15.162116	Reject Ho	
Gambia	13.547227.	Reject Ho	
Guinea	16.740341	Reject Ho	
Nigeria	19.088641	Reject Ho	

Source: Takyi-Ofori (2021)

The results reveal that variables are cointegrated asymmetrically. Specifically, the computed F-statistics for the model under of the countries is greater than all the critical upper bound values at all the significant levels. This confirms a possible cointegration and as such the existence of an error correction mechanism. In view of this, the NARDL model is used to estimate the long and

short run parameters. Table 21 below, therefore, presents the estimated asymmetric long run results for WAMZ.

Table 22: NARDL Long-run results for WAMZ

Variable	Coefficient	Std. Error
LNGE_POS	0.871247***	(0.147171)
LNGE_NEG	0.548138***	(0.077050)
LNTAXR_POS	-0.547710***	(0.067417)
LNTAXR_NEG	0.500221**	(0.204730)
LNMS_POS	0.337918***	(0.026221)
LNMS_NEG	0.200314***	(0.013938)
LNRIR_POS	-0.204855***	(0.055505)
LNRIR_NEG	-0.348220***	(0.028719)
LNEXR_POS	0.192526***	(0.064681)
LNEXR_NEG	0.144574***	(0.023004)
LNINFL_POS	-0.212023***	(0.045351)
LNINFL_NEG	-0.255451***	(0.081590)
LNCAPA	0.312811***	(0.083410)
LNLABF	0.064345	(0.055201)

LNGE*MS	0.167513***	(0.035474)
LNTAXR*INFL	0.401305	0.240493
CONSTANT	2.348215***	(0.411208)

Source: Takyi-Ofori (2021)

Note: ***p< 0.01; **p<0.05; p*< 0.1.

It is obvious from Table 22 that, government expenditure positively and significantly influences economic growth with coefficient 0.871247 while it negatively affects growth with coefficient 0.548138 both at 1 percent. This, however, implies that a percentage increase in government expenditure causes the economy of member countries within the zone to expand more by about 0.9 percent as compared to a 1 percent decrease in government expenditure which brings about 0.5 percent fall in growth. According to Mankiw and Scarth (2008), a rise (fall) in government expenditure increases (decreases) the aggregate demand of an economy which ultimately enhances (retards) growth. This means that, economic growth responses to variations in government expenditure need not be the same but rather determined by the magnitude of the economic changes. This is the main tenet of Bird (1971) Ratchet hypothesis, which posits an asymmetry in government expenditure share to GDP over the business cycle. This finding is in line with that of Bayrak and Esen (2014).

Furthermore, tax revenue significantly and negatively affects economic growth of member countries within the zone with coefficients -0.547710 and 0.500221 at 1 and 5 percent respectively. The coefficients indicate that, the

economic growth of member countries within the zone respond negatively to the positive and negative changes in tax revenue. Specifically, a percentage increase in tax revenue causes economic growth to fall by about 0.5 percent. This finding supports the empirical findings of Srithongrung and Sanchez-Juarez (2015) in Mexico that, tax revenue negatively affects economic growth. Intuitively, high tax rates or regimes impact the spending patterns of economic agents such that the disposable incomes of consumers reduce. Hence, they tend to spend less which consequently leads to slower growth. Also, a percentage decrease in tax revenue causes the economy of member countries within the zone to fall by about 0.5 percent. This implies that, a fall in tax revenue adversely affects growth. In the works of Ogbonna and Ebimobowei (2012), they argued that, tax revenue is a very vital tool through which government regulates and funds the economy to bring about sustained growth. Thus, tax serves as a major source of revenue for various developmental projects within an economy which consequently lead to improved welfare of citizens.

Also, money supply significantly, positively and negatively affects economic growth within the zone with coefficients 0.337918 and 0.200314 respectively. A percentage increase in money supply causes economic growth to expand by approximately 0.3 percent while a percentage decrease in money supply causes the economy to contract by about 0.2 percent fall. From table 1.31 above, economic growth responses from positive variations in money supply is larger compared to its negative variations. The implication here is that, an expansionary monetary policy which injects more money into the economy lowers the real

interest rate and consequently leads to more investment decisions being formed by investors, businesses among others. This ultimately leads to increased outputs which bring about enhanced welfare and growth. In contrast, contraction in money supply raises the cost of borrowing and hence serves as a disincentive to private businesses as well as consumers consequently leading to less output. This finding conforms to that of Barnichon, Matthes and Ziegenbein (2016).

Moreover, economic growth is influenced significantly by real interest rate. Thus, a percentage increase in real interest rate causes the economy of member countries within the zone to contract by approximately 0.2 percent while its percentage reduction brings on about 0.3 percent rise in growth. Comparing and observing the two coefficients, the respond of economic growth to a decrease in real interest rate is greater than that of its increase. This finding indicates that, within the zone, there are higher levels of real interest rates which are associated with lower economic growth as well as lower levels of real interest rates which leads to expansion in economic growth and as such explains it asymmetric nature. The implication here is that, higher interest rates are associated with lower investments which consequently lead to slow growth. This result conforms to that of Dolado and Maria-Dolores (2006).

Again, real exchange rate positively and significantly influences economic growth with coefficient 0.192526 at 1 percent as well as affect economic growth negatively with coefficient 0.144574 at 1 percent. Thus, a percentage increase in exchange rate causes economic growth within the zone to rise by approximately 0.5 percent. The implication here is that, assuming the Marshal-Lerner condition holds,

an increase in exchange rate (depreciation of the domestic currency) causes an expansion in net exports (increased injection) and a fall in the demand for imports (a reduced leakage in the circular flow) which consequently lead to high economic growth within the zone. In contrast, a percentage decrease in exchange rate (appreciation of domestic currency) leads to a fall in economic growth by approximately 0.1 percent. Consistent with studies conducted by Siew-Pong, Thian-Hee and Cheong-Fatt (2017) the findings reveal that economic growth is asymmetrically responding to exchange rate shifts. However, the respond of economic growth to an increase in real exchange is greater than that of a decrease in real exchange rate.

Finally, another major determinant of economic growth within the zone is rate of inflation. Specifically, rate of inflation significantly and positively influences economic growth with coefficients -0.212023 while it negatively affects economic growth with coefficient -0.255451. Thus, a percentage increase in inflation results in about 0.2 percent fall in economic growth while 1 percent decrease in inflation causes growth to expand by about 0.3 percent. Here, the implication is that, higher levels of inflation within the zone bring on lower economic growth while lower levels of inflation bring on increased economic growth. Comparing the two coefficients however, shows that economic growth reacts more towards a fall in inflation rate than an expansion in inflation rate and hence in line with of Mohsen and Mohsen, (2015).

Table 23: NARDL Short run results for WAMZ

Variable	Coefficient	Std. Error
C	5.584701***	(0.954696)
D(LNGDPPC)	0.550955***	(0.105093)
D(LNGDPPC(-1))	0.106774**	(0.041320)
D(LNGE_POS)	0.260321***	(0.045631)
D(LNGE_POS(-1))	0.564715***	(0.100646)
D(LNGE_NEG(-1))	0.517302**	(0.210927)
D(LNTAXR_POS)	-0.448263***	(0.110433)
D(LNTAXR_NEG)	-0.348219***	(0.118774)
D(LNTAXR_NEG(-1))	-0.457414***	(0.082309)
D(LNMS_POS(-1))	0.204848***	(0.045556)
D(LNMS_NEG)	0.182918***	(0.020263)
D(LNRIR_POS(-1))	-0.302514***	(0.086707)
D(LNRIR_NEG)	-0.380035***	(0.070806)
D(LNRIR_NEG(-1))	-0.202051***	0.047010
D(LNEXR_POS)	0.129550***	(0.008209)
D(LNEXR_POS(-1))	0.017334***	0.001857

D(LNEXR_NEG)	0.165503***	(0.007945)
D(LNINFL_POS)	-0.181729***	(0.060281)
D(LNINFL_NEG)	-0.302604***	(0.100782)
D(LNCAPA)	0.381221***	(0.079211)
D(LNLABF)	0.250283	0.237594
D(LNGE*MS)	0.430293***	(0.113581)
D(LNTAXR*INFL)	0.520505	0.313073
ECM(-1)	-0.814802***	(0.132961)
R-squared	0.765860	
Adjusted R-squared	0.685105	
DW	1.892198	
F-statistic	212.5501	
Prob(F-statistic)	0.000000	

Source: Takyi-Ofori (2020)

Note: ***p< 0.01; **p<0.05; p*< 0.1.

The results in Table 23 show that the lagged as well as current positive and negative values of the explanatory variables significantly influence economic growth of member countries within the zone. The result further indicates that, the coefficient of the error correction term is -0.814802, clearly having the expected sign as well as significant.

