MONETARY POLICY SHOCKS AND ECONOMIC GROWTH IN ECONOMIC COMMUNITY OF WEST AFRICAN STATES

By

Olusegun Jonathan FAMOROTI

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DECLARATION

I, Jonathan Olusegun Famoroti, declare that:

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DEDICATION

I dedicate this degree to the glory of God and my late Parent, Late Pa Ojogbede, Rufus Famoroti, and Late Mrs. Aina Eunice Famoroti.

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ABSTRACT

An effective economic management is contingent upon the knowledge of how shocks emanate from monetary policy and other sources that affect the economy. This study examines the monetary policy shocks and economic growth in the Economic Community of West African States (ECOWAS), segregated into sub-regions of WAMZ and WAEMU. This is carried out under three related sub-objectives, using quarterly secondary data from 1980(1) to 2020(4).

The first objective offers an empirical investigation into the determinants of the monetary policy rate in ECOWAS, considering both internal and external variables, using ARDL. The results revealed that in order to ensure long-run stability in the policy rate among the members' states of ECOWAS, determinant variables including exchange rate, inflation rate and the gross domestic product should be given closer attention, so that the trajectory for potent structure can be designed and incorporated into the economic structure and policy frameworks accordingly.

The second objective of this study employed a Panel Structural Vector for the modelling of monetary policy transmission shock in the region. The key results suggest that fluctuations of the monetary policy do not have significant effects on economic growth but significantly impact the general price level. Moreover, the study finds that the exchange rate is persistently a vital mechanism that significantly influences the variables of the real economy. Our estimates further suggest that there is idiosyncratic evidence found in the results, which is the anomaly of Price puzzle.

Furthermore, this study used the Markov switching model for the third objective to investigate the impact of monetary policy shocks in two regimes of the business cycles in ECOWAS countries. The results show that the countries are having common business cycles. In addition, the study offered enough evidence that the monetary instruments are significantly more potent at contractionary than expansionary regimes. ECOWAS region appears to have a comparatively shorter business cycle than the developed countries. Hence, the design of policies by the monetary authorities in this region, aimed at shortening the duration of the contractionary period must be meticulously formulated to avert negative consequences of strict contractionary policy and ditto to expansionary policy.

Keywords: Monetary policy shocks, Economic growth, WAEMU, WAMZ, Business cycles

Abbreviations

ADF -	Augmented Dickey-Fuller
AFDB -	African Development Bank
AIC -	Akaike Information Criterion
ARDL-	Autoregressive Distributed Lag
ASEAN-	Association of Southeast Asian Nations
AU -	African Union
BCEAO -	Central Bank of West African States
BOG-	Bank of Ghana
BSL-	Bank of Sierra Leone
CBG -	Central bank of Gambia
CBN -	Central bank of Nigeria
CPI -	Consumer Price Index
DFID -	Department for International Development
ECF -	Extended Credit facility
ECM -	Error Correction Model
ECOWAS –	Economic community of West African States
EGARCH -	Exponential Generalized Conditional Heteroscedasticity
FAVAR -	Factor-Augmented Vector Autoregression
FDI-	Foreign Direct Investment
FFR –	Federal Funds rate
FPE -	Final Prediction Error
GCB-	Ghana Central Bank
GDP –	Gross Domestic Product
GOP -	Global Oil price
HO -	Hanna-Quinn Information Criterion
HP -	Hodrick-Prescott
IMF -	International Monetary Fund
LA_VAR	Lag-Augmented Vector Autoregressive
MDG-	Millenium Development Goal
MDRI -	Multilateral Debt Relief Initiative
MPC -	Monetary Policy Committee
MPR -	Monetary policy Rate
MRR -	Minimum Rediscounting Rate

MSM -	Markov Switching Model
NBER -	National Bureau of Economic Statistics
NCM -	Preference and New Consensus Model
NEER -	Nominal effective exchange rate
OECD -	Organization for Economic Co-operation and Development
OMO -	Open Market Operation
PP-	Phillips Perron
QE -	Quantitative Easing
RGDP -	Real Gross Domestic Product
SC -	Schwarz Criterion
SSA -	Sub-Saharan Africa
STLPM -	Smooth Transition Local Projection Model
SVAR -	Structural Vector Autoregressive
TOP -	Trade openness
TVP -	Time-Varying Parameter
UN –	United Nations
USD-	United State Dollars
VAR-	Vector Autoregressive
VECM -	Vector Error Correction Model
WAEMU-	West African Economic and Monetary Union
WAMZ -	West African Monetary Zone
WEMU -	West African Economic and Monetary Union

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CHAPTER ONE

INTRODUCTION

1.1 Background of the study

In the global economic discourse, the task of designing a suitable and efficient domestic economic policy has been the major focus since the 1980s. Consequently, since then, the crucial policy objectives in many developing economies have focused on macroeconomic adjustments, growth, and stabilization, which cannot but be influenced by shocks. The effects of shocks can be global during which most countries are affected like the global financial crisis of 1980, 2008, and 2014. It could also be regional, having effects on a group of countries like Asian countries in 2005 and the regional debt crisis in Europe in 2011. Thus, the cross-country growth variation has been driven by both global and regional factors (Kose et al., 2and Francis et al.,2019).

Paradoxically, efforts are yet to be made to unearth what can be acquired from normalizing the short-run and long-run macroeconomic fluctuations in the developing countries, ECOWAS inclusive, as stressed by Rands and Tarps, (2002). Thus, the extent of the process through which monetary policy shocks integrate the global economies and promote economic growth and general price stability is probably less understood. Notwithstanding, significant efforts had earlier been made for the understanding of the topic in a general perspective (Gali and Gertler, 2010), including the roles played by monetary policy in the advanced and the emerging economies (Rajan, 2013 and Kim and Yang, 2009). However, virtually all the existing literature have centred on the developed and the emerging economies, while developing economic regions like ECOWAS, have received a relatively little or no attention**.**

Generally, monetary policy objectives include promoting growth, achieving full employment, smoothing the trade cycles, preventing a financial crisis, interest rates stability and price stability and the real exchange rate stabilization (Rao et al., 2006). Thus, monetary policy is a vital policy instrument like fiscal policy to achieve targeted macroeconomic results, with prioritised objectives. In a small open economy, it could be inflation targeting while in some others it could be exchange rate targeting or output growth targeting (Kandil, 2014). However, some objectives are not consistent with each other, for example, the objectives of price stability often conflict with the objectives of interest rate stability and short run employment. This implies that such objectives must be mutually exclusive.

In order to achieve a mutually exclusive monetary policy objectives, three major tasks are required from the monetary authorities of an economy: First, right assessment of the period of policy implementation, Second, right assessment of the impact of their monetary policy on the economy and third, appropriate knowledge of the monetary policy mechanism as it affects the economy (Mishkin, 1995). This opinion was further strengthened by Raghavan and Silvapulle, (2008) that propelling monetary policy in the right direction demands that policy makers should have a better understanding of the transmission mechanism by which the monetary policy shocks affect the economy, particularly, the real sectors. Accordingly, monetary policy transmission mechanism, which identifies the appropriate channels through which monetary policy affects growth, is very crucial to the relationship between monetary policy shocks and economic growth. (See Mishkin, 1995; Raghavan and Silvapulle, 2006). This is important because weak transmission of the monetary policy tools results into counter-intuitive reaction of the inflation and this could further dampen economic growth (Rabanal, 2007).

By inference, in the economic literature, there are three notable strands by which research is carried out towards the understanding of monetary policy shock transmission mechanism and there is yet to be a consensus opinion on each of the perspectives, which is the focus of this study:

(i) Identifying the drivers of the policy rate, which is the prime monetary policy instrument; (ii) Identifying the channels through which monetary policy shocks affect an economy; and (iii) Identification of the period by which the mechanisms impact the economy.

On the first strand, the monetary policy authorities have identified monetary policy as a major instrument owing to its suitability and efficiency in regulating the economy to long run equilibrium level (Dornbusch, et al., 2011). The ability of the monetary policy to accomplish the targeted macroeconomic objectives is a function of many factors which include, among others, the potency of the Central bank, the analytical competency of the monetary authority as well as the stage of development of such country's financial system. It is imperative to note that for optimum resource allocation for growth, stability and economic development, the significance of monetary policy rate cannot be undermined (Woodford, 2003).

The design and execution of policy rates are very significant in the developing countries with regards to allocation of resources, savings, control of inflation as well as growth enhancement. The main issue is how to guarantee a realistic policy rate in the developing economies dominated by imperfect and oligopolistic market. Indeed, policy rates determination through

the market force is not feasible, thus the intervention of monetary authorities in some instances cannot be denied. Hence, it is of paramount importance to identify the macroeconomic determinants of policy rates, specifically in developing economies like ECOWAS. The knowledge about the determination of the policy rate is justified on the fact that policy rate is not only for the purpose of economic growth and stability but also a vital instrument for the transmission of monetary policy shocks. For instance, policy rate is the major instrument for steering monetary policy. Also, the responsiveness of investment and aggregate demand is conditional to policy rate adjustments.

It should be noted that economic growth analysis cannot be divorced from externalities and the consequences of the externalities depend on the circumstances of the country. More advanced industrialized economies typically have more integral instinctive stabilizers and strong safety nets, that are capable of absorbing the shocks better. This is contrary to the developing countries, like ECOWAS member countries that lack in-built stabilizers but are being confronted with constraints that exacerbate economic growth and stability. For instance, policy design in developed countries is typically counter-cyclical, whereas in developing countries, it is pro-cyclical. Moreover, policies recommended to or enforced on developing countries may make matters worse However, growth generates negative externalities and negative externalities generate growth (See Antoci and Bartolini, 1999; Stiglitz, 2000). Similarly, each country's monetary policies inflict externalities on other countries, and the common policies have their time-consistency problem. Monetary policy has many aspects, and each can create positive or negative externalities or spillovers. (See Dixit and Lambertini, 2003).

Another strand is the transmission mechanism of the monetary policy. Analytically, since monetary policy constitutes an influential instrument for effecting the economy (Mishkin (2006), it is therefore imperative to have a virtuous knowledge of the channels (transmission mechanism) through which monetary policy is being transmitted. Thus, Belke & Polleit, (2009) stressed that this mechanism inclines to operate through the channels by affecting both nominal and real variables and various sectors of an economy, at different speeds and intensities. Hence, the knowledge of the transmission mechanism of monetary policy is a crucial interest to both the investor and policy makers as it gives room for the identification of the policy tool(s) that are effective, period of the policy changes, as well as the corresponding constraints confronting the central bank of such an economy in formulating their policies. Theoretically, positive change in money supply for example, should result to positive general price level and may potentially lead to rise in real output. This chain of reactions can ensue through various

mechanisms comprising the interest rate channel, money supply channel, exchange rate channel, lending rate channel, among others.

There are several studies that have analytically discussed monetary policy mechanism. For example, Bernanke and Gertler (1995) on the United States economy, Chong and Yong (2007) on Malaysia, Mishra et al., (2011) on low-income countries, Poddar, et al., (2006) on Jordan; Boivin et al., (2010); Misate et al., (2012) on Kenya; Omolade, and Ngalawa, (2016) on Libya and Nigeria; Omolade, etal., (2019) on Nigeria, Christensen, (2011) on Low-Income African Countries; Li, et al., (2019) on Low-Income African Countries economy, among others. No related study that is known to this study has been carried out on ECOWAS.

The third empirical strand relates to the link between monetary policy and real economic activities, with respect to business cycles in ECOWAS. Another essential source by which economic shocks are being transmitted asymmetrically across countries is by varied monetary policy regimes. In other words, apart from the transmission of monetary policy shocks, asymmetric shock emanates from the macroeconomic shocks that hit the member countries (De Grauwe, 2003; Beck, 2013). The cross-country proliferation of these shocks affects the synchronisation of business cycle in diverse ways. It has been suggested in the economic literature that when countries with common monetary stance are challenged with monetary policy shocks, the economic impacts and their responses to these shocks are similar. Consequently, transmission of symmetric shocks is facilitated and further encourages strict synchronisation of business cycles. (Dai, 2014). On the other hand, economies that are affected by uncommon monetary policy regimes of countries implementing a synchronised monetary policy system are unable to implement sovereign policy stance as reactions to the idiosyncratic shocks. This therefore results to lesser synchronisation of business cycles (see Guillemineau, 2006 and Dai, 2014). These situations are akin to what is obtainable in WAEMU and WAMZ sub-regions of ECOWAS.

Monetary policy shocks and business cycle nexus has been discussed among various scholars for over 2 decades including Canova and De Nicolo, (2002), Gali, (2002), Korenok and Radchenko, (2004), among others. The question on whether monetary policy shocks actually play an important role in the fluctuations of the business cycle has been viewed differently by the Macroeconomists Earlier, Sims (1998) claimed that monetary policy cannot be held accountable for the great depression and that monetary policy is not effective enough to curb recession. This implies that the roles played by the monetary policy during the great recession

was insignificant. Meanwhile, empirical evidence from Canova and De Nicolo, (2002), suggests that the role of monetary policy shocks in business cycle is crucial and significant. However, the effects of monetary policy at different regimes of the business cycle, as argued in the various economic literature are without a consensus.

1.2 Statement of problem and motivation for the study

The formulation and implementation of monetary policy rest on reacting to the issues on macroeconomic and shocks that affect an economy. However, there are diverse views on how policy makers strive to achieve their ultimate objectives of price stability and sustainable growth. Some countries adopt inflation targeting and floating exchange rates in the quest for the achievement of their goals and control the effects shocks, while others embraced direct monetary control through frequent intervention of the growth of money supply (Kutu and Ngalawa, 2016). Despite the regional framework facilitated by monetary policy interventions to tackle the influence of shocks affecting the regional growth, yet economic growth and stability in ECOWAS member countries still fall below expectation in recent years. As a result of the economic slowdown, the monetary policy, among others, create credit crunch (Adrian and Shin, 2009) in the banking sector. This further leads to low growth rate in lending activities in some countries and stalling it in others.

In Nigeria and Ghana, for example, the economic recession of 2008 was deepened by devaluation of their currencies, which has puffed-up the value of US dollar and tightens the interest rate. Worse still, the devaluation works contrary to expectation as most of the countries in the region experienced double digit inflation rate. The inflation for the region stood at 13.4% in 2018, which was the highest rate vis-a-vis other sub-regions in Africa. This has been attributed to the inflationary pressure from countries like Nigeria (16%), Sierra Leone (11.7%), Liberia (11.2%) and Ghana (8.3%) (See UN. 2019).

The Central banks, in their efforts to maintain price stability and sustainable growth, employed different monetary policy frameworks. This includes the use of inflation targeting (for instance in Ghana) and/or other regimes usually with monetary aggregates for their operational targets (Berg et al 2015). The effects put in place to counter currency depreciation include tightening of monetary policy, but with adverse effect on the activity of the private sector. Also, in Nigeria there are mix policy structures, focussing on output growth and inflation control in Nigeria,

including currency devaluation and management of exchange rate flexibility, at any time, within the limit of 3%, relative to the official exchange rate of USD (Agu, 2011).

In addition, among the countries in ECOWAS, there are diverse exchange rate regimes for their macroeconomic management. Some operate relatively fixed while others operate flexible exchange rates system. Countries with weak financial markets have the challenges of implementing the policies, while countries that were hard hit by external shocks were confronted with conflicting targets. In response to low growth, the WAEMU maintained an interest rate (benchmark) constant at 3.5%, contrary to 2.45% in the Central African Economic and Monetary Union (CEMAC). (See AEO, AFDB, 2016). The central Bank for Africa (BCEAO) sets the instruments of interest rate and the reserves at the discretions of the MPC for policy goal achievement. Since 2009 the policy rate has been amended five times, while the reserves requirements have been changed three times. (Kireyev, 2015). All these efforts constitute monetary policy shocks with attendant effects on the economic growth of the regions

Also, at the regional level, one of the vital elements required to fast track the idea of monetary union requires the participating countries (ECOWAS) to pursue monetary policy that could lead to macroeconomic convergence (See Masson, 2006; Balogun, 2007 and Tapsoba, 2010). Notwithstanding, meeting the required criteria for macroeconomic convergence in the region remains an issue. According to Nkwatoh (2018), no ECOWAS member state has been able to meet all the criteria, which implies that the degree of macroeconomic convergence in the region however remains deficient in relation to the set goals. Similarly, one of the vital prime criteria for macroeconomic convergence is the realization of single digit inflation in West African Monetary Zone (WAMZ), which comprises Gambia, Ghana, Guinea, Nigeria, and Sierra Leone. Existing information shows that none of the member states has been able to achieve these criteria except Gambia. This triggers concern about the efficacy of monetary policy transmission instrument in the Zone for the control of inflation and promotion of economic growth.

Therefore, it could be deduced that despite these countries' efforts and regional framework facilitated by monetary policy interventions to tackle the influence of internal/external shocks that affect the regional growth, yet sustainable economic growth in ECOWAS remains a mirage. The reason behind the inefficient policy interventions from the monetary policy perspectives on growth of the ECOWAS might not be unconnected with the inability of these economies to marry their growth objectives properly with monetary policy shocks and /or in

most cases the policy effects might be counterproductive (Balogun, 2007). The question then is how has monetary policy shocks drive economic growth?

Different opinions have emerged in the economic literature over the years on the contentious issues in monetary policy. In the first instance, there is yet to be consensus on policy rate determination, on the operations of monetary policy rates whether by rules or discretion (Larch, and Salto, 2005; Patra and Kapur, 2012). Some economists are of the notion that prices can be stabilized and economic growth enhanced using monetary policy rule. Conversely, other economists are of the view that rules are impracticable, but monetary policy can be efficient at the exception of rules. By rules policy mistakes are minimized, policy transparency is enhanced, and political influence is disallowed. On the other hand, discretionary policy engenders economic instability, is predisposed to inflation and prone to special political influence. They also argued that monetary policy action attempting to fix low interest rate only results in higher interest rates and inflation in the long run. Therefore, monetary authorities can only regulate money growth, which can influence economic stability. Proponents of policy discretion object to monetary policy rules as it is autopilot in its operations and disregards the role of verdict in monetary policymaking (Rivot, 2015). Certain rules place some countries' monetary position into fixed paths, regardless of the prevailing circumstances, while some rules (like Taylor's and McCallum's), demands that possible exigencies should be predetermined whenever the rule is formulated (see Friedman, 1968; McCallum, 1989 and Lear, 2000).

There are other conflicting issues relating to monetary policy rate and macroeconomic variables. For example, some views conceived that the shock of oil price of the 70s accounted for the macroeconomic performance of that period. Conversely, another view believes that it was the reaction of monetary policy to oil price shock that really stimulated macroeconomic instability, at that time (Reicher and Utlaut, (2010). The empirical results of Frankel (2006) indicates that the relationship between policy rate and oil price is inverse, but the relationship could not hold after the 80s. On the other hand, Frankel and Rose (2009) and Alquist et al. (2011) find a relatively non-significant relation between oil price and policy rate. Furthermore, there is no consensus on the relationship between the policy rate and the output. The findings of Udoka and Roland (2012) indicate that policy rate increase does not significantly affect economic growth. Conversely, Obamuyi, (2009), Habanabakize and Meyer (2018), among others, suggested that policy rate enhances growth. Further affirmation of either side of these conflicting issues form part of the contributions of this study.

In addition, the key issue of what constitute the channels of monetary transmission mechanism is contentious, even in advanced economies (Allen and Robinson, 2015) where a lot of literature has been written. In other words, getting the right channels of monetary policy transmission to output has remained a challenge to monetary authorities across the countries. In other words, there is yet to be an agreement on the channel and the impact of monetary policy shocks to the macroeconomic variables. For instance, Mishra et al., (2011) examined the orthodox monetary transmission mechanism in low-income countries and opined that those shocks from bank lending channels are more effective, while other channels are weak, particularly the interest rate. Conversely, the empirical investigations of Boivin et al., (2010) and Ncube and Ndou, (2011) suggest that interest rates are the main transmission mechanism, while Acosta-Ormaechea and Coble, (2011), in their findings revealed that though, the interest rate is an effective channel of transmission mechanism, but the shock of exchange rate is more effective. Empirical findings of Bayangos (2010) suggested that the credit transmission mechanism is more effective than other monetary policy instruments. This is another area of contribution of this study.

Moreover, monetary policy shocks have been linked to different economic regimes. A sudden deviation of the Central Bank from its usual plan of action could have negative effect on growth if it is carried out in a wrong regime of business cycle (Krolzig, 2003). However, there are two schools of thought on this. Some authors claim that the effectiveness of monetary policy shocks is more significant at tight regime than during loose regime (see Shen, 2000; KA-Fu, 2000; Fehr and Tyran, 2000; Karras, 2013, Zakir and Malik, 2013; Huber and Fischer, 2018; and Ulke and Berument ,2016). Contrary to this view, is the claim by another school of thought that monetary policy shocks are more effective during loosed monetary policy regimes than at tight policy regimes (see Bodman 2006; Berger and Vavra, 2015; Huber and Fischer, 2015; and Tenreyro and Thwaites, 2016). This study also intends to make its contributions in this regard.

Besides, the existing economic literatures on the monetary policy shocks and economic growth focus on the advanced countries and emerging markets. Few related literatures in the region had concentrated on the feasibility of monetary union of West Africa Monetary Zone (WAMZ) or West Africa Monetary Union (WAEMU) (see Balogun 2007; Harvey and Cushing 2015; Fielding and Shields 2001; Fiador, (2016) on Ghana, Gambia and Nigeria). Other authors have been country specifics, including Adejare (2014) on Nigeria; Quartey and Afful -Mensah

(2014) on Ghana; Olumuyiwa (2017) on Nigeria; Adediran and Matthew (2017) on Nigeria; Herve, (2017) on Cotedlvoire; Apere and Karimo (2015) and Sriram (2009) on Gambia. The literature on the impact of monetary policy shocks (internal and external) on the economic growth in West African countries, is still a missing gap that this study intends to fill. especially as the region continues to debate on the possibility of a unified monetary zone (Houssa, 2008).

1.3 Research Questions

In view of the above, the under listed questions therefore arise**:**

i. What are the determinants of monetary policy rates in ECOWAS?
ii. What are the transmission mechanisms through which monetary policy shock affect economic growth in West African countries?
iii. What is the potency of the monetary policy at different regimes of the business cycle?

Consequently, this study hopes to provide answers to the above research questions through the underlisted objectives.

1.4 Objectives of the study

To carry out the above research questions, this study set its main objective to examine the monetary policy shocks and economic growth in West African countries. The specific objectives are to:

i. investigate the determinants of monetary policy rates in ECOWAS.
ii. examine the transmission mechanism through which monetary policy shocks affect economic growth in ECOWAS, and
iii. assess the potency of the monetary policy at different regimes of the business cycle, specifically at expansion and contraction regimes in ECOWAS.

1.5 Significance and justification for the study

Department for International Development (DFID) considers economic growth as the most powerful tool for alleviating poverty and enhancement of quality of life in developing economies. This was further emphasized by Rodrik (2008) that:

> *"Historically, nothing has worked better than economic growth in enabling societies to improve the life chances of their members, including those at the very bottom*".

Hence, in ECOWAS, rapid and sustainable growth is an ingredient not only for the achievement of macro-economic objectives (Often called 'holy grail'), but also for better social life, poverty reduction and accelerating Millennium Development Goals (MDG).

Furthermore, the improvement in the drive towards the achievement of a unified monetary union in West Africa has led to increase in research around monetary policy and economic growth of this region. West African Monetary Union (WEMU) has been on the table of the monetary policy authorities of the ECOWAS countries over the years with various contributions from different research on how to make it work and achieve the much-desired sustainable economic growth which has eluded the region for many years. Specifically, for a more unified integration in Africa, the newly formed African Union (AU) is currently working on having a common currency for the whole of Africa. Similarly, the ECOWAS members recently agreed to create one single currency for the region, called 'ECO', which was expected to have been effective since 2020. The policy makers of the ECOWAS conceived the ideal of monetary union as a means of getting a thorough macroeconomic policy and sustainable economic growth for the whole region.

There are some common economic targets for better economic integration in each sub-region of ECOWAS, which are better achieved through better knowledge of monetary policy analysis. For instance, the WAMZ aims at achieving macroeconomic convergence with single digit inflation criteria. The available report shows that except Gambia, none of the member countries has been able to achieve these criteria. This raise worries over the effectiveness of monetary policy for the control of inflation in the zone. Similarly, one of the vital elements required to fast track the idea necessitates that the participating countries (ECOWAS) is to pursue monetary policy that could lead to macroeconomic convergence. (See Masson, 2006; Balogun, 2007 and Tapsoba, 2010). This is because West African countries are susceptible to the spill over effect of any economic shock from any affected country (ies) to the other, specifically in economic growth and stability. Also, as African countries expect the birth of its monetary union and the implementation of single currency, this may bring about several challenges particularly the extent to which the monetary policies relate with the real economy.

Hence, in the achievement of the macroeconomic convergence criteria as well as the transition to a common monetary union (Balogun, 2008), the knowledge of the spill over effects of the policy shocks to economic growth is of immense importance to design an effective monetary policy in Africa, which are analysed in this study. A clear knowledge of the degree of

heterogeneity across the countries in WAEMU and WAMZ, (Fielding and Shields, 2003). of transmission mechanism would be a valuable source of information to the various central banks and policy makers in the region. This would unveil regional macroeconomic features to the international organizations to design and implement better economic policy to achieve their goals for the economic region.

This study, therefore, contributes to the existing literature in numerous ways. Firstly, it provides empirical evidence on the determinants of the policy rate, both in the short and long runs for economic stabilization, in ECOWAS. The practical implication of considering both internal and external factors in modelling for the determinants of policy rates in the ECOWAS economy shall assist in the generation of possible results for a more reliable economic analysis and forecast. Furthermore, the robust comparative analysis of the importance of the external and internal drivers in both WAMZ and WAEMU in West Africa is another contribution to knowledge for the region. To the best of our knowledge, there is no known study that has chiefly investigated the determinants of policy rate in ECOWAS, specifically, in WAMZ and WAEMU both in the short and long runs for economic stabilization.

Secondly, it is to be an extension of the frontier of research on the monetary policy shocks and economic growth nexus. This is an area that has not been fully harnessed in ECOWAS region. Thirdly, this study covers the recent topical global economic recession, during which West African countries were not excluded. By this, the study employs a panel set of 12 West African economies, disintegrated into their common economic union, WAMZ and WAEMU, over the period of 1980-2020. Fourthly, this study is making a maiden contribution through the employment of Markov switching VAR for the examination of monetary policy shocks at different regimes of the business cycle, which is a novelty to the extant literature. Indeed, to the knowledge of this study, there is no known study that has been carried out to investigate and analyse monetary policy shocks and economic growth in ECOWAS region, using Markov switching model.

1.6 Data and scope

Sequel to the above, this study employs a quarterly data, which spans over the period 1980(Q1) to 2020(Q4). This is based on the believe that it is a period long enough to capture the growth trends, inflationary trends, and the movements in the business cycles. The intention here is to cover the global financial crisis periods in the monetary policy, between 1980 to the recent one of 2014, during which West African economies were not exempted. Subject to availability of

data, this study covers 12 countries. This includes eight countries in CFA- WAEMU countries (Benin, Burkina Faso, Cote D'lvoire, Mali, Guinea Bissau, Senegal and Togo) and four countries in Non-CFA- WAMZ countries (The Gambia, Ghana, Nigeria, and Sierra Leone).

1.7 Ethical consideration

This study employs entirely secondary data for its estimation and analysis. There is no unethical situation arising from the data compilation. Therefore, the required ethical clearance, with protocol reference number 00014126, was obtained from the institution accordingly.

1.8 Structure of the study

For the purpose of logical presentation and deduction, this study has been segmented into seven chapters. Chapter one deals with the introduction to the study, including the motivation for the study, the aim, and objectives of the study, and contributions to knowledge. Chapter two contains an overview of economic features, monetary policy of member countries, and transmission mechanism, as well as policy framework in each sub-region. It also includes external shocks and macroeconomic performance, economic characteristics of the economies of each the member countries and their monetary policy systems. The import of this chapter is to aid in the analysis of results and to assess if there are similarities in their economic indicators. Chapter three is dedicated to the theoretical framework, and literature review. The subsequent chapter (chapter four) deals with the adopted methodology for this study, specifically the model specification and estimating techniques for each objective of the study. Also included are the data collection and the variables of interest contained in this chapter. Chapter five of this study is dedicated to the presentation and interpretation of the empirical results, while chapter six deals with discussion of empirical findings. These are made in relation to each objective of this study. It includes the implications of the results as well as drawing of inferences from the relevant studies. Lastly, chapter seven of this thesis contains the summary of findings, and conclusion. The last section of this chapter comprises policy recommendations and suggested areas for further research.

CHAPTER TWO

AN OVERVIEW OF ECONOMIC FEATURES, MONETARY POLICY OF MEMBER COUNTRIES, AND TRANSMISSION MECHANISM.

This chapter is divided into sections. The first two sections contain the monetary transmission mechanism and Policy instruments. Following this are the monetary policy framework, and a brief discussion of the external shocks and macroeconomic performances, respectively. This chapter also covers the economic outlook and Monetary policy of each member country in both WAMZ and WAEMU, where the monetary policy framework of each of the countries in WAMZ is discussed, and the common monetary policy being operated by the WAEMU. Included in this chapter, are the performances of the key macroeconomic indicators, as well as related macroeconomic trends in ECOWAS relative to SSA. The significance of this chapter is to comprehend the operating framework as it waves into the empirical analysis and interpretation of our results in the subsequent chapters.

2.1 Monetary transmission mechanism

The monetary transmission mechanism is a means by which the monetary policy is conveyed to the economy. That is a process by which fluctuations in the monetary policy decisions impact economic activity, measured by real output and price level. An in-depth knowledge of the monetary transmission mechanism is vital for the implementation and to ascertain the expected outcomes of monetary policy (Tahr 2012). Ipto facto, a lot of reviews in the economic literature had been done in the past and recurrently on the monetary policy transmission mechanism. Even though there are many channels, however, this study briefly discusses the mechanism by which the convectional channels (money supply, interest rate, credit, exchange rate, assets price and expectation) operate to affect the macroeconomic variables and the unconventional mechanisms.

2.1.1 Money Channel

This refers to the broad money or M2 in an economy, which is composed of narrow money and other kinds of money that are not easily exchangeable for cash. However, its definition as M2 or M3, etc., depends on the financial and economic development of such an economy. In a given economy, it is generally observed as the most liquid and a more comprehensive means of the money supply. Thus, being closely related to inflation, the Central bank used it as one of the prime instruments of monetary policy. Fluctuations in the broad money are vital

indicators that give the Central Banks reliable signs relevant for the liquidity management of the economy.

Money channel is a prime channel of monetary transmission mechanism that involves the transmission of the reserved deposit to broad money and through multiplier effects, money is created by the banks. In the short run, the Central Bank may induce money into the economy through open market operation, which impacts consumption and investment and subsequently output growth and general prices. This channel of monetary policy is under the assumption that aggregate demand depends on the money balances of the financial transactions, which invariably affects the real GDP and general price level. Thus, in an economy where the focus of the monetary policy is on money, broad money forms the intermediate target of the Central Bank (Mishkin, 1998).

2.1.2 Interest Rate Channel

Like the money channel, the interest rate channel is another traditional and conventional monetary policy mechanism, derived from the policy rates. The policy rate is the short-term, classically, the overnight interest rate that central bankers use to regulate the stance of monetary policy. The policy interest rate determines the levels of the rest of the interest rates in the economy since it is the price at which private agents-mostly private banks-obtain money from the central bank. These banks will then offer financial products to their clients at an interest rate that is normally based on the policy rate. A fall in the interest rate by the Central bank, for example, leads to an increase in demand, which will discourage savings but encourage borrowing and consumption. This will afterward result in higher prices. Thus, an increase in investment and rising consumption leads to rises in aggregate demand and consequently increases the inflation rate (Mishkin, 2004). One of the features of the effectiveness of the monetary policy rate to interest rate is the slowness in the adjustment of the price. This is termed price stickiness in the modern monetary approach (Head et al, 2010). It is through the short-term monetary policy rate that the monetary authority uses to stimulate the real interest rate in the long run. Its operations can also be summarized through the Keynesian IS-LM framework. Expansionary monetary policy results to a decline in real interest rate, leading to a decrease in the cost of the capital and motivating investment and further leads to a rise in aggregate demand and output growth. It should be noted, however, that Central banks or the monetary authorities can only control the short-term nominal interest rate, whereas it is the real interest rate that

affects the spending decisions. Thus, a vital factor that promotes the efficacy of this channel is the framework of the inflation targeting monetary anchor (Bordon and Weber, 2010).