Long run NARDL Estimates for the Member Countries

Table 24: NARDL Results for Member Countries

Country	Ghana	Sierra Leone	Gambia	Guinea	Nigeria
Variable					
LNGE_POS	-0.457407***	0.793825***	0.526562***	0.473668***	0.485493***
	(0.130097)	(0.231947)	(0.124017)	(0.148385)	(0.121440)
LNGE_NEG	0.548740***	0.215762***	0.482483***	0.457421***	0.220166***
	(0.108837)	(0.043787)	(0.133926)	(0.159882)	(0.060586)
LNTAXR_POS	0.501885***	0.481251***	-0.535373***	-0.502305***	-
	(0.099210)	(0.133949)	(0.140729)	(0.102607)	0.302971***
					(0.101057)
LNTAXR_NEG	0.414353***	0.413596***	-0.232832***	0.443029***	0.432738***
	(0.127811)	(0.093595)	(0.074605)	(0.40945)	(0.140164)
LNMS_POS	0.371400***	0.304987***	0.201862***	0.401612***	0.510445***
	(0.052741)	(0.101403)	(0.017163)	(0.125514)	(0.101607)
LNMS_NEG	0.203420***	0.215086***	0.494144***	0.616052	0.753184***

	(0.060478)	(0.016665)	(0.089654)	0.505752	(0.217084)
LNRIR_POS	-0.156557*	-0.337692***	-0.176764	-0.214666***	-
	(0.074200)	(0.068255)	0.034771	(0.051969)	0.202327***
					(0.040431)
LNRIR_NEG	-0.148467***	-0.578455***	-0.316645**	-0.165361***	-0.111148
	(0.046214)	(0.177308)	(0.133494)	(0.036173)	0.011706
LNEXR_POS	0.109876***	0.017694***	0.101093***	0.197973***	0.119983***
	(0.026375)	(0.002501)	(0.031109)	(0.063528)	(0.014920)
LNEXR_NEG	0.118580***	0.028079***	0.186081***	0.158981***	0.158225***
	(0.024160)	(0.001965)	(0.060854)	(0.022851)	(0.045957)
LNINFL_POS	-0.285761***	-0.402486***	-0.203590	-0.217311***	-
	(0.053974)	(0.023183)	0.051400	(0.018815)	0.216949***
					(0.024078)
LNINFL_NEG	-0.127544***	-0.205078***	-0.145696**	-0.167301***	-
	(0.027892)	(0.012401)	(0.056623)	(0.030645)	0.169913***
					(0.035828)

LNCAPA	0.814061**	0.205078***	0.367615***	0.509971**	0.678647
	(0.331350)	(0.043658)	(0.119463)	(0.211770)	(0.552691)
LNLABF	0.205759	0.216754	0.203590	0.196718	0.188345
	(0.203901)	(0.183993)	0.301415	(0.190725)	(0.209184)
LNGE*MS	0.950361***	0.593928***	0.601672***	0.682160***	0.404891***
	(0.303691)	(0.147732)	(0.105346)	(0.233509)	(0.120111)
LNTAXR*INFL	0.653890	0.730442***	0.330302.	0.516043***	0.251021
	(0.465700)	(0.193810)	0.220461	(0.156026)	0.157009
C	3.531891***	8.220463***	3.051655***	2.524140***	6.765901***
	0.556130	(0.825941)	(0.506523)	(0.352550)	(1.165334)

Source: Takyi-Ofori (2021)

Note: ***p< 0.01; **p<0.05; p*< 0.1.

From Table 24, a percentage positive change (or increase) in government expenditure brings about 0.79 percent increase in the economic growth of Sierra Leone, 0.53 percent increase in Gambia, 0.47 percent increase in Guinea and 0.49 percent increase in that of Nigeria. In contrast, a positive change in government expenditure negatively affect the economic growth of Ghana. Specifically, a percentage increase in government expenditure brings about a fall in the economic growth of Ghana by about 0.46 percent. This negative effect could be explained by the crowding-out effect usually associated with government spending. However, a percentage negative change (or decrease) in government expenditure causes the economic growth of Ghana, Sierra Leone, Gambia, Guinea and Nigeria to fall by 0.55 percent, 0.22 percent and 0.48 percent, 0.46 percent and 0.22 percent respectively. Mankiw and Scarth (2008) argue that a fall in government expenditure decreases the aggregate demand of an economy which ultimately retards growth. For countries such as Sierra Leone, Gambia and Nigeria, their economies' reaction to an expansion in government expenditure is greater as compared to a decrease. The economy of Guinea expands more following a fall in government expenditure as compared to an expansion while both positive and negative changes in government expenditure adversely affect the economy of Ghana. This finding is in line with that of Okoro (2013) and Bayrak and Esen (2014) who emphasize the asymmetric relationship between government expenditure and growth.

Moving on, a percentage increase in tax revenue leads to about 0.50 percent and 0.48 percent rise in the economic growth of Ghana and Sierra Leone

respectively. For countries such as Gambia, Guinea and Nigeria, a percentage increase in tax revenue causes their economic growth to fall by about 0.54 percent, 0.50 percent and 0.30 percent respectively. On one hand, the positive effect is in line such that, output expansion can be realised through projects and social amenities which will be funded by tax revenue and consequently enhance growth while the adverse effect of tax revenue could be because high tax rate which could pull the aggregate demand downwards and hence translating into retard growth. However, a percentage decrease in tax revenue causes the economic growth of both Ghana and Sierra Leone to rise by about 0.41 percent, that of Guinea and Nigeria to rise by about 0.44 percent and 0.43 percent respectively. Observing the coefficients, it can be realized that for countries such Ghana and Sierra Leone, a positive change in tax revenue greatly affects their economic growth as compared to a fall while both positive and negative change in tax revenue causes the economies of Gambia, Guinea and Nigeria to contract. This severity of the negative effect of tax revenue is felt by these countries when tax revenue changes upwards.

Also, a percentage increase in money supply expands economic growth by about 0.37 percent in Ghana, 0.30 percent in Sierra Leone, 0.20 percent in the Gambia, 0.40 percent in Guinea and 0.51 percent in Nigeria. This could be explained by the fact that an expansionary monetary policy lowers real interest rate, leads to more investment decisions and ultimately lead to increased outputs in the economy. In contrast, a negative change in money supply adversely affects the economic growth of these countries. Specifically, a percentage increase in money supply causes economic growth to increase by about 0.20 percent in Ghana, 0.22

percent in Sierra Leone, 0.49 percent in the Gambia, 0.62 percent in Guinea and 0.51 percent in Nigeria. The asymmetric effect of money supply as expounded is in confirmation with other studies including Barnichon, Matthes and Ziegenbein (2016). A positive change in money supply greatly affects the economic growth of countries such as Ghana and Sierra Leone than a negative change while for Gambia, Guinea, and Nigeria, their economic growth responds more to a negative shift in money supply compared to a positive shift.

Again, a percentage increase in the real interest rate causes economic growth to fall by about 0.16 percent in Ghana, 0.34 percent in Sierra Leone, 0.18 percent in the Gambia, 0.21 percent in Guinea and 0.20 percent in Nigeria. Consistent with the empirical findings of Dolado and Maria-Dolores (2002), higher real interest rates bring about lower levels of investment which consequently retards growth. However, a percentage decrease in the real interest rate expands growth by about 0.15 percent in Ghana, 0.58 percent in Sierra Leone, 0.32 percent in the Gambia, 0.17 percent in Guinea and 0.11 percent in Nigeria. Observing from table 24, the response of economic growth to positive real interest rate is more than a decrease in the real interest rate for Ghana, Guinea, and Nigeria. For Sierra Leone and Gambia, their economic growth is greatly affected by a negative shift in real interest rate compared to a positive change.

Furthermore, a percentage increase in real exchange rate brings on an expansion in economic growth by approximately 0.11 percent in Ghana, 0.01 percent in Sierra Leone, 0.10 percent in the Gambia, 0.20 percent in Guinea and 0.12 percent in Nigeria. However, a percentage decrease in real exchange rate

contracts the economy by about 0.12 percent in Ghana, 0.03 percent in Sierra Leone, 0.19 percent in the Gambia and 0.16 percent in Guinea and Nigeria. Comparing the coefficients, Guinea's economic growth responds more to positive shifts in real exchange rate than negative shift while for Ghana, Sierra Leone, Gambia, and Nigeria, the respond of their economic growth to a negative change in the real exchange rate is greater than a positive change. The above findings suggest that economic growth asymmetrically respond to exchange rate changes and hence consistent with authors such as Cheah, Yiew and Ng (2017).

Finally, economic growth is influenced by positive and negative shifts in the inflation rate. Thus, a percentage increase in inflation rate causes economic growth to fall by about 0.29 percent in Ghana, 0.40 percent in Sierra Leone, 0.20 percent in the Gambia and 0.22 percent in both Guinea and Nigeria. In contrast, a percentage decrease causes growth to rise by about 0.12 percent in Ghana, 0.20 percent in Sierra Leone, 0.15 percent in the Gambia and 0.17 percent in both Guinea and Nigeria. The negative effect of inflation could be explained such that high inflation reduces investment, which adversely affects growth, Keynes (1936). However, the economic growth of all the member countries respond more to a positive shift in inflation rate than a negative shift. This finding conforms to studies by Han and Mulligan (2002).

NARDL Short-run Estimates

Table 25: Parsimonious Error Correction Model

Country	Ghana	Sierra Leone	The Gambia	Guinea	Nigeria
Variable					
C	6.829658***	9.598538***	2.240463***	4.090639***	2.140610***
	(2.163956)	(3.196097)	(0.725941)	(1.006267)	(0.610853)
D(LNGDPPC(-1))	0.847165***	0.660903***	0.244636*	0.304989***	0.708091***
	(0.132689)	(0.060516)	(0.119501)	(0.101323)	(0.149778)
D(LNGE_POS(-1))	-0.682197***	0.576487***	0.574193**	0.693928***	0.501700***
	(0.104141)	(0.118370)	(0.228973)	(0.231153)	(0.103206)
D(LNGE_NEG)	0.616305***	0.378791***	0.786363***	0.339187**	0.919834***
	(0.113721)	(0.108537)	(0.261895)	(0.132034)	(0.229819)
	0.385738**	0.182984***	0.158163**		
D(LNGE_NEG(-1))	(0.158914)	(0.056183)	(0.065245)	-	-

D(LNTAXR_POS)	-0.319194*	-0.562847***	-0.340157***	0.239419***	0.577413***
	(0.145529)	(0.171181)	(0.102438)	(0.068457)	(0.109653)
	0.125468***		0.227450***		0.557475***
D(LNTAXR_POS(-1))	(0.041420)	-	(0.072884)	-	(0.151135)
D(LNTAXR_NEG)	-0.295448***	-0.363921***	0.240382***	0.237332***	0.116509***
	(0.042763)	(0.121049)	(0.079101)	(0.023244)	(0.016507)
	0.924258***	0.445867***	0.515691***	0.808566***	0.203713***
D(LNMS_POS)	(0.215307)	(0.126852)	(0.108201)	(0.226941)	(0.032985)
D(LNMS_NEG)	0.106683***			0.225117***	0.485320***
	(0.025375)	-	-	(0.066004)	(0.122126)
D(LNMS_NEG(-1))	0.412101***	0.309997***	0.344877***	0.521444***	
	(0.131430)	(0.101550)	(0.102098)	(0.112071)	-
D(LNRIR_POS)	-0.101098***	-0.208793***	-0.305341***	-0.222358***	-0.330904***
	(0.032079)	(0.030084)	(0.029176)	(0.048567)	(0.030781)

D(LNRIR_NEG)	-0.208696***	-0.179923***			-0.215163***
	(0.025294)	(0.039952)	-	-	(0.050461)
D(LNRIR_NEG(-1))		-0.115842***	0.156350***	0.108229***	
	-	(0.024496)	(0.029127)	(0.031786)	-
D(LNEXR_POS)	0.017915***	0.181126***	0.293937***	0.043412***	0.010281***
	(0.003208)	(0.038379)	(0.045382)	(0.008996)	(0.002549)
D(LNEXR_NEG)	0.010493***	0.049926***	0.290442***	0.025108***	0.027673***
	(0.003065)	(0.005531)	(0.031866)	(0.005849)	(0.008541)
D(LNINFL_POS)	-0.046187***	-0.220864***	-0.246775***	0.269120***	0.274813***
	(0.008304)	(0.072037)	(0.082191)	(0.051079)	(0.041074)
	-0.022741**	-0.309015**	-0.176157*	-0.132743***	-0.080772***
D(LNINFL_NEG)	(0.020583)	(0.011787)	(0.025796)	(0.025746)	(0.009106)
D(LNCAPA(-1))	0.610270***	0.370967***	0.316395***	0.162985***	0.274712***
	(0.201692)	(0.054644)	(0.050613)	(0.023537)	(0.032836)

D(LNLABF)	0.377241	0.461311	0.536616	0.445859	0.278652
	(0.420680)	(0.299881)	(0.371362)	(0.290257)	(2.169186)
D(LNGE*MS)	0.450117***	0.980273***	0.616993***	0.402306**	0.585268***
	(0.101645)	(0.310497)	(0.156204)	(0.155023)	(0.1608562)
D(LNTAXR*INFL)	0.401120**	0.341780***	0.772455	0.191708***	0.268027
	(0.156120)	(0.075120)	(0.451880)	(0.060059)	(0.235018)
ECM(-1)	-0.623509***	-0.701065**	-0.617052***	-0.793628***	-0.806546***
	(0.112862)	(0.287873)	(0.150575)	(0.245270)	(0.253068)
R-squared	0.862094	0.711780	0.814313	0.914933	0.953899
Adjusted R-squared	0.857168	0.701016	0.800445	0.901138	0.943126
DW	1.881643	1.966940	2.081205	2.234959	2.008709
F-statistic	115.036	261.186	147.702	189.307	225.171
Prob(F-statistic)	0.000000	0.000000	0.000000	0.000000	0.000000

Source: Takyi-Ofori (2021)

Note: ***p< 0.01; **p<0.05; p*< 0.1 and values in parenthesis denote standard error.

The results in Table 25 show that both previous and current year's positive and negative changes in both dependent and independent variables significantly influence the economic growth of Ghana, Sierra Leone, Gambia, Guinea and Nigeria.

The result further indicates that, the coefficient of the error correction term is -0.623509 for Ghana, -0.701065 for Sierra Leone, -0.617052 for the Gambia, -0.793628 for Guinea and -0.806546 for Nigeria, clearly having the expected sign as well as significant. Observing the coefficient of the ECM reveals that the variables are cointegrated. The size of the coefficient on the error correction term (ECM) denotes that about 62 percent (for Ghana and Gambia), about 70 percent (for Sierra Leone), about 80 percent (for Guinea) and about 81 percent (for Nigeria).

Diagnostic and Stability Tests

Here, diagnostic tests such as serial correlation, functional form, heteroscedasticity and structural stability of the model are considered so as to ensure the results. The test statistics for the various test are expected to be statistically insignificant to ensure the absence of these econometric problems.

From table 3.6, P-values for all the tests are statistically insignificant and hence implying that no heteroscedasticity, no misspecification and absence of heteroscedasticity among the error terms.

Table 26: Diagnostic tests

Country	Ghana	Sierra Leone	The Gambia	Guinea	Nigeria	WAMZ
Tests	Statistic& P-value					
Serial Correlation	1.337381	0.089598	0.145951	0.416295	2.330807	1.354505
	(0.2941)	(0.9148)	(0.8654)	(0.6669)	(0.1275)	0.2991
Heteroskedasticity	0.463970	0.641424	1.047804	0.968100	0.656860	1.041872
	(0.8780)	(0.7470)	(0.4407)	(0.4915)	(0.8483)	0.4778
Functional Form	0.694264	0.011425	1.425616	0.004229	2.272926	0.074220
	(0.4178)	(0.9163)	(0.2499)	(0.9490)	(0.1490)	0.7886

Source: Takyi-Ofori (2021)

Stability Test

According to Brown et al. (1975), the stability test is based on the cumulative sum of the recursive residuals. Pesaran and Pesaran (1997) suggest that once the models have been estimated, it is necessary to apply the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) tests to assess the parameter constancy. This aims to check the stability of the parameters in the model for the sample period. From Appendices J to O, it shows that the parameters in the NARDL model are stable.

Conclusion

The findings of both the symmetric and asymmetric effects on the subject matter were discussed in this chapter. To achieve these objectives, this chapter presented the descriptive statistics on the variables. The IPS, IM, ADF and PP unit root tests suggested the absence of unit root. Since all the variables were of order either I (0) or I (1), the study employed the panel ARDL, time-series ARDL, and the NARDL model to examine the long and short run effects and hence achieve the above stated objectives.

Additionally, the study presented the diagnostics to show the robustness and behavior of the model.The graph of CUSUM and CUSUMSQ as presented in Appendices D to I (for ARDL model) and J to O (for NARDL model) showed the stability of the coefficients.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

Here, the summary briefly captures the overview of the research problem, objectives, methodology as well as the results of the study, the conclusion highlights the overall findings of the study. In addition, the recommendations and the direction for future research are presented.