According to the hypothesis of the rational expectations, the real interest rate, in the long run, depends on the expectations of the short-term real interest rates in the future. Hence the monetary authority uses the short-term interest rates to stimulate the long-run interest rates via price stickiness, which invariably affects the real economy. The interest rate channel as a monetary policy tool has subsided in the recent years, particularly in advanced countries. This is as a result of the interest rate being determined by the price mechanism which has been globally reduced to near- zero or to some extent to negative levels, whereas the policymakers can only perceive the future increase in interest rate as a potential instrument of preventing any nascent inflation. Thus, monetary policy arrangement, through further reduction in the interest rate, to enhance spending, is no longer conceivable (Jordan, 2017).

2.1.3 Credit Channels

Bernanke and Gertler (1995) considered information obtainable from the financial market as the necessary source of credit channel and as not an isolated mechanism, but as an amplifier to the traditional monetary channel. Contractionary monetary policy increases the premium payable by a borrower, which eventually decreases the loanable funds.

There are two mechanisms by which this channel operates: the bank lending mechanism and the balance sheet mechanism.

2.1.3.1 Bank Lending channel

The monetary authority operates through the monetary policy rate to affect both the interest rate and size of external finance payments (Bernanke et al, 1995). According to the operation of the channel, it depends on the quantum of the bank loans made available for the households. During expansion, for instance, when the Central bank reduces reserve requirements, it will lead to the availability of more loanable funds. Therefore, aggregate demand will increase, due to increased investment and spending, thus leading to growth increases and higher inflation. What determines the strength of the lending channel includes the level of development of the economy's security market, larger size lower level of capitalization of the lending banks etc (Dabla-Norris and Floerkemeier, 2006).

2.1.3.2 Balance Sheet

Firms negotiate with the banks on agreed terms and conditions based on their collateral securities (assets) as positioned in their balance sheets. The borrowing firms can also be affected by the monetary policy through their net worth, as it appears in their balance sheets, which constitutes their net worth and collateral (Simatele, 2004). A contractionary monetary policy reduces the net worth of the firms. For instance, when the equity of the borrower falls, the ability to borrow will reduce because of the lesser collateral for loans. Hence investment will fall, and aggregate demand will also fall. According to Bernanke and Gertler, (1995) when the net worth of a firm is low, such credit facilities are vulnerable to risk. This is because they are further led to portfolios that are riskier, thereby becoming defaulters (Angelopoulu and Gibson, 2007). This is not a common channel of monetary transmission in West African countries.

2.1.4 Exchange Rate Channel

This channel gains more importance in an open economy and more specifically in the present state of financial globalization. The impact of the monetary authority on the exchange rate affects both the prices of domestic goods and imported goods (Tahir 2012). Needless to say, the effect of the monetary policy shock of this channel is via net export. At contraction, for instance, when interest rate is increased, the exchange rate becomes more favourable to the domestic economy, imported goods become cheaper and importation is encouraged. Hence few goods will be imported because the cost of domestic goods is higher relative to foreign materials. hence demand will reduce, and inflation will decline. However, the operations of this channel are determined by various factors according to Mishra et al, (2010) and Boivin et al., (2010). This includes the regime, the sensitivity of the interest rates, the extent of capital mobility, the openness and size of the economy, and the extent to which the expenditure is swapped between imported and domestic goods. Evidence from some authors revealed that countries with fixed (pegged) exchange rates usually experience higher inflation rates. while countries with adopted flexible exchange rates experienced a relatively lower rate of interest. (Gosh et al, 1995; Bleaney and Fielding, 2002). On the other hand, Burdekin & Siklos, (1999), had a different conclusion and submitted that countries adopting fixed exchange rates do experience higher rates of inflation, instead of lower rates. The ECOWAS economy is dominated by two exchange rate regimes of pegged and flexible regimes.

On the monetary policy framework in ECOWAS countries, their nominal anchor has been more of monetary targeting rather than exchange rate pass-through or inflation targeting, particularly the Anglophone countries. For example, Gambia, Ghana, Guinea and Sierra Leone have been inflation targeting between 1980- 2014. While Nigeria was between 1975- 2014 and on the transition stage to inflation-targeting, but Ghana transited to inflation targeting since 2002. (Tarawalie et al, 2013)

In many small and open economies, the exchange rate channel is one of the vital monetary policy instruments for the control of such economies. The influence of the exchange rate channel on the monetary policy is embedded in the Uncovered interest rate parity (UIP) theory. The theory simply states that the expected future fluctuations in the nominal value of the exchange rate is a function of variance between the domestic and the foreign interest rates. The UIP theoretically aids the monetary authority to vary the exchange rate, which relatively affects the domestic and foreign prices of goods and services. The validity of this theory has been criticized as its effectiveness is based on the UIP conditions. Hence it has been suggested that its conditions should include risk-premium terms by compensating the foreign investors on domestic assets for expected depreciation and for holding domestic assets (Loayza and Schmidt-Hebbel, 2002).

The exchange rate is the relative value of the domestic currency to the foreign currency. Hence, the effect of the rate of change is a function of both the domestic and foreign monetary policies, coupled with the prevailing inflation rate of the economy. Exchange rates can also be affected through policies modifying the interest rates. Ceteris paribus, an unanticipated rise in the official exchange rate will probably result to an instantaneous increase in the value of the domestic currency in the forex, and vice versa when the rate decreases. An increase in the rate of exchange could be because of a relative increase in the domestic interest rate vis-a-vis the foreign rates, which makes the real assets more attractive to foreign investors.

The effect of the exchange rate fluctuation is that it results in sporadic changes in the prices of goods and services, both the domestic and foreign markets, which may subsequently affect the consumption expenditure.

2.1.5 Asset Price Channel

The impact of the monetary policy on the discount rate would influence the asset prices, which subsequently affect the real economic variables.

For instance, tight monetary policy leads to an increase in asset prices. This, in turn, will increase the value of the firm's market value and investment is enhanced.

This channel operates through two mechanisms of the permanent income hypothesis or Tobin's q theory. The stock prices affect the consumption level and output which invariably affects the general price level. With an expansionary monetary policy, stocks' demand is increased, which will lead to an increase in their prices and output growth (Mishkin 1995 and 1996). According to Norris and Floerkemeier (2006), during the expansionary monetary policy, firms' net-worth increases, which gives more value to the collateral security for a loanable fund. The major determinants of this channel as a monetary transmission mechanism include households' participation in the capital market, funds generated by firms through shares, and stock market development. This issue of stock markets is well developed in the advanced countries contrary to what is in operation in the developing economies, characterized by instability and uncompetitive nature (Butkiewicz and Ozgdogan, 2014). Economic literature revealed that apart from Ghana, Kenya, Mauritius, South Africa and Zambia, the Asset Price channel has not been a common monetary policy transmission mechanism in sub-Saharan Africa (ECOWAS inclusive). This may be because of the level of their financial markets. Thus, Mishra, et al (2014) posited the asset price channel is irrelevant in many developing countries since their stock markets are either small or underdeveloped.

2.1.6 Expectation Channel

In economic theory, expectations could be adaptive or rational. It is adaptive, as claimed by the Monetarists when past activities are used to predict future outcomes. With the rational expectation, as agued by Lucas and other Neo-Classicals, not only the past activities are considered but also the present activities and future projections. Expectation channels are common in the industrial world, where there are well-functioning financial markets (Davoodi et al 2013). Whereas its uncommonness in developing economies might be attributed to their weak economic and market structures, it is a transmission channel that is based on future changes in the monetary policy rate. For instance, the perception of a change in the monetary policy rate in the future can instantly affect the long-term interest rate, afterward general price and output. Expectation channels play a crucial role in the monetary policy transition mechanism because in the modern World all economic agents are not only rational but forward-looking. Out of the 15 Sub-Saharan countries surveyed by Chritensen (2011), 6 countries had

adopted this channel, including Botswana, Kenya, Mauritius, South Africa Zambia, and Ghana from West Africa.

Fluctuations in the monetary policy can affect the expectations of the real economic activities through the inflation expectations. This provides a guide to the policymakers on the direction of the prospective economic activities. Thus, the expectation channel is becoming popular in recent times with a transmission mechanism based on the fact the monetary policy in modern times is forward-looking. Also, the expectation channel is vital to the functioning of other channels of the monetary transmission mechanism.

The future growth of real economic activity can be influenced by expectations. Thus, such discernment will affect the stakeholders in the financial market, as well as other sectors of the economy like unemployment, anticipated wage rate, sales, and profits etc., The effects could be bi-directional. For instance, any rise in the rate could be perceived to be a likelihood of a fast-growing economy, which triggers future growth and general confidence. On the other hand, the rise could be conceived to be a sign of slowing down the economic growth rate for the purpose of achieving an inflation target, thereby creating a depression on the expected future growth and assurance. Therefore, the likelihood of these effects enhances the importance of implementing a reliable monetary policy regime in an economy.

2.1.7 Unconventional Monetary Mechanism

In the recent past, many central banks failed to achieve their monetary objectives of macro-economic stability, using conventional instruments. The reason the conventional policies failed, and the proffered solution are still an ongoing debate (Jordan 2017). The unconventional policy tools recently operated since the global crisis of 2008 include the followings: (1) Payment of interest on the reserves at the central banks in the United States, which was an authority from the congress, (2) operation twist, (3) quantitative easing (QE), (4) Mandatory holding of a significant percentage of assets in liquidity balances by big Commercial banks,(5) imposition of negative interest rates on the reserve balances of the commercial banks, and (6) Direct financing of government expenditure. A system known as helicopter money. The unconventional monetary policy was strongly supported by the empirical investigation of MacDonald and Popiel (2017), in a small open economy. Further arguments on the combination of unconventional monetary policies are ongoing.

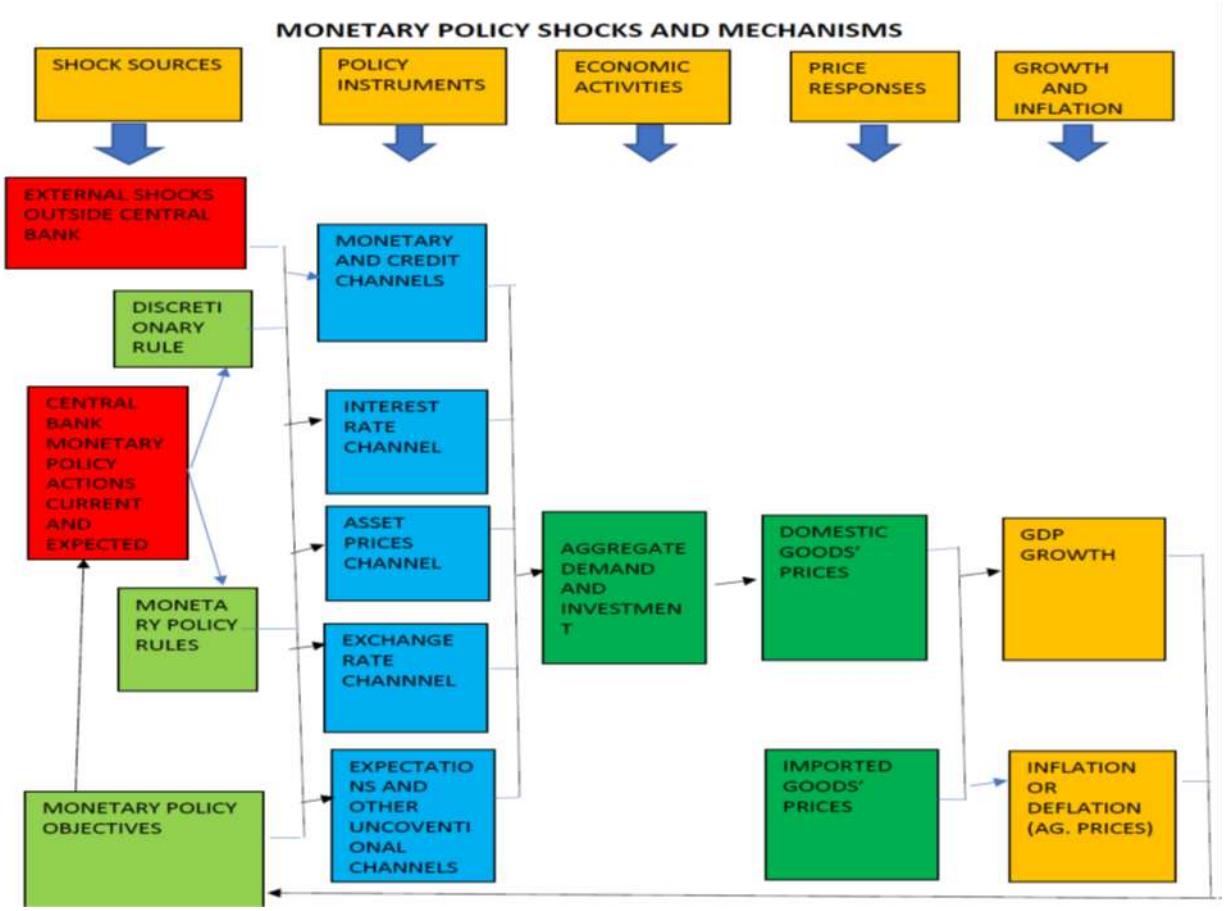
Indeed, the use of these unconventional channels further confirms the opinion of Bernanke and Gertler (1995) that the monetary policy transmission mechanism remains a 'black box'. This is because of the dynamism of the transmission mechanism of the monetary policy. More so, the area yet to be explored in the literature and policymakers is the independence of these channels and the degree of complementarity of these channels to one another to make them effective

Meanwhile, the strong argument against the low rate of nominal interest rates of this channel is that it gives room for speculative demand for money in line with Keynes. It could also be seen as "Delphic", a situation whereby the stakeholders perceived the lowered interest rate as a sign of future economic deterioration. Also, low-interest rate produces negative effects on the profit of the banks, which leads to a reduction in credit and loans and thus the expansionary monetary policy is weakened (see Borio and Gambacorta 2017; Borio et al. 2017).

In summary, all the aforementioned demonstrate the transmission channels for monetary policy implementation, which may vary from country to country, depending on the level of development of the economy and the institutional framework. Countries have unique transmission mechanisms and not uniform channels. A very open economy with developed money and financial market has more channels of transmission than an underdeveloped economy with weak institutional arrangements Whatever channel of the monetary policy transmission mechanism is dominant in a country, the apex bank has the responsibility of adequate policy implementation and monitoring to ensure stability, improved aggregate economic activity, and sustainable growth. Meanwhile, which of these policies and actions contributed to the failure of the conventional policies remains unresolved. In the alternative, the use of unconventional monetary tool, has been on the increase since the global financial crisis of 2008. For instance, in the USA, unconventional monetary tools like zero interest rate, quantitative easing, and operation twist, among others, were implemented for the economic recovery during the global economic crisis of 2008 and the recent global recession of 2014.

As summarized in the schema (figure 2.1), the shocks emanate internally from the Central Bank and from the external sources, through any of the policy instruments. In another dimension, the shocks could also be from external sources, for instance, through international trade or global financial meltdown.

Figure 2.1 Monetary policy Transmission Mechanism.



Source: Loayza and Schmidt-Hebbel (2002)-Modified by Author

This subsequently, stimulates the level of economic activities, either positively or negatively. The price responds domestically and externally, leading to economic growth, and the aggregate price is affected (inflation/deflation), which in turn creates room for further policy decisions of the monetary authority. For example, the monetary authority may induce money into the economy through open market operation (expansionary policy), which impacts consumption and investment and subsequently output growth and general prices. Or an increase in the interest rate (contractionary policy) by the Central bank is expected to decrease aggregate demand, which will encourage savings but discourage borrowing and consumption. This will afterward result into lower prices. Conversely, an increase in investment and rising consumption leads to rises in aggregate demand and consequently an increased inflation rate. (Mishkin, 2004).

Empirically, it has been suggested that the member countries of WAEMU are having weak and unreliable monetary transmission mechanisms, which has restrained the use of monetary policy for macroeconomic stabilization and growth (Babilla 2014). Pieces of evidence the suggest that

bank-lending channel significantly improves monetary policy transmission mechanism and sustain economic growth in WAEMU. Also, evidences revealed that the channels of monetary policy transmission differ across the WAMZ member states. While the interest rate channel remains ineffective for the various WAMZ countries, the exchange rate channel is the most effective channel in Nigeria. whereas, bank lending channel was only effective in Ghana and The Gambia (Quaidoo 2018).

2.2 Monetary Policy Framework

2.2.1 Sub-Region of WAEMU

Eight out of the sixteen west African countries are in CFA, belonging to a union called West African Economic and Monetary Union (WAEMU). These countries are Benin, Burkina Faso, Cote d'Ivoire, Guinea Bissau, Mali, Niger, Senegal and Togo. The largest economy in this union is Cote d'Ivoire, which accounts for over 40% of the Union's GDP. This is followed by Senegal's economy with about 15%, while Mali, Burkina Faso and Benin contribute almost 10% each (IMF 2018), for the coordination of their macroeconomic and common monetary policies. Their operations are carried out under the umbrella of the BCEAO which is responsible for the conduct of a common monetary policy for the member states. The issuance of a common currency, is pegged to the Euro, pooling the foreign reserves and other oversight functions of the banking system in the union. (Kireyev 2015).

The major challenge of this monetary policy arrangement is that the countries are subject to the so-called "Trilemma", which indicates that such countries with full capital mobility cannot concurrently enjoy monetary autonomy and fixed exchange rates. Thus, in trilemma, a country with partial control of its capital is incapacitated from having monetary autonomy, unlike those with an open capital account (See Montiel 2009, Obstfeld et al., 2008). However, as suggested by Rey (2013) the trilemma can be transformed into a dilemma, based on the condition that the capital account is directly or indirectly managed by such country, regardless of the exchange rate regime.

Meanwhile, in WAEMU, the monetary policy has been reviewed since 2010, including the operational working tools, the decision-making body, and the monetary policy objectives. For instance, the responsibility of setting the monetary policy and defining the operational tools lies on the MPC. They meet quarterly and are headed by the governor. Among other monetary policy objectives in WAEMU, price stability is the optimum objective, which is defined at 2

percent plus or minus, per annum. Article 62 of WAEMU treaty supports the economic union while article 76 contains the intermediate monetary policy targets. In respect of the exchange system, as said earlier, the economic union sustains a fixed exchange rate. It is the CFA franc at 655.957 to one euro and is characterized by fixed parity with the euro, a common issuing body and unlimited convertibility. However, for any member country to enjoy unlimited convertibility a reserve requirement of 50 percent deposit to the operations account is necessary. Furthermore, reserve requirement is another instrument used by this body of countries for its monetary policy for the purpose of prudence.

According to Kireyev, one principal instrument at the disposal of the BCEAO used for the control of monetary policy within the sub-region is the reserve requirements. This instrument is set at the discretion of the MPC. Reserve requirements are used by the BCEAO as instruments for monetary policy and prudential regulations. Even though, the interest rate has been challenged not to fully mirror the liquidity conditions of the union, however, the interest and liquidity injection constitutes the most active monetary policy tools for the BCEAO.

It remains unchallenged empirically that the countries in this union have enjoyed a greater level of price stability than their non- CFA neighbours (like Gambia, Ghana, Nigeria etc.). This is accounted for by the exchange rate of the CFA franc pegged to the euro, thus the imported inflation by member countries of the eurozone is relatively low. An average inflation rate of 0.3% was recorded in 2014-2016 compared to 11% (West Africa Economic outlook, 2019) in the non-CFA countries. However, this privilege of relative price stability was accomplished at the expense of the constricted monetary policy, which has resulted to low growth as compared to non-CFA countries in West Africa (Amin 2000). In WAEMU, the monetary transmission mechanism is similar to the schematic diagram stated in figure 2.1 Even though, not all the channels are active, however, the active channels in these countries include the credit channel, the interest rate channel, the asset channel and the exchange rate channel.

2.2.2 Sub-region of WAMZ

As opposed to their counterparts in WAEMU, Countries in the Non-CFA zone, except Liberia, operate the floating system. Between 2014 and 2016, the inflation rate in WAMZ raged from 0.5% in Cape Verde to 16.7 % in Ghana. As of 2017, the range has increased from 0.8% in Cape Verde to 18.2 % in Sierra Leone. By records, the countries in this zone devalued their currencies between 2008 and 2018, as part of their monetary policy measures (WA outlook 2019). Countries on the lead include Ghana, Nigeria and Sierra Leone.

The monetary framework for these countries is shown in table 2.1. The monetary policy anchors of these countries are similar, except in Ghana where Inflation targeting is their anchor. Open Market Operation (OMO) is a common operation instrument in all the countries, while their primary objective is generally price stability. Furthermore, the intermediate target varies from country to country, but the mostly used macroeconomic variable is the broad money (M2). Relative to the primary objectives in these countries, their ultimate goal is the inflation control.

Table 2.1: Monetary policy Framework in WAMZ

COUNTRY	Policy Anchor	Operation Instruments	Primary Objective	Operational Target	Intermediate Target	Ultimate Target
THE GAMBIA	Monetary Aggregate Targeting	OMO, Reserve Requirement and Re-discounting	Price Stability	Reserve Money	Broad Money	CPI Inflation rate of 5%
GHANA	Inflation Targeting,	OMO, Reserve Requirement, and standing Deposit and credit facility	Price Stability	MPR,	Interbank Rate and Annual Inflation rate	CPI Inflation rate of 8% +/-2
GUINEA B.	Monetary Aggregate Targeting	OMO, Reserve Requirement and Re-discounting	Price Stability	Reserve Money	Exchange Rate	CPI inflation Rate
NIGERIA	Monetary Aggregate Targeting	OMO, Liquidity Ratio, Forex Reserve Requirement	Price Stability	Reserve Money	Broad Money and interbank Rate	CPI Inflation Rate 6-9%
SIERRA LEONE	Monetary Aggregate Targeting	OMO, Reserve Requirement and Re-discounting	Price Stability	Reserve Money	Broad Money	CPI Inflation Rate

Source: Collated by Author from IMF (2016), Central bank of each country

The monetary policy framework adopted by the Central Banks of the member countries in WAMZ (Table 2.1), could be categorized under Monetary aggregate targeting, and inflation targeting. Apart from Ghana with inflation targeting, other countries adopt monetary aggregate

monetary policy anchors. Accordingly, the monetary policy takes the dominance of this policy anchor in the sub-region. Price stability is a common primary objective in the monetary policy framework of all the countries. Similarly, their ultimate goal is centred on CPI and inflation but at different rates.

The Central bank of Gambia operates through the OMO, Reserve Requirement and Re-discounting, to target inflation at 5%. Ghana is inflation targeting and it operates via the instruments of the Reserve Requirement, standing Deposit and credit facility, to target inflation at 8% plus or minus 2%. The monetary policy revolution in Ghana, before 1992, had undergone various stages of operations. Initially the policy was direct control of monetary management, unfortunately, the policy fails to achieve its required goals of economic stability. The failure of the policy led to the use of an indirect system, using a market-based regime in 1992. Again, the failure of the policy to achieve the desired result led to the implementation of a mixed policy of money supply cum inflation targeting. As a result of the persistent inflation rate, in 2002 the Ghana act 612 adopted the inflation-targeting monetary policy. After South Africa, Ghana is the second country to adopt inflation targeting in Sub-Saharan African countries (see Bawumia 2010, Kwakye 2012 and Quartey & Afful-Mensah 2014,).

Furthermore, in Guinea Bissau Monetary-Aggregate Targeting constitutes the policy anchor, using the monetary instrument of OMO, Reserve Requirement and Re-discounting. The policy framework in this country aims at inflation targeting as its ultimate goal (Table 2.1). The CBN in Nigeria is monetary targeting, using OMO, Liquidity Ratio, and Forex Reserve Requirement as its operating instruments to set the inflation at a range of 6- 9%. (Table 2.1). Similar to Ghana, the Central Bank of Nigeria employed indirect monetary policy for its market-based policy regime since 1992. This OMO monetary instrument is complemented with policy indicators including minimum rediscount rate and reserve requirement (Adenekan and Ahortor, 2013). Similarly, in the Bank of Sierra Leone (BSL), the ultimate goal is price stability, like other counterpart countries in the WAMZ, with direct control of monetary policy before 1992. Thereafter it resorts to indirect market-based monetary targets using OMO and reserve requirements as monetary instruments (Ogunkola and Tarawalie 2008).

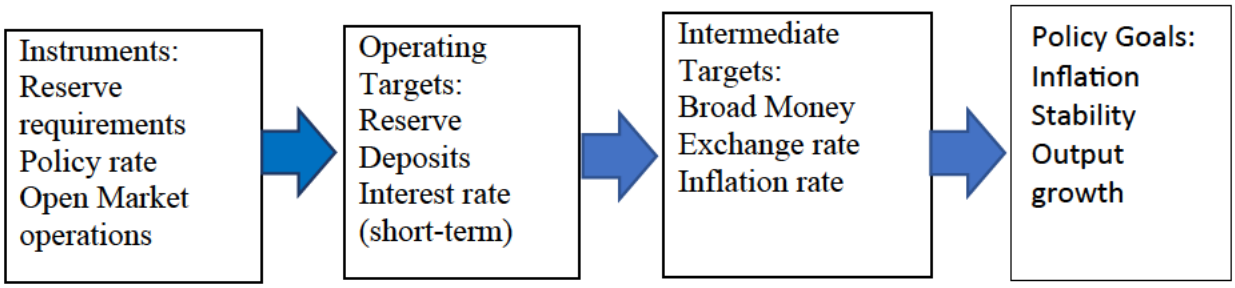
In summary, for a better understanding of monetary policy, attention must be focused on the transmission mechanisms through which the action of the monetary authority is implemented. This is based on the structure and current economic conditions. In monetary policy, the

mechanisms operate through various channels to impact different macroeconomic variables and markets at different speeds and intensities.

2.3 Monetary Policy framework in West Africa

The banks of West African countries operate Open Market System for the computations of their monetary policy with reliance on policy rates, reserve requirements and foreign exchange. The monetary policy centres on deposits as the operating targets, while broad money constitutes the intermediate target. The ultimate goal of the monetary policy is price stability and economic growth.

Figure 2.2 The Monetary policy Framework



Source: Davoodi et al 2013

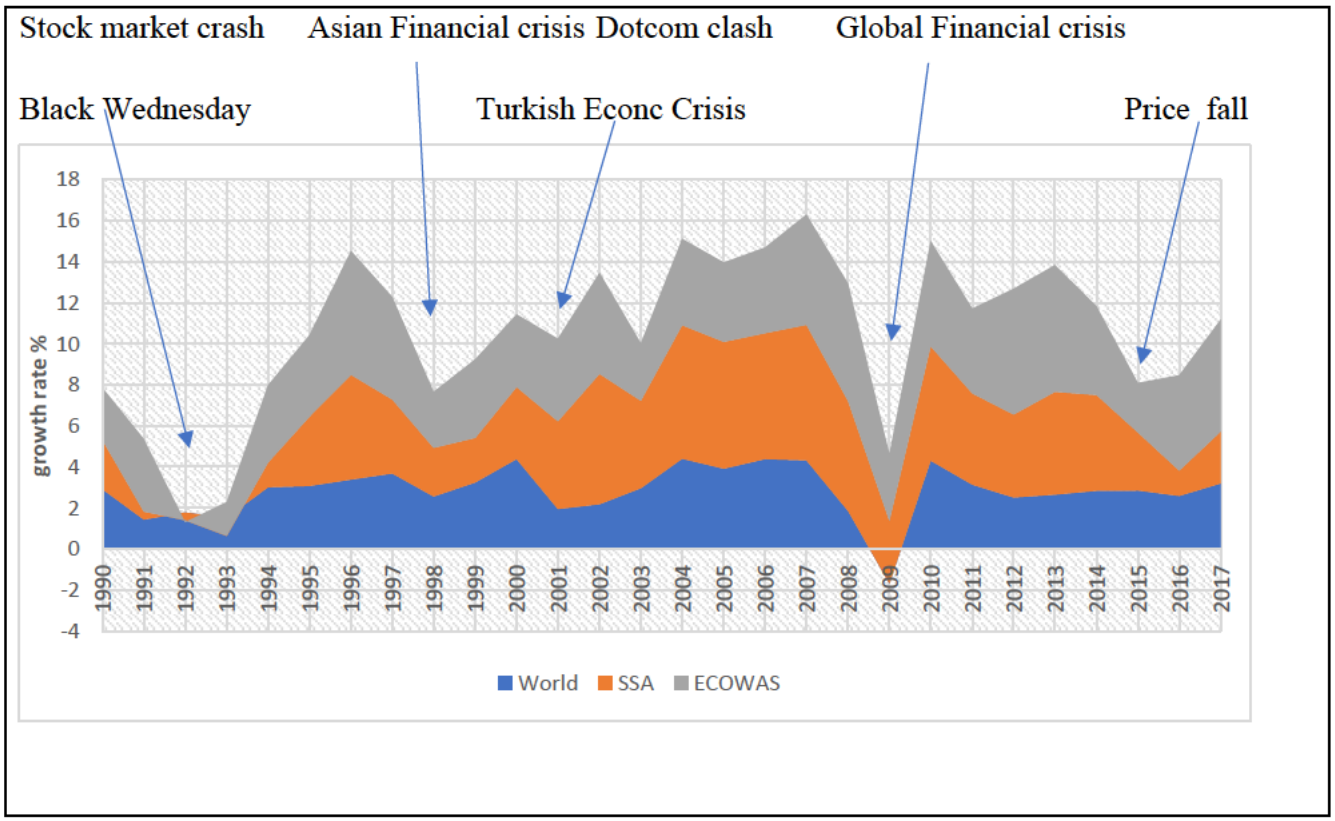
However, the Central Banks are not in direct control of these macro-economic variables rather they use a set of tools such as Reserve requirements, Policy rate and Open Market operations to achieve their ultimate goals. In other words, neither the intermediate goals nor the final goals are in complete control of the Central Bank. These instruments invariably operate through the interest rates and money supply to affect the macroeconomic goals with lags. These instruments of money supply and short-term interest rate also constitute the indicators for the Central bank to measure the effectiveness of its policies. The operating target performs crucial roles in the daily operations of monetary policy.

Operationally, the choice of intermediate targets entails three basic criteria. Firstly, the intermediate variable must be a stable and close link with the final policy goals; it should be closely associated with the tools of monetary policy. Secondly, it should have a close link with the tools of monetary policy. Lastly, for effective and easy monitoring, it should be able to provide frequent and reliable information. The intermediates are the nominal anchors with the major role of preventing the internal and or the external shocks from lasting and higher inflation and maintaining price stability (see Khan 2000, Koning 1986)/

2.4 External shocks, and macroeconomic performance

In the past two decades, the impact of external shocks has rekindled the interest of various researchers, particularly, the negative shock effects on the economic growth and sustainability in the developing countries. The sporadic occurrence of the external shocks from 1990 to the recent time and the effects on economic growth in the world, SSA and the Ecowas region are evidently demonstrated in figure 2.3

Figure 2.3: Economic growth trends and External effects episodes (1990- 2017)



Source: Author's computation from data from WDI

The global economic downturn began in 1929, through 1939, which resulted into a great economic depression experienced by both developed and developing nations worldwide. Although it emanated from US, but it degenerated into a drastic fall in output, critical unemployment, and serious inflation in all the countries in the world (Romer, 2003). Similarly, another notable shock was in the early 90s, which was also cause by the stock market crash, captioned 'black Wednesday'. Following this was the Asian Financial crisis, Turkish economic crisis and Argentina economic crisis (Dotcom clash) characterized by negative spillover effects in 1998 and 2001, respectively. Another global economic crisis (great depression) was in 2008 with a far-reaching effect on the economies around the globe, characterized by the stock market

downturn, unemployment, etc. (Chang et al. 2013). During the crisis, the world economic growth recorded a negative growth rate of -1.6%. The growth rate of SSA fell from 5.3% to 3% on the average, while the increasing growth rate of the ECOWAS region was halted by the global shock as it declined from 5.7% to 3.2%, during the great depression. The downturned commodity price of 2013/2014 was the recent external shock, with a significant economic impact on the growth rate of SSA, which fell from 5% in 2013 to as low as 1.2% in 2016. Similarly, the shock led to a sharp fall in Ecowas growth rate from 6.2% in 2013 to 2.4% in 2015 (WDI, 2020).