Summary

Over the years, rapid and sustainable economic growth which is highly accelerated through sound macroeconomic policies has been the key objective for countries all over the world and particularly that of the West African Monetary Zone. Unfortunately, this objective is fraught with several challenges which threaten its impact on the economy.

The West Africa Monetary Institute (WAMI) annual country report (2016) revealed that the average growth rate for member countries during the period 1960 to 2017 has been 3.4 percent while real GDP in WAMZ countries, however, has remained mostly stagnant over the years. Also, researchers revealed that in spite of the frantic efforts by WAMZ to achieve sustained growth through the adoption of various policies are faced with several challenges.

This work then sought to assess both the linear and asymmetric effects for both the zone and the individual member countries using both yearly time series and panel data from 1990 to 2016. This work's significance was to bring to bear the magnitude of effects that these two policies have on the growth of WAMZ and its participant nations to help policymakers implement sound and informed

decisions. The general overview of WAMZ, theoretical and empirical works that underpin fiscal and monetary policy were reviewed in this study as well as documented in the literature.

With regards to the study's objective as well as insights obtained from the review of literature, both theoretical and empirical model specification were given using the panel ARDL and the time series ARDL estimation techniques respectively. The study used the non-linear ARDL to achieve the objective of assessing the asymmetric effect is indicated as one of the objectives. These estimation techniques were used for the study because of their inherent benefits including giving the long and short-run effects affording policymakers the opportunity to make effective decisions. Variables used for the study included gross GDP per capita (GDPPC), government expenditure (GE), tax revenue (TAXR), real interest rate (IR), broad money supply (MS), real exchange rate (EXR), Inflation rate (INFL), capital accumulation (CAPA) and labor force participation rate (LABF) sourced from the World Development Indicators database (WDI).

Prior to estimation, Augmented-Dickey Fuller (ADF), Phillip-Perron (PP), Levin *et al.* (LLC) and the Im *et al.* (IPS) unit root tests were employed which revealed that all the variables were either I (0) or I (1) and this justified the use of the ARDL and NARDL approach. After establishing cointegration, the long and short run effects were estimated thereof.

Again, the assessment of the diagnostic and stability tests revealed that the estimated models were satisfactory. The plots of the CUSUM and CUSUMQ test

for the models indicated that parameter stability was achieved over the course of study. The findings are therefore given below:

The results from the estimation indicated that indeed these two policies affect economic growth in the WAMZ. This is because, based on the results, government expenditure had a positive and significant effect on economic growth in the WAMZ both in the long and short run. Tax revenue, on the other hand, had negative significant effect on growth in the long run but it lagged or last year's value positively affected growth in the short run. Also, money supply and the real exchange rate were significant and positively affected growth while real interest rate and inflation had significant negative effects on economic growth all in the long and short run. The combined effect of government expenditure and money supply had a significant positive effect on growth in the long run but its previous year' value had a positive effect on growth in the short run. Again, capital accumulation had a significant positive effect on economic growth.

In the case of the individual member countries, the result indicated that in the long run, government expenditure had a significant positive effect on economic growth in Ghana, Gambia, Guinea and Nigeria while it had a significant negative effect on the economic growth of Sierra Leone. Also, tax revenue though significant, negatively affected growth in Ghana, Gambia, Guinea, and Nigeria but had a positive effect on the economic growth of Sierra Leone. Money supply, real exchange rate, as well as the interaction terms all, had significant positive effects while real interest rate and inflation rate had a significant negative effect on the

economic growth of these member countries (Ghana, Sierra Leone, Gambia, Guinea, and Nigeria).

In the short run, however, last year's GDP per capita together with the current year's value of the interaction terms all had significant positive effects on the economic growth of these member countries. Again, for Ghana and Sierra Leone, both the current and last year's values of tax revenue, inflation rate and real interest rate significantly and positively influence their growth while capital accumulation, government expenditure, and the real exchange rate had significant positive effects. For Gambia and Nigeria, both the current and last year's values of government expenditure, tax revenue, money supply, real exchange rate, and capital accumulation had significant positive effects on their growth. However, for the Gambia, the inflation rate significantly and negatively influence its economy while significant positive effects of inflation rate was recorded for Nigeria. Both current and lagged values of government expenditure, money supply, real interest rate, real exchange rate, and capital accumulation had significant positive effects for Guinea while tax revenue and inflation had negative significant effects.

Investigating the asymmetric effects of the two policies in the WAMZ as well as for its member countries was achieved through the use of the non-linear ARDL model. The results showed that indeed whether in the long or short run, there exist an evidence of asymmetric effects in the WAMZ as well as the member countries. Thus, in the WAMZ the result showed that a positive change (an increase) in government expenditure, money supply, and the real exchange rate had a significant positive effect while a negative change caused economic growth to

fall. Also, an upward shift in tax revenue, real interest rate, and inflation had significant negative effects while its negative change (a decrease) had a significant positive effects on economic growth.

For the individual member countries, the study revealed that, for countries such as Sierra Leone, Gambia, Guinea and Nigeria, a positive change in government expenditure, money supply and real exchange rate had a significant positive effect for these countries while a negative change had a significant negative effect on their economic growth. However, for Ghana, both a positive and a negative change in government expenditure had a significant negative effect on its economic growth while a positive change in the real exchange rate and money supply caused its economy to contract. In addition, an expansion in the real interest rate and inflation had a negative consequence for the economic growth of all the member countries while a decrease in these same variables caused member countries' economic growth to rise. A positive change in tax revenue had a significant negative effect on the economic growth of all the member countries while a negative change causes economic growth in Ghana, Sierra Leone, Guinea and Nigeria to fall but not that of Gambia.

Conclusions

This study's main focus was to investigate the effects of fiscal and monetary policies on economic growth in the WAMZ. Specifically, to examine these effects for each member country, examine their joint as well as their asymmetric effects.

With regards to the findings, the study concludes that indeed the direction and magnitude of effects of these two policies vary with that of each member country and therefore re-emphasizes this study's argument that the true effect cannot be ascertained when results from the particular region (WAMZ in this case) are used to inform decisions or policy for the respective countries. This is because, the study showed that for instance, while a percentage increase in government expenditure causes expansion within WAMZ approximately by 0.68 percent, a percentage increase in government expenditure causes the economic growth of Sierra Leone to by fall by about 0.6 percent.

Again, jointly, these policies affect growth in the WAMZ as well as in each member country. Evidently shown in this work, the combined effect of the interaction terms (that is government expenditure and money supply; tax revenue and inflation) was more than the individual effects signifying the importance as well as re-enforcing the need for the region and the individual member countries to effectively coordinate these two policies to bring about rapid and sustainable growth.

Finally, the results of the NARDL estimation revealed that there are asymmetric effects for both the WAMZ as well as each member country. Thus, growth is affected by both positive and negative shifts in fiscal and monetary policies. For instance, the study showed that the economic growth of Sierra Leone,

Gambia and Nigeria respond more to positive changes or socks in government expenditure as compared to negative shocks. Hence, sharing similar views as Abdelsalam (2018), investigating this non-linear effect is vital for decision makers because policies implemented based on linear effects might not give the intended results.

Recommendations

The following recommendations are made based on the findings of this study:

First, owing to the significant role of government expenditure in welfare advancements, there is the recommendation that, WAMZ should implement suitable interventions or measures tailored towards expanding government expenditures. For countries such as Ghana, Gambia, Guinea, and Nigeria, easing fiscal policy stance will help to ensure the economy's expansion in the long-run. Policies or interventions such as public investment and social spending should be encouraged in order to, for instance, bridge infrastructure gap especially in transport, energy and boost investment. Governments of these countries should, however, take into consideration the countries' debt sustainability condition so as to avoid the accumulation of external debt that can hinder growth. With regards to Sierra Leon, governments should maintain a prudent fiscal policy stance since public spending impact its economy negatively.

Also, high tax burdens are found to have adverse effects on economic growth within the region. Hence, this work recommends that policymakers should put in place appropriate policy measures geared towards expanding the tax base to accumulate more revenue rather than an excessive increase in tax rates. For

countries including Ghana, Gambia, Guinea, and Nigeria, the study recommends that their fiscal authorities should institute, monitor and regulate the tax structures of these countries since high tax burdens negatively affect their economic growth. Thus, government should put in place measures to eliminate evasion of tax and also include more contributions from the formal and informal sectors.

Furthermore, recommendation is given that, implementation of monetary policies should be geared towards creating conducive environment which enhances investment by stabilizing all the monetary policy variables to ensure sustained growth. The convergence criteria that member countries of WAMZ should maintain real exchange rate stability and positive real interest rate is in the right direction and makes a lot of economic sense since it promotes economic growth in the long run.

In addition, strong and effective coordination of the two policies is recommended for WAMZ and its members as well to ensure sustainable growth. Thus, the study revealed that both policies jointly and positively affect economic growth. It, therefore, beckons on policymakers within the region as well as governments in the respective member countries to strive to coordinate the two policies effectively.

Finally, policymakers within the region as well as those in the respective member countries should take into consideration the non-linear effects when implementing fiscal and monetary policies and even other macroeconomic policies as a whole. This is because assuming a linear effect might not depict the true magnitude of the effect of policies implemented.

Direction for further research

Future studies can consider similar analysis by investigating the threshold of these macroeconomic variables on economic growth. Other regions can be investigated as well.

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APPENDICES
APPENDIX A

HAUSMAN SPECIFICATION TEST FOR WAMZ

	Coefficients			
	(b)	(B)	(b-B)	Sqrt(diag(V_b-V_B)
	Mg	Pmg	Diff.	Standard Errors
LNGDPPC	0.2712966	0.2429452	0.0283514	0.0528531
LNGE	0.5597758	0.9917419	-0.4319661	0.0743879
LNTAXR	-8.357349	-3.98039	-4.376959	1.485932
LNMS	4.270597	1.40414	2.866458	1.116189
LNRIR	-0.0260094	-0.0110186	-0.0149908	0.0027956
LNEXR	1.490533	1.501122	0.0105893	1.354158
LNINFL	-4.003503	-1.593005	-1.472998	2.75973
LNCAPA	0.1200072	3.681697	3.167336	3.272114
LNLABF	6.849033	1.501122	0.291981	2.896099
LNGE*MS	1.793103	3.681697	0.3218065	3.682363
LNTAXR*INFL	3.705139	3.584410	0.120729	1.335725
LNGE*INFL	1.284011	0.836830	0.447181	3.207751
LNMS*TAXR	2.740255	1.043799	1.696456	1.607634

b= consistent under Ho and Ha; obtained from xtpmg

B= inconsistent under Ha, efficient under Ho; obtained from xtpmg

Test: Ho: difference in coefficients not systematic

Chi2 (10) = (b-B)'[(V_b-V_B)^ (-1)] (b-B)=1.38

Prob>chi2=0.6730

APPENDIX B

NET EFFECT CALCULATION

WAMZ

LONG RUN NET EFFECT OF MONEY SUPPLY

$$LNGDPPC = 0.68LNGE + 0.33LNMS + 0.71LN(GE * MS)$$

$$\frac{\partial LNGPPC}{\partial LNMS} = 0.33 + 0.71LN(GE)$$

Using the mean vale of government expenditure = (3140000000);

$$\frac{\partial LNGPPC}{\partial LNMS} = 0.33 + 0.71LN(21.867)$$

$$\frac{\partial LNGPPC}{\partial LNMS} = 15.86\%$$

LONG RUN NET EFFECT OF GOVERNMENT EXPENDITURE

$$LNGDPPC = 0.68LNGE + 0.33LNMS + 0.71LN(GE * MS)$$

$$\frac{\partial LNGPPC}{\partial LNGE} = 0.68 + 0.71LN(MS)$$

Using the mean vale of money supply = (22.62);

$$\frac{\partial LNGPPC}{\partial LNGE} = 0.33 + 0.71LN(3.12)$$

$$\frac{\partial LNGPPC}{\partial LNGE} = 2.89\%$$

LONG RUN NET EFFECT OF TAX REVENUE

$$LNGDPPC = -0.17LNTAXR - 0.26LNINFL + 0.431LN(TAXR * INFL)$$

$$\frac{\partial LNGPPC}{\partial LNTAXR} = -0.17 + 0.43LN(INFL)$$

Using the mean vale of inflation rate = (15.66);

$$\frac{\partial LNGPPC}{\partial LNTAXR} = -0.7 + 0.43LN(2.75)$$

$$\frac{\partial LNGPPC}{\partial LNTAXR} = 0.30\%$$

G GHANA

LOLONG RUN NET EFFECT OF MONEY SUPPLY

$$LNGDPPC = 0.62LNGE + 0.74LNMS + 0.8LN(GE * MS)$$

$$\frac{\partial LNGPPC}{\partial LNMS} = 0.74 + 0.8LN(GE)$$

Using the mean vale of government expenditure = (3140000000);

$$\frac{\partial LNGPPC}{\partial LNMS} = 0.74 + 0.8LN(21.867)$$

$$\frac{\partial LNGPPC}{\partial LNMS} = 15.86\%$$

LOLONG RUN NET EFFECT OF GOVERNMENT EXPENDITURE

$$LNGDPPC = 0.62LNGE + 0.74LNMS + 0.8LN(GE * MS)$$

$$\frac{\partial LNGPPC}{\partial LNGE} = 0.62 + 0.8LN(MS)$$

Using the mean vale of money supply = (22.62);

$$\frac{\partial LNGPPC}{\partial LNGE} = 0.62 + 0.8LN(3.12)$$

$$\frac{\partial LNGPPC}{\partial LNGE} = 3.12\%$$

LONG RUN NET EFFECT OF TAX REVENUE

$$LNGDPPC = -0.7LNTAXR - 0.37LNINFL + 0.4LN(TAXR * INFL)$$

$$\frac{\partial LNGPPC}{\partial LNTAXR} = -0.7 + 0.4LN(INFL)$$

Using the mean vale of inflation rate = (15.66);

$$\frac{\partial LNGPPC}{\partial LNTAXR} = 0.74 + 0.8LN(2.75)$$

$$\frac{\partial LNGPPC}{\partial LNTAXR} = 0.4\%$$

SIERRA LEONE

LONG RUN NET EFFECT OF MONEY SUPPLY

$$LNGDPPC = -0.61LNGE + 0.37LNMS + 0.73LN(GE * MS)$$

$$\frac{\partial LNGPPC}{\partial LNMS} = 0.37 + 0.73LN(GE)$$

Using the mean vale of government expenditure = (3140000000);

$$\frac{\partial LNGPPC}{\partial LNMS} = 0.37 + 0.73LN(21.867)$$

$$\frac{\partial LNGPPC}{\partial LNMS} = 16.33\%$$

LOLONG RUN NET EFFECT OF GOVERNMENT EXPENDITURE

$$LNGDPPC = -0.6LNGE + 0.37LNMS + 0.73LN(GE * MS)$$

$$\frac{\partial LNGPPC}{\partial LNGE} = -0.61 + 0.73LN(MS)$$

Using the mean vale of money supply = (22.62);

$$\frac{\partial LNGPPC}{\partial LNGE} = 0.74 + 0.8LN(3.12)$$

$$\frac{\partial LNGPPC}{\partial LNGE} = 1.67\%$$

LOLONG RUN NET EFFECT OF TAX REVENUE

$$LNGDPPC = -0.24LNTAXR - 0.09LNINFL + 0.60LN(TAXR * INFL)$$

$$\frac{\partial LNGPPC}{\partial LNTAXR} = -0.24 + 0.60LN(INFL)$$

Using the mean vale of inflation rate = (15.66);

$$\frac{\partial LNGPPC}{\partial LNTAXR} = 0.74 + 0.8LN(2.75)$$

$$\frac{\partial LNGPPC}{\partial LNTAXR} = 1.89\%$$

GAMBIA

LONG RUN NET EFFECT OF MONEY SUPPLY

$$LNGDPPC = 0.32LNGE + 0.18LNMS + 0.42LN(GE * MS)$$

$$\frac{\partial LNGPPC}{\partial LNMS} = 0.18 + 0.42LN(GE)$$

Using the mean vale of government expenditure = (3140000000);

$$\frac{\partial LNGPPC}{\partial LNMS} = 0.18 + 0.42LN(21.867)$$

$$\frac{\partial LNGPPC}{\partial LNMS} = 9.63\%$$

LONG RUN NET EFFECT OF GOVERNMENT EXPENDITURE

$$LNGDPPC = 0.32LNGE + 0.18LNMS + 0.42LN(GE * MS)$$

$$\frac{\partial LNGPPC}{\partial LNGE} = 0.32 + 0.42LN(MS)$$

Using the mean vale of money supply = (22.62);

$$\frac{\partial LNGPPC}{\partial LNGE} = 0.32 + 0.42LN(3.12)$$

$$\frac{\partial LNGPPC}{\partial LNGE} = 1.63\%$$

LONG RUN NET EFFECT OF TAX REVENUE

$$LNGDPPC = -0.14LNTAXR - 0.03LNINFL + 0.59LN(TAXR * INFL)$$

$$\frac{\partial LNGPPC}{\partial LNTAXR} = -0.14 + 0.59LN(INFL)$$

Using the mean vale of inflation rate = (15.66);