In developing nations and low-income countries, business cycle fluctuation reflects are more exposed to external shocks such as trade openness, foreign aid, and climate conditions, as well as having a lower ability to absorb these shocks. The impact of trade openness affect business cycle fluctuations is higher in developing nations than developed economies (Tomz and Wright, 2007). Thus, in ECOWAS, the magnitude and frequency of disturbance in macroeconomic activities has negative effects on welfare (Blyde, et.al 2010; Daude and Fernández-Arias, 2010) as well as harmful and persistent effects on income distribution and poverty (Calderón and Yeyati, 2009).

2.5 THE GAMBIA

2.5.1 Gambia Economic Indicators

The Gambia constitutes the fourteenth largest economy in the ECOWAS region. As of 2018, The Gambia has a population of 2.28million with a growth rate of 2.9% in 2018. Due to thin natural resources, 3/4 of the population depends on agriculture, which contributes 1/3 of the GDP of the country and dominated by the production of groundnut. The export of the country is majorly within the region with 51.9% to Guinea Bissau. Thus 48.6% of the population lives below the poverty line (see ADB 2018, World Bank 2018 and World Factbook, 2019).

As depicted in Table 2.2, the growth rate exhibits a short-term steady growth in 2007-2010. Generally, the trend is volatile, characterized with both positive and negative values within the period 2004 to 2018, with an average value proportion of 2.8%. The per capita growth rate is a mirror of the RGDP growth rate with a negative mean value of -0.3%. Similarly, throughout the period, the trade balance and the current account balance were persistently deficit, which indicates that the country is import-dependent with a frail export base. However, the external debt shows a significant decrease in 2007 with 90.6% from 113% proportion of GDP. It is however encouraging that the debt rate is at a declining trend.

Table 2.2 Gambia Economic Indicators

Year	GDPR	GDPR_CA	INF	BM	EXCH	EXP	IMP	E-I	EXT_DT	CAT
2004	7.0	3.7	14.2	18.8	93.3	20.6	29.3	-8.7	122.0	-2.7
2005	-2.4	-5.3	4.8	20.9	99.1	19.9	30.1	-10.2	110.9	-6.3
2006	-0.6	-3.5	2.1	26.2	98.6	21.0	29.3	-8.3	113.9	-4.3
2007	3.0	0.0	5.4	26.0	107.5	18.0	26.3	-8.2	90.6	-5.2
2008	6.3	3.1	4.4	28.3	113.8	14.5	24.6	-10.1	42.7	-7.6
2009	6.7	3.5	4.6	30.3	102.8	15.7	26.0	-10.3	60.5	-7.8
2010	5.9	2.8	5.0	30.7	100.0	14.7	26.3	-11.7	59.4	-10.0
2011	-8.1	-10.9	4.8	35.5	92.5	16.9	25.8	-8.9	58.9	-7.4
2012	5.2	2.1	4.3	35.0	89.0	19.8	27.9	-8.0	62.0	-4.5
2013	2.9	-0.2	5.7	37.0	81.6	19.2	26.9	-7.7	41.6	-6.7
2014	-1.4	-4.3	5.9	39.7	73.7	19.8	32.9	-13.1	42.9	-7.3
2015	4.1	1.0	6.8	34.4	73.3	16.3	32.6	-16.4	39.1	-9.9
2016	1.9	-1.1	7.2	36.1	88.9	16.4	31.7	-15.2	36.5	-9.2
2017	4.8	1.8	8.0	40.1	90.4	22.5	39.0	-16.5	44.7	-7.4
2018	6.5	3.5	6.5	42.9	89.1	21.9	41.5	-19.7	42.7	-9.7
Mean	2.8	-0.3	6.0	32.1	92.9	18.5	30.0	-11.5	64.6	-7.1

Source: Author's computation- Data from IMF and WDI

Note1: GDPR= Gross Domestic Product, Real, % change, Previous period; GDPR_CAP= GDP per Capita, Real, % change, Previous period; INF=Inflation, consumer prices (annual %) INF=Inflation, consumer prices (annual %); BM= Broad Money, % of GDP; EXCH= Exchange Rates, Nominal Effective Exchange Rate; EXP= Exports of goods and services (% of GDP); IMP= Imports of goods and services (% of GDP); E-I = Export -Import; EXT_DT= External debt stocks (% of GNI); CAT= Current Account, Total, Net, % of GDP;, based on CPI.

Note2: The above definitions of these variables applied to all the tables in 2.2 to 2.13

2.5.2 Monetary Policy Framework in The GAMBIA

The Central bank of Gambia (CBG) employs an indirect monetary policy framework, following the country's financial and economic reforms of 1986. This encompasses the use of monetary instruments including Open Market Operation (OMO), bank securities, and reserve requirements at the expense of interest rate control and selective credit. In 1987, a treasury bill

was introduced to facilitate the shifting from a direct to the indirect monetary policy system. On weekly basis the CBG auctions the treasury bills of the central bank. Through the prime dealers for the regulation of money supply and financing government deficit, the reserve money is being used as an intermediate target.

Other innovations include the establishment of the Monetary Policy Committee (MPC) to supervise the monetary policy design and execution. The MPC is also saddled with the responsibility of ensuring that price stability is prioritized through the activities of the Central bank using the exchange rate and monetary policy. It also reports on inflation as well as other macroeconomic indicators as guides for price regulation (GCB, 2005),

2.6 GHANA

2.6.1 GHANA Economic Indicators

Ghana is a member of WAMZ and one of the major economic contributors to the ECOWAS economy. The country has a population of 29.77million and an annual growth rate of 2.2% in the year 2018. The economy is driven mainly by oil sector, while agriculture led by cocoa, accounts for about 20% of the GDP. Furthermore, in line with the world economic and financial development, with a view to finding a substitute for the declining power of the monetary targeting, Ghana abandoned the monetary-targeting and adopted inflation-targeting in 2002. This was specifically buttressed by Bank of Ghana (BOG) Act 617, section 33(2) that:

"The Bank, in counteracting unusual movements in the money and prices in the country, shall use any of the instruments of control conferred upon it under this Act or under any other enactments to maintain and promote a balanced growth of the national economy"

Hence since the implementation of this policy, even though the inflation remains at double-digit, but Ghana has been enjoying a relatively stable exchange rate (Quarter 2010).

Ghana's economic performance shows steady growth, but the slide from 6% (2006) to 4% (2007) could be linked to the global economic recession of 2007 (Table2.3). However, the lost growth was swiftly recovered in 2010 with 7.9% growth rate and to the peak of 17.4% in 2011. The crude oil production might have been the main driver to the robust growth. This strong growth of 2011 is mirrored by the per capita growth rate in the same year of 14.6%. The country experienced sluggish growth between 2014 and 2016 but bounced back in 2017 The net export shows a consistent deficit value, but with a significant reduction from -11% to -1.1% in 2015

and 2018 respectively. Similarly, the current account balance reflects a deficit throughout the years. The Stock of external debt significantly dropped from 69.2% in 2005 to 18.2% in 2006 and on a gradual increase from 25.5% (2009) to 36.3% (2018). The inflation rate in Ghana is relatively high and persistently on a double-digit level, except in 2011(8.7%), 2012(7.1%) and more recently, 2018 (9.8%).

Table 2.3 Ghana: Economic Indicators

Year	GDPR	GDPR_CA	INF	BM	EXCH	EXP	IMP	E-I	EXT_DT	CAT
2004	5.5	3.0	12.6	14.6	95.1	39.3	60.4	-21.1	83.4	-3.4
2005	6.2	3.7	15.1	13.7	104.2	36.4	61.7	-25.3	69.2	-5.0
2006	6.0	3.5	10.9	16.0	109.9	25.2	40.7	-15.5	18.2	-5.8
2007	4.0	1.6	10.7	18.1	109.1	24.5	40.8	-16.3	17.4	-6.4
2008	9.3	6.8	16.5	20.0	103.8	25.0	44.5	-19.5	16.6	-8.9
2009	5.5	3.2	19.3	20.9	94.8	29.3	42.3	-13.0	25.5	-4.1
2010	7.9	2.5	10.7	22.3	100.0	29.5	45.9	-16.4	26.4	-6.4
2011	17.4	14.6	8.7	22.4	95.2	36.9	49.4	-12.4	27.1	-6.6
2012	9.0	6.4	7.1	22.3	86.5	40.4	52.8	-12.4	30.1	-8.7
2013	7.9	5.4	11.7	21.8	86.2	25.8	35.9	-10.0	26.0	-9.0
2014	2.9	0.6	15.5	23.7	66.4	28.8	36.3	-7.5	34.4	-7.0
2015	2.2	-0.1	17.1	25.8	64.7	32.0	43.6	-11.7	41.4	-5.8
2016	3.4	1.2	17.5	26.4	74.2	31.9	37.5	-5.6	39.2	-5.2
2017	8.1	5.8	12.4	25.8	73.6	35.3	38.4	-3.1	38.9	-3.4
2018	6.3	4.1	9.8	25.5	73.8	35.3	36.4	-1.1	36.3	-3.1
Mean	6.8	4.2	13.0	21.3	89.2	31.7	44.4	-12.7	35.4	-5.9

Source: Author's computation- Data from IMF and WDI

2.6.2 Monetary Policy in Ghana

The main goal of monetary policy in Ghana is price stability. The BOG Law (2002), Act 612. Section 3(1) expressly stated that "the primary objective of the Bank is to maintain stability in the general level of price". The law further empowers the BOG to carry out inflation targeting. Earlier, before 2007, Ghana operated monetary targeting under the view that inflation is really a monetary phenomenon. In May 2007, the BOG adopted the inflation targeting for its

monetary policy for the purpose of tracking inflation, using the consumer price index (CPI) that does not include utility and energy prices.

Furthermore, the country's currency 'cedi' was noted to be one of the highly depreciated currencies before November 2006. The value of the currency was revamped by the central Bank of Ghana through the re-denomination of the cedi. This eventually relieved the Ghanaians of the burden of carrying a large number of currencies for their transactions. This new monetary policy involved the removal of four zeros and the printing of new currency into circulation. (Bawumia 2010).

2.7 NIGERIA

2.7.1 NIGERIA Economic Indicators

Nigeria is a member of WAMZ and the largest economy in ECOWAS and in Sub-Sahara African countries. The country, which majorly relies on oil revenue, contributes about 2/3 (about70%) of the economy of West Africa and about 20% of the entire continent's GDP. The population of the country was estimated at 195.89 million people, with a growth rate of 2.6% in 2018 and a poverty rate of about 46%. The 2008 global financial crisis warranted the recapitalization of the banking sector. The subsequent global economic crisis of 2014, caused by the general falling oil prices, aggravated by the attack of the militant group on oil pipelines, hurled the economy of the country into recession. The economy was further worsened by the harmful economic policy enacted, which included restrictions on foreign exchange.

The performance indicator summarized in table 2.4 shows that Nigeria experienced marginal growth between 2004 and 2009 from 7.0% to 7.8.4%. The peak period was in 2010 (11.3%) after which the rate of growth has not only been slow, but in a range of single digit persistently. Worst still, a negative growth rate of -1.6% was recorded in 2016. A similar pattern was followed by the per capita growth rate. The export base of the country is strong, thereby recording a persistent surplus in the trade balance. The net export is however prone to world oil prices, which are being affected by the country's major oil importers, particularly, US and China. Similarly, the performance of the current account balance is favourable throughout the period of 2004-2018, which implies that the capital account balance had a good performance. However, since 2008 the current account balance has been on the declining trend.

Furthermore, Nigeria experienced a sharp decline in the external debt shock, with a record of single-digit proportion between 2006(4.2%) and 2016(7.9%). The inflation rate of the country has been double-digit since 2004, except for 2006-2007 and 2013-2015, leading to an average rate of 11.8 within the period. This is far above the ECOWAS expected convergence criteria.

Table 2.4 Nigeria: Economic Indicators

Year	GDPR	GDPR_CA	INF	BM	EXCH	EXP	IMP	E-I	EXT_DT	CAT
2004	10.4	7.7	15.0	13.1	76.0	20.3	11.6	8.6	31.5	12.9
2005	7.0	4.3	17.9	11.8	87.0	21.0	12.0	9.0	15.8	21.5
2006	6.7	4.0	8.2	14.1	92.3	29.5	13.1	16.5	4.2	16.4
2007	7.3	4.5	5.4	17.7	91.4	21.2	18.1	3.1	4.6	10.5
2008	7.2	4.4	11.6	23.5	100.5	25.7	15.1	10.5	4.1	8.8
2009	8.4	5.5	12.6	24.3	92.6	18.6	17.4	1.2	5.7	4.7
2010	11.3	8.3	13.7	20.8	100.0	25.7	17.7	8.0	4.5	3.6
2011	4.9	2.1	10.8	18.8	100.5	31.6	21.7	10.0	4.6	2.6
2012	4.3	1.5	12.2	21.3	110.5	31.5	13.0	18.6	4.1	3.8
2013	5.4	2.6	8.5	19.3	117.4	18.0	13.0	5.1	4.3	3.7
2014	6.3	3.5	8.1	20.9	124.5	18.4	12.5	6.0	4.6	0.2
2015	2.7	0.0	9.0	22.1	119.0	10.7	10.8	-0.1	6.1	-3.2
2016	-1.6	-4.2	15.7	25.4	110.2	9.2	11.5	-2.3	7.9	0.7
2017	0.8	-1.8	16.5	24.7	100.8	13.2	13.2	0.0	11.1	2.8
2018	1.9	-0.7	12.1	25.4	109.1	15.5	17.5	-2.0	12.4	1.3
Mean	5.5	2.8	11.8	20.2	102.1	20.7	14.5	6.1	8.4	6.0

Source: Author's computation- Data from IMF and WDI

2.7.2 Monetary policy in Nigeria

The core monetary policy aim in Nigeria is economic growth and price stability. The central bank of Nigeria (CBN) operates a monetary targeting framework Thus the target is on aggregate money supply, using the monetary policy instruments of OMO and others to achieve the targets. The MPC adopted the Interest Rate corridor approach, leading to the substitution of the Minimum Rediscounting Rate (MRR) for the Monetary policy Rate (MPR). This action becomes imperative as the MRR was not adequately reacting to the policy initiatives of the CBN, particularly in solving the issue of excess liquidity in the circulation. The MPC meets bi-

monthly to review the economic development of the country The monetary policy in Nigeria, over time, depends on an indirect transition mechanism. There are mixed policy structures, focusing on output growth and inflation control. A part of the policy thrusts is the management of exchange rate flexibility, at any time, within the limit of 3%, relative to the official exchange rate of USD (Agu, 2011). The main driver of the Nigerian economy is the oil sector and in the same vein, it constitutes the major source through which the economy is affected by external shock. Other sectors like industrial and agricultural sectors are characterized with underutilization of resources

2.8 SIERRA LEONE

2.8.1 SIERRA LEONE Economic Indicators

Sierra Leone is a member of WAMZ and the eleventh largest economy in ECOWAS. In 2018, its population estimate was put at 7.65million people, with a growth rate of 2.4% and 50% of the work force are into subsistence farming. Ore mining has made the country to be susceptible to external shocks of international price variations. Thus, the poverty rate is about 52.9% of the population.

The economic performance indicators shown in table 2.5 indicate mixed results. A sharp rise was recorded in 2012 from 6.3% in 2011 to 15.2% in 2012 and to a peak in 2013(7%). However, the country had a significant setback in 2015 with a negative growth rate of -20.5%, which may not be unconnected with the global economic crisis of 2014. Correspondingly, this growth pattern is also mirrored by the Per capita growth rate with negative growth of-22.2% in 2014. The net export and the current account balance are persistently in deficit. The duo became worst in 2011 with -48.2% and -65.0% respectively. The inflation rate is double-digit, except from 2008 to 2015, and is generally above the expected ECOWAS limit. Global oil and agricultural prices are the major drivers of the inflation rate in this country. This is coupled with the weak national currency of the country.

Table 2.5 Sierra Leone: Economic Indicator

Year	GDPR	GDPR_CA	INF	BM	EXCH	EXP	IMP	E-I	EXT_DT	CAT
2004	6.6	2.0		14.6	91.4	16.5	29.1	-12.6	118.8	-6.9
2005	4.5	0.5		15.9	92.8	17.6	29.3	-11.7	111.9	-6.4
2006	4.2	0.9		16.1	96.1	16.9	25.0	-8.2	82.7	-5.0
2007	8.1	5.1	11.6	17.6	96.7	15.6	24.7	-9.1	24.3	-7.4
2008	5.4	2.9	8.2	19.2	101.4	13.5	25.7	-12.2	23.5	-9.0
2009	3.2	0.8	7.5	22.6	103.7	13.5	27.9	-14.4	32.2	-13.3
2010	5.3	3.0	7.2	23.5	100.0	16.8	34.5	-17.7	35.7	-22.7
2011	6.3	3.9	6.8	23.1	102.0	16.3	64.5	-48.2	36.2	-65.0
2012	15.2	12.6	6.6	21.9	118.1	32.9	60.4	-27.5	34.0	-31.8
2013	20.7	18.0	5.5	19.8	126.8	28.6	58.8	-30.2	28.5	-17.5
2014	4.6	1.3	4.6	21.7	131.5	30.8	52.4	-21.7	29.1	-9.3
2015	-20.5	-22.2	6.7	24.0	142.6	19.4	47.4	-28.1	37.3	-15.5
2016	6.4	4.1	10.9	25.1	129.7	24.9	54.5	-29.6	48.8	-4.4
2017	3.8	1.5	18.2	23.7	112.3	26.1	48.0	-22.0	47.3	-14.4
2018	3.5	1.2	16.0	23.0	102.4	17.5	39.2	-21.8	45.1	-13.8
Mean	5.1	2.4	9.2	20.8	109.8	20.4	41.4	-21.0	49.0	-16.

Source: Author's computation- Data from IMF and WDI

2.8.2 Monetary Policy of Sierra Leone

The monetary policy framework of Sierra Leone is monetary targeting. Before 1990, the country controlled the economy with direct monetary instruments. In their attempt to proffer solutions to the emerging economic problems, the Bank of Sierra Leone switched from the direct controls to the indirect system of monetary administration. Hence, the major monetary policy instrument is OMO, and the operations of government securities are focused on the primary markets.

2.9 Monetary policy of the WAEMU member countries.

The WAEMU are member countries belonging to the CFA zone. Their monetary policy arrangement is between the French Treasury and the Central Bank of West African States (BCEAO). The central banks of the eight countries in WAEMU (Benin, Burkina Faso, Côte

d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal, and Togo) form the BCEAO. The WAEMU member states are using the same currency, CFA franc, which has unlimited convertibility to Euros at a fixed parity. i.e., a quid pro quo for the French 'guarantee' of convertibility. The institutional framework of the BCEAO for monetary policy was revamped in 2010. There were reviews of the objectives of monetary policy and the enlargement of the operational tools. The decision-makers include the Governor, the MPC, board of directors, audit committee, and national credit council in each of the member states of WAEMU. The MPC is charged with the responsibility of designing the monetary policy and defining the instruments needed for the achievement of policy goals. The activities of the MPC are published quarterly by the BCEAO.

The objective of the monetary policy in WAEMU (CFA zone) includes price stability and preserving a suitable level of reserves out of their pooled foreign exchange reserves**.** The objective of price stability is set at an annual average inflation rate of 2% plus/ minus 1% point, arranged over 24 months horizon. This rate forms the operational indicator. Other secondary monetary objectives (BCEAO article 8) include achieving sound and sustainable economic growth. Its intermediate monetary policy target is the ratio of average foreign assets to liabilities set above 20% for three consecutive months (Article 76 of BCEAO). Otherwise, the MPC must take appropriate action in its restoration. The BCEAO adopts a combination of indirect policy tools to tackle these monetary goals. These tools include discount rates, repurchasing agreements, and periodic auctioning of Central bank bills. (Shortland and Stasavage, 2004).

The WAEMU operates a fixed exchange rate. The currency CFA franc is pegged at CFAF 655.957 to one euro. The monetary cooperation treaty is grounded on three pillars: a single common institution, fixed parity with euro currency and an unlimited convertibility guarantee by the BCEAO. In order to facilitate convertibility, each member state is to save 50% of its reserves into the French Treasury operations account. The interest rate and the reserves requirements constitute the monetary policy instruments used by the BCEAO for its control. These instruments are set at the discretion of the MPC for policy goal achievement. Since 2009 the policy rate has been amended five times, while the reserves requirements have been changed three times. (see Masson and Patillo, 2004 and Kireyev, 2015). The main criticism against this system has been the issue of sovereignty.

2.10 BENIN

2.10.1 BENIN Economic Indicators

Benin Republic, apart from being a member of ECOWAS, is also a member of WAEMU. Benin Republic is a country, with a population of 11.49million people and an average annual growth rate of 2.7% as at 2018. Agriculture and services take the dominance of the economy. Due to the low level of revenue and its distribution, the poverty rate of the country stands at 40.1%of the proportion of the entire population in 2018. The country has a high integration of its economy with the regional market as about 70% of its exports go to ECOWAS Zone (chiefly Nigeria). The rise in world oil price in the year 2014 did not have a significant impact on the economy. However, due to trade opportunities with Nigeria, this has been reduced since 2015 due to the emergence of some economic reforms in Nigeria. After custom duties, another pillar of the economy is agriculture with cotton production. Cotton, which forms the major exports, accounts for 80% of the export revenue and 40% of the GDP. (See World Bank,2018, IMF 2018). Favourable economic policy in Nigeria and low custom duties of the country offers the country the opportunity of re-exporting restricted commodities, mainly through informal channels.

On the economic performance, the selected economic indicators in Table 2.6 revealed mixed results. The country experienced a positive but alternating RGDP growth rate throughout the period of the horizon. The sharp decline in the growth rate from 6.0% in 2007 to 2.1% in 2010 and from 6.4% in 6.4% in 2014 to 1.8% in 2015 might not be unconnected with the global economic shocks of 2007 and 2014. The per capita RGDP growth was positive, except in 2005,2009,2010, and 2015 during which it had a negative rate of -1.2%., -0.5%, -0.7% and -1.0% respectively. On overall, the average RGDP growth rate from 2004 – 2018 is 4.3%. The inflation records a low rate, even below the 5% ECOWAS convergence rate, except in 2005(5.4%), 2008(6.9%) and 2012(6.7%).

There is a persistent record of negative net export and current account as proportions of GDP. This implies that the Republic of Benin is consistently dependent on imports and therefore subjecting the country to spill-over effects from the trading partners. The performance of the stock of external debt shows a little improvement from 36.0% in 2004 to 12.7% in 2006 but has consistently been on the increase from 21.2% to 35.9% since 2014 to 2018 respectively.

Table 2.6 Benin: Economic Indicators

Year	GDPR	GDPR_CP	INF	BM	EXCH.	EXP	IMP	E-I	EXT_DT	CAT
2004	4.4	1.3	0.9	13.8	103.5	18.8	27.6	-8.7	36.0	-4.4
2005	1.7	-1.2	5.4	15.2	102.6	18.9	26.9	-8.0	32.4	-4.3
2006	3.9	1.0	3.8	18.3	101.9	18.5	28.3	-9.8	12.7	-3.3
2007	6.0	3.0	1.3	20.4	105.3	22.6	35.2	-12.6	14.9	-6.9
2008	4.9	2.0	7.9	23.1	107.3	22.9	33.6	-10.8	13.7	-5.5
2009	2.3	-0.5	2.2	24.0	105.7	20.4	31.5	-11.1	18.5	-6.1
2010	2.1	-0.7	2.3	25.5	100.0	23.8	32.9	-9.1	22.9	-6.0
2011	3.0	0.1	2.7	26.2	101.3	21.2	29.4	-8.2	23.7	-5.3
2012	4.8	1.9	6.7	24.9	96.2	23.0	31.7	-8.7	20.7	-5.4
2013	7.2	4.2	0.9	26.9	99.3	27.3	36.6	-9.4	22.0	-6.1
2014	6.4	3.4	-1.0	29.9	100.9	31.3	42.8	-11.5	21.2	-7.2
2015	1.8	-1.0	0.3	30.9	92.3	24.4	34.4	-9.9	26.5	-7.3
2016	3.3	0.5	-0.8	29.8	95.5	24.8	36.3	-11.4	27.1	-6.8
2017	5.7	2.8	0.1	28.6	97.9	27.3	40.3	-13.0	31.6	-7.3
2018	6.7	3.8	1.0	27.9	101.4	35.4	44.2	-8.8	35.9	-6.0
Mean	4.3	1.4	2.2	24.4	100.7	24.0	34.1	-10.1	24.0	-5.9

Source: Author's computation- Data from IMF and WDI

2.11 Burkina Faso

2.11.1 BURKINA FASO Economic Indicators

Burkina Faso is a landlocked country and a member of WAEMU, using CFA franc as its national currency. The population estimate as at 2010 was 19.75million, with a growth rate of 2.9%. The country is economically poor due to poor soil inadequate pattern of rainfall, limited natural resources and a scrawny industrial base. Thus, the poverty rate of the population (at US$1.90/day) is put at 46.7% (2010). According to the African economic outlook, this might have been accounted for by the country's labour force, which is mostly unskilled poor people, living in the rural areas and characterized by low productivity. These subsequently contribute to the vulnerability of the economy to external shocks. The mainstay of the economy is agriculture where 80% of the people are subsistence farmers, while the key export of the country centres on cotton and gold. The government, with the aim of reducing poverty, adopted a new strategy; the National Plan for economic and social development in 2016, spanning between 2016 and 2020 and another three-year programme of the IMF (2018-2020). (ADB, 2018, World Fact Book, 2019).

In table 2.7, the RGDP growth rate revealed a positive growth rate during the period with a maximum growth rate of 8.7% and the lowest of 3.0% in 2005 and 2009 respectively. The country experienced a declining trend from 2010 to 2015. The average growth rate for the period is 5.8%, which is comparatively higher than its counterpart Republic of Benin at 4.3%. Per capita, RGDP growth follows a common fluctuation as that of the growth rate, showing a positive rate, except in 2009 with -0.1%.

The trade position of the country shows no surplus records from 2004 to 2018 as shown by the negative net exports, which indicates that the country is import-dependent. Correspondingly, the current account balance is steadily in a deficit position. Other indicators revealed that the external debt stock declined from 40.22% in 2004 to 23.4 in 2018 and inflation within the time horizon is below the ECOWAS convergence rate of 5%, excluding 2005 of 6.4% and 2008 of 10.7%.

Table 2.7 Burkina Faso Economic Indicators

2004	4.5	1.5	-0.4	21.6	100.8	11.3	25.8	-14.5	40.2	-11.0
2005	8.7	5.5	6.4	18.6	101.8	9.7	25.8	-16.0	36.8	-11.6
2006	6.0	2.9	2.3	19.6	100.7	11.6	25.4	-13.8	19.5	-9.4
2007	4.4	1.3	-0.2	19.7	99.5	10.5	24.9	-14.3	21.7	-8.3
2008	5.8	2.6	10.7	22.0	107.7	10.0	26.3	-16.4	19.0	-11.5
2009	3.0	-0.1	2.6	25.9	109.4	12.7	27.7	-15.0	23.0	-4.5
2010	8.4	5.2	-0.8	27.2	100.0	19.2	29.6	-10.4	24.6	-2.0
2011	6.6	3.5	2.8	27.4	100.3	25.0	33.2	-8.1	22.2	-1.5
2012	6.5	3.3	3.8	28.3	98.8	25.5	37.2	-11.6	23.1	-1.5
2013	5.8	2.7	0.5	30.3	100.4	22.3	27.9	-5.6	21.9	-11.3
2014	4.3	1.3	-0.3	32.0	101.7	22.3	24.4	-2.1	21.2	-8.1
2015	3.9	0.9	1.0	37.9	96.0	26.0	36.3	-10.2	26.1	-8.6
2016	5.9	2.9	-0.2	40.5	95.5	30.0	36.5	-6.5	26.9	-7.2
2017	6.3	3.3	0.4	44.2	95.1	30.3	36.2	-5.9	26.2	-7.3
2018	6.8	3.8	1.9	44.6	97.5	30.8	37.2	-6.4	23.4	-5.8
Mean	5.8	2.7	2.0	29.3	100.4	19.8	30.3	-10.5	25.1	-7.3

Source: Author's computation- Data from IMF and WDI

2.12 Côte d'Ivoire

2.12.1 CÔTE D'IVOIRE Economic indicators

Cote d' Ivory, also known as the Ivory Coast, is the dominant economy in WAEMU, the third largest in ECOWAS, following Ghana. The country has a population of about 25.07 million people, which grew at the rate of 2.6% in 2018. The poverty rate stands at 46.3% of the population. The country is one of the most prosperous countries in West Africa as it is endowed with cocoa production for export. However, the country was confronted with serious shocks in 2017as a result of the fall in the prices of cocoa, increased oil prices and social tension.

The economic performance in Cote d'Ivoire (Table 2.8) revealed a positive but slow growth rate since 2004 to 2010 until a negative growth of -4.9 in 2012. The growth rate declined subsequently from 10.9 in 2012 to 7.4 in 2018. This could be a result of the civil crises

witnessed in the country in 2011, which was reflected in the per capital RGDP that declined to a negative rate of -7.3%. Regardless of these crises, the country steadily recorded surpluses in balance of trade, showing a robust export sector. The peak of the trade surplus was in 2011 with 16.5% net export. Similarly, the country has an unfavourable current account balance between 2015 and 2018. However, the external debt stock is at a significant decline from 89.3% in 2004 to 37.9% in 2018. Apart from 2008 with an inflation rate of 6.3%, the inflation performance falls below the convergence ECOWAS rate of 5%. However, the inflation rate of 4.9% experienced in 2011 is a risk to the ceiling.

Table 2.8 Cote D'Ivoire: Economic indicators

Year	GDPR	GDPR_CA	INF	BM	EXCH	EXP	IMP	E-I	EXT_DT	CAT
2004	1.2	-1.3	1.5	10.4	100.9	46.4	38.2	8.2	89.3	1.5
2005	1.7	-0.9	3.9	10.2	101.1	49.9	44.0	5.9	73.1	0.2
2006	1.5	-1.1	2.5	10.2	100.9	52.4	42.7	9.7	79.8	2.7
2007	1.8	-0.8	1.9	12.2	102.6	47.2	42.2	5.0	73.6	-0.7
2008	2.5	-0.1	6.3	12.0	107.1	47.1	40.2	7.0	55.6	1.9
2009	3.3	0.6	1.0	14.1	107.3	50.9	39.9	10.9	63.8	6.7
2010	2.0	-0.6	1.2	15.7	100.0	50.6	43.3	7.3	48.8	1.9
2011	-4.9	-7.3	4.9	18.7	102.2	53.8	37.3	16.5	52.4	10.4
2012	10.9	8.1	1.3	14.8	97.4	48.9	44.7	4.2	36.8	-1.2
2013	9.3	6.5	2.6	14.5	100.7	41.5	38.6	2.9	33.0	-1.4
2014	8.8	6.0	0.4	14.6	101.2	39.3	34.4	4.9	28.5	1.4
2015	8.8	6.1	1.3	15.2	94.5	37.7	34.2	3.5	35.4	-0.6
2016	8.0	5.2	0.7	14.6	95.7	33.4	30.3	3.0	32.5	-1.2
2017	7.7	5.0	0.7	13.6	95.1	33.7	31.1	2.6	36.8	-2.7
2018	7.4	4.7	0.4	13.7	97.2	29.8	29.2	0.5	37.9	-4.7
Mean	4.7	2.0	2.0	13.6	100.3	44.2	38.0	6.1	51.8	0.9

Source: Author's computation- Data from IMF and WDI

2.13 Guinea- Bissau

2.13.1 GUINEA- BISSAU ECONOMIC INDICATORS

Guinea Bissau is a member of WAEMU, and it is one of the smallest among the member nations of ECOWAS. It has a population of about 1.8 million people, with a poverty rate of

about 69.3 as of 2010. Over 65% of the population are predominantly farmers and their major export of cashew nuts accounted for about 81% in 2009 and reached 90% of the country's export in 2011.