$$\frac{\partial LNGPPC}{\partial LNTAXR} = -0.14 + 0.59LN(2.75)$$

$$\frac{\partial LNGPPC}{\partial LNTAXR} = 1.48\%$$

GUINEA

LOLONG RUN NET EFFECT OF MONEY SUPPLY

$$LNGDPPC = 0.70LNGE + 0.49LNMS + 0.9LN(GE * MS)$$

$$\frac{\partial LNGPPC}{\partial LNMS} = 0.49 + 0.9LN(GE)$$

Using the mean vale of government expenditure = (3140000000);

$$\frac{\partial LNGPPC}{\partial LNMS} = 0.49 + 0.9LN(21.867)$$

$$\frac{\partial LNGPPC}{\partial LNMS} = 20.17\%$$

LOLONG RUN NET EFFECT OF GOVERNMENT EXPENDITURE

$$LNGDPPC = 0.70LNGE + 0.49LNMS + 0.9LN(GE * MS)$$

$$\frac{\partial LNGPPC}{\partial LNGE} = 0.70 + 0.9LN(MS)$$

Using the mean vale of money supply = (22.62);

$$\frac{\partial LNGPPC}{\partial LNGE} = 0.70 + 0.9LN(3.12)$$

$$\frac{\partial LNGPPC}{\partial LNGE} = 3.51\%$$

LONG RUN NET EFFECT OF TAX REVENUE

$$LNGDPPC = -0.37LNTAXR - 0.015LNINFL + 0.63LN(TAXR * INFL)$$

$$\frac{\partial LNGPPC}{\partial LNTAXR} = -0.37 + 0.63LN(INFL)$$

Using the mean vale of inflation rate = (15.66);

$$\frac{\partial LNGPPC}{\partial LNTAXR} = -0.37 + 0.63LN(2.75)$$

$$\frac{\partial LNGPPC}{\partial LNTAXR} = 1.36\%$$

NIGERIA

LONG RUN NET EFFECT OF MONEY SUPPLY

$$LNGDPPC = 0.57LNGE + 0.66LNMS + 0.63LN(GE * MS)$$

$$\frac{\partial LNGPPC}{\partial LNMS} = 0.66 + 0.63LN(GE)$$

Using the mean vale of government expenditure = (3140000000);

$$\frac{\partial LNGPPC}{\partial LNMS} = 0.66 + 0.63LN(21.867)$$

$$\frac{\partial LNGPPC}{\partial LNMS} = 2.54\%$$

LOLONG RUN NET EFFECT OF GOVERNMENT EXPENDITURE

$$LNGDPPC = 0.57LNGE + 0.66LNMS + 0.63LN(GE * MS)$$

$$\frac{\partial LNGPPC}{\partial LNGE} = 0.57 + 0.63LN(MS)$$

Using the mean vale of money supply = (22.62);

$$\frac{\partial LNGPPC}{\partial LNGE} = 0.57 + 0.63LN(3.12)$$

$$\frac{\partial LNGPPC}{\partial LNGE} = 2.54\%$$

LOLONG RUN NET EFFECT OF TAX REVENUE

$$LNGDPPC = -0.7LNTAXR - 0.037LNINFL + 0.82LN(TAXR * INFL)$$

$$\frac{\partial LNGPPC}{\partial LNTAXR} = -0.7 + 0.82LN(INFL)$$

Using the mean vale of inflation rate = (15.66);

$$\frac{\partial LNGPPC}{\partial LNTAXR} = -0.7 + 0.82LN(2.75)$$

$$\frac{\partial LNGPPC}{\partial LNTAXR} = 1.56\%$$

APPENDIX C

SHORT RUN NET EFFECT CALCULATION

WAMZ

SHORT RUN NET EFFECT OF MONEY SUPPLY

$$LNGDPPC = 0.41LNGE + 0.32LNMS + 0.75LN(GE * MS)$$

$$\frac{\partial LNGPPC}{\partial LNMS} = 0.32 + 0.75LN(GE)$$

Using the mean vale of government expenditure = (3140000000);

$$\frac{\partial LNGPPC}{\partial LNMS} = 0.32 + 0.75LN(21.867)$$

$$\frac{\partial LNGPPC}{\partial LNMS} = 16.72\%$$

SHORT RUN NET EFFECT OF GOVERNMENT EXPENDITURE

$$LNGDPPC = 0.41LNGE + 0.32LNMS + 0.75LN(GE * MS)$$

$$\frac{\partial LNGPPC}{\partial LNGE} = 0.41 + 0.75LN(MS)$$

Using the mean vale of money supply = (22.62);

$$\frac{\partial LNGPPC}{\partial LNGE} = 0.41 + 0.75LN(3.12)$$

$$\frac{\partial LNGPPC}{\partial LNGE} = 2.75\%$$

SHORT RUN NET EFFECT OF TAX REVENUE

$$LNGDPPC = 0.23LNTAXR - 0.39LNINFL + 0.67LN(TAXR * INFL)$$

$$\frac{\partial LNGPPC}{\partial LNTAXR} = 0.23 + 0.67LN(INFL)$$

Using the mean vale of inflation rate = (15.66);

$$\frac{\partial LNGPPC}{\partial LNTAXR} = 0.23 + 0.67LN(2.75)$$

$$\frac{\partial LNGPPC}{\partial LNTAXR} = 2.07\%$$

GHANA

SHSHORT RUN NET EFFECT OF MONEY SUPPLY

$$LNGDPPC = 0.59LNGE + 0.73LNMS + 0.32LN(GE * MS)$$

$$\frac{\partial LNGPPC}{\partial LNMS} = 0.73 + 0.32LN(GE)$$

Using the mean vale of government expenditure = (3140000000);

$$\frac{\partial LNGPPC}{\partial LNMS} = 0.73 + 0.32LN(21.867)$$

$$\frac{\partial LNGPPC}{\partial LNMS} = 7.73\%$$

SHSHORT RUN NET EFFECT OF GOVERNMENT EXPENDITURE

$$LNGDPPC = 0.59LNGE + 0.73LNMS + 0.32LN(GE * MS)$$

$$\frac{\partial LNGPPC}{\partial LNGE} = 0.73 + 0.32LN(MS)$$

Using the mean vale of money supply = (22.62);

$$\frac{\partial LNGPPC}{\partial LNGE} = 0.73 + 0.32LN(3.12)$$

$$\frac{\partial LNGPPC}{\partial LNGE} = 1.59\%$$

SHORT RUN NET EFFECT OF TAX REVENUE

$$LNGDPPC = -0.36LNTAXR - 0.35LNINFL + 0.50LN(TAXR * INFL)$$

$$\frac{\partial LNGPPC}{\partial LNTAXR} = -0.36 + 0.50LN(INFL)$$

Using the mean vale of inflation rate = (15.66);

$$\frac{\partial LNGPPC}{\partial LNTAXR} = -0.36 + 0.50LN(2.75)$$

$$\frac{\partial LNGPPC}{\partial LNTAXR} = 1.015\%$$

SIERRA LEONE

SHORT RUN NET EFFECT OF MONEY SUPPLY

$$LNGDPPC = 0.29LNGE + 0.17LNMS + 0.13LN(GE * MS)$$

$$\frac{\partial LNGPPC}{\partial LNMS} = 0.17 + 0.13LN(GE)$$

Using the mean vale of government expenditure = (3140000000);

$$\frac{\partial LNGPPC}{\partial LNMS} = 0.17 + 0.13LN(21.867)$$

$$\frac{\partial LNGPPC}{\partial LNMS} = 3.10\%$$

SHSHORT RUN NET EFFECT OF GOVERNMENT EXPENDITURE

$$LNGDPPC = 0.29LNGE + 0.17LNMS + 0.13LN(GE * MS)$$

$$\frac{\partial LNGPPC}{\partial LNGE} = 0.29 + 0.13LN(MS)$$

Using the mean vale of money supply = (22.62);

$$\frac{\partial LNGPPC}{\partial LNGE} = 0.29 + 0.13LN(3.12)$$

$$\frac{\partial LNGPPC}{\partial LNGE} = 0.70\%$$

SSHORT RUN NET EFFECT OF TAX REVENUE

$$LNGDPPC = -0.15LNTAXR - 0.21LNINFL + 0.13LN(TAXR * INFL)$$

$$\frac{\partial LNGPPC}{\partial LNTAXR} = -0.15 + 0.13LN(INFL)$$

Using the mean vale of inflation rate = (15.66);

$$\frac{\partial LNGPPC}{\partial LNTAXR} = -0.15 + 0.13LN(2.75)$$

$$\frac{\partial LNGPPC}{\partial LNTAXR} = 0.17\%$$

GAMBIA

SHORT RUN NET EFFECT OF MONEY SUPPLY

$$LNGDPPC = 0.33LNGE + 0.17LNMS + 0.58LN(GE * MS)$$

$$\frac{\partial LNGPPC}{\partial LNMS} = 0.17 + 0.58LN(GE)$$

Using the mean vale of government expenditure = (3140000000);

$$\frac{\partial LNGPPC}{\partial LNMS} = 0.17 + 0.58LN(21.867)$$

$$\frac{\partial LNGPPC}{\partial LNMS} = 12.85\%$$

SHORT RUN NET EFFECT OF GOVERNMENT EXPENDITURE

$$LNGDPPC = 0.33LNGE + 0.17LNMS + 0.58LN(GE * MS)$$

$$\frac{\partial LNGPPC}{\partial LNGE} = 0.33 + 0.58LN(MS)$$

Using the mean vale of money supply = (22.62);

$$\frac{\partial LNGPPC}{\partial LNGE} = 0.33 + 0.58LN(3.12)$$

$$\frac{\partial LNGPPC}{\partial LNGE} = 2.14\%$$

SHORT RUN NET EFFECT OF TAX REVENUE

$$LNGDPPC = 0.14LNTAXR - 0.52LNINFL + 0.46LN(TAXR * INFL)$$

$$\frac{\partial LNGPPC}{\partial LNTAXR} = 0.14 + 0.46LN(INFL)$$

Using the mean vale of inflation rate = (15.66);

$$\frac{\partial LNGPPC}{\partial LNTAXR} = 0.14 + 0.46LN(2.75)$$

$$\frac{\partial LNGPPC}{\partial LNTAXR} = 1.3\%$$

NIGERIA

SSORT RUN NET EFFECT OF MONEY SUPPLY

$$LNGDPPC = 0.34LNGE + 0.28LNMS + 0.55LN(GE * MS)$$

$$\frac{\partial LNGPPC}{\partial LNMS} = 0.28 + 0.55LN(GE)$$

Using the mean vale of government expenditure = (3140000000);

$$\frac{\partial LNGPPC}{\partial LNMS} = 0.28 + 0.55LN(21.867)$$

$$\frac{\partial LNGPPC}{\partial LNMS} = 12.31\%$$

SHSHORT RUN NET EFFECT OF GOVERNMENT EXPENDITURE

$$LNGDPPC = 0.34LNGE + 0.28LNMS + 0.55LN(GE * MS)$$

$$\frac{\partial LNGPPC}{\partial LNGE} = 0.34 + 0.55LN(MS)$$

Using the mean vale of money supply = (22.62);

$$\frac{\partial LNGPPC}{\partial LNGE} = 0.34 + 0.55LN(3.12)$$

$$\frac{\partial LNGPPC}{\partial LNGE} = 2.1\%$$

SHORT RUN NET EFFECT OF TAX REVENUE

$$LNGDPPC = 0.32LNTAXR - 0.39LNINFL + 0.60LN(TAXR * INFL)$$

$$\frac{\partial LNGPPC}{\partial LNTAXR} = 0.32 + 0.60LN(INFL)$$

Using the mean vale of inflation rate = (15.66);

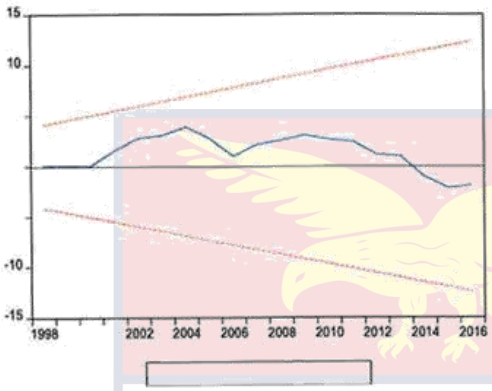
$$\frac{\partial LNGPPC}{\partial LNTAXR} = 0.32 + 0.60LN(2.75)$$

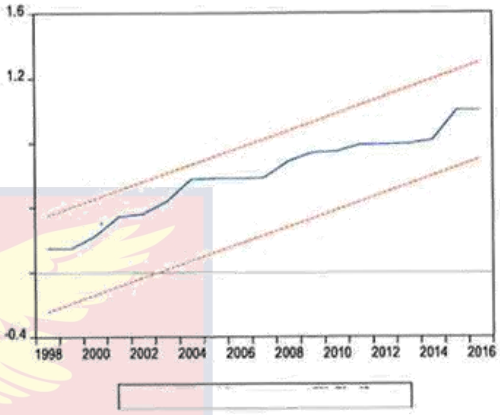
$$\frac{\partial LNGPPC}{\partial LNTAXR} = 1.78\%$$

APPENDIX D

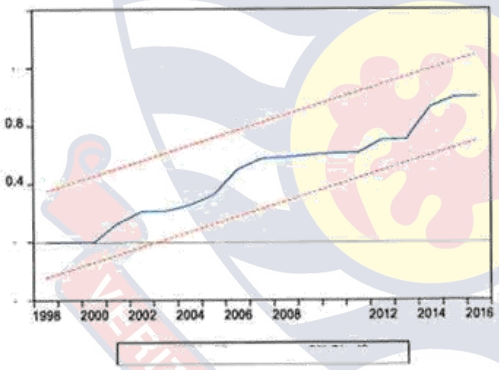
ARDL MODEL

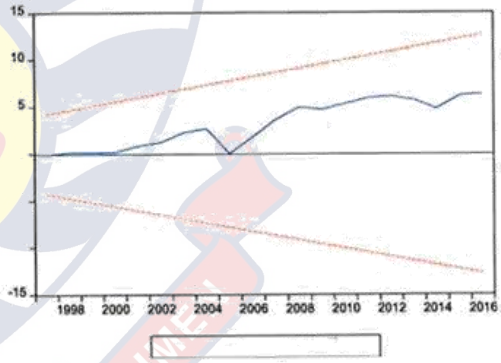
GHANA



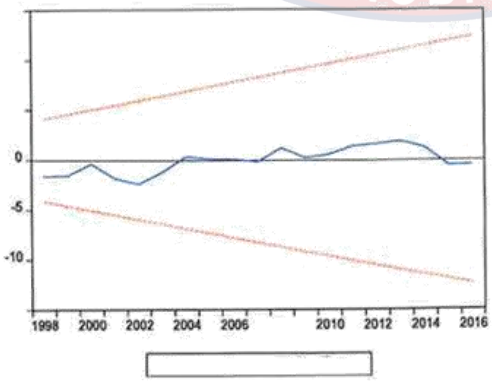


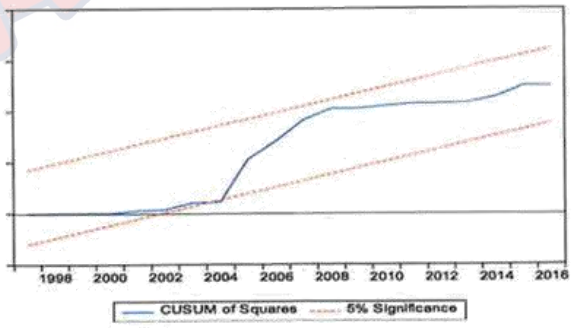
GAMBIA



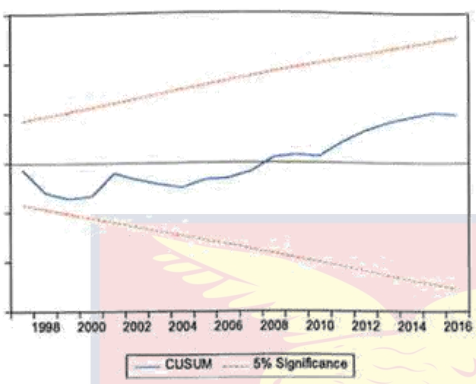


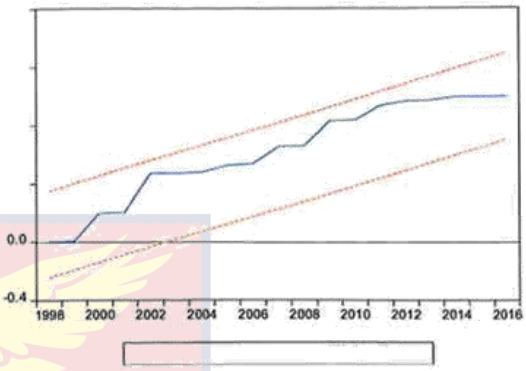
SIERRA LEONE





GUINEA





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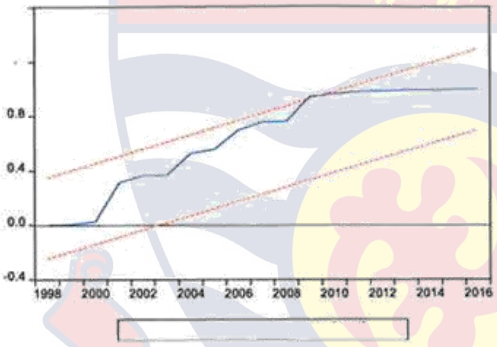