From table 2.9 the RGDP growth rate in this country is low and relatively stagnant till 2010 with a peak growth rate of 8.1% in 2011, followed by a sharp decline to -1.7 in 2012. Per capita, RGDP is also small and its growth rate is a reflection of RGDP growth. capital growth rate reflects the growth rate performance. There is a persistent negative trade balance throughout the period from 2004 to 2018. Similarly, the current account balances had negative performances, except for the minor positive records between 2014 and 2017. The country's external debt was very high ranging between 129.0% and 214% of the GDP between the period 2004 and 2010, which declined to 25.7% in 2011. Between 2012 and 2018, the inflation rate has been contained within the WAEMU 3% norm and ECOWAS 5% convergence standard.

Table 2.9 Guinea- Bissau: Economic indicators

Year	GDPR	GDPR_CA	INF	BM	EXCH	EXP	IMP	E-I	EXT_DT	CAT
2004	2.8	0.6	0.9	15.3	97.9	18.5	26.4	-7.9	214.0	-1.7
2005	4.3	2.1	3.3	16.5	97.9	16.1	25.2	-9.0	177.7	-1.8
2006	2.3	0.1	2.0	17.2	96.9	12.8	27.6	-14.8	178.7	-6.7
2007	3.3	1.0	4.6	20.2	99.7	20.2	34.0	-13.8	157.7	-4.4
2008	3.2	1.0	10.5	22.5	106.6	19.9	32.8	-12.9	129.2	-3.3
2009	3.4	1.1	-1.7	24.0	105.1	18.8	35.2	-16.4	140.8	-5.8
2010	4.6	3.8	2.5	26.6	100.0	14.9	35.2	-20.3	131.2	-8.3
2011	8.1	5.8	5.0	31.4	102.7	25.7	30.9	-5.3	25.7	-1.3
2012	-1.7	-3.8	2.1	30.5	99.5	15.5	25.7	-10.2	28.1	-8.4
2013	3.3	1.0	1.2	31.3	101.3	18.3	25.8	-7.6	27.0	-4.6
2014	1.0	-1.2	-1.5	46.3	100.2	20.2	31.4	-11.2	24.9	0.5
2015	6.1	3.8	1.4	49.4	95.4	27.5	32.2	-4.7	29.3	1.9
2016	6.3	4.0	1.6	47.9	97.3	26.5	31.3	-4.8	24.4	1.3
2017	5.9	3.6	1.4	44.7	97.8	27.8	33.1	-5.3	25.4	0.3
2018	3.8	1.6		46.0	100.0	25.3	32.5	-7.1	28.9	-4.5
Mean	3.8	1.6	2.4	31.3	99.9	20.5	30.6	-10.1	89.5	-3.1

Source: Author's computation- Data from IMF and WDI

2.14 Mali

2.14.1 Mali Economic indicators

Mali has an estimated population of about 19.8 million, with about 80% of the labour force being engaged in farming and fishing. The population growth rate in 2018 stood at 3.0%, while poverty was about 41.1% in 2010. Agriculture dominated the primary sector, with the main products of livestock, cotton and rice. The growth rate in Mali appears to be low. The economic growth of the country was retarded in 2012 when the growth rate recorded negative growth of -0.8% (Table 2.10) as a result of the civil unrest and political coup. However, the economy rebounded back in 2014 with a 7.1% growth rate, but afterward at a declining rate. This is majorly driven by agricultural production. Similarly, the per capita growth rate is on a declining trend. Both the net export and the current account balances depict a deficit throughout the period 2004-2018. Apart from 2005,2008 and 2012, with inflation records of 6.4%. 9.2%, and

5.3% respectively, other periods had been within the WAEMU expected limit of 3% and even ECOWAS 5% target.

Table 2.10 Mali Economic Indicators

Year	GDPR	GDPR_CA	INF	BM	EXCH	EXP	IMP	E-I	EXT_DT	CAT
2004	1.6	-1.5	-3.1	25.2	95.7	23.7	31.6	-8.0	62.5	-6.9
2005	6.5	3.2	6.4	24.6	98.1	23.0	31.1	-8.1	52.9	-7.1
2006	4.7	1.3	1.5	24.6	97.3	28.4	32.5	-4.1	24.1	-3.3
2007	3.5	0.1	1.4	22.5	97.6	24.2	32.5	-8.3	23.3	-5.6
2008	4.8	1.3	9.2	17.4	104.5	25.3	38.5	-13.3	21.6	-13.6
2009	4.8	1.4	2.5	22.5	106.4	21.7	28.8	-7.1	22.2	-10.9
2010	5.3	1.9	1.1	24.0	100.0	22.8	35.1	-12.3	23.9	-10.7
2011	3.2	0.0	3.0	23.4	100.2	22.7	31.2	-8.5	23.3	-5.1
2012	-0.8	-3.8	5.3	26.0	100.4	26.9	31.8	-4.9	25.6	-2.2
2013	2.3	-0.7	-0.6	27.3	100.5	24.9	39.9	-15.0	26.9	-2.9
2014	7.1	4.0	0.9	26.7	101.6	22.6	38.1	-15.5	24.8	-4.7
2015	6.2	3.1	1.5	26.9	97.0	24.0	39.6	-15.6	28.8	-5.3
2016	5.8	2.7	-1.8	27.8	95.1	23.5	40.3	-16.9	27.8	-7.2
2017	5.4	2.3	1.8	26.8	95.6	22.2	35.8	-13.6	29.2	-7.3
2018	4.7	1.6		28.9	98.1	23.6	34.1	-10.5	29.5	-3.8
Mean	4.3	1.1	2.1	25.0	99.2	24.0	34.7	-10.8	29.8	-6.4

Source: Author's computation- Data from IMF and WDI

2.15 NIGER

2.15.1 Niger Economic Indicators

The landlocked country of Niger is a member of WAEMU with a population of 22.44 million at a growing rate of 3.8% in 2018. The inhabitants are predominantly farmers. More specifically, about 80% of the population lives in agriculture and contributes 40% of the GDP. The poverty rate is about 48.9% of the population. Nevertheless, the programmes put in place to alleviate poverty and enhance economic development include an Extended Credit Facility (ECF) of US$131million agreement with IMF for a

three-year period from 2012- 2015, which was extended to 2016; another 3-year credit facility was approved for the country in 2017 for a sum of US$134million and the granting of US$1billion by the World Bank (IDA) in 2018.

The economic performance, as shown in Table 2.11, revealed that Niger has its peak growth period in 2012, similar to Cote D'Ivoire. This is contrary to their counterparts, Mali, and Guinea Bissau, when duo had their lowest growth rate period. The growth rate is low and at an average of 5.4% within the period. The per capita RGDP recorded a low growth rate of 1.5% on average during the period. There is a persistent trade balance deficit and unfavourable current account balance. This implies that the capital and good flow records poor performance. The relieved debt burden from 2006 is associated with the relief initiative received from the Multilateral Debt Relief Initiative (MDRI) in 2006. This relief package is feasible (Table 2.10) by a significant reduction in the Debt stock to GDP from 57.8% in 2005 to 20.9% in 2006, leading to an average of 32.8% within the period. The inflation performance is within the WAEMU, and ECOWAS expected rate, except for 2005 and 2008 with 7.8% and 11.3% respectively.

Table 2.11 Niger Economic indicators

Year	GDPR	GDPR_CA	INF	BM	EXCH	EXP	IMP	E-I	EXT_DT	CAT
2004	-0.8	-4.4	0.3	12.8	100.9	17.4	27.9	-10.5	65.0	-8.0
2005	8.4	4.4	7.8	11.6	103.6	16.6	30.8	-14.2	57.8	-9.2
2006	5.8	1.9	0.0	12.1	100.1	16.4	29.5	-13.1	20.9	-8.6
2007	3.2	-0.6	0.1	16.5	99.9	17.4	29.9	-12.5	25.5	-8.2
2008	9.6	5.6	11.3	15.4	108.1	17.8	35.8	-18.0	18.0	-12.0
2009	-0.7	-4.4	0.6	17.6	107.0	20.4	47.1	-26.7	23.7	-24.4
2010	8.4	4.3	0.8	19.5	100.0	22.2	49.1	-26.9	27.3	-19.8
2011	2.2	-1.7	2.9	19.5	99.6	20.9	47.8	-26.9	35.1	-22 3
2012	11.8	7.6	0.5	21.9	93.8	21.9	39.4	-17.5	26.7	-14.7
2013	5.3	1.2	2.3	22.6	96.7	22.6	39.1	-16.4	26.9	-15.0
2014	7.5	3.4	-0.9	26.2	95.7	21.0	39.3	-18.3	25.0	-15.8
2015	4.3	0.4	-0.6	26.0	90.8	18.3	40.9	-22.6	31.7	-20 5
2016	4.9	1.0	1.7	26.8	91.6	17.2	31.5	-14.4	34.4	-15 5
2017	4.9	0.9	2.8	24.4	91.0	16.6	33.0	-16.3	38.5	-15.7
2018	6.5	2.5	3.0	21.8	93.9	15.7	33.0	-17.3	36.1	-18 1
Mean	5.4	1.5	2.2	19.7	98.2	18.8	36.9	-18.1	32.8	-15 2

Source: Author's computation- Data from IMF and WDI

2.16 SENEGAL

2.16.1 SENEGAL Economic indicators

Senegal is a member of WAEMU, constituting the second-largest economy within the union and one of the major contributors to the economic growth of the West African region. The country has a population of 15.85million people at a growing rate of 2.8 in 2018, while the poverty rate stood at 46.7%. Agriculture forms the mainstay of the economy with a specialization in the production of groundnut and fishing. The economy is further supported with a little component in mining.

Table 2.12 of the economic indicators of Senegal shows that the growth rate exhibits a positive but volatile trend between the period 2004 and 2018. In the same fashion, the per capita growth rate is more volatile with negative values in 2006 (-0.2%), 2009 (-0.7%) 2011(-1.5%) and 2013(-0.2%). There was a short decline in the external debt stock between 2004 and 2008, but from 2009 to 2018 it was an increasing trend. The trade and current account balance exhibit persistent deficit values. In the general view, the inflation rate was relatively low and falls within the WAEMU and ECOWAS expected limits, except in 2007, 2008, and 2011 with growth rates of 5.9%, 7.3%, and 3.4% respectively.

Table: 2.12 Senegal Economic Indicators

Year	GDPR	GDPR_CA	INF	BM	EXCH	EXP	IMP	E-I	EXT_DT	CAT
2004	5.9	3.1	0.5	21.8	105.1	27.1	39.8	-12.6	39.1	-5.0
2005	5.6	2.9	1.7	22.2	102.8	27.0	42.4	-15.4	35.3	-6.1
2006	2.5	-0.2	2.1	23.2	102.0	25.6	43.1	-17.5	16.4	-6.1
2007	4.9	2.1	5.9	23.6	106.5	20.1	37.8	-17.7	18.2	-9.3
2008	4.1	1.2	7.3	23.5	111.7	20.6	41.4	-20.8	16.9	-11.2
2009	2.1	-0.7	-2.2	26.3	107.6	19.2	32.5	-13.3	23.1	-5.3
2010	3.6	0.6	1.2	28.0	100.0	19.8	32.1	-12.3	24.3	-3.5
2011	1.5	-1.5	3.4	28.8	100.9	21.2	35.9	-14.7	24.6	-6.5
2012	5.1	2.0	1.4	28.3	96.1	22.3	39.0	-16.7	27.9	-8.7
2013	2.8	-0.2	0.7	29.8	97.3	22.2	38.0	-15.9	28.0	-8.2
2014	6.6	3.5	-1.1	31.8	96.2	21.8	36.7	-14.9	29.0	-7.0
2015	6.4	3.3	0.1	35.2	88.2	22.7	35.4	-12.8	34.0	-5.6
2016	6.4	3.4	0.8	37.3	90.2	21.6	32.5	-11.0	36.1	-4.0
2017	7.1	4.2	1.3	37.9	90.6	21.8	35.6	-13.8	43.4	-7.3
2018	6.7	3.7	0.5	40.3	92.1	21.9	36.1	-14.2	52.4	-8.8
Mean	4.7	1.8	1.6	29.2	99.1	22.3	37.2	-14.9	29.9	-6.9

Source: Author's computation- Data from IMF and WDI

2.17 TOGO

2.17.1 TOGO ECONOMIC INDICATORS

Togo is a member of WAEMU and has a population of 7.89 million people, which grew at 2.4% in the year 2018. The country is one of the largest producers of phosphate in the World today. However, the poverty rate is still high ,55.1%, as of 2018. The country witnessed relatively stable economic growth over time due to political stability in the country. About 50% of the labour force earns their living in agriculture. The exports of the country account for 32%, and about 70% of which are to ECOWAS countries.

The country's growth rate exhibits a positive and relatively stable growth trend from 2008 to 2018 with a peak record in 2012 at a 6.5% growth rate The per capita growth rate demonstrates a similar pattern to the growth rate. The inflation is relatively within the regional targets except in 2005, and 2008, with 6.8% and 8.7% respectively. The country has a persistently

unfavourable trade and current account balances, this is evident in the negative value records throughout the period of the horizon. This implies that Togo is an import-dependent country (Table 2.13).

Table 2.13 Togo Economic Indicators

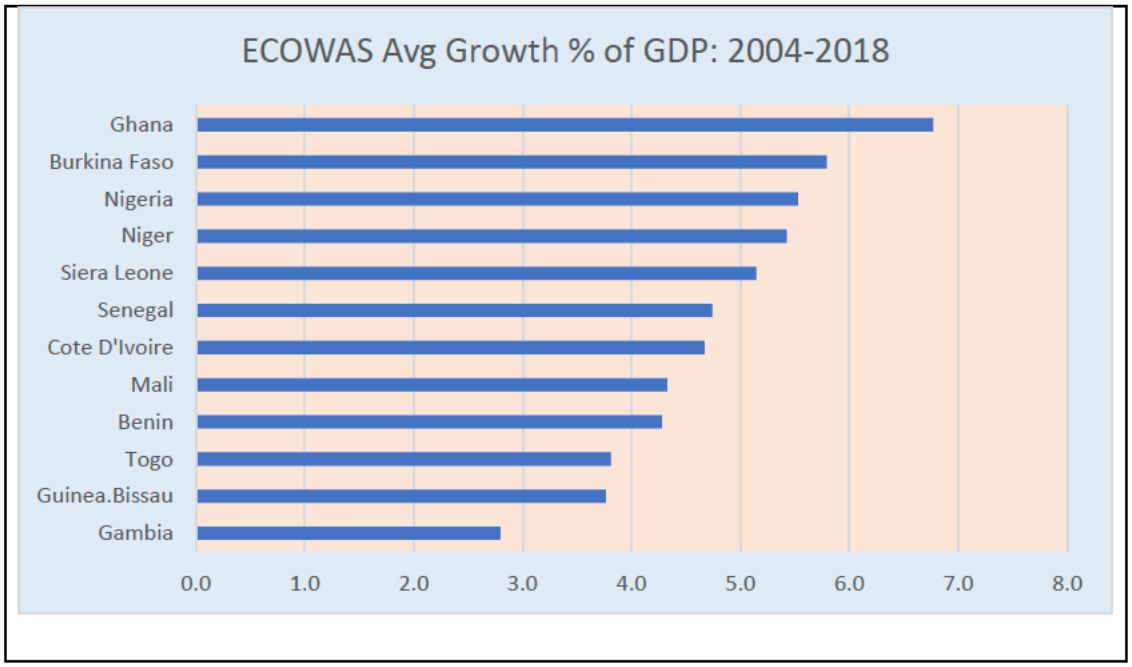
Year	GDPR	GDPR_CA	INF	BM	EXCH	EXP	IMP	E-I	EXT_DT	CAT
2004	-1.0	-3.5	0.4	24.5	99.0	33.1	49.7	-16.6	82.7	-9.2
2005	-4.7	-7.2	6.8	24.9	100.6	37.1	54.4	-17.3	75.1	-8.9
2006	2.7	-0.1	2.2	30.2	99.3	35.8	52.6	-16.8	77.7	-7.5
2007	-1.2	-3.8	0.9	32.1	99.7	25.6	25.8	-0.3	74.9	-8.1
2008	4.1	1.3	8.7	34.4	104.5	33.9	49.6	-15.7	49.8	-6.7
2009	5.5	2.7	3.7	36.6	107.2	34.5	49.2	-14.7	51.7	-5.2
2010	6.1	3.3	1.4	39.5	100.0	37.2	53.1	-15.9	37.6	-5.8
2011	6.4	3.6	3.6	43.1	100.7	38.3	54.7	-16.4	15.2	-7.8
2012	6.5	3.7	2.6	43.8	96.5	46.6	60.4	-13.8	19.2	-7.6
2013	6.1	3.3	1.8	47.2	98.4	49.8	68.3	-18.5	20.6	-13.2
2014	5.9	3.2	0.2	46.2	98.8	39.7	57.7	-18.0	21.4	-10.0
2015	5.7	3.1	2.6	51.0	93.2	35.8	57.8	-22.0	24.6	-11.0
2016	5.6	3.0	1.3	53.6	95.4	35.2	53.5	-18.3	26.3	-9.8
2017	4.4	1.9	-1.0	56.0	94.7	33.1	43.7	-10.6	34.3	-2.0
2018	4.9	2.3	0.9	57.2	95.9	31.3	42.3	-11.0	33.3	-4.9
Mean	3.8	1.1	2.4	41.4	98.9	36.5	51.5	-15.1	43.0	-7.8

Source: Author's computation- Data from IMF and WDI

2.18 Growth rates, policy rates, and economic stability in ECOWAS

The summary of the average growth rate as a percentage of GDP between the period 2004 and 2018 is as shown in figure 2.4, which is between the range of 2.8% to 6.8%. Comparatively, Ghana has the highest growth rate, while the Gambia has the least. It further suggests that the countries in WAMZ, apart from the Gambia have higher growth rates than their counterparts in WAEMU. Pairs of countries in WAEMU are identified with a common growth proportion within the period. For instance, Senegal and Cote D'Ivoire 4.7%, Mali and Benin 4.3%, Togo and Guinea Bissau 3.8%. However, countries in WAEMU experienced a relatively lower inflation rate compared to the members of WAMZ. The main reason could be due to the fixed exchange rate that they operate.

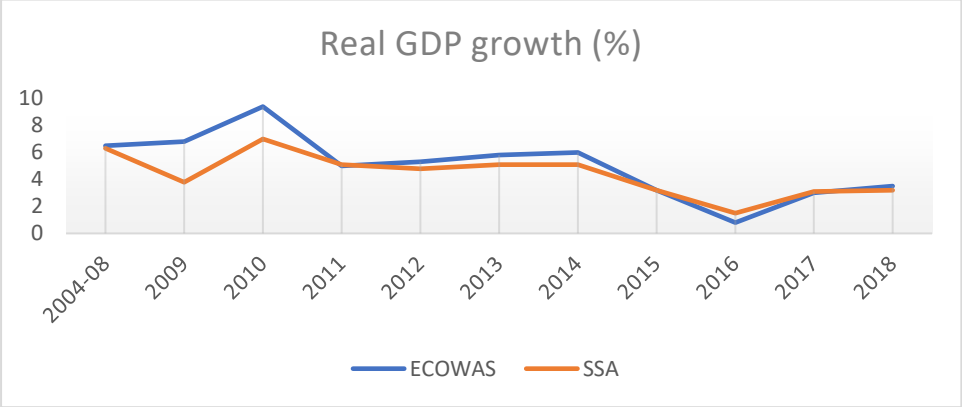
Figure 2.4 summary of Average growth rate



Source: Author's computation- Data from West Africa Economic Outlook 2019

In figure 2.5 the real GDP growth rate for ECOWAS was at an increasing trend reaching its peak in 2010, though at a descending order but still above the SSA growth rate till 2015. The lowest growth rate was recorded in 2016 at less than 2 percent. As at 2017, it was about 2.7 percent which rose up to 3.3 in 2018. According to IMF (2019) report, the growth trailed that of Africa but was still faster than southern and central Africa. The report further adduced the tepid growth as a reflection of dwindling oil prices in Nigeria (being the prime economy in the region), reduction in commodity prices and the effect of the Ebola virus epidemic. The growth shrinkage in Nigeria stunned the high growth rate recorded in other countries which eventually pulled down the average growth rate of the region.

Figure 2.5 Real GDP growth rate.

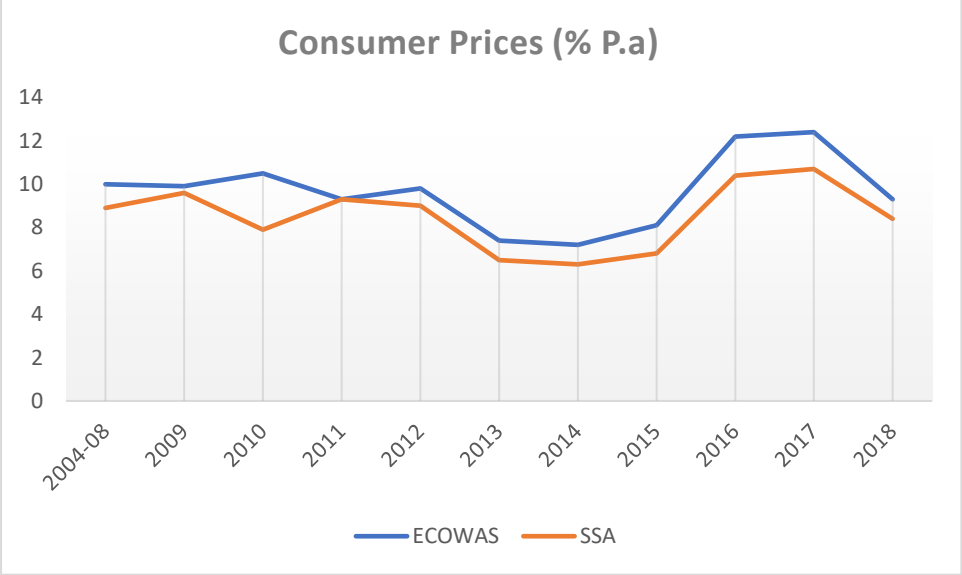


Source: Author's computation- Data from West Africa Economic Outlook 2019

The inflation rate (proxied by CPI) is shown in figure 2.6 The general price was relatively stable between 2011 and 2015 with a sharp rise in 2016 for both ECOWAS and SSA., recording the highest in 2017 at 12.4 and subsequently decline to 9.3 in 2018. The general price level in ECOWAS was persistently above that of the SSA average price level.

The hike is probably driven by supply constraints and expansionary fiscal policy, thus posing a challenge to the investors and economic growth sustainability in the ECOWAS economy.

Figure 2.6 Consumer price index

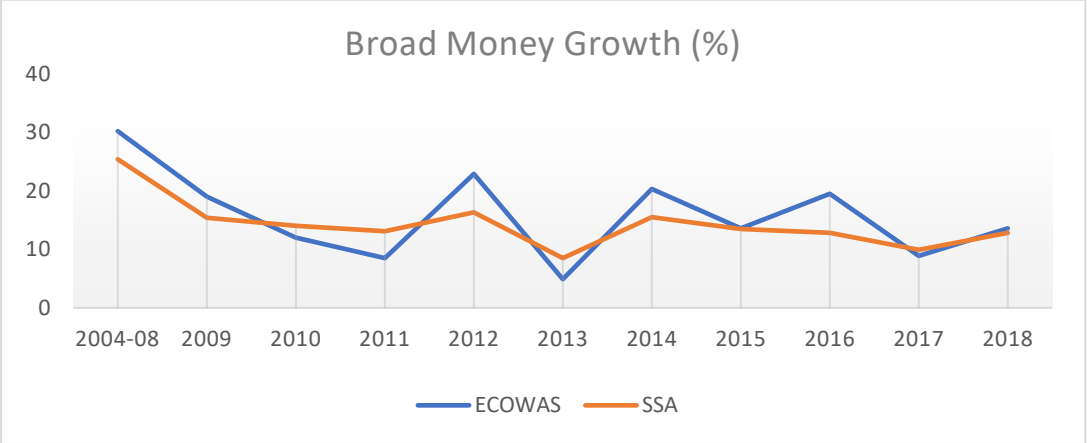


Source: Author's computation- Data from West Africa Economic Outlook 2019

Figure 2.7 represents the Broad Money Growth rate. Comparatively, the growth rate in ECOWAS is higher than SSA except in few periods of 2010, 2011 and 2013. Also, the rate in ECOWAS demonstrates a greater volatility. Generally, between 2004 and 2018, the

growth rate is at a declining rate. this might have been accounted for by the growth rate of internet banking.

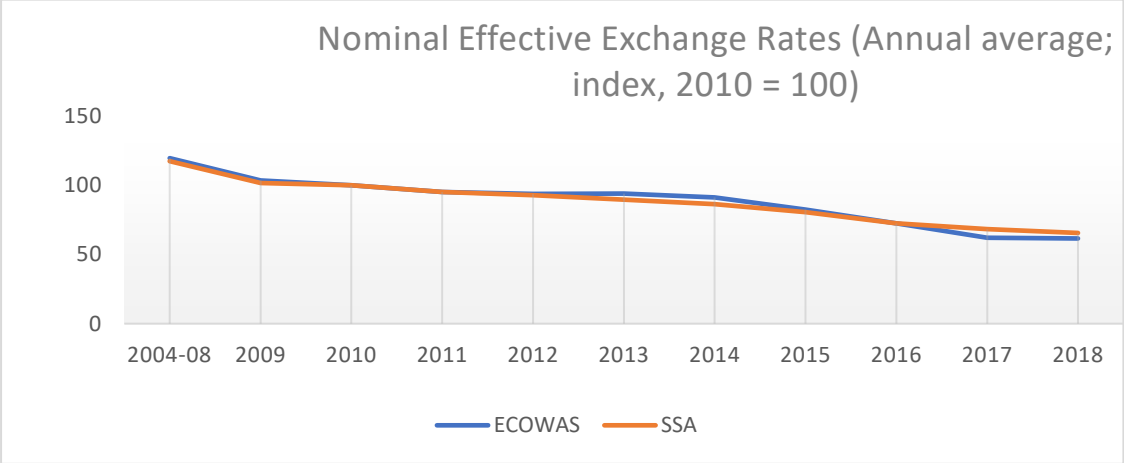
Figure 2.7 Broad Money Growth rate



Source: Author's computation- Data from West Africa Economic Outlook 2019

The figure in 2.8. shows the Nominal Effective Exchange rate (NEER) in ECOWAS compared to the SSA. It indicates the weighted average rate at which each country's currency is being exchanged for the currency of another basket of foreign countries. The NEER shows that the currencies of the ECOWAS countries appreciate by 19.5 and 3.4 in the year 2008 and 2009 over that of 2010. This is similar to what is obtained in the SSA region. Conversely, the currency depreciates subsequently from 2011 to as low as 62%, which falls below the SSA rate of 68.2 percent relative to the base year 2010. The economic implication is that the currencies of these countries in the ECOWAS are becoming less competitive in the foreign exchange (forex) market.

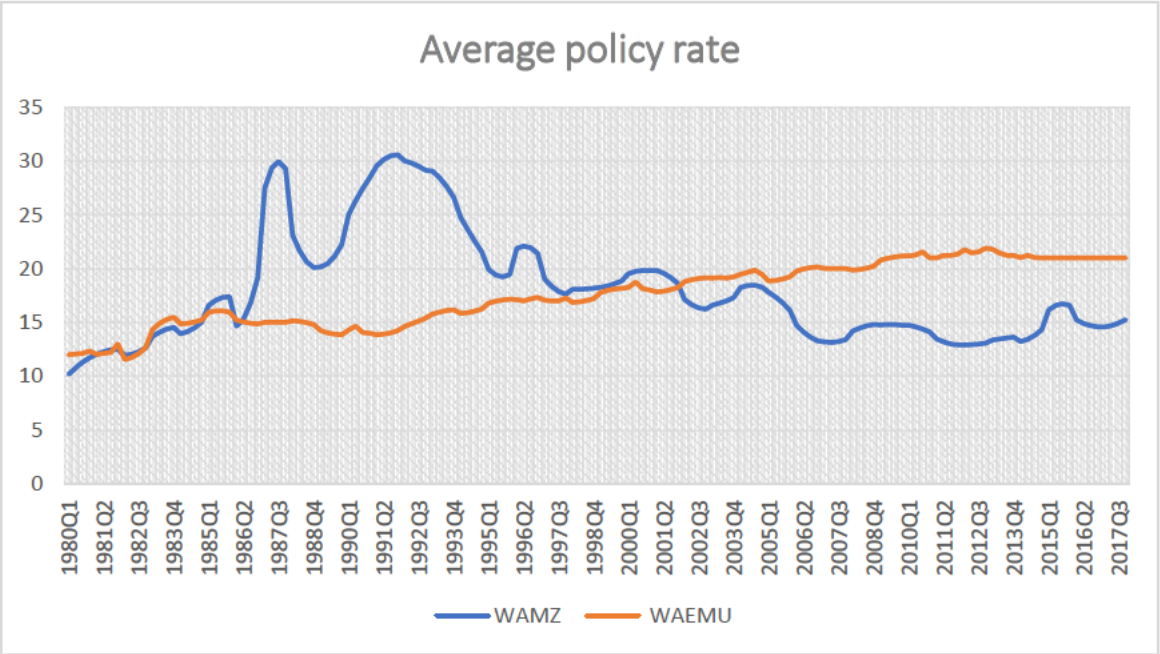
Figure 2.8: The nominal effective exchange rate (NEER)



Source: Author's computation- Data from West Africa Economic Outlook 2019

The average policy rate of both WAMZ and WAEMU are shown in figure 2.9. The policy rate in WAMZ shows a higher degree of volatility than that of WAEMU with low volatility. In WAMZ, the trend shows a hump feature between the period 1987 and 1993, during which the rate was far above the average policy rate in WAEMU. This might be partly caused by the global oil price shock. Also, the monetary policy independence of the member countries in WAMZ over their monetary policy rate might have accounted for the adjustments of lower rates in WAMZ from 2001 to 2018 as against the WAEMU average rate.

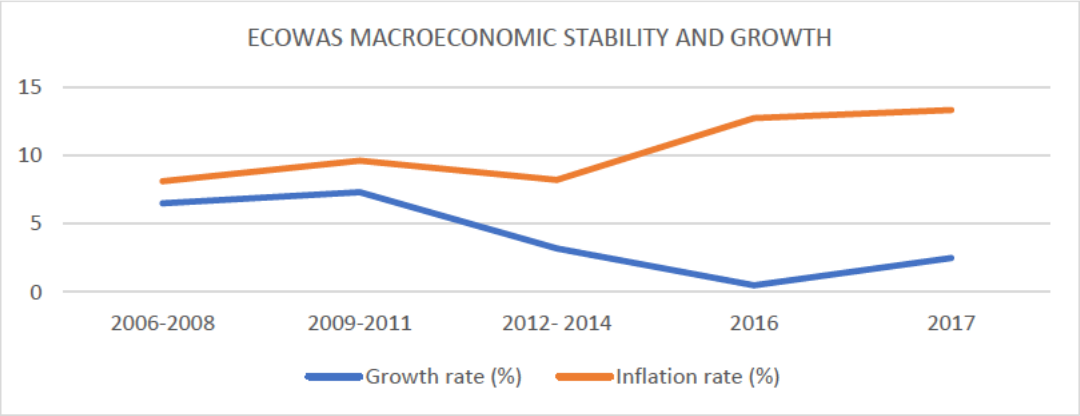
Figure 2.9 Average policy rate



Source: Author's computation- Data from West Africa Economic Outlook 2019

Furthermore, the economy of West Africa demonstrated a unique feature in recent times. The two macroeconomic variables commonly used to measure economic stability (real growth rate and inflation rate) exhibit a co-movement up till 2012. And thereafter, their movements were in the opposite directions between 2014 and 2016 (Figure 2.10).

Figure 2.10 ECOWAS macroeconomic stability and growth



Source: IMF 2018

The contra-movements are idiosyncratic in nature, as it does not conform to theoretical expectations. This could be as a result of a liquidity puzzle or price puzzle, which can only be explained through empirical investigations.

In summary, we have discussed in this chapter various economic and related issues on the monetary policy framework and economic growth and stability of each member country in both WAMZ and WAEMU. The performance indicators also reveal some common characteristics of these countries as well as related macroeconomic trends in ECOWAS relative to SSA.

CHAPTER THREE

THEORETICAL FRAMEWORK AND REVIEW OF EMPIRICAL LITERATURE

This chapter deals with the Theoretical framework and review of the related empirical literature on the research objectives of this study. Theoretical frameworks are those related to both monetary theory and growth theory as well as their importance to this study. Also contained in this chapter is the review of the empirical literature and the existing gaps, relative to each objective of this study.

3.1 Theoretical framework

3.1.1 Economic Growth Theories

From the existing numerous growth theories, this study briefly reviewed the neoclassical and endogenous growth theories that are having implications for economic growth as well as monetary matters.

3.1.1.1 The Neoclassical Growth Theory

The theory of neoclassical growth was introduced by Solow (1956) and Swan (1956) for modelling long-run economic growth. Also known as the Solow-Swan model. It is an economic model based on the stability of economic growth, which leans on three main factors that significantly influence economic growth, namely: labour, capital, and technological state. As stressed by neoclassical growth theory, the position of technology in economic growth is a vital factor.

The Production function of the Neoclassical Growth Theory

Traditionally, the neoclassical growth model could be estimated through the formula:

$$Y = AF(K, L) \quad \text{.....3.1}$$

where Y indicates the growth, proxied by GDP, K symbolizes capital and L denotes labour employed in the production process.

From the viewpoint of Degupta and Heal 1974), Solow (1974) and Stiglitz (1974), (jointly known as Dasgupta-Solow-Stiglitz, 1974) the production function can also be explained in another perspective to link monetary policy and growth.

Specifically, this could be expressed as:

$$(Y_i \dots, Y_m) = f(A, X_i \dots, X_n, P_i \dots, P_T) \quad \text{.....3.2}$$

where: Y_i are numerous outputs of goods and services; X_i are various inputs, such as capital and labour, among others; P_i are monetary policy and other macro-economic policies. Hence GDP can be affected through the following agents:

Substitution among inputs of monetary policy, changes in technology, a shift in the structure of output and monetary policy instruments and other inputs.

Assumptions of the Neoclassical Growth theory

- Diminishing returns of the capital employed is an important assumption of the neoclassical growth model. In a closed economy, the capital K is subject to diminishing returns.
- Assumption of fixed or constant labour with diminishing marginal productivity,

  a "steady state" of the economy

Important implications of the Neoclassical Model of Growth

- The neoclassical growth model elucidates that total output depends on growth in inputs, labour, capital, and technological changes.
- The steady state, which is also the equilibrium level is equivalent to the labour force, which is not affected by the rate of savings.
- The model emphasized that even though the savings rate does not impact the steady-state of economic growth, however, it leads to a rise in steady-state of income per capita and invariably aggregate income.
- The technological progress or otherwise determines the growth rate in the long run.

The Solow growth model

Robert Solow and Trevor Swan first introduced the neoclassical growth theory in 1956. The theory states that economic growth is the product of three factors viz: labour, capital, and technology. An economy is confronted with limited resources in terms of capital and labour, but the contribution of technology to growth is boundless. The theory states that short-term equilibrium results from varying amounts of labour and capital in the production function. The

theory also argues that technological change has a major influence on an economy, and economic growth cannot continue without technological advances

Specifically, Solow's neoclassical **assumptions** include:

• Constant returns to scale.

• Perfect competition.

• Complete information.

• No externalities.

The basic model

The key stakeholders in the model according to Solow are the consumer, the firm and the Market.

Consumer

Labour is being supplied by the consumer L_t to the market, at market wage w_t . The consumer also owns all of the capital K_t and rents to the market at rental rate r_t. The consumer also owns the firm and receives its total profit π_t.

Therefore, the income could be expressed as:

$$Y_t = r_tK_t + w_tL_t + \pi_t \quad \text{……………………………………………………3.3}$$

The supply of labour would be at a growth rate of gL exogenously.

$$L_{t+1} = (1 + gL)L_t \quad \text{……………………………………………………3.4}$$

There is Capital accumulation by the consumer, which depreciates at rate δ.

$$K_{t+1} = (1 - \delta)K_t + I_t \quad \text{……………………………………………………..3.5}$$

I_t denotes gross investment.

If the consumer saves part of his income and also supplies all of his labour and capital, regardless of prices (inelastically).

Then equation 3.5 becomes:

$$K_{t+1} = (1 - \delta)K_t + sY_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.6$$

Firm

The conversion of labour and capital to output is done by the firm. Which are resold to the consumer.

The technology of the firm is described by the production function $Y_t = F(K_t , A_tL_t)$.

A_t indicates the level of "technology" at time t and it grows at an exogenous rate of gA:

$$A_{t+1} = (1 + gA)A_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.7$$

In principle, labour and capital can be augmented or neutral technological progress

$Y_t = A_tF(K_t , L_t)$..

Under the assumption that F is a "neoclassical" production function F(K, L), which have the following properties:

- F is homogeneous of degree 1. Formally, for any $c \geq 0$, $F(cK, cL) = cF(K, L)$. That is production exhibits constant returns to scale.
- Both factors (capital and labour) are necessary, i.e., $F(0, L) = F(K, 0) = 0$, for any K, L.
- Both factors contribute to output:

  $\partial F(K, L)/ \partial K > 0$ ……..……3.8

  $\partial F(K, L)/ \partial L > 0$ ……3.9
- The firm has decreasing returns in each product, or F is concave in both arguments:

  $\partial\ 2F(K, L)/ \partial K2 < 0$ ……3.10

  $\partial\ 2F(K, L)/ \partial L2 < 0$ ……...3.11
- The "Inada conditions" hold:

  $Lim(K\rightarrow 0)\ \partial F(K, L) /\partial K = \infty$ ……...3.12

  $\lim (K\rightarrow\infty)\ \partial F(K, L)/ \partial K = 0$ ……3.13

The profit of the firm is denoted by:

$$\pi_t = F(K_t , A_tL_t) - r_tK_t - w_tL_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.14$$

Since the firm's profits go to the consumer, the consumer's income is equal to the firm's total output:

$$Y_t = F(K_t , A_tL_t) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.15$$

All goods are traded on a competitive market

3.1.1.2 Endogenous growth theory

Endogenous growth theory can be accredited to Arrow (1962); Uzawa (1965) and Sidrauski (1967), who strongly objected to the classicals' unwarranted preferences for exogenous factors of economic growth and suggested another vital determining factor to replace the inexplicable technical progress in the model. In the 80s, endogenous growth encompasses a distinct form of theoretical and empirical work. The endogenous growth is a distinguishing model from the neoclassical model by accentuating that economic growth is a product of endogenous reactions and not the outcome of external forces. Therefore, the theory does not include external technological changes to describe the reason for the increase in income per capita by a notable magnitude ever since the industrial revolution. Like the neoclassical, the focal point of the endogenous growth model is aggregate economic behaviour (Romer 1994).

Further developments were also made by Romer (1986), Lucas (1988) and Robelo (1991) with a model resting on unlimited human capital investment which was opined to have a spillover impact on the economic growth and subsequently, cause a decline in diminishing returns to the capital increase.

Fundamental tenets of the endogenous growth theory

The endogenous growth model fundamentally depends on endogenous, (rather than exogenous factors) drivers of economic growth. The theory emphasizes the importance of human capital investment, innovation and acquired knowledge to growth processes and consequently economic development.

Basically, the endogenous theory further postulates that economic growth, in the long run, is influenced by policy measures, including research and development. The theory suggests that spending on innovations will positively enhance economic growth in the long run.

The basic tenets include the following:

- The capability of the policy(ies) to enhance growth through market competition and encouragement of innovation
- Capital investment for increasing returns to scale particularly from the real sector of the economy

- Private sector participation in technological progress through research and development.
- Human capital outlay constitutes a vital aspect of economic growth.
- Policies for stimulating entrepreneurship for the purpose of creativity, innovation and enhancing employment opportunities.

Models of endogenous growth theory

Fundamentally, endogenous growth theory pivots into three major models, namely the Kenneth Arrows'(AK) model, Romer's model and Lucas's endogenous growth model

The AK models

The AK model is an endogenous model accredited to Kenneth Arrows' (1962), modified by Romer (1986), which focuses more on investment.

The model specification is in the form of the Cobb-Douglas production function:

$Y = AK^{\alpha}L^{1-\alpha}$ ……3.15

Where Y represents total output in an economy; A is factor productivity; K and L are the inputs in form of Capital and labour respectively. α denotes a parameter for output elasticity of the input of capital. Hence if α = 1, the production function of equation 3.3 would be in a linear form:

$Y=AK$…… ……..3.16

The AK model employed linear modelling, which suggest a direct functional relationship between output and capital.

The Lucas model

Lucas's endogenous growth theory adopted human capital investment as a critical driver of economic growth. That is, investments in education stimulate human capital output and subsequently lead to economic growth.

Lucas emphasised that human capital development exhibits a higher productivity rate contrary to exogenous impact scaling up both capital and labour in the economy. Therefore, investment in human capital has a more pronounced spillover effect than investment in physical capital. Thus, the model takes the form of:

$Y_i = A(K_i).(H_i).H^e$ ……………………………………………………………………3.17

Where A is the technical coefficient, Ki capital investment and H_i is the average human capital in an economy.

In the Lucas model, each firm experiences unvarying returns to scale as growth increases. Human capital is influenced by learning or capacity acquisition through on-the-job training. Hence it is not the corporate knowledge of other firms that is essential to economic growth, but average knowledge and skill in the economy.

Romer's model of technological change

The Romer (1986) endogenous model focuses on the technological changes. There are three additional watershed contributions made by Romer (1990) to the theory namely:

i. Identification of nonrivalry ideas as vital to economic growth. That is, the accumulation of ideas, cannot be undermined in growth theory. Romer emphasised the increasing returns to scale to production.
ii. Romer highlighted the role of the entrepreneur, being a profit maximising producer and the existence of imperfect competition. In an economy with perfect competition, inputs cannot earn their marginal product with increasing returns to scale due to insufficiency. The Romer's idea of imperfect competition to the growth theory was adopted from Dixit and Stiglitz (1977) and Ethier (1982), which produced elegant results in the economic context of the real world.
iii. Romer's third contribution centres on the consideration of Crucial linearity in the production function, that is, the idea of AK structure in the production function.

Furthermore, three ways have been identified by Romer by which knowledge could be applied to production processes. Firstly, the employment of a new scheme in the intermediate goods segment leads to the production of additional intermediate input. Secondly, human capital and producer durables constitute the final sector to produce the final product. The third aspect is in the research sector whereby as new designs generate increased stock of knowledge; the human capital employed is scaled up.

Assumptions of Endogenous Growth

The operation of the endogenous model is based on certain assumptions, which include:

i. Assumption of the presence of numerous firms in the market
ii. The model assumes that diminishing returns to scale are not established by the production function. Rather capital investment produces positive spillover effects to the economy and/or successive technological processes.
iii. There is the assumption of a constant-savings rate in the endogenous growth model.
iv. Technological advancement or knowledge is a non-rival good.
v. Technological advancement is grounded on innovations.
vi. Numerous entrepreneurs and firms benefit from market power, arising from increasing returns to scale.

A brief review of the Endogenous growth

According to Bassanini & Scarpetta (2001), endogenous growth theory suggests an endogenous technology, depending on the determination to invest in research and development. It further postulates technological increasing returns to scale (Cortright 2001).

The endogenous growth model is not without some implications for the economy. First, the convergence of per capita growth rate of both developed and developing economies is no more feasible. This is because unlike in the developing economies, the rate of returns from investments of human and physical capital does not decrease in developed economies. Also, the rate of returns to capital is comparatively greater in developed economies vis-a-vis the developing economies. Thus, the flow of capital cannot be from the advanced economies to the developing economies, but vice versa.

Second, the estimated impact of the human and physical capital to the economic growth rate might be more than the projection, as stated in Solow's residual model. Expenditure on research and development does not only benefit the firm itself but to other firms and the whole economy are beneficiaries of the ripple effects. The third implication is on the issue that it may not be important for an economy with increasing returns to scale to attain a constant level of income growth as postulated by Solow-Swan (1956).

Also, an additional indication of the model is that the economies with higher capital and investment experience faster economic growth rates. This may not be unconnected with the slow growth rates being experienced in some developing countries.

Implications of the Endogenous growth theory

Endogenous growth theory has an economic implication on the one part that policies incorporating competitiveness, openness, and innovations will enhance economic growth. On the contrary, policies limiting changes through the protection of certain firms or industries are likely to slow down the growth rate at the expense of the entire economy (Aghion et al., 2014). Also, sustainable economic growth basically requires the process of incessant transformation. The economies progress attained by the advanced economies have been made possible through wrenching changes.

Criticisms of Endogenous Growth Theory

The endogenous growth model has been criticized in many ways, for example:

- Srinivasan (1998) criticized that no novelty is found in the endogenous growth theory and that endogenous variables and increasing returns to scale that are adopted in the model are borrowed ideas from the neoclassical model.
- In Fisher's criticism, the new growth model relied mainly on the production system and steady state.
- It has further been criticised that there is too much reliance of the model on the role played by human capital instead of the institutional role
- From the postulations of the endogenous growth model is its inability to differentiate between human capital and physical capital.
- The use of secondary school data as a surrogate for human capital in the theory allows for the discovery and accumulation of human and physical capital which cannot continually enhance economic growth (Mankiw et al.,1992).
- Another main weakness of the endogenous growth theory is that the model fails to clarify conditional convergence as contained in the empirical literature (Howitt, 2007).
- Furthermore, the basic assumption of diminishing returns to capital is also criticised. Parente argues that the new growth theory has not been efficient as the exogenous growth theory (Parente, S. 2001).

- Krugman criticized that the theory is almost impossible to verify through empirical evidence. Many assumptions of the model are on how unmeasurable factors affect other immeasurable factors.

3.1.2 Monetary policy theories

Theories on economic growth and monetary policy have progressed over time, characterized by obscurities, divergences, and inconclusiveness. The theories relating to the nexus between economic growth and monetary policy could be predated by the quantity theory of Money (QTM), which was preceded by other theories in the 1930s including Keynesian Liquidity Preference and the New Consensus Model (NCM).

All the theoretical literature could be segregated into two: Extreme and one non-extreme cases, in relation to the way by which monetary policy impacts economic growth. One of these extremes emphasised on "money does not matter" and therefore, could not influence economic growth (Keynesian proposal). The proponents are of the view that the relationship between the monetary sector and the real sector is feeble, and that the relationship is indirect (Khabo, 2002). Conversely, the other extreme (Monetarists' proposal) opined that "money matters", hence supporting the employment of monetary policy to impact economic growth. The non-extreme cases focus on the neutrality of money, particularly in the long run (Asongu, 2014).

Generally, the effects of monetary policy on the real macroeconomic variables, both in the short and long runs have remained equivocal in the academic discourse (Twinoburyo and Odhiambo, (2018). This study, however, shall briefly provide a heterogeneous review of a few theoretical and empirical literature relating to monetary policy shocks and economic growth, both in the short run and long run. However, for better clarity of purpose, the empirical aspects shall be discussed under each objective as segmented in the study.

3.1.2.1 Monetarism

Monetarism is a monetary theory, as developed by Milton Friedman (1995), relating to the quantity theory of money (QTM), which asserts that the availability of the quantity of money determines the price level. Therefore, monetarists believe that inflation is a monetary phenomenon. Quantitatively stated as follows:

MV = PY. where M represents the money supply, V is the velocity of the transaction, P represents the price level, and Y represents the real output. This theory assumes that the

velocity V and the output Y remain constant. Therefore, the equation above is written thus $m\bar{v}$ =p$\bar{y}$. Money, in this case, was referred to as a veil by Pigou. The positivist school of thought's emphasis is on the velocity at which money income relates to the quantity of money. This implies that money and price are directly related. An increase in the money supply will bring about an increase in the price level. Therefore, to avoid inflation, the monetarist said that the money supply, in the long run, should not be above the output growth rate.

Criticism: Mishkin (1996) earlier stressed that this model of monetary theory denotes the transmission process of money, which can only be effective only at the neglect of interest level, real income etc. It was further criticized on the velocity of money that is made constant, whereas the velocity of money is predominantly motivated by consumer behaviour. Thus, the non-accountability of other factors makes the quantity theory of money reflect a partial description of monetary policy and growth. However, the economic content of the theory is relevant for economic modelling.

3.1.2.2 Keynesian Theory

In another dimension, Keynes (1936) rejected the assumption of the monetarists that real output 'Y' and the velocity of money 'V' are constant and the assumption of the absence of trade-off between output and inflation. Prices are assumed to be rigid with rapid adjustments. Based on the liquidity preference of money supply (LM curve), the Keynesians further assumed a positive relationship between interest rate and output. The theory does not believe in the direct relationship between money supply and prices but emphasizes the multiplier effects, interest rate, investment and total income. During expansion, loanable funds are increased by the banks, which makes the interest rate fall, and investment rise. This will lead to an increase in consumption and output will subsequently increase.

Keynesians are sceptical of the effectiveness of the monetary policy as regards the control of the economy since the banking system may not loan out their excess reserves to the firm. Also, the firms and households may not be sensitive to the reduced interest rate. In view of this, Keynesian places more emphasis on fiscal policy than monetary policy for the control of the economy. The view of classical economists on the issue of the money supply is that money is exogenous. That is, the Central Bank has the sole authority over money. The money supply is a product of the money base and the multiplier, which implies that the economy is made stable where the central bank controls the money base. Contrary to the classical, the post Keynesians

proposition is that the supply of money is endogenous, and the key determinant of money is the demand for the loanable funds.

Criticisms: The criticisms against Keynesians include, among others, the neglect of long-run problems, the assumption of perfect competition is unrealistic, and partial equilibrium is not explained.

3.1.2.3 The Taylor's Rule

Taylor's rule was another monetary model, accredited to the famed Economist, John Taylor in 1992. It involves the use of interest rates by the Central Bank to control the economy. The theory can also be used when in the long run the expected GDP differs from the actual GDP, with the almost aim of stabilizing the economy. According to Ullrich (2003), it is the responsiveness of the interest rate to the real output gap and inflation that characterizes Taylor's rule. The suggested original Taylor's rule is as stated in the following formula:

$$i_t = r^* + \pi_t + 0.5(\pi_t - \pi^*) + 0.5y_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.18$$

Where: i_t = Central Bank policy rate, r^* = Real interest rate at equilibrium, π_t= Average inflation rate for the Preceding three quarters, π^* = Central Bank inflation target, and y_t= Output gap= 100x (GDP real – GDP potential / GDP potential).

The policy implication of this is that when inflation is above the target or the GDP (real) increase above the GDP (potential), then, the Central Bank policy rate will rise. On the other hand, if the target rises above the inflation, or the GDP (potential is above the GDP (real), then the Central bank policy rate will fall.

Criticism: The model has been criticized as backward looking and that the long-term economic prospect has not been considered. The strong evidence found against the Talor rule is that while variables into the rule are easily predictable, the actual interest adjustment is difficult to predict (Soderlind et al.,2005). Another criticism against the rule asserts that nominal rate targeting gives room for volatile inflation when projected inflation induce current inflation being experienced. Also, discretion allows for greater flexibility to account for uncertainty, contrary to rules, whereas uncertainty must be acknowledged because policy makers are confronted with various elements of uncertainty.

3.1.3 Other Theories

Other subsequent theories have been post- Monetarism models, which include the Real business cycle, New Classical, New Keynesian and New Consensus and they are propounded with minor modifications of rigidities of wages and prices (Palley, 2007; Twinoburyo and Odhiambo, 2018)

3.1.3.1The new classical model

New classical model entails the assumption of rational expectation, imperfect information to the agents, and incessant market clearing. with propelling force by the technology, the monetary policy sets the equilibrium for the macro-economic variables. Thus, under flexible prices and perfect competition, the model postulates near neutrality of monetary policy nexus real variables.

3.1.3.2 The Real Business Cycle (RBC)

The RBC is based on the philosophy that money plays a minor role in the business cycle and the agents in the business cycle are rational, responding mainly to real shocks, particularly the technology. The model further assumes an existence of a perfect market. According to Mankiw (2006), anticipated monetary policy does not have impact on real variables like GDP contrary to unexpected monetary policy, which affects the real variables.

Assumptions: The assumption of market clearing and flexible prices and wages in the long run of the RBC forms the bases of the New Keynesian model. The New Keynesians objected to the assumption and the relevance of the theory (Gottschalk 2005). The new Keynesian models assume that prices and wages are temporarily rigid. In the model, the quantities adapt to external shocks in response to changes in monetary policy. Prices are set by the monopolistic firms in the goods market, while the households set the wages in the labour market. The model supports the neutrality of money in the long run but has effect on output in the short run.

Criticism: This theory has been criticised on the grand of absence of the role of money (Arestis and Sawyer, 2008).

3.1.3.3 New Consensus Model (NCM)

The NCM is an offspring of both the neoclassical and the New Keynesian models, particularly for an open economy. Under the **assumption** of rational expectation and price rigidity, the model postulates that monetary policy should centre on output stabilization in the long run and

price stability in the long run. Thus, there is an inverse relationship between output and real interest rate. The **economic implication** of the NCM paradigm is that in an economy, the demand side is affected by the short-term monetary policy rate, which consequently converges to the equilibrium of the supply side in the long run (Fontana and Palacio-Vera, 2007). As inflation is a monetary phenomenon, monetary policy is used for the achievement of price stability, through the fluctuations of the interest rate.

Criticism: The NCM has been criticized for the use of the single monetary tool, no money, no bank roles, and the independence of the central bank (Arestis, 2009). The model may not be appropriate for an economy with persistent inflation, which is supply-driven.

With regards to the applicability of these theories, the contemporary growth theories and models does not have adequate capability to determine the main factors affecting economic growth rates in less developed countries (Zarra-Nezhad and Hosainpour 2011). The definitions and measurements of the few determinants indicated in economic literature in less developed countries (ECOWAS member countries) are inaccurate and different from those in advanced countries. Also, the current economic growth theories do not consider other factors like cultural variables and religion that constitute set of crucial values for economic development.

3.2 Review of empirical literature

3.2.1 OBJECTIVE ONE: Determinants of monetary policy rate

Theoretically, the classical economists, under the framework of loanable funds theory, opined that the determination of appropriate policy rates in an economy centre on the interaction of demand and supply of savings and investments. Keynes (1936) emphasized on liquidity preference, which is the relationship between supply and demand for money as a contending theory on monetary policy rate determination.

Over time, the role of monetary policy particularly, policy rate in resource allocation, economic growth and stability, capital accumulation and development cannot be undermined (see Woodford, 2003; Kim & Orphanides, 2012 Asamoah & Adu 2016). The classical theorists, using the loanable fund as a basis for the interest rate determination stressed the interactions between demand and supply of savings and investments in an economy. This is similar to the Keynesian framework of the theory of liquidity preference, which also centres on the interface between the demand for money and money supply.

The arguments of the policy rate proponents are that monetary policy stimulates an increase in nominal interest rate; considering its long-run effects, the investors encourage changes in the anticipated risk returns on their assets (Clarida, Gali, & Gertler, 1999). In q-theory of investment through the asset price transmission channel views the investors' expectation on the nexus in risk-return. Policy changes of increase in interest rates entice the investors on the debt instruments. Monetary tightening leads to a decrease in q, which results into decline in output and employment.

In an open economy, monetary tightening through increase in policy rates necessitates devaluation of local currency that equates to risk-adjusted returns on the instruments of debt, which is necessary for the uncovered interest rate parity. Therefore, the prices slowly adjust to a rise in the value of the local currency, a rise in the cost of domestic goods and subsequently a fall in output, employment, and net exports (Asamoah and Adu 2016). This is in line with Mark and Sul (2001) that devaluation of currency is inflationary, rise in import and general prices, which leads to a rise in demand for money with consequential side effects on the policy rate of the economy. In Fisher's theoretical framework, while analysing the nexus between the policy rate and inflation he argued that in the long run, because of the variations in the money supply, the policy rate eventually adjusts to fluctuations in inflation expectations. Hence, if Fisher's proposition holds, it would affect the monetary policy of the developing economies.

The relationship between the policy rate and inflation in Ghana was investigated by Adu and Marbuah (2011) using a data set between 1960 and 2009. The results show a positive relationship, which was due to the use of short-term interest rate by the Central Bank as the prime policy anchor for its inflation targeting policy. Booth and Ciner (2000) examined the long run relationship between inflation rate and interest rate for 8 Euro countries and US, using cointegration method. The results suggest that Euro currency and inflation have a causal relationship of one-on-one. The study stated that the incorporation of market participants would integrate a probable percentage of the inflation rate into the interest rate. The analysis of Asghapur, et al., (2014) on the connection between policy rates and inflation suggest a negative relationship as hypothesized by Fisher (1930). However, the relationship was reported (Ghazali, 2003) to be weak.

The findings of Udoka and Roland (2012) in respect of the policy rate nexus GDP, support that interest rate is one of the factors driving the economic growth of an economy. Thus, a hike in interest rate shows a dwindling GDP. The findings further indicates that policy rate increase

does not significantly affect economic growth. This is contrary to the findings of Obamuyi (2009), that found that a hike in interest rate leads to increase in real GDP, which indicates that policy rate impacts economic growth. This is similar to Habanabakize and Meyer (2018) who used a data set from 2000 to 2016 in South Africa and employed a quantitative approach, including ARDL, to analyse the existing relationship among foreign direct investment (FDI), GDP and repo rate in south Africa. The author found a negative long-run relationship between the repo rate and GDP, but a positive and a significant impact in the short run was the relationship between the FDI and the repo rate in the short run

The investigation of Sarno and Thornton (2002) was on the dynamic relationship between the US policy rates FFR and treasury bill (3months) rate. The authors employed daily data ranging from 1974 to 1999 and found a solid relationship between the variables which were steady in all the monetary policy regimes. Monetary transmission channels were analysed by Atesoglu (2003) between the FFR and the prime interest rate, using VECM. The findings suggest the impact of FFR on prime interest rate was solid in the long run. That is FFR constitutes the driver towards the long-run equilibrium. Similarly, Atesoglu (2005) examined the relationship between long term interest rates and FFR. The study extends the interest rates to include yield on corporate bond and Treasury bond of 30-year term. The results depict a cointegrated relationship between the long-term interest rates and the FFR while the impact of the FFR on the long-term interest rates is not significant in the short run. The FFR nexus domestic interest rates were investigated by Payne (2006), using Johansen cointegrated model and VEC. The author's finding is that the domestic interest rate (fixed mortgage interest rate) cointegrates with the FFR. In addition, the causality passes through the latter to the former.

In respect of the relationship between the monetary policy rate and the global oil price, Kim et al., (2017) investigated this in China economy, using diverse econometric models including, Time Varying Parameter SVAR (TVP SVAR) and VAR(SVAR) with short run recognizing restrictions. The analysis depicts mixed results at different times. The policy rate depicts a negative response to the oil price variation between 1992:4–2001:10, and thereafter shows that the response was positive within the period 2001:11–2014:5. The negative response to the interest rate implies a boosting economy, while the positive response is evidence of inflation stabilization of the monetary authority in China, even though the main objective is on stabilization of the value of the domestic currency for enhancing economic growth. ThankGod and Maxwell, (2013) investigated the effect of the oil price volatility on macroeconomic variables in Nigeria, using EGARCH and Lag-augmented VAR (LA_VAR) models. The

authors evidently found the existence of a unidirectional relationship from oil price to interest rate and exchange rate. Thus, similar to the findings of Balke et al., (2002) and Jin (2008), global oil price, working through the exchange rate, is a substantial determinant to the policy rate in the long run.

Chiaraah, (2019) analysed the influence of trade openness and trade policy on the effectiveness of the monetary policy in Ghana. The study adopted a cointegration approach and employed a quarterly data set from 2002 to 2016 for its investigation. The empirical findings suggest that increased trade openness reduces the efficacy of the monetary policy. Karras (2001) investigated the influence of openness on monetary policy as it affects output in 8 countries (Australia, Canada, Germany, Italy, Japan, South Africa, the U.K., and the U.S.A.). The study employed quarterly data from 1960 to 1994. The results conform to the theoretical expectation that openness hypothetically diminishes the capacity of the variations in the money supply to impact the economic activity of a country. That is, with a given change in monetary policy, output decreases relative to trade openness.

In the empirical study of Jordaan, (2013) the findings indicated that a negative relationship exists between the policy rates and exchange rates. This is contrary to Berument and Gumay (2003) that the relationship is direct. That is, increasing the policy rates leads to an increase in the exchange rates, which implies a depreciation of the local currency. Hnatkovska et al., (2013) examined a cross-sectional relationship between short term interest rates and exchange rates in 80 countries. The empirical results suggest a non- monotonic relationship; a little rise in the interest rate leads to currency appreciation, but a higher increase depreciates the currency. Money demand is increased with higher interest rates, which further increases the fiscal deficit and weakens output and consequently leads to currency depreciation. Aytug (2017) analysed 14 emerging countries and some economies in the Euro area for the period 2001–2014. The result revealed that monetary policy as a macroprudential tool fails to be effective when interest rates are changed subject to capital flow. Andrieș et al. (2017) on Romania economy, adopted wavelet theory to analyse the relationship between interest rate and exchange rate with daily data for the period 1999 – 2004. The authors find that the two variables had co-movements through policy changes and challenging periods. There is negative relationship during short term and positive relationships at long term. Berument (2007) studies the monetary policy mechanism effect in Turkey between the period 1968 and 2000. The paper opined that the innovation in the monetary policy within this period of study was the dispersal between the

local currency depreciation rate and the interest rate of the Central Bank. A constricted monetary policy leads to a general price reduction and income and currency appreciation

Furthermore, Kim and Lim (2018) focused on developed economies and by using VAR models to examine the monetary policy effects on the exchange rate. The results show that contractionary monetary policy results in a significant appreciation of the exchange rate. Kruskovic, (2017) on Serbia's economy, reports that the exchange rate seems to respond more significantly than policy rates to monetary policy interference. This adduced to the fact that it exerts more impacts on inflation than on other real economic variables. It is prominent among the emerging economies to amass foreign currency reserves to confront the challenges of inflation, being inflation-targeting and exchange rate depreciation economies, which eventually affects the long-term interest rates. Himmels and Kirsanova (2018) adopted a Keynesian model to analyse interest rate and exchange rate nexus in a "soft peg" nominal exchange rate regime. The model suggests multiple equilibria with the assumption of imperfect financial market under unrestricted monetary policy. In developing countries empirical studies have suggested probable asymmetric effects of the exchange rate on interest rate. Recently, Capasso et al., (2019) employed ARDL model to explore the relationship between interest rates and exchange rates as a response to the action of the monetary authority in Mexico's economy. The results suggest an asymmetrical relationship between policy rate and exchange rate nexus. The exchange rate significantly affects the interest rates in the long run. Conversely, the interest rate wields no significant influence on the exchange rate.