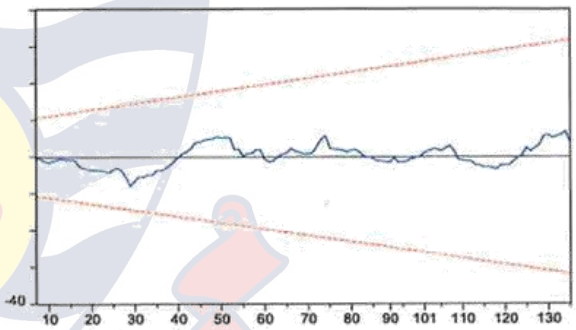

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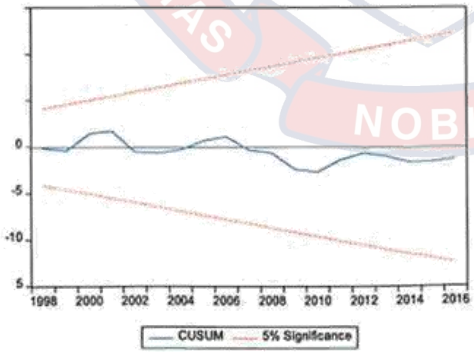
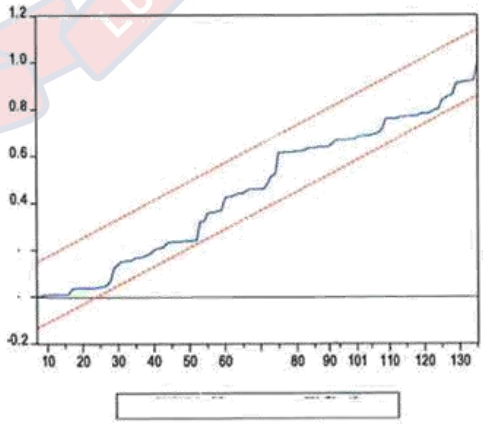
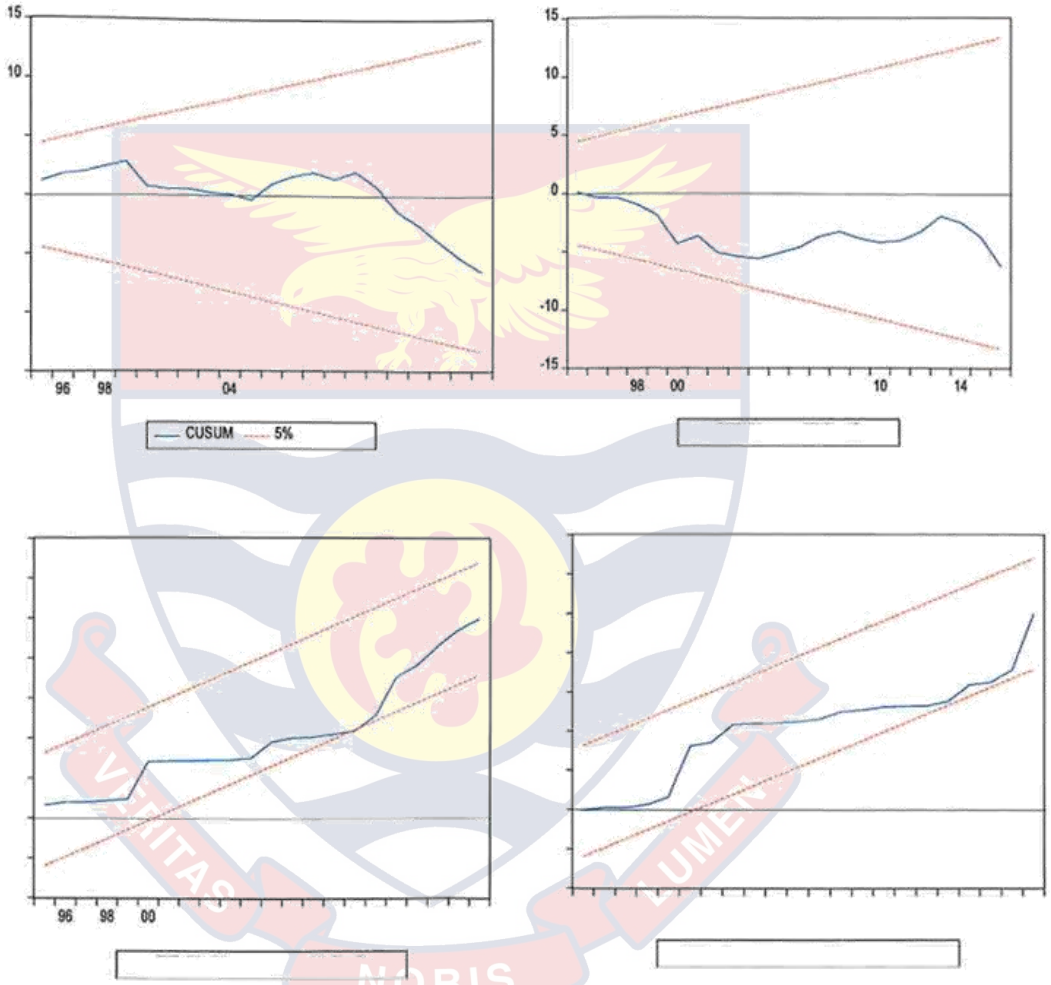




APPENDIX E

NARDL MODEL

GHANA **SIERRA LEONE**



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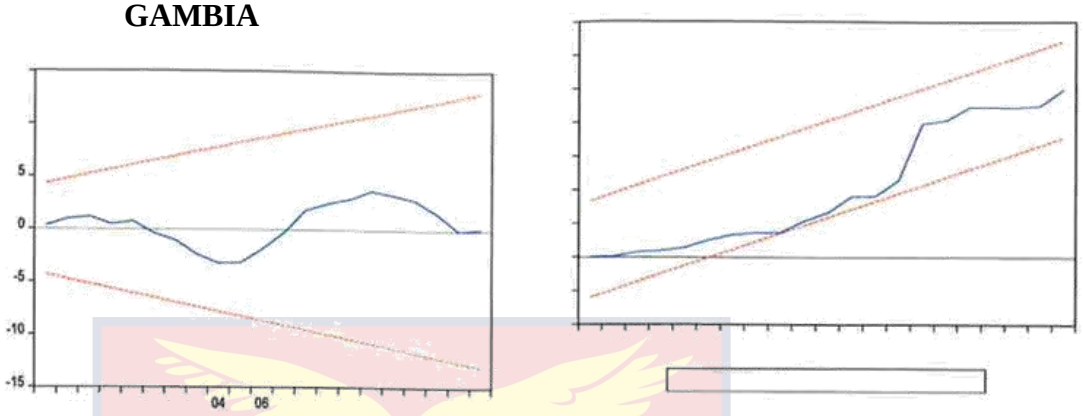

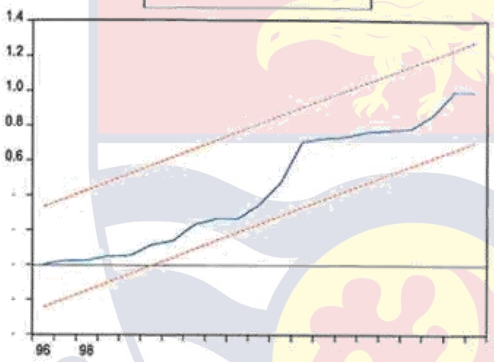

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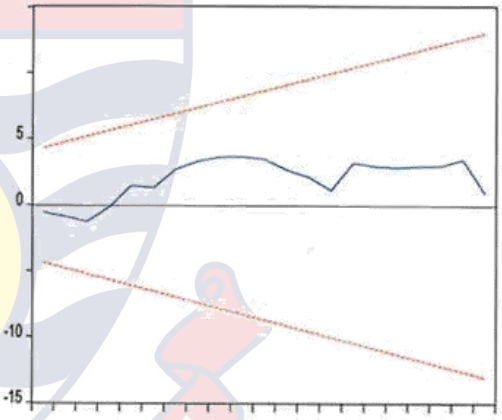

GUINEA