3.2.2 OBJECTIVE TWO: Monetary policy shocks and economic growth

There are divergent views in the various empirical findings on the significant level of the monetary policy shocks to economic stabilization. There are a lot of studies, upholding the view that the effects of the monetary policy shocks on economic growth are positive and greatly significant, this includes the investigation of Aragon and Portugal, (2009) on the impact of monetary policy shocks in Kenya, using VAR and MS-VAR which found out that they are significantly effective on the macroeconomic variables of the economy. Hammed and Ume, (2011), applied regression technique to investigate the impact of monetary policy on the GDP in Pakistan for the period, 1980 to 2009. Their results show that GDP is highly affected by monetary policy. Specifically, among other factors affecting GDP, money supply stands out as a major policy that greatly affected GDP. Supporting this investigation, Ayub et al., (2015), also examined the impact of monetary policy on GDP in Pakistan. Using 10-year data between

2005 and 2014, the study revealed that the GDP had been greatly affected by money supply, interest rate and inflation. Also, in a related empirical study carried out by Vinayagathasan (2013) on the macroeconomic variables in Sri Lanka, used the SVAR model with data by employing a data set between 1978m1 and 2011m12. The findings of the author suggest that the shock of interest rate had a significant effect on output growth, while the shock of money supply produced a significant but negative impact on the output.

Furthermore, Chaitip et al (2015), used ARDL of Pooled Mean Group Estimator (PMGE) to study the influence of money supply on economic growth in 8 countries and found that the is a positive long-run correlation exists between money supply and economic growth. The study conducted by Cambazoglu (2012), using the VAR model on time series data for the period 2005(1) to 2010(7) to examine the monetary policy shocks on macroeconomic variables including industrial production and broad money (M2), shows that M2 had a positive impact on output and employment. Furthermore, the investigation carried out by Fiado (2016) in three sub-Saharan African countries (Ghana, Gambia, and Nigeria) on monetary policy and economic performance, for the period 1975 to 2011, shows that the real GDP growth is positive and significant with improved risk-taking. Milani and Treadwell (2012) utilized DSGE econometric model to disentangle anticipated and unanticipated monetary policy shocks and their impacts on US economy, between 1960q1 and 2009q1.The authors estimated with Bayesian techniques with macroeconomic variables of output, inflation, and federal funds rate. The results show that unanticipated monetary policy shocks had small, but momentary effects on output, whereas the anticipated monetary policy shock produces a large and persistent impact.

Conversely, there is another school of thought showing that the effects of monetary policy on output growth are weak and statistically insignificant. By empirical studies, a policy change of 1.0 per cent leads to a price and output change between 0.5 and 1.0 percent in United states of America. (Sims 1992 and Bernanke 1990). Kim (1999) studied whether monetary policy shocks matter in the G-7 countries. The study revealed that in the short run, the monetary policy shocks affected the output growth on a minor level. This implies that changes in the output of the G-7 countries were not significantly determined by the monetary policy. Similarly, Chen Kevin, (2006) used VAR to analyse Kenya's monetary policy Transmission Mechanism. The report showed that a short-term increase in prices leads to a reduction in interest rate but has insignificant effects on output growth. Kapuscinski et. al (2015) attempted the investigation of the importance of monetary policy channels of transmission in Poland, using the SVAR model

and monthly data from 2001q1 to 2015q3. The authors' findings suggest that the impact of the shock of the exchange rate channel on other economic sectors declined sharply during the period. The weakness in the effectiveness of the channel was adduced to the massive influx of international enterprises. They further claimed that the principal driver of inflation was the interest rate, which was the strongest channel.

Berg et.al., (2013) took a narrative approach to find evidence of a working transmission mechanism in the Tropics. In line with Romer and Romer (1989), the authors focused on a significant tightening of monetary policy that took place in 2011 in four members of the East African Community: Kenya, Uganda, Tanzania, and Rwanda. They found that after a large policy-induced rise in the short-term interest rate, lending and other interest rates rise, the exchange rate tends to appreciate, output growth tends to fall, and inflation declines. The standard features of the transmission mechanism are more prominent in Kenya, Uganda, and Tanzania while in Rwanda the evidence is less suggestive. Recently, Kanga (2021), using a dynamic panel estimator, examines the role of banks in the transmission of monetary policy in WAEMU and finds, among others, that bank lending is sensitive to monetary.

In summary, despite deferred opinions on the effectiveness of the monetary policy on economic growth and which of the transmission channels is most important, there is consensus in the empirical literature about the neutrality of monetary policy in the long run (Chen 2007; Bae et al,2005; and Noqueira, 2009). From the above, the reason for the weakness of the monetary policy may, however, be adduced to few data observation covered by some studies, which might have led to few degrees of freedom e.g., Buigut (2009) and Bagzibagli (2014).

3.2.3 OBJECTIVE THREE: Regime switching effects of monetary policy

From the theoretical point of views, the first class of theories, based on imperfect credit market, where the asymmetric information that transpires between the lender and the borrower leads to agency costs at an increasing rate. The agency cost is a function of the borrower's net worth. That is, the higher the net worth of a borrower the more the collateral assets. Bernanke and Gertler (1989) further expatiated that the reliance of an external premium on the net worth of a borrower generates a financial mechanism known as a 'financial accelerator'. Take for instance, when an economy is in a boom period, the net worth of firms will naturally rise. This will eventually result in to decrease in the external cost of financing such an economy. In return, it may reduce the effects of the initial shock. Otherwise, this propagation mechanism on

monetary policy shock is likely to be stronger during the recession than during expansion regimes.

In an expansion regime, financial institutions can sufficiently finance themselves with retained earnings. Hence external facial premium is relatively low because of their strong balance sheets. Therefore, the effect of the monetary policy is limited to the premium. On the other hand, a recession regime, the firms/ financial institutions rely much on external finance, during which the external finance premium will be more susceptible to interest rate fluctuations. Hence, monetary policy may not be much effective on economic activity.

Another strand of the theory hypothesized that, with convex monetary aggregate supply, the monetary policy will have a tougher impact on the economy during the recession. Complexity implies that the gradient of the supply curve steeps more at a greater level of capacity utilization and low inflation. Subsequently, the monetary policy drive produces a stronger effect on output and weak effects on inflation during recession and vice versa at expansion (Peersman and Smets, 2001).

Even though several theories have emerged on the relationship between output growth and monetary policy and inflation and output growth, in this study, we do not extricate among the various existing theories, but this study intends to document the impact of monetary policy on the output growth during recession and expansion regime in West African countries. Similarly, In the economic literature, there are also diverse empirical results from various studies on the phase asymmetry of monetary policy, both in the developed, emerging and developing economies. Some findings show that monetary policy shocks are more effective in the expansion regime than in the contraction regime, while some show contrary findings. The study of Ka-Fu (2000), was an attempt at examining the variability in the effects of monetary policy in the U.S., using VAR. The study covers the period between 1959(1)- 1994(12) and the variables used are the Industrial production index, CPI, Non-borrowed reserves, Fed funds, and Total Reserves. The result suggested that negative monetary policy shock is stronger. Also, there is short run price stickiness and existence of long run neutrality. Lo and Piger, (2003); Dolado and Maria-Dolories, (2005) studied the monetary policy in the Euro area, using a cross sectional Global Markov switching model. They submitted in their findings that Monetary policy actions have larger effects during recession than expansion and there are larger effects of interest rate during the recession than expansion. More recently, Kutu and Ngalawa (2017), carried out an investigation on the monetary policy and industrial output in BRICS countries,

using a Markov Switching model. Their findings depict that Monetary policy has a significant and greater effect during the recession than during expansion. And that there is a higher probability for the economies to move from a recession state to an expanded state than the reversal.

Contrary to the above views, another strand of literature observed in their empirical findings that monetary policy instruments are more effective at expansion (Loose) regimes rather than contractionary (Tight) regimes. Bodman (2006) studied the effect of monetary policy in Australia between the period 1972(1) and 2005(1). The author explores Cover, (1992) methodology and found out that an unanticipated decrease in the interest rate leads to an increase in GDP, while its increase does not significantly affect GDP. Monetary policy is more powerful at expansion shocks, since during boom durable expenses are more sensitive to policy shocks, in US., according to Berger and Vavra, (2015). This was further supported by Huber and Fischer, (2018), who employed Markov Switching factor augmented VAR (FAVAR) for US business cycle and monetary policy, with monthly data set spanning between 1959(1) to 2014(7). The authors also affirmed that the impact of monetary policy tools is more pronounced during expansion than in a recession. Similarly, Tenreyro and Thwaites, (2016) adopted Smooth Transition Local Projection Model (STLPM) for U S. monetary data from 1969- 2007. Their result suggested that monetary policy is less powerful in recession, especially, on durable expenditure and business investment.

How long does a regime last in a business cycle? The recent empirical evidence shows that the duration of a regime varies from region to region and from country to country. Rand and Tarp, (2002) investigated the business cycle in 15 developing countries using Bry Broschan procedure and document that countries in Latin America have a longer expansion period than at contraction, but the contrary is the case in Asian countries and North America countries. In the case of Sub-Saharan African countries, the authors could not ascertain the average period, but they appeared to have a more durable period than the other two regions. Generally, the average duration of a business cycle range between 7.7 and 12.0 quarters, which is lesser than the industrial countries of between 24 and 32 quarters. Calderon and Fluentes, (2010) found that the average contraction period in a sample of 12 LAC is 3.5 quarters, like 8 East Asian Countries of 4.5quarters and 12 OECD economies of 3.6 quarters. And their average expansion duration differs substantially. That is 16 quarters, 24 quarters, and 11 quarters, respectively. This is, however, different from the findings of Male, (2009), whose findings revealed that in

developing countries, business cycles are not shorter than the developed nations and that output volatility, on average, doubles that of the developed countries. Altug and Bildirici (2010) employed a univariate Markov switching model to model the business cycle of 22 countries in both developed and developing countries. The cross-section permits the comparative analysis of the cyclical fluctuations between the developed and the developing economies. Their report documents the relevance of heterogeneity in the experience of individual countries. It is suggesting the appearance of an important global factor that induced the cyclical fluctuations in both developing and developed countries.

Other recent literature centre on the identification of crisis episodes and dynamics of varying duration and intensity, which are not only of large economic dislocation during financial crises but also sluggish build-up and recovery phases surrounding them (Reinhart and Rogoff, 2009; Boissay et al., 2016). This is further buttressed by the estimated DSGE model of Benigno, et al. 2020.that crisis period displays sluggish and long-lasting build-up and stagnation phases driven by plausible combinations of shocks. More so, different sets of shocks explain different variables over the business cycle and the three historical episodes of sudden stops identified.

3.3 Gaps in literature

Generally, the empirical literature reviewed has shown various spots where there is no consensus. More specifically on the relationship between monetary policy shocks and economic growth. The effectiveness of monetary policy in different regimes of the business cycle is also contentious. Furthermore, no known research has studied the ECOWAS region in a conglomerate, particularly by partitioning the region in line with their foreign exchange system of fixed exchange rate countries and flexible exchange rate countries. Other gaps in the literature that could be extracted include:

Objective 1: On the first objective, it is apparent from the above that there is no known research that has investigated the determinants of the monetary policy rate in the ECOWAS region or in the sub-regions of WAEMU and WAMZ. Also, the inclusion of both the internal and external variables constitutes another vacuum yet to be filled. This study therefore provides more insight into the conduct of monetary policy in the WAMZ countries.

Objective 2: On the second objective of the monetary transmission mechanism, it is obvious from the empirical literature above that earlier studies on monetary policy shock and economic growth have been concentrated on advanced economies (Bernanke 1990; Sims 1992; Kim

1999) and Kapuscinski et. al 2015, among others) as against developing economies like the West Africa region. Few related studies have been country-specific (Aragon and Portugal, 2009; Ayub et al. 2015; Hammed and Ume, 2011) and the investigation carried out by Fiado (2016) in three sub-Saharan African countries (Ghana, Gambia, and Nigeria) are inadequate for generalization. This study includes twelve west African countries, which suffices for general conjectures. Furthermore, unlike Bergs et.al., (2013) transmission mechanism in low income economies of Kenya, Uganda, Tanzania and Rwanda, using a narrative approach, this study centres on West African countries using econometrics approach, which gives a more quantitative and qualitative economic analysis. In another stance, unlike Kanga (2021) whose study centres only on the role of banks and transmission of monetary policy in WAEMU, this study extends the transmission policy to other West African countries operating flexible exchange rates (WAMZ).

Objective 3: Moreover, other insufficiencies in the empirical studies above, relating to the third objective include the employment of a univariate model (e.g., Altug and Bildirici, 2010), and the selection of a small sample size of the developing countries (e.g., Rand and Tarps, 2002), which may not be adequate to justify a large region like West African countries. Therefore, this study attempts to bridge these gaps, by not only extending this group of sample size, but is also adopting a multivariate approach in its switching modelling. Specifically, the study investigates the policy shock effects at contractionary and expansionary phases of the business cycle, in the selected 12 ECOWAS member countries in sub-Saharan Africa. No known study has been able to attempt this gap using the Markov switching model, which makes it a pioneer in this respect.

Conclusively, the discussions in this chapter have centred the review of related theoretical and empirical literature for objectives i. ii, and iii respectively, including the existing gaps in the literature

In summary, it can be deduced from the above that in the economic literature, the consensus is that monetary policy shocks impact economic fluctuations, but the nature and the magnitude of the effect are still questionable. It could also be inferred that most of these empirical studies were carried out in developed countries and emerging markets, at the neglect of the sub-region of West Africa. The few West African countries included in the studies were either country-specific or too few countries or univariate, which are not fit for generalization.

Furthermore, the empirical studies confirm the presence of the spill over effects of the monetary policy from US, Eurozone, and other advanced countries. Specifically, they have positive effects on the growth of their counterpart developed countries and emerging markets. Conversely, the policy shocks from the developed nations reflect a negative effect on the economies of the developing economies. In Addition, various studies on cross country correlations of monetary policy shocks on outputs have shown controversial reports. For instance, countries with flexible exchange rate are more susceptible to external monetary policy shocks than those operating fixed exchange rates. These controverses require further investigations.

CHAPTER FOUR

RESEARCH METHODOLOGY

4.1 Research Design

In this chapter, the methodologies employed to achieve the three objectives are discussed. Generally, the study adopts a quantitative econometric approach to analyse the empirical results generated from the secondary data employed. The relevant estimating model for each of the objectives is specified in this chapter, which is followed by the definition of the variables. Specifically, after this introduction is the research philosophy, which is trailed by the methodology for objective one, objective two and objective three respectively. Finally, is the concluding part of this chapter.

4.2 Research philosophy

The philosophical stance of this study is based on positivism, which involves the employment of realism to generalize. As stated by Macionis and Gerber (2010) Positivism relates to philosophical theory in which specific knowledge is established on real phenomena, properties, and relationships. The positivism research philosophy has been considered appropriate for the achievement of the set objectives of this study since it involves a large sample size of 12 countries in the ECOWAS, which employed quantifiable secondary data and a statistical analytical method of analysis. In other words, this study is based on rationalism and does not have any predetermined results. Therefore, for objectivity, the results are not under the control of the investigator but subject to the estimated results from the data employed.

4.3 Research methods for objective one

The first objective of this study is to investigate determinants of the monetary policy rate in ECOWAS. The import of this investigation is based on the fact that the choice of monetary policy rate is not an accident or a random act, but requires the knowledge of the drivers of the policy rate by the Central bank or monetary authorities of the economy. The basic content of the methodology concerning a framework, modelling, variables, data and estimating techniques are as stated below:

4.3.1 Theoretical framework for objective one

The neoclassical growth theory forms the basis of the methodology of this objective. The general form of the model describing the relationship between economic output and economic inputs could be stated as follows:

$Y_i = f(AX_i \dots X_{n,} \rho_i \dots \rho_n)$ …… 4.1

Where Y_i represents output, X_i denotes various inputs including capital and labour, ρ_i being monetary policy and A is a constant value for total factor productivity.

With the inclusion of time, the equation (4.1) could also be expressed as:

$Y_{i,t} = f(X_{it}, \rho_{it})$ …… 4.2

$Y_{i,t}$ denotes the output growth of an economy at time *t,* X_{it} are other exogenous inputs for output growth at time *t* and ρ_i is the monetary policy at time *t.*

Adopting Cobb Douglass production function, as entrenched in Omolade and Ngalawa, (2014)

Equation 4.2 can be expressed as follows:

$Y_{i,t} = A_{it} X_{it}^{\beta} \rho_{it}^{\alpha}$ …….. 4.3

Variable ρ_{it} in equation 4.3 is made the subject of the formula to become:

$\rho_{it} = Y_{it}^{-\alpha} (A_{it} X_{it}^{\beta})$ …… 4.4

By linearising equation 4.4 we have:

$log\rho_{it} = log\, Y_{i,t} + logA_{i,t} + \beta logX_{i,t} + \mu_t$ …… 4.5

Therefore, for this study

ρ_{it} is proxied by policy rate, $Y_{i,t}$ is the output growth, $X_{i,t}$ other macroeconomic variables of global oil price, federal funds rate, trade openness, inflation rate and exchange rate in ECOWAS member countries, and μ_t is the error term.

4.3.2 Model Specification for Objective One

The interest of this study centres on the relationship between the policy rate and other monetary policy instruments including gross domestic product, trade openness, inflation rate, and

exchange rate as well as external variables of trade openness and federal funds rate constituting the exogenous variables.

The Panel ARDL model could generally be stated in the form

$Y_{i,t} = \sum_{j=1}^{m} \alpha_{i,j} Y_{i,t-j} + \sum_{j=0}^{n} \delta'_{i,j} X_{i,t-j} + \mu_i + \varepsilon_{it}$ ………………………………. 4.6

Where Y denotes the dependent variable, X represents the vector of the explanatory variables.

In the case of this study Y represents the monetary policy rate, while X encompasses GDP, INF, TOP, EXCH, FFR, and GPR).

By parametrizing we have:

$\Delta Y_{i,t} = \emptyset_i \left(Y_{i,t-1} - \beta'_{i,} X_{it,}\right) + \sum_{j-1}^{m-1} \alpha^*_{i,j} \Delta Y_{i,t} \alpha_{i,t-j} Y_{i,t-j} + \sum_{j=0}^{n-1} \delta^*_{i,j} \Delta X_{i,t-j} + \mu_i + \varepsilon_{it}$
……………………………………………………………………………. 4.7

Where β_i indicates the vector of interest for the measurement of the long-run influence of the explanatory variables. $\emptyset_i$is an error correction mechanism. Other parameters are the short-run coefficients. ε_{it} represents the disturbances with iid (i.e. Zero mean and constant variance within units).

Equation (4.6) of the model permits parameters to change between units, which can be estimated with a mean group estimator for the estimation of each country and group mean. Nevertheless, for homogenous long-run coefficients across the group., the model permits the use of a pooled mean group. This allows the parameters to fluctuate between countries in the short run, while the [parameters are required to be homogenous in the long run. (See Pesaran and Smith (1995), Pesaran et al. (1999) and Silva et al. (2018).

4.3.3 Variables and sources for Objective One

The data for this objective are extracted country by country and data covers the period between 1980 and 2020.

Table 3.1: Variables Description and sources for objective one

Variable	Description	Sources
Gross domestic product rate (GDP)	It is the total of the gross value of goods and services produced in an economy. It is used in the study as the proxy for economic growth in USD	World Development Indicator (WDI)
Exchange rate (EXR)	It is the value of the national currency per USD. An increase in the exchange rate implies a depreciation of the country's currency. ECOWAS being an open economy necessitates the introduction of the variable into the model.	IMF, IFS statistical data
Trade openness (TOP)	This is exports plus imports as per cent of GDP	AFDB, social economic data
Inflation Rate (INF)	This is proxied by the Period average consumer price index (2010 = 100)	IMF, IFS statistical data
Monetary Policy rate (MPR)	It constitutes the Interest rate, which forms the depended variable	IMF, IFS statistical data
Global Oil Price (GPR)	Global price of Brent Crude in U.S. Dollars per Barrel and Not Seasonally Adjusted	Federal Reserve Bank of St Louis (Federal Reserve economic data)
Federal Funds Rate (FFR)	The federal funds rate is the central interest rate in the U.S. financial Calculated at Percent, Not Seasonally Adjusted	Federal Reserve Bank of St Louis (Federal Reserve economic data)

Source: Author's computation

The Federal funds rate (FFR) and Global Oil price (GPR) are external variables incorporated as exogenous variables to the domestic economy. Although the FFR has been commonly used by various researchers, however, this study considers the employment of GPR as additional prominent external variable for better economic analysis. Also, the inclusion of these exogenous variables centres on the dominant roles played by the US on global influence with the attendant spill over effects that cannot be undermined. This is because the economic development of the US certainly has a substantial impact on the global economy, west Africa inclusive, because of its international relations, coupled with its size, the magnitude of foreign direct investments and its organized financial markets (Pham and Nguyen, 2019). In the first instance, the US dollar is the most generally used currency in global financial transactions and trade, hence fluctuations in the monetary policy of the US play a vital role among the drivers of global financial transactions. Thus, about 62% of the world currency that is in reserves is being held in US dollars. Also, World-widely, the US has the only single main economy that accounts for about 22% of the total output of the world, 20% of global FDI, 10% of world trade and about 20% of world energy demand (Kose et al, 2017). Therefore, any monetary policy

impact of the US can have significant spill over effects on other countries of the world, without the exclusion of the countries in West Africa.

4.3.5 Estimating techniques technique for objective one

The relevant estimating technique employed for its estimation is stated underneath in addition to the justification of its usage, more specifically, analysing both the short-run and long-run relationship between interest rate and other macroeconomic variables. Hence, the Autoregressive Distributed Lag (ARDL) model has been considered appropriate for this study. The use of this approach is considered fit for the study based on its accrued advantages among which include its flexibility, particularly its applicability regardless of whether the variables are integrated of the same order. ARDL helps to assess the determinants of the fluctuations of the monetary policy, both in the short and long run. The model also has the capacity of accommodating enough lag numbers of a set of data from general to the specific model framework. (See Pesaran et al. 1997, Kutu and Ngalawa, 2017). Other merits of ARDL that cannot be undermined include its applicability for investigating both long-run and short-run dynamics and its ability to accommodate varied lags of the variable (Giles, 2013; Magweva and Sibanda 2020); it is suitable for large and small samples sizes (Rafindadi and Yosuf, 2013). It is also a model that accounts for cross-sectional dependence in a panel data analysis (Chudik and Pesaran (2013). However, ARDL model is not without its own challenges as the model splits the exogenous variable into two sequences in a situation where one series consists of a fractional sum of positive variations whereas another series consists of a fractional sum of negative variations. Hence, it does not differentiate the effect of large positive /negative variations from moderate positive /negative variations in the explanatory variable (Chanc 2020). Despite this challenge, it is considered appropriate in this study because its merits outweighs the challenges.

In modelling an appropriate methodology, we considered the unit root and cointegration of the sets of data for both the WAEMU and WAMZ. As a condition for the application of these approaches, the variables must of 1(0), 1(1). Also, the variables must be cointegrated for the error correction model. The test of stationarity results suggests that our variables are integrated of order1(0) while some are integrated of order 1(1) which is in line with Chudik and Pesaran (2013). However, certain conditions may be confronted while using the data that Katircioglu, 2009 and Giles (2013) outlined and proffered solutions.

Firstly, If the series is I(0), but stationary: Ordinary least square is suggested to be the appropriate method to employ. Secondly, if they are in order I(1) without congregation for all the series, the suitable method is to estimate using the first difference except for the long-run components. Thirdly, when the series is in the same order of cointegration, then OLS can be used for the estimation of the short-run dynamism, while Vector Error Correction Model (VECM) or Error correction Model (ECM) can be used to capture the short-run variations.

Finally, if the variables are in a mixture of I (0) and I (1). Then adoption of panel ARDL in line with Pesaran (2013) has been recommended as appropriate. This is the case of this study, where some variables employed are in order I (0) and some are I (0). Various studies have employed the panel ARDL for similar empirical analysis. These include Kutu, (2017); Mercan *et al.*, (2013); Bakar *et al.,* (2013), among others.

In this study, we pooled the cross-sectional time-series data for the panel data analysis. Panel data are notable for numerous advantages accredited to them. These include but are not limited to its efficiency around data variability, offering more explanatory data, but also appropriate for the control of heterogeneity featuring in individual data analysis (Baltagi, 2008).

4.3.6 Descriptive statistics of the variables connecting economic growth, inflation, interest rate, broad money supply and exchange rate (step 1).

Descriptive statistics gives the details and pattern of how the data is distributed among the variables employed in the estimation. It summarises the statistical computations, including the mean, median, and standard deviation, as well as the maximum and minimum values and the total number of observations of all the variables included in the estimation.

4.3.7 Correlation matrix (step 2)

A correlation matrix is a table showing correlation coefficients between variables. Each cell in the table shows the correlation between two variables. A correlation matrix is used to summarize data, as an input into a more advanced analysis, and as a diagnostic for advanced analyses. The correlation matrix relates to a tabular array of data, showing the correlation coefficients of the variables of interest (Policy rate global oil price, federal funds rates, growth rate, inflation, broad money supply and exchange rates). The table depicts the relationship among pairs of the variables employed. They are shown in two folds, the covariance and correlation matrices. The covariance matrix gives information on the direction of the

relationship, while the correlation matrix depicts the level of correlation among the variables 1included in the analysis. The degree of relationship between variables can either be positive (direct) or negative (inverse). Also, the magnitude of the relationship depicts in the correlation matrix is important in panel estimation as it helps in discovering the likelihood of multicollinearity in the specified model.

Mathematically:

variance (X, Y) = $\frac{1}{n} \sum_{i=1}^{n} (\chi_i - \bar{\chi})(\gamma_i - \bar{\gamma})$ 4.8

Correlation (X, Y) = $\frac{Cov\ (\chi,\gamma)}{\sqrt{Var\ (\chi)}\sqrt{Var\ (\gamma)}}$ 4.9

Cov X represents the standard deviation of variable x

Cov Y represents the standard deviation of variable y.

4.3.8 Panel Test of Unit root – (Step 3)

One of the preliminary tests necessary for the estimation of Panel ARDL is the panel unit root test. A unit root or difference stationary process relates to the stochastic trend of a time series data. The formal unit root test entails a trend stationary fluctuating around the mean value of the series (deterministic trend). Graphically, the displayed amplitude does not have the predisposition of increase or decrease in fluctuations. The mean depends on time, while the variance remains constant with an error term without a white noise. The difference stationary is a process by which a non-stationary is made stationery using differencing. Thus the series is captioned to be integrated of order I(1) or I(2), depending on the number of times the differencing is done. It could also be integrated of order zero I(0), when the series is stationary without differencing. In this study both processes, the trend and difference stationary were carried out.

In the estimation of Panel ARDL, the necessary condition demands that variables are stationary at level or first difference. There are several approaches for the conduct of the panel unit root test. However, in this study more than one approach is used for comparative analysis. Specifically, this study employed the commonly used lm Pesaran & Shin (IPS) and Augmented

Dickey-Fuller Fisher (ADF) panel unit root tests. These two approaches are briefly discussed below:

4.3.8.1 Lm, Pesaran & Shin (IPS)

Im, Pesaran and Shin (1997) were the proponents of the IPS unit root test as an alternative testing technique, which employs a regimented t-bar statistics built on an augmented Dickey-Fuller test with the mean across the panels. It is a test that objects to the convergence of the units towards equilibrium at the same velocity. IPS is a flexible approach for the computation of t-bar statistics as it accommodates both stationary and non-stationary series simultaneously. It also gives room for autocorrelation and heterogeneous stochastic variables. Unlike ADF which pooled data, IPS treats each unit of the cross-sectional data for the estimation of the t-bar statistics.

The null hypothesis, Ho is: p_i=0 for all i

Alternative hypothesis: $$H_a: \begin{cases} \rho_i < 0 \ for \ i = 1 \ldots . N_1 \\ \rho_i = 0 \ for \ i = N_1 + 1 \ldots . N \end{cases} with \ 0 < N_1 \leq N$$

The null hypothesis implies that there is a unit root, and the alternative hypothesis suggests the absence of a unit root. That is, some of the specified series may have unit roots, while some may not. The golden rule is that the null hypothesis is rejected if the probability value is significant, which implies that such series is stationary or else the series is non-stationary.

4.3.8.2 The Fisher's ADF test

The Fisher ADF is a panel unit root test, as a development over the LLC and IPS. The test adopts Fisher's non-parametric model to evaluate the p values for cross-section statistics. In the ADF fisher test, the LLC restricted assumptions are relaxed, and information is obtained from individual statistics of cross-section data. The null (Ho) hypothesis is the presence of a unit root as opposed to the alternative hypothesis of the absence of a unit root.

The test operates under the assumption of a limitless number of groups with non-stochastic elements; common T series across sections and unlike the LLC, its critical values are insensitive to lag lengths (it accommodates different lag lengths). The main advantages of this approach are its flexibility and does not necessarily need a balanced panel.

4.3.9 The lag length criteria (Step 4)

Another basic requirement for the estimation of the panel ARDL model is the selection of the optimum lag-length, using the econometric approaches for the estimation, including the Akaike's information criterion (AIC) (Akaike 1973), final prediction error (FPE) (Akaike 1969), Hannan-Quinn criterion (HQC) (Hannan and Quinn 1979) Bayesian information criterion (BIC) (Akaike 1979) and Schwarz information criterion (SIC) (Schwarz 1978). However, this study employed the most used criteria, justified by the majority of results of the criteria selected.

4.3.10 Panel cointegration test - Step 5

Once it is derived from the unit root test that there is stationarity of the variables, then the succeeding step is the cointegration test for the examination of whether the long-run relationship exists among the employed variables. The cointegration approach gives room for heterogeneity across panel members (Revathy and Paramasivam, 2018). In econometric research panel cointegration tests can be carried out in different forms. For a reliable comparative analysis, this study has restricted the test to the three common tests of KAO, Pedroni and Fisher tests.

4.3.10.1 Kao -Panel cointegration test

There are four kinds of DF unit root assessment, as recommended by Chiwa Kao (1997). The first and second are carried out with the assumption of strict homogeneity of the error term of the regression model. Conversely, the third is based on the stringent endogeneity of the error term.

The fourth requires that the estimation is done from the pool of the residual in the regression model. In the KAO test, there are also the assumptions of steady-state achievement of the test statistics and convergence to normal distribution. It requires the adoption of the normal ADF statistics for the acceptance or the rejection of a stated hypothesis. The Null hypothesis (Ho) in KAO is 'there is no cointegration' if the probability value is more than 5%. On the other hand, the alternative hypothesis (H1) is 'there is cointegration' if the probability value is less than 5%, which implies that the null hypothesis is rejected.

4.3.10.2 Pedroni - Panel cointegration test.

This Panel cointegration test as developed by Pedroni (1997) is based on the assumption of heterogeneous panels in the first and second groups. This test employs the residuals of the regression for the estimation of the test statistics, it generates a long run covariance, useful for the determination of the long-run impact. The rule of thumb is the same as in KAO. That when the Null hypothesis is rejected, the alternative hypothesis is upheld, indicating cointegration of the panel and vice versa.

4.3.10.3 Fisher - Panel cointegration test.

Fisher (1932) developed a collective test, which employs the individual self-determining test results. This was further adopted by Maddala and Wu (1999) to postulate an alternative method of testing for cointegration in panel statistical data. The proponent combined individual cross-sectional tests for panel cointegration. The Fisher cointegration test depicts the p-values for the trace test and maximum Eigen test, which is derived from MacKinnon's (1999) $\chi 2$ value. The combination of tests in Fisher is to provide information derived from distinct tests of independent data.

4.3.11 PMG and MG estimation – (Step 6)

In the economic literature it has been debated that the existence of the long-run relationship is only from the perspective of cointegration of cointegrated variables between cointegrated variables (Johansen 1995). Meanwhile, with the use of the Pooled mean Group (PMG) and/ or Mean group (MG) method, panel ARDL is a technique that allows for the estimation of both the short and the long-run relationships between variables. This study employed the PMG method in its analysis of the Panel ARDL. This is because the approach entails lesser restrictions in terms of N and T vis a vis the MG and its performances are relatively better in a smaller sample size than the MG (Pesaran, et al., 1999).

PMG denotes the mean values of an unrestricted cross-section parameter estimation. The approach with an identifiable coefficient, constant and error term in the short run allows the speed of adjustment to vary heterogeneously in the long-run equilibrium while the slope is homogenous. Meanwhile certain necessary conditions are necessary for the application of PMG, which include in the short run, the coefficient of the variables must be negative and not less than -2. In a homoscedastic nature, the stochastic variable must not be correlated with the

regressor. Also, in estimating the ARDL model, T and N must be large enough to avoid biased residuals

4.4 Methodology for objective two

The second objective of this study focuses on the investigation of the transmission mechanism through which monetary policy shocks affect economic growth in ECOWAS. This segment includes the theoretical framework, the methodology by which this objective is achieved stated below, including the justification for its choice. Also included is the definition of the data and sources, as well as methods of estimation.

4.4.1 Model specification for objective two.

The Panel SVAR is derived from the conventional panel Var model. Therefore, following Kutu and Ngalawa (2017), the structure of the economic model is expressed is in the form:

Let ECOWAS member countries be in the notation as stated as follows

$$HY_{it} = N_{i0} + A_1 Y_{it-1} + A_1 Y_{it-1} + \cdots A_p Y_{it-p} + B\varepsilon_{it} \quad \text{……...…….. 4.10}$$

Where H denotes invertible (NxN) matrix; Y_{it} is (Nx1) vector of the endogenous variables, which is further specified that $Y_{it} = Y_{1t}$, Y_{2t}, ... Y_{nt} ; N_{i0} is (Nx1) vector for the constant values, which represents the country-specific intercept subjs; A_j is (NxN) matrix of the coefficients of the lagged value (p) of the endogenous variables and j=1, … p; H is in the form (NxN) matrix with non-zero elements that are off-diagonal ε_{it} denotes the vector error of the error terms.

To ease the problem of estimating the model in equation (4.9), because of the interactions of the current values with their lag values, we reinstate the model into a reduced form by multiplying $(Y_{it})\ by\ (H^{-1})$.

Therefore,

$$Y_{it} = H^{-1}N_{i0} + H^{-1}A_1 Y_{it-1} + H^{-1}A_1 Y_{it-1} + \cdots H^{-1}A_p Y_{it-p} + H^{-1}B\varepsilon_{it} \quad \text{……...4.11}$$

Let $H^{-1}N_{i0} = C_i$, $H^{-1}A_1$, ... , $H^{-1}A_p = D_p$, and $H^{-1}B\varepsilon_{it} = \mu_{it}$ …...……..…..4.12

Hence, in a reduced form

$$Y_{it} = C_i + D_1 Y_{it-1} + D_2 Y_{it-2} + \cdots + D_p Y_{it-p} + \mu_{it} \text{ ……...4.13}$$

In line with Ender (2004), equation (4.12) is the standard panel SVAR with no contemporaneous relationship among the variable and error terms (μ_{it}) is a composite of (Y_{it}) shocks.

In another form, the equation could also be written as:

$Y_{it} = C_i + H(L)Y_{it} + \mu_{it}$ ……..…….. 4.14

Where Y_{it} denotes the vector-matrix of the ECOWAS the selected variables for this study.

Specifically:

$Y_{it} = (RGDP, inf, ms, intr, exc)$ ……..……..…..…….4.15

C_i represents the constant values for the country's intercept, $H(L)$ indicates the matrix of the polynomial lags, which encompasses the interactions between the endogenous variables and the lag values, μ_{it} equals $H^{-1}B\varepsilon_{it}$ representing the vector of the disturbance random effects. Therefore H$\mu_{it} = B\varepsilon_{it}$. …… .4.16

In a structural form, we therefore, impose certain restrictions on the matrices H and B

4.4.2 Shocks identification and ECOWAS modelling

Several authors (including Christiano,et al, 1999, 2005) have identified shocks of the monetary policy to an economy using Cholesky decomposition. Similarly, in this study we apply recursive restrictions to the ECOWAS economy. The recursive VAR involves structural rigidity of the underlying relationships between the variables, which, therefore, leads to the questioning of its ability to appropriately describe the dependencies between the variables of a model. Hence, to eliminate these weaknesses, it is essential to use the SVAR identification method.

The ECOWAS monetary policy equation can be specified in the order: Y= [Real GDP, inflation rate, money supply, domestic interest rate and exchange rate,]. The basis of this ordering centres on the implicit assumption of the monetary authority that some variables may or may not contemporaneously vary with the policy decisions. For instance, Output growth and prices do not respond simultaneously to the monetary policy changes. Similarly, the interest rate does not respond simultaneously to the changes in output growth and the exchange rate. However, the exchange rate has a contemporaneous relationship with the various shocks of all

the variables. These shocks are identified through the imposition of zero restrictions to the matrix coefficients of H and B. Following Allen and Robinson (2015); Amisano and Giannini (2012); Coric, et al, (2015); and Nizamani et al, (2017), the Panel SVAR requires a maximum of n(n+1)/2 or 15 restrictions to matrices A and B altogether. (n= no of variables).

$$\mathbf{H}=\begin{bmatrix} U^{RGDP} \\ U^{Inf} \\ U^{M2} \\ U^{Int} \\ U^{Exh} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ a_{21} & 1 & 0 & 0 & 0 \\ a_{31} & a_{32} & 1 & a_{34} & 0 \\ a_{41} & 0 & 0 & 1 & a_{45} \\ a_{51} & a_{52} & a_{53} & a_{54} & 1 \end{bmatrix} \begin{bmatrix} V^{RGDP} \\ V^{Inf} \\ V^{M2} \\ V^{Int} \\ V^{Exh} \end{bmatrix} \mathrm{B} = \begin{bmatrix} b_{11} & 0 & 0 & 0 & 0 \\ 0 & b_{22} & 0 & 0 & 0 \\ 0 & 0 & b_{33} & 0 & 0 \\ 0 & 0 & 0 & b_{44} & 0 \\ 0 & 0 & 0 & 0 & b_{55} \end{bmatrix} \ldots.4.17$$

This study therefore estimate equation 4.16 with the shock restrictions in equation 4.17

4.4.3 Variables and sources of data for objective two

Various empirical and theoretical literature has identified different domestic monetary policy variables as sources of economic fluctuations including stock of money supply, interest rate, and inflation exchange rate, among others. This study, therefore, employed common variables similar to some of these authors like: Chen and MacDonald, (2012); Popescu, 2012; Coric et al, (2015) and Hur (2017). These variables are defined as follows:

Table 3.2: Variables, description and sources for objective Two

Variable	Description	Sources
***Real GDP rate* (RGDP).**	This is the deflated value of goods and services that are produced an country. It is the product of the nominal GDP and the GDP deflator. The RGDP is used in the study as the proxy for economic growth, which measures the economic effects of the policy shocks in ECOWAS. It is also a variable for further assessment of the validity of the opinion, (Mishkin, 1995) that economic stabilization (both output growth and inflation), is a function of monetary policy for the achievement of Pareto optimality	World Development Indicator (WDI)
Domestic Interest Rate (IR)-	This represents the bank lending rate. It denotes the policy indicator, which is brought into the model as a monetary policy tool (Ngalawa and Viegi, 2011). An instrument used by the monetary authority to regulate the effects of inflation and growth by acting as an incentive or disincentive for commercial banks of the respective countries to borrow from their central banks.	IMF, IFS statistical data
Exchange rate (ER)	This is the value of the national currency per US Dollar. The use of the US Dollar as the yardstick is based on its general acceptability and most traded currency in the exchange market (Ibrahim and Amin, 2005). An increase in the exchange rate implies a depreciation of the country's currency, which implies that the variable has effects on inflation. It is introduced into the model being an open economy. In an open economy the importance of the exchange rate channel in the monetary transmission mechanism cannot be undermined (Goeltom 2008)	IMF, IFS statistical data
Money supply (M2)	This is the monetary base growth rate. It is the aggregate money supply rate, representing the total money in circulation plus demand deposit plus time deposit (i.e. Broad money) in all the countries under study. This is incorporated into the model as an intermediate monetary policy target	IMF, IFS statistical data
Inflation Rate (INF)	This is the general increase in the price level. This is the consumer price index (base year 2000=100) of goods and services consumed by each country. The RGDP, is a key macroeconomic variable commonly used to measure economic stability (IMF 2018). According to literature, the inflation rate may be affected through the flexibility of the exchange rate (Bernanke 1990), hence it serves as a control variable by which macroeconomic targets are achieved.	IMF, IFS statistical data

Source: Author's computation

4.4.5 Estimating technique for objective two

The estimating technique of the second objective is the Panel SVAR, as specified in the model. The Panel SVAR approach allows for the interaction of all the employed variables among themselves devoid of the dependent variable or independent variables. That is, at random all variables are treated as endogenous variables and equally as dependent variables. Its results are interpreted using the generated impulse responses and Variance decomposition (Elbourne, 2008). There are two methodologies to the model viz: the ordinary panel VAR, which is done without imposing restrictions on the shocks and the panel Structural VAR, which involves the imposition of restrictions on the identified shocks.

As a result of policies that do not have an immediate impact on the macro-economic variables, but with some lags, restrictions are imposed on orthogonal matrix and P-matrix in the short run contemporaneous shocks or on the accumulated impacts in the long run. Accordingly, Panel-SVAR may not respond contemporaneously across all variables selected for the model, as a result of the policy-effects lag (see Kim and Roubini, 2003 and Killian and Vigfusson, 2009).

4.4.6 Panel SVAR unit root test (Step1)

All the variables in the model must be stationary, similar to the panel ARDL estimating techniques. They are either stationary at levels or after the first difference. This has been broadly discussed under section 4.2.8.

4.4.7 Optimal lag length selection (step 2)

The selection of the optimum lag is another important step in the Panel SVAR model, the purpose of which is to minimize the residual correlation (Stock and Watson, 2001**)**. There are various criteria in the economic literature but in this study, we have limited the tests to LR, EPE, AIC, SC and HQ, while the mode of selection has been the popular choice of lag.

4.4.8 Modelling Panel SVAR (Step 3)

The SVARs are multivariate, linear illustrations of a vector of observations with lags. They are purposely designed for the recovery of economic shocks from observations with the imposition of some basic assumptions like other models. Two essential equations are hypothesizing the relationship between variables and that which must be solved viz: structural and reduced forms of equations.

4.4.9 Structural and reduced equations (Step 3)

The structural form of the equation in SVAR is based on the economic theories derived from several macro-economic policies and behaviour. These equations rely on some set of economic models. Thus, in ordinary VAR the problem of contemporaneous relationships is not generic between variables. The reduced form of the equation is derived from the simplified dependent variables such that endogenous variables, which also depend on the exogenous variables.

The reduced forms in often described as non-structural analysis. On the other hand, the non-reduced equations are also referred to as structural analysis. The reduced form is obtained through economic theory, intuitions, and inferences to identify established relationships to

obtain an equation that postulates relationships between the dependent and explanatory variables. Hence, with the use of econometric techniques the relationships are verified if they can be established from the data. The empirical application of the model justifies its employment (Killian and Vigfusson, 2009).

4.4.10 Model Specification-Panel SVAR (Step 4).

The Panel SVAR employed in this study is preferred to VAR and other relater models because, it captures the dynamic behaviour of all the variables in the model. Also, the estimation of the parameters is more efficient in SVAR and the rationale for the imposition of restrictions to identify the monetary policy shocks is equally provided, making it a more powerful instrument for analysing macroeconomic policy. Apart from the restrictions, the main assumption in panel SVAR is that all the variables are endogenous, and more variables can be accommodated without the risk of the degree of freedom. Various studies have employed this technique including Omolade (2014), Kutu and Ngalawa, (2016); Akande and Kwenda (2017), among others. This is the phase dealing with the identification and estimation of the model. The details are as explained in the section 4.4.11 Imposition of restrictions- Panel SVAR (Step 5).

This is the last step of the SVAR estimating techniques. At this stage restrictions are imposed on the relevant elements of the Matrices. There are three common restrictions in the economic literature viz: sign restrictions, Short-run restrictions, and long-run restrictions. This study identifies monetary policy shock in Panel SVAR through the systematic restrictions of the elements. Specifically, we imposed zero (short-run) restrictions on the appropriate variables in the matrices above.

4.4.11 Impulse Response Function (IRF)- Panel-SVAR

Essentially, the generated outputs from the model containing the Impulse response function (IRF) as well as the Variance decomposition (FEVD) are the relevant tools of analysis in this study. IRFs illustrate the outcome of endogenous macro-economic variables relative to a particular shock over a period. That is, they indicate the reactions of macro-economic variables to a particular disturbance/ shock hitting an economy. In this study we would employ the IRFs

to analyse the effects of the shocks emanating from monetary policy instruments on economic growth and economic stability in ECOWAS.

The IRF describes the impact of one standard deviation of shocks on the dependent variable, precisely on the error term constituting the panel SVAR (Stock and Watson, 2001 and Elbourne, 2008). In this study we employed the multivariate version of the IRF with structural factorisation through Cholesky orthogonalization.

4.4.12 The forecast error variance decomposition (FEVD)

The FEVD, also known as variance composition, shows the proportional contributions of each variable to other variables in an autoregressive analysis. It indicates the quantity of the variance of the forecast that each of the variables employed in the SVAR can be accounted for by the exogenous shocks of other variables at a period (Stock and Watson, 2001). The proportional effect can be interpreted in percentages

4.5 Research methods for objective Three.

The third objective of this study assessed the potency of the monetary policy at different regimes of the business cycle, specifically at expansion and contraction regimes in ECOWAS. The model specification and justification for the choice of the model and other steps are as discussed below.

Several studies have used linear models such as moving average (MA), autoregressive (AR) and mixed autoregressive moving average (ARMA) models, which are not without their drawbacks. For instance, their weaknesses include, among others, the inability to measure asymmetry, volatility clustering and amplitude dependence (Arora, 2011). Thus, for the past 2 decades there is an increased knowledge of applying non-linear, parametric time series models for the economic analysis of the business cycle, including Smooth Transition Autoregressive models, Threshold Autoregressive models and Markov switching Autoregressive models. These models have addressed several questions relating to business cycles, which among others include: the asymmetries of the business cycle, dating and measuring the business cycle, response of output and other macroeconomic variables in the business cycle, whether or not the business cycle matters, how responsive is a business cycle to negative shocks, turning points and forecasting in business cycle dynamics (see Milas et al. 2006; Alexandrov et al., 2010 and Dagum, 2010). Most of these models are not without their limitations as some were limited to time series data, while some were based on linear models.

Thus, this study intends to bridge this gap and for better economic analysis, the study employs Markov switching VAR model to estimate the trend cycles of a parametric non-linear model for the West African region, where there are limited studies.

Specifically, the use of parametric models like the Markov switching VAR approach brings about the identification of different regimes and these regimes differ concerning their average growth rates and /or their volatilities. In this study, we identified two regimes in these countries and investigated whether the selected economies operate under any similar business cycle(s) and ascertain the probability of stirring from one regime in the business cycle to another. In addition, apart from the associated merits of nonlinear models, the employment of the Markov Switching Model in this study is based on the premise that the model is not only flexible for the dynamic structure of any empirical observation, but parsimoniously capable of capturing the dynamic effects of switching from one regime to another.

The model has been used by various authors for similar empirical analysis, including Peersman and Smets, (2005), Manera and Cologni, (2006); and Lange (2018), among others. Meanwhile, the model employed in this study is similar to Kutu and Ngalawa (2017) but we extended the model to include two other major independent variables of monetary policy, which are the inflation rate and the exchange rate. This is due to their impact on the real GDP which is our dependent variable. Also, the inclusion of AR(1) to AR(4) in our model gives more reliable economic estimates. Although Kim et al., (2008) proposed a kind of the Markov Switching model that captures more than two regimes, however this study is limited to the only two-phase regime (contraction and expansion regimes) to investigate the asymmetric effects of monetary policy in different regimes in the region.

4.5.1 Estimating technique for objective 3

4.5.1.1 The switching technique

The methodology adopted in this study for the achievement of the third objective is the Markov switching model. It was introduced by Goldfeld and Quandt (1973) and further developed by and Hamilton (1989), applicable to time series data analysis. Given a dependent variable y_t,and x_t as the independent variable. t = 1…T Where T represents the sample period. Therefore both variables y_t,and x_t could be scalar, vector or matrix.

In a latent state of S_t taking the value of k∈{1,2,,K}, where K denotes a positive integer for a number of states. S_t being the latent state is the regime indicator. The distributing probability

of S_t routed through S_{t-1}, S_{t-2}, is a function of the recent state, which is S_{t-1}. The *transition probability* can be defined as:

$Pr(S_t = j | S_{t-1} = i, S_{t-2}, \ldots, S_1) = Pr(S_t = j | S_{t-1} = i) = P_{ij}$. ……………………………………….. 4.17

Where i,j=1,…,K. Therefore, if the process is at state i at time t−1, the probability of staying at state j at time t would be equal to P_{ij} (Song and Wozniak (2021).

This study considers the switching regression type of Hamilton (1989), regime two switching regression. In this estimating technique the Markov switching state procedure with the lagged state provides the needed information for identification, which is uncorrelated with the existing regression error. Other information is acquired once the transition probabilities of the switching procedure are affected by exogenous variables. Like the case of "time-varying transition probability.

4.5.1.3 Filtering Technique

This is the last step in this segment, necessary to complement the empirical analysis. The HP is a common macroeconomic smoothing process for the estimation of a long-term trend element of a series. A method postulated by Hodrick and Prescott (1997) for the analysis of post-war. Technically, the HP filter operates with a dual lineal filtter, which calculates the smoothed series through the minimisation of the variance but is subject to the constraints of the second difference as may be selected by the HP filter to minimise. Since this study is employing quarterly data in its estimation, the standard of setting the lambda parameter at 1600 is adopted.

4.5.2 Model specification

Following the framework of the Markov Switching Model (MSM) of Peersman and Smets, (2001), on the effects of Monetary policy in seven countries in the Euro area, where the deviations of the output growth from its mean follow the p^{th} order of the autoregressive process, as may be stated below:

Consider a regime model

$y_t = g\,(x_t\ , y_{t-1}, y_{t-p,} s_t, s_{t-1} \ldots\ s_{t-p}) +\ \sigma_{st}\varepsilon_t$ -- 4.18

ε_t ~iid N(0,1).

Where g (.) is a conditional mean function, $y_t = Scalar$

x_t = KX1 vector of observed (exogenous variable)

$s_t \in$ (0,1, … N-1) an integer-valued state variable

For a regime-switching autoregression

$y_t = \mu_{st} + \phi_1 (y_{t-1} - \mu_{st-1}) + \phi_2 (y_{t-2} - \mu_{st-2}) + \cdots + \phi_p (y_{t-p} - \mu_{st-p}) + \sigma_{st}\varepsilon_t$ ……..4.19a

$y_t - \mu_{st} = \phi_1 (y_{t-1} - \mu_{st-1}) + \phi_2 (y_{t-2} - \mu_{st-2}) + \cdots + \phi_p (y_{t-p} - \mu_{st-p}) + \sigma_{st}\varepsilon_t$ .. …….4.19b

The regime-switching can be reduced to:

$y_t = x_t'\beta_{st} + \sigma_{st}\varepsilon_t$ ----------4.20

Like Bazzi et al., (2017) the Markov process with time-varying transition probability:

$\wp_{ij,t=} \wp_r (s_t = iIs_{t-1} =$ j, $Z_t)$ ---------- 4.21

The disturbance term is independent of the latent variables at leads and lags

E $(\varepsilon_t \Omega_{i,t+r})$= 0, $\forall_t, , i, \Gamma$ .And $\forall_t, i, \Gamma \neq 0$ ---------- 4.22

s_t is contemporaneously correlated with ε_t $\forall$

If the joint probability between ε_t and $\Omega_{i,t}$ is bivariate:

$$\begin{bmatrix} \Omega_{i,t} \\ \varepsilon_t \end{bmatrix} \sim N \begin{bmatrix} 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 & \wp_i \\ \wp_i & 1 \end{bmatrix}, \quad i = 1, 2 \ldots . N-1$$

The endogenous switching is being controlled by $\wp_i$ parameters, i=1…N-1

4.5.3. Transition probability

Then the transition probabilities shall be in the form:

f($\Omega_{1,t,}$ $\Omega_{2,t\ldots} I\varepsilon_t$) = $f_1 (\Omega_1 I\varepsilon_t) f_2 (\Omega_{2,} I\varepsilon_t) \ldots f_{N-1}(\Omega_{N-1t,} I\varepsilon_t)$ …… 4.23

Where $\Omega_{1,t} I\varepsilon_t \sim N(\wp_i \varepsilon_t \sqrt{1 - +\wp_i{}^2})$

Generally, the matrix of the transposition probabilities is

$$\wp = \begin{bmatrix} \wp_{00} & \wp_{01i} \cdots & \wp_{0N-2} \\ \wp_{10} & \wp_{11} \ddots & \wp_{1N-1} \\ . & . & . \\ . & . & . \\ . & . & . \\ \wp_{N-10} & \wp_{N-11} & \wp_{N-1\,N-1} \end{bmatrix} \text{..... 4.24}$$

At Recession: $\wp_{00} = \wp\,[s_{t+1} = 0 I s_t = 0] = \frac{\exp(\phi_0)}{1+\exp(\phi_0)}$

At Expansion: $\wp_{11} = \wp\,[s_{t+1} = 1 I s_t = 1] = \frac{\exp(\phi_1)}{1+\exp(\phi_1)}$

The economic interpretation is as follows: At Recession, the probability will be $\wp_{00}$, which implies that the series would be at state 0 (i.e. Recession) at time t and would remain at same o at time t+1. $\wp_{01}$ implies that the series would be at state 0 at the time t and transit to state 1 (i.e. Expansion) at time t+1. $\wp_{10}$ depicts that the series is at state 1 at time t and transit to state 0 at time t+1. $\wp_{11}$ Means that the series is at state 1 at time t and remains at the same 1 at time t+1.

4.5.4 Average duration of a regime

In line with Peersman and Smets (2005) for the estimation of each country i the equation will be as stated below in a reduced form:

$$y_{it} = (\alpha_{i0}\wp_{0,t} + \alpha_{i1}\wp_{1t}) + \phi_{i,1}\, y_{i,t-1} + \phi_{i,2}\, y_{i,t-2} + (1 - \phi_{i,1} - \phi_{i,2})(\beta_{i,0}\, p_{0,t-1}\, MP_{t-1} + \beta_{i,1}\, \wp_{1,t-1}\, MP_{t-1})\, \varepsilon_{i,t}. \text{ ..... 4.25}$$

Where y_{it} denotes the real output growth rate per annum

I = individual selected country i

MP_t = Policy indicator

$\wp_{0,t}$ = Probability at recession

$\wp_{1,t}$ = Probability at expansion

Hence $\wp_{0,t} + \wp_{1t} = 1$

Following Subagyo et al (2016), in this study we estimated the Markov Switching model by employing the growth rate means switching with error that follows a regime invariant AR(4). It is assumed in the model that the error variance is common during the regime. We used the real GDP as the leading indicator and other four monetary policy tools as predictors.

4.5.5 Trends and cycles

To investigate the business cycles in an observed data set, it is imperative to segregate the cyclical components from the trends. Regression or filtering are commonly used for the decomposition of the observed data into trends and cycles. Indeed, there are various approaches to identify the business cycle, which can be grouped into three broad methods. First, the classical method for the identification of the contraction and expansion of economic activity and the determination of the turning points (Burns and Mitchell 1946). Second, the deviation method with statistical filters like HP filters, used to produce new stochastic variables from the cyclical component of the original tended series. (Hodrick and Prescott, 1997). Third, model-based methods like SVAR analysis, (Du Plessis et al 2007), and Markov switching, for the identification of the economic cycle, is based on theoretical priors.

However**, t**his study employs Hodrick-Prescott (HP filter) to decompose the observed macroeconomic variables into trends and cycles for clearer economic analysis. A macroeconomic tool is used to extract the components in trend from a time series as it gives room for the smoothness of the parameters of the model. The application of Hodrick-Prescott filter estimation has become a paradigm in various economic analyses of a business cycle. It has been a subject of significant discussion and commendation in the context of business cycle estimation. It has not only been the most widely used detrending method in macroeconomics, but also offers a simplified solution to the basic need in economic policy formulation and monitoring (Kaiser and Maravall, 2002).

Originally, the detrending estimate from the optimization problem is as follows:

$y_t = r_t + c_t$ 4.26

Min $(r_t)\ \Sigma(y_t - r_t)^2 + \lambda\ \Sigma(r_t - 2r_t - r_{t-1})^2$ 4.27

Where: r_t and c_t represent the trend and cyclical component, respectively.

Relative to the function of our data period, the appropriate frequency power for the smoothing of the parameters (λ) is put at 1600, being a quarterly data set.

4.5.6 Definition of variables for objective three

The variables employed for the estimation of this objective are the same as defined in section 4.4.3

4.5.7 Sources of data

Similarly, the sources of data are as stated in section 4.4.4

In brief, this chapter discussed the methods employed for the achievement of each objective, including the variable definitions and scope. Firstly, we stipulated the panel ARDL model for purpose of achieving the first objective, which is to investigate both the internal and external determining factors of the monetary policy rate in ECOWAS. Secondly, we specified the Panel SVAR for the achievement of the second objective, which centres on the investigation of the transmission mechanism through which monetary policy shocks affect economic growth in West African countries. Thirdly, we stated the model adopted for the accomplishment of the third objective, which is Markov switching VAR to estimate the transmission probability and average period of switching from one regime to the other. Moreover, in this section, **t**his study employs Hodrick-Prescott (HP filter) to decompose the observed macroeconomic variables into trends and cycles for clearer economic analysis.

CHAPTER FIVE

PRESENTATION AND INTERPRETATION OF EMPIRICAL RESULTS

This chapter considers the presentation and interpretation of empirical results, including the appropriate economic implications. Also, each section deals with empirical results of each objective. Thus, the first section, after this introduction, (5.1) discusses the determinants of monetary policy, considering both internal and external factors on ECOWAS economy. The second section (5.2) encompasses the investigation of the transmission mechanism through which monetary policy shocks affect economic growth in West African countries. The third section (5.3) relates to the assessment of the potency of the monetary policy at different regimes at expansion and contraction regimes of the business cycle in ECOWAS.

5.1 Analysis of determinants of monetary policy rate in ECOWAS -objective one

The first objective of this study is to investigate the determinants of policy rate (Interest rate), considering both the internal and internal variables in ECOWAS. Panel ARDL is employed to capture the existence of the short and long run relationships. Basically, this commenced with the presentation of descriptive statistics to give the summary of the data employed and the conduction of panel unit root test to determine the fitness of the variables employed for the panel model. This is followed by Panel ARDL Estimation and Cross-sectional Short run Estimation.

5.1.1 Descriptive statistics of the determinants of monetary policy rate in ECOWAS– objective one

The descriptive statistics of the ECOWAS region has been analysed in two separate panels of WAMZ and WAEMU sub regions respectively.

5.1.1.1 Descriptive Statistics -WAMZ

Table 5.1 Shows the summary of the result of the descriptive statistics for the 608 observations for WAMZ. It indicates the statistics relating to the mean, medium, maximum, minimum, standard deviation, and skewness of the distribution in WAMZ.

The mean values of the variables of MPR, GPR, FFR, TOP, INF and EXCH are nearer to their respective minimum values than the maximum. This implies that the data set for WAMZ are concentrated at the lower band of the distribution. The outliers of the mean value of inflation signifies high inflation rates in this zone. Similarly, the exchange rates are relatively high in

these countries. The value of the probability affirms that the data distribution is free of heteroscedasticity of the model, which is at a significance level of less than 1%. This implies that both the data and the residuals used for the modelling WAMZ are normally distributed.

The high standard deviation of the policy rates indicates that the data points are spread out over a large range of values. The data set skewed to the right as they all have positive values. Nonetheless, the normality tests of the Jarque-Bera, and Kurtosis show normality

Table 5.1: Summary of statistics WAMZ

	MPR	GPR	FFR	GDP	TOP	INF	EXCH
Mean	17.92576	3.51173	4.799211	1.10E+10	0.015075	159.1443	186.4020
Maximum	63.78776	4.807921	19.10000	1.40E+11	0.064261	1164.991	2679.101
Minimum	0.546875	2.406044	0.070000	68296103	5.64E-05	0.032330	0.000503
Std Dev.	10.47561	0.658957	4.101932	2.70E+10	0.012309	202.0396	468.4798
Skewness	1.380301	0.444116	1.005421	3.279231	1.534223	2.139098	3.042942
Kurtosis	6.954056	2.076216	4.198264	12.85820	5.159081	8.406940	11.98577
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Observations	608	608	608	608	608	608	608

Source: Author's computation from data, 2021

5.1.1.2 Descriptive Statistics -WAEMU

The result of the descriptive statistics for the 1216 observations for WAEMU is as depicted in Table 5.2 The mean values of the variables of GPR, FFR, GDP, TOP and INF are nearer to their respective minimum values than the maximum. This implies that the data set for these variables concentrated at the lower band of the distribution. Exceptionally, MPR and Exchange rate show that they are closer to their maximum values, which implies that they are concentrated at the upper band. It also implies that they are relatively high during the period. The value of the probability supports that the data distribution is free of heteroscedasticity of the model, which is at a significance level of less than 1%. This indicates that both the data and the residuals used for the modelling WAEMU are normally distributed. The data set for the variables skewed to the right as they all have positive values, except MPR, INF and EXCH with negative values of -0.263870, -0.366895 and -0.544514 respectively. In addition, the normality tests of the Jarque-Bera, and Kurtosis show normality. Generally, there is low standard deviation recorded in GPR, FFR, GDP, and TOP, which indicates that their data sets are clustered around the mean, whereas, the data sets for INF and EXCH show high standard

deviations indicating that data points are more spread out. The volatility of the inflation rate might have accounted for these outliers.

Table 5.2: Summary of statistics WAEMU

	MPR	GPR	FFR	GDP	TOP	INF	EXCH
Mean	17.45924	3.511737	4.799211	1.574984	0.139686	92.03802	179.6404
Maximum	21.89765	4.807921	19.10000	13.31875	1.011928	161.2000	247.5698
Minimum	11.53125	2.406044	0.070000	0.085156	0.025524	0.061145	60.57124
Std Dev.	2.872587	0.658685	4.100244	1.807875	0.124042	37.96208	37.97479
Skewness	-0.263870	0.444116	1.005421	2.791860	3.575593	-0.366895	-0.544514
Kurtosis	1.917477	2.076216	4.198264	14.38668	18.91516	2.409953	2.340472
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Observations	1216	1216	1216	1216	1216	1216	1216

Source: Author's computation from data, 2021

5.1.2 Panel unit root tests results

Another important pre-condition required for the estimation of the data panel analysis is the conduct of the unit root test for the variables employed. The lm Pesaran & Shin (IPS) and ADF Fisher panel unit root test presented in table 5.3 showed the nature of stationarity of variables used in the study, both for the WAEMU countries and WAMZ countries.

As depicted in Table 5.3 the data fulfils the requirement of stationarity of variables after the first difference. Technically, a non-stationary series contains unit roots and such series have the inclination of sustaining shocks. The converse is the case for a stationary series (a series that does not contain unit-roots). It is important that all the series are integrated in the same order before the error-correction based panel cointegration can be applied.

As reported in Table 5.3, the selected variables reflect integrating order one. Specifically result showed that for WAEMU countries, MPR, FFR, GPR, EXC, INF, and GDP are stationary after first difference, that is integrated of order one I(1). By implication, the unit root test reflects that the variables retained innovative shock passed on them for a short period.

In the case of the WAMZ countries all variables are integrated of order one. Thus, the unit root test reflects those variables included in the model of the study are integrated of order one, which conforms to one of the conventional requirements of ARDL estimation.

Table 5.3: Panel Unit Root Test

Variables	Panel Unit Root Test (WAEMU)			
	Im, Pesaran and Shin (IPS)		*ADF Fisher*	
	IPS Stat	Order of Integration	ADF Stat	Order of Integration
MPR	-9.99474*	I(1)	137.166*	I(1)
FFR	-4.93642*	I(1)	53.7879*	I(1)
GPR	-16.7623	I(1)	282.410*	I(1)
TOP	-14.5173*	I(1)	27.5790**	I(1)
EXC	-9.23070	I(1)	123.157	I(1)
INF	-8.57594	I(1)	110.620	I(1)
GDP	-8.84173*	I(1)	116.718	I(1)
	Panel Unit Root Test (WAMZ)			
	Im, Pesaran and Shin IPS		*ADF Fisher*	
	IPS Stat	Order of Integration	ADF Stat	Order of Integration
MPR	-8.22272*	I(1)	84.1223*	I(1)
FFR	-6.74626*	I(1)	63.3717*	I(1)
GPR	-12.4043*	I(1)	150.434*	I(1)
TOP	-16.8617*	I(1)	221.765*	I(1)
EXC	-2.24664*	I(1)	28.7756*	I(1)
INF	-3.10159*	I(1)	26.4233	I(1)
GDP	-6.78150	I(1)	64.8565	I(1)

Source: *Author's Computation, (2021)*

5.1.3 Panel cointegration test

Table 5.4 shows the summary of panel co-integration tests of Kao, Pedroni and Fisher conducted in this study. Results reported for both monetary union and monetary zone showed validation for rejection of null hypothesis of 'no co-integration' between policy rate and determinant variables included into the model of the study and fails to reject the alternative hypothesis that there is a long run cointegration relationship among the variables in the model. This is therefore evident in the panel data sets suggesting long run relationship amongst the variables. Specifically reported statistics for monetary union stood at -6.370641($p < 0.05$) for Kao adf stat, 2.157605 ($p< 0.05$), and -2.581344 ($p < 0.05$) for Pedroni v-stat and ADF-stat, while Fisher result stood at 53.60($p< 0.05$) and 39.37($p< 0.05$) for trace and max eigen stats respectively. For monetary zone, result stood at -5.416045($p< 0.05$) for Kao adf stat, -

0.017833($p > 0.05$) and -3.898753($p < 0.05$) for Pedroni v-stat and ADF-stat, while Fisher result stood at 91.55 ($p< 0.05$) and 58.39($p< 0.05$) for trace and max eigen stats respective.

Table 5.4: Panel Co-integration Test

MONETARY UNION				
s/n	Tests	Stats	Stat Values	Prob
1	KAO TEST	(ADF-stat)	-6.370641*	0.0000
2	PEDRONI TEST	(v-stat)	2.157605*	0.0155
		(ADF-stat)	-2.581344*	0.0049
3	FISHER TEST	(Trace stat)	53.60*	0.0000
		(Max-eigen stat)	39.37*	0.0010
MONETARY ZONE				
s/n	Tests	Stats	Stat Values	Prob
1	KAO TEST	(ADF-stat)	-5.416045*	0.0000
2	PEDRONI TEST	(v-stat)	-0.017833	0.5071
		(ADF-stat)	-3.898753*	0.0000
3	FISHER TEST	(trace stat)	91.55*	0.0000
		(Max-eigen stat)	58.39*	0.0000

Note:* connote significance at 5% level of significant; (Fisher test report test with respect to rejection of 'none' cointegrating equation, details for other no of cointegrating equation is contained in the appendix)

Source: *Author's Computation (2022).*

In summary, there is strong evidence in support of co-integration between interest rate and determinant variables identified in the study. Thus, investigation into the long run equilibrium interrelationship between interest and the determinant variables is methodologically valid using panel ARDL estimation that can trace both long run and short run positions. Hence, this study engaged panel ARDL estimation in this respect.

5.1.4 Panel ARDL estimation

Following the order of integration of set of variables included in the study as established by the unit root test reported above. Panel ARDL model was estimated for both sub-regions (Table 5.5) reflecting both the long run and short run effect of determinant variables identified in this study on the monetary policy rate. The global oil price and the Federal funds rates are the two exogenous variables introduced in this estimate which the ECOWAS member counties do not

have control over, while other variables including trade openness, exchange rate, inflation and growth can be controlled by these countries.

Estimation result for the WAEMU countries revealed that on the long run variables including exchange rate, inflation rate and gross domestic product exert significant positive effect on the policy rate. Specifically, result showed that other things held constant, 1% increase in exchange rate, inflation rate and gross domestic product of WAEMU countries respectively, will culminate into about 0.272890%, 0.027397% and 0.043330% increase in policy rate on the long run, ceteris paribus. On the short run however, result showed that federal fund rate (FFR), federal fund rate lagged by a period FFR(-1), and global oil price lagged by a period GPR(-1) exert significant negative effect on policy rate to the tune of -0.001953%, -0.006129% and -0.018518% respectively.

For West Africa Monetary Zone countries, result showed that on the long run global oil price (GPR), exchange rate (EXC), inflation rate (INF) and gross domestic product (GDP) exert significant influence on policy rate. Specifically, result revealed that while global oil price and inflation rate exert significant positive influence on policy rate with reported coefficient estimates of 1.073791($p < 0.05$) and 0.304021 ($p< 0.05$) respectively. Exchange rate and gross domestic product exert significant negative impact on policy rate with coefficient estimate of -0.275919 ($p < 0.05$) and -0.391941($p < 0.05$) respectively.

With regards to the external variables of GPR and FFR, it is evident from the estimate that GPR significantly drives the monetary policy rate in WAMZ and not in WAEMU. This may not be unconnected with the flexible exchange rates being operated by the WAMZ member countries (as opposed to non-flexible exchange rates in WAEMU), more so that oil price has positive correlation with the policy rate.

Table 5.5: PMG Estimation Result

Variables	(WAEMU)		(WAMZ)		
	Long Run estimates		*Long Run estimates*		
	Coefficient	Probability	Variables	Coefficient	Probability
FFR	-0.013096	0.1130	FFR	-0.027838	0.1981
GPR	0.065238	0.2997	GPR	1.073791*	0.0003
TOP	0.004432	0.8665	TOP	-0.075586	0.2226
EXC	0.272890*	0.0000	EXC	-0.275919*	0.0000
INF	0.027397*	0.0003	INF	0.304021*	0.0000
GDP	0.043330**	0.0543	GDP	-0.391941*	0.0000
Short Run Estimates			*Short Run Estimates*		
Variables	Coefficient	Probability	Variables	Coefficient	Probability
COINTEQ01	-0.052698*	0.0000	COINTEQ01	-0.098084*	0.0092
D(MPR(-1))	0.518290*	0.0000	D(INTR(-1))	0.413601*	0.0000
D(FFR)	-0.001953*	0.0066	D(INTR(-2))	0.100768*	0.0010
D(FFR(-1))	-0.006129*	0.0000	D(FFR)	-0.008631	0.1397
D(GPR)	0.002818	0.6221	D(GPR)	-0.027218	0.3552
D(GPR(-1))	-0.018518*	0.0012	D(TOP)	0.046061	0.3412
D(TOP)	0.001395	0.6162	D(EXC)	-0.717767	0.1098
D(TOP(-1))	0.000184	0.9486	D(INF)	1.876413	0.2313
D(EXC)	0.056279	0.7129	D(GDP)	-0.021720	0.8144
D(EXC(-1))	0.027815	0.8549	C	0.796645	0.0104
D(INF)	-0.222735	0.1988			
D(INF(-1))	0.112213	0.5126			
D(GDP)	0.022734	0.2801			
D(GDP(-1))	-0.029136	0.1434			
C	0.069287	0.0000			

*implies significant. **Source:** *Author's Computation, (2021)*

5.1.5: Cross-sectional short run estimation result (WAEMU)

Also covered in this study as reported in table 5.6, result showed that on the short run variables including federal fund rate, global oil price, trade openness, exchange rate, inflation rate, and gross domestic product are core determinants of policy rate for each of countries in the west Africa, economic and monetary union, given the significant coefficient estimates corresponding to each of the determinant variable included in the model for all the 8 WAEMU countries.

More specifically, result showed that on the short run 1% change in federal fund rate, (one of the exogenous variables in the model) will culminate into about 0.002347%, 0.00284%, 0.00311%, 0.00197%, 0.00306%, 0.00397%, 0.00269%, 0.00197% change in policy rate of Benin, Burkina Faso, Cote D'ivoire, Guinea Bissau, Mali, Niger, Senegal and Togo respectively. The reported percentage change in policy rate as a result of changes in federal fund rate is statistically significant across all the WAEMU countries covered in this study.

For global oil price, the second exogenous variable employed in this study, which cannot be controlled by the sub-region, the report from the short run coefficient estimates reflects that for every 1% change in global oil price, policy rate will change by about 0.02726%, 0.01199%, 0.007858%, 0.01471%, 0.009285%, 0.002943%, 0.012887%, and 0.023389% in Benin, Burkina Faso, Cote D'ivoire, Guinea Bissau, Mali, Niger, Senegal and Togo respectively. The reported percentage change is statistically significance for all WAEMU countries.

For trade openness, reported percentage change in policy rate for every 1% change in trade openness stood at 0.010083%, 0.00535%, 0.002044%,-7.41E-0%, 0.001120%, 0.010187%, -0.00592%, -0.01441 for Benin, Burkina Faso, Cote d'ivoire, Guinea Bissau, Mali, Niger, Senegal and Togo respectively, result showed that the reported percentage change in response to change in trade openness is significant for all the WAEMU countries covered in the study except for Guinea Bissau,

For exchange rate reported percentage change in policy rate for every 1% change in exchange rate stood at 0.12718%, 0.621844%, 0.62198%, 0.097999%, 0.22538%, 0.14376%, 0.037089%, 0.120334% for Benin, Burkina Faso, Cote d'ivoire, Guinea Bissau, Mali, Niger, Senegal and Togo respectively. Similar to Andries et al.,(2017) and Berument and Gunay (2003), the result showed that in the short run percentage change in policy rate in response to

changes in exchange rate is significant for all the WAEMU countries covered in the study except for Senegal.

For inflation rate reported percentage change in policy rate for every 1% change in inflation rate stood at 0.36291%, 0.72850%, 0.590069%, 0.016245%, 0.082750%, 0.23055%, 0.293347%, 0.08852% for Benin, Burkina Faso, Cote d'ivoire, Guinea Bissau, Mali, Niger, Senegal and Togo respectively. Result showed that in the short run percentage change in policy rate in response to changes in inflation rate is significant for all the WAEMU countries covered in the study except for Senegal.

For gross domestic product, reported percentage change in policy rate for every 1% change in gross domestic product stood at 0.06188%, 0.013678%, 0.026093%, 0.001620%, 0.09411%, 0.035590%, 0.035590%, 0.05249%, 0.092633% for Benin, Burkina Faso, Cote d'ivoire, Guinea Bissau, Mali, Niger, Senegal and Togo respectively.

Table 5.6: Cross-sectional Short Run Estimation Result (WAEMU)

Variables	Benin	Burkina Faso	Cote D'ivoire	Guinea Bissau	Mali	Niger	Senegal	Togo
COINTEQ01	-0.11289*	-0.02542*	-0.05057*	-0.08495*	-0.04345*	-0.03087*	-0.03716*	-0.05145*
D(MPR(-1))	0.223805*	0.56650*	0.628397*	0.54212*	0.529072*	0.532005*	0.520265*	0.52855*
D(FFR)	0.002347*	-0.00284*	-0.00311*	-0.00197	-0.00306*	-0.00397*	-0.00269*	-0.00197*
D(FFR(-1))	-0.01011*	-0.00520*	-0.00522*	-0.0066*	-0.00804*	-0.00674*	-0.00369*	-0.00509*
D(GPR)	-0.02726*	-0.01199*	0.007858*	0.01471*	0.009285*	0.002943*	0.012887*	0.023389*
D(GPR(-1))	0.001056**	0.01128*	-0.02568*	-0.0276*	-0.02021*	-0.03701*	-0.02319*	-0.02592*
D(TOP)	0.010083*	0.00535*	0.002044*	-7.41E-0	0.001120*	0.010187*	-0.00592*	-0.01441*
D(TOP(-1))	-0.01473*	-0.00725*	-0.00419*	0.002429*	0.001870*	0.005825*	0.006887*	0.007662*
D(EXC)	-0.12718*	0.621844*	-0.62198*	0.097999*	-0.22538*	-0.14376*	0.037089	0.120334*
D(EXC(-1))	0.374754*	-0.35399*	0.646415*	-0.09376*	0.185349*	0.313046*	0.233842*	-0.06922*
D(INF)	-0.36291*	-0.72850*	0.590069*	0.016245*	0.082750*	-0.23055*	-0.293347	-0.08852*
D(INF(-1))	0.056570**	0.534566*	-0.73066*	0.007129*				
D(GDP)	-0.06188*	0.013678*	0.026093*	-0.001620	0.09411*	0.035590*	-0.05249*	0.092633*
D(GDP(-1))	0.073479*	-0.01658*	-0.05383*	-0.001983	-0.06378*	-0.05127*	0.031794*	-0.09442*
C	0.149024	0.03385*	0.070126*	0.107084	0.057417*	0.042416*	0.048450*	0.069360*

*Implies significant. **Source:** *Author's Computation, (2021)*

Table 5.7: Cross-sectional Short run Estimation Result (WAMZ)

Variables	Gambia	Ghana	Nigeria	Sierra Leone
COINTEQ01	-0.170874*	-0.028428*	-0.154490*	-0.038543*
D(MPR(-1))	0.438455*	0.460461*	0.402253*	0.353236*
D(MPR(-2))	0.016394**	0.100694*	0.158402*	0.127582*
D(FFR)	-0.023217**	-0.012873*	0.000178	0.001388*
D(GPR)	0.023218	-0.110961*	-0.022197**	0.001068
D(TOP)	0.190704*	-0.010744*	-0.002638*	0.006922*
D(EXC)	-1.876670	-0.935724*	0.160190*	-0.218865*
D(INF)	6.531080	0.710756*	-0.264159*	0.527974*
D(GDP)	0.246643	-0.171284*	-0.057285*	-0.104955*
C	1.025725	0.238252*	1.567039	0.355563

*implies significant. **Source:** *Author's Computation, (2021)*

5.1.6: Cross-sectional short run estimation result (WAMZ)

Table 5.7 presents an overview of the short run effect of determinant variables identified in this study on policy rate for the WAMZ countries. As reported, result only Federal funds rate and trade openness has significant short run influence on policy rate for Gambia with a record of 0.023% and 0.191%, respectively. This may not be unconnected with the structure of the economy of the country, the country is import-dependent with a insubstantial export base.

For Ghana all the determinant variables identified in this study has significant influence on policy rate. Particularly, the results show statistical estimates of 0.013%, 0.111%, 0.11%, 0.011%, 0.935%, 0.711%, and 0.171% for Federal funds rates, global oil price, trade openness, exchange rate and inflation respectively.

In the case of Nigeria all determinant variables except federal fund rate exert significant effect on policy rate with the rate of 0.0002%, 0.022%, 0.003%, 0.160%, 0.264% and 0.057% for Federal funds rate, global oil price, trade openness, exchange rate, inflation and growth respectively.

In Sierra Leone all the determinant variables except global oil price exert significant influence on policy rate. Precisely, at the rate of 0.0013%, 0.007%, 0.219%, 0.528%, 0.105% for the variables of Federal funds rate, trade openness, exchange rates, inflation and growth respectively.

5.2 Analysis of transmission mechanism through which monetary policy shocks affect economic growth in ECOWAS- objective two

The second objective of this study centres on the investigation of the transmission mechanism through which monetary policy shocks affect economic growth in ECOWAS. For the purpose of ascertaining a reliable result, this starts with selection optimal lag length and conduction of unit root test. Thereafter is the analysis of the impulse responses and variance decomposition.

5.2.1 Selection of optimal lag length for the monetary policy shocks nexus economic growth in ECOWAS

For the criteria used for the selection of the optimal lag lengths, we explored the five conventional optimal lag lengths regression methods. The Sequentially Modified LR test statistics (LR), Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Criterion (SC) and Hanna-Quinn Information Criterion (HO). The major reasons for the selection of the optimal lag length are to avoid multi-collinearity, serial correlation of the error term in the models and to prevent mis-specification errors (Elboure, 2007). The results for the sub- region of WAMZ, Table 5.8 depicts that all the methods (LR, FPE, AIC, SC and HQ) suggest the use of 6lags, being their lowest values, for example the lowest value in AIC is 3.792748 at the 6^{th} lag. Hence this study employed 6-lag length for the WAMZ sub region. On the other hand, WAEMU sub-region, estimated results depict that FPE and AIC allow 7 optimal lags, while SC and HO permitted the use of a 6-lag length. The odd-one-out is the LR suggesting 8 optimal lag length. Therefore, we employed 7-lag length for the WAEMU, as suggested by the AIC with the most negative value of -1.569333. (Table 5.9)

Table 5.8: Optimal lag length-WAMZ

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-9145.350	NA	43256771	31.77205	31.80986	31.78680
1	-2103.977	13936.05	0.001137	7.409644	7.636524	7.498125
2	-1563.048	1061.199	0.000189	5.618222	6.034170	5.780437
3	-1533.646	57.17073	0.000187	5.602937	6.207952	5.838886
4	-1524.424	17.77191	0.000197	5.657721	6.451803	5.967404
5	-1108.302	794.6770	5.07e-05	4.299659	5.282808	4.683076
6	-937.3114	323.5755*	3.06e-05*	3.792748*	4.964965*	4.249899*
7	-931.1633	11.52777	3.26e-05	3.858206	5.219490	4.389091
8	-912.5688	34.54185	3.34e-05	3.880447	5.430798	4.485066

* indicates lag order selected by the criterion. Source: Author's computation from results

Table 5.9: Optimal lag length - WAEMU

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-13556.49	NA	20772.49	24.13077	24.15312	24.13922
1	-1247.510	24486.55	6.68e-06	2.273149	2.407258	2.323830
2	-242.3063	1990.732	1.17e-06	0.529015	0.774883	0.621930
3	-170.5478	141.4740	1.07e-06	0.445815	0.803441	0.580964
4	-137.9921	63.89496	1.06e-06	0.432370	0.901755	0.609754
5	659.7357	1558.550	2.68e-07	-0.942590	-0.361447	-0.722972
6	1036.927	733.5763	1.43e-07	-1.569265	-0.876364*	-1.307413*
7	1061.965	48.47341	1.43e-07*	-1.569333*	-0.764674	-1.265247
8	1086.098	46.50474*	1.43e-07	-1.567790	-0.651373	-1.221470

* Indicates lag order selected by the criterion. Source: Author's computation from results

5.2.2 Descriptive statistics for the monetary policy shocks nexus economic growth in ECOWAS

The result of the descriptive statistics for the 608 and 1188 observations for WAMZ and WAEMU respectively, are presented in Table 5.10. The mean values of the variables are all positive and are nearer to their respective minimum values than the maximum except the INF, MS and INTR for WAEMU. This implies that the data set for WAMZ are concentrated at the lower band of the distribution, while that of the INF, MS and INTR for WAEMU are at the upper band. The value of the probability affirms that the data distribution is free of heteroscedasticity of the model, which is at a significance level of 1%. This implies that both the data and the residuals used for the modelling WAMZ and WEMU are normally distributed.

The data sets are skewed to the right except INF, INTR and EXCH (all in WAEMU) skewed to the left with negative values of -0.233242, -0.289582, and -0.544644 respectively**.** Nonetheless, the normality tests of the Jarque-Bera, and Kurtosis show normality.

Table 5.10: Descriptive statistics

Variable	Sub-Region	Obs	Mean	St.Dev.	Min	Max	Skewness	Prob.
RGDP	WAMZ	608	9698499	16445988	16707.50	69914488	2.250371	0.000000
	WAEMU	1188	3545363	3428271	204990.3	19071008	1.550384	0.000000
INF	WAMZ	608	5.501145	6.659241	2.495685	47.29536	2.833708	0.000000
	WAEMU	1188	94.20067	35.66265	1.193489	161.2000	-0.233242	0.000000
MS	WAMZ	608	23.86832	19.65968	-24.39180	90.14575	0.594175	0.000000
	WAEMU	1188	14.99363	38.92215	-128.6538	618.0023	10.43351	0.000000
INTR	WAMZ	608	17.92576	10.47561	0.546875	63.78776	1.380301	0.000000
	WAEMU	1188	17.54414	2.840457	11.53125	21.89765	-0.289582	0.000000
EXCH	WAMZ	608	186.4020	468.4798	0.000503	2679.101	3.042942	0.000000
	WAEMU	1188	180.4591	37.57090	85.14288	247.5698	-0.544644	0.000000

Source: Author's computation from results, 2021

5.2.3 Unit root test

The stochastic non-stationarity of the series was examined in this study and their integration order were established through the conduction of a battery of the unit root tests. This was considered necessary in order to avoid misleading and spurious results. Therefore, for a consistent and reliable result, three statistical tests had been conducted, viz: Im, Pesaran Shin. (IPS), Dickey- Fuller (ADF), and Phillips Perron (PP). Testing for stationarity of data in analysis, is a precondition for the implementation of VAR and SVAR estimation for the purposes of avoiding a persistent shock that may be infinite, evading a situation whereby the standard assumption of asymptotic analysis from being invalid and a non- stationary time series data may lead to spurious regression. (Afandi, 2005; Dendramis et al., 2014). Also including lagged variables in VAR or SVAR will allow the residual to be stationary including I(1) variables (see Berkelmans, 2005; Sharifi-Renani, 2010 and Ncube and Ndou, 2011).

In this study, having taken the above into consideration, we conducted the unit root tests for the variables with individual intercepts and at intercepts and trends, which permits this study to proceed to proceed on the estimates. The summary of the results for WAMZ and WAEMU are as shown in Tables 5.11 & 5.12 respectively.

Table 5.11: Unit Root test- WAMZ

Variable		IPS		ADF		PP	
		t* stat.	Order of Interg.	t* stat.	Order of Interg.	t* stat.	Order of Interg.
RGDP	Ind. Intercept	-4.30813***	1(1)	44.3221***	1(1)	65.8231***	1(1)
	Ind. Intercept & Trends	-4.70862***	1(1)	41.3327***	1(1)	65.1612***	1(1)
INF	Ind. Intercept	-3.49366***	1(1)	28.2224***	1(1)	23.5781***	1(1)
	Ind. Intercept & Trends	-3.85198***	1(1)	29.0382***	1(1)	25.6396***	1(1)
MS	Ind. Intercept	-3.61178***	1(1)	29.5015***	1(1)	32.4071***	1(1)
	Ind. Intercept & Trends	-4.78585***	1(1)	38.1049***	1(1)	26.8495***	1(1)
INTR	Ind. Intercept	-1.89004**	1(1)	70.0725***	1(1)	149.592***	1(1)
	Ind. Intercept & Trends	-6.44719***	1(1)	55.5823***	1(1)	130.223***	1(1)
EXCH	Ind. Intercept	- 0.18729**	1(1)	9.28065**	1(1)	36.4219***	1(1)
	Ind. Intercept & Trends	-1.55490**	1(1)	14.1684**	1(1)	39.0878***	1(1)

Significance level: *** (1%) and ** (5%). Source: Author's computation from results

Table 5.12: Unit Root test- WAEMU

Variable		IPS		ADF		PP	
		t* stat.	Order of Interg.	t* stat.	Order of Interg.	t* stat.	Order of Interg.
RGDP	Ind. Intercept	-4.16424***	1(1)	60.6740***	1(1)	208.319***	1(1)
	Ind. Intercept & Trends	-10.1784***	1(1)	136.353***	1(1)	212.972***	1(1)
INF	Ind. Intercept	-1.73067***	1(1)	181.171***	1(1)	196.335***	1(1)
	Ind. Intercept & Trends	-10.9883***	1(1)	147.712***	1(1)	159.476***	1(1)
MS	Ind. Intercept	-7.67438***	1(1)	97.2583***	1(0)	72.6092***	1(1)
	Ind. Intercept & Trends	-9.92159***	1(1)	126.179***	1(1)	47.4036***	1(1)
INTR	Ind. Intercept	-7.29206***	1(1)	84.7536***	1(0)	47.4036***	1(1)
	Ind. Intercept & Trends	-3.77032***	1(1)	39.5732***	1(0)	284.694***	1(1)
EXCH	Ind. Intercept	-11.1918***	1(1)	166.989***	1(1)	218.434***	1(1)
	Ind. Intercept & Trends	-10.3151***	1(1)	137.787***	1(1)	179.742***	1(1)

Significance level: *** (1%) and ** (5%). Source: Author's computation from results

5.2.4 Correlation and co-variance analysis

The covariance and correlation matrices of the panel data is described in this section. The dependency and relationship of the variables are shown by the covariance, while direction and the strength of the relationships are measured by the correlation matrix ranging from -1 to +1. In this study, we provide a robust analysis of the covariance/correlation for both sub regions. Diverse form of relationship has been exhibited in the relationship amongst the variables of the ECOWAS region. In WAMZ (Tables 5.13), the explanatory variables of INF, MS and EXC demonstrate a negative relationship with the dependent variable of RGDP. In WAEMU (Table 5.15), inverse relationship exist between the variables MS and RGDP/INF, INTR and MS/ EXC/MS; while others have positive relationships, which suggests the presence of puzzles. The correlation results further show that the values are low, which implies weak relationship between the RGDP and other variables (Tables 5.14 and 5.16).

Table 5.13: Covariance Matrix- WAMZ

Covariance	RGDP	INF	MS	INTR	EXC
RGDP	2.70E+14				
INF	-8238656.	44.27255			
MS	-86199918	59.28804	385.8672		
INTR	7562307.	30.72866	69.96742	109.5579	
EXC	-1.22E+08	-503.9397	-565.2056	758.0884	219112.4

Source: Author's computation from results

Table 5.14: Correlation Matrix- WAMZ

Correlation	RGDP	INF	MS	INTR	EXC
RGDP	1.000000				
INF	-0.075351	1.000000			
MS	-0.267046	0.453608	1.000000		
INTR	0.043967	0.441219	0.340295	1.000000	
EXC	-0.015867	-0.161800	-0.061469	0.154726	1.000000

Source: Author's computation from results

Table 5.15: Covariance Matrix- WAEMU

Covariance	RGDP	INF	MS	INTR	EXC
RGDP	1.17E+13				
INF	40704775	1270.754			
MS	-15500136	-209.2572	1513.658		
INTR	2925292.	93.15762	-4.670280	8.061402	
EXC	48041262	1126.866	-179.8478	82.48407	1410.384

Source: Author's computation from results.

Table 5.16: Correlation Matrix- WAEMU

Correlation	RGDP	INF	MS	INTR	EXC
RGDP	1.000000				
INF	0.333213	1.000000			
MS	-0.116260	-0.150881	1.000000		
INTR	0.300657	0.920412	-0.042279	1.000000	
EXC	0.373296	0.841730	-0.123090	0.773564	1.000000

Source: Author's computation from results.

5.2.5 Analysis of the Impulse Responses

In this sub-section, having estimated the model, we analyse the shock effects, through the impulse response functions. The analysis of the impacts of monetary policy innovations in the economic literature is prevalent, as it gives room for distinguishing between contending theoretical models in an economy (Christiano et al., 1999).

Therefore, in this study, having estimated the model, we discuss the panel SVAR results in this section. Specifically, we employed the impulse response functions (IRF) to analyse the dynamic responses of the respective exogenous variables, to a one standard deviation of the monetary policy over a period of 38 quarters in the panel SVAR model for the two sub-regions in ECOWAS.

The blue line of the IRF represents the main point estimates for each lag level and bootstrapped 95 percent confidence intervals are shown with dashed red lines around it. The red bands represent the lower and upper bounds of the 95% confidence intervals. The interval estimate gives an indication of how much uncertainty there is in our estimate of the true mean. The narrower the interval, the more precise is our estimate. The blue lines indicate the significance level of the estimates.

In this study for simplicity, the period is allocated to a compact of 12 quarters for both sub-regions (see Figures 5.1 and 5.2). In this study we used the IRFs to illustrate the dynamic responses of the RGDP and inflation to one standard deviation of monetary policy shocks in the two sub-regions (WAMZ and WAEMU) in ECOWAS.

5.2.5.1 Impulse Responses of economic growth to shock of monetary policy instruments.

Figure 5.1 shows the IRFs of the real GDP to a standard deviation in inflation and variables of monetary policy (Money supply, interest rate, and exchange rate). In WAMZ (row one of column one), the response of the growth rate to one standard deviation of inflation rate is persistently negative and significant. Whereas the results obtained for WAEMU (row one of column two) differs a little from WAMZ sub-region, where the shock produces an insignificantly mixed effect. The growth rate was initially positive to the 6^{th} quarter and thereafter remains negative. The preliminary rise in growth rate arising from inflation rate could be attributed to asymmetric information in the economy.

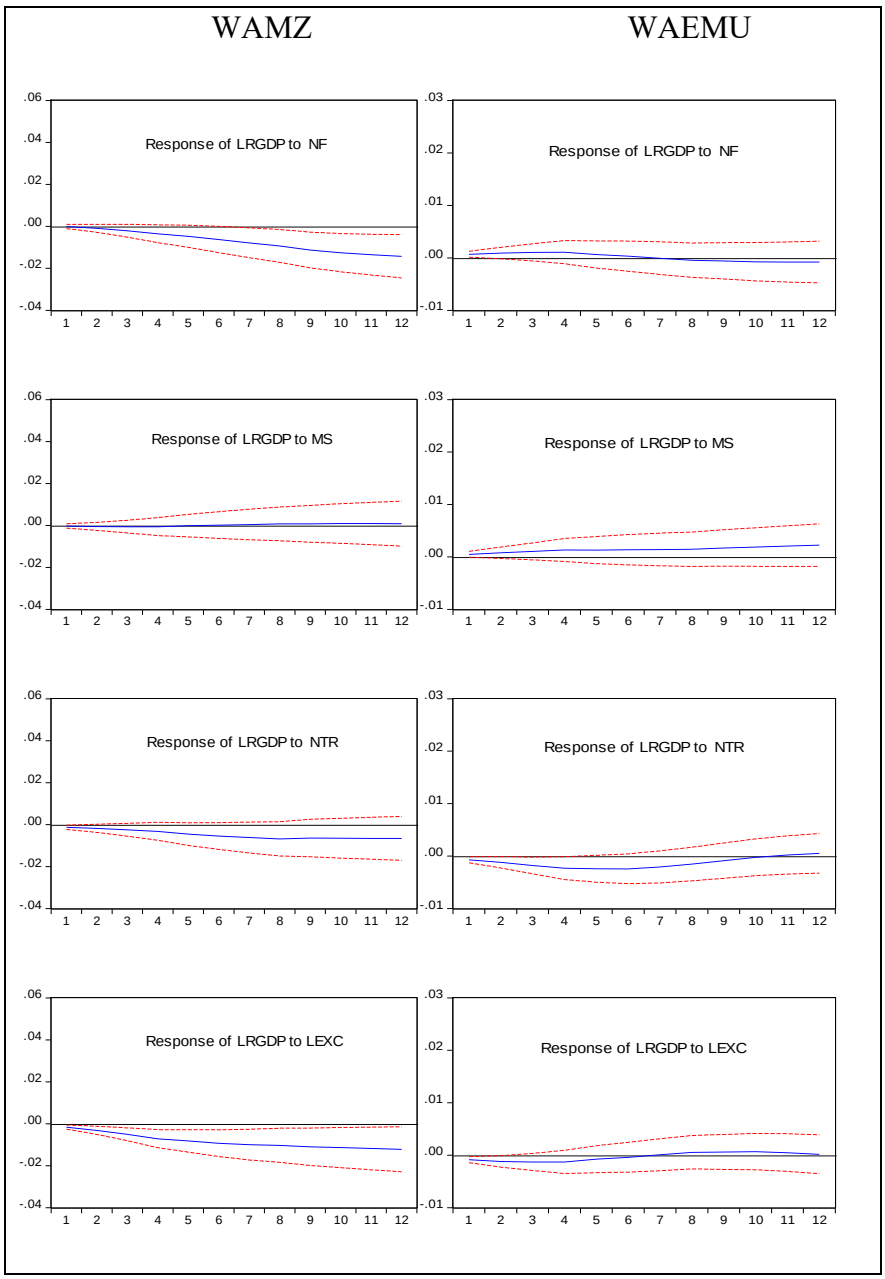
The one standard deviation of the aggregate money supply in ECOWAS shown in row two from both WAMZ and WAEMU depicts an insignificant effect on growth rate. In both sub-

regions the effect is however positive, which implies that an expansionary money supply, which is expected to lower the interest rate, reduce investment, and subsequently leads to output growth, has little effects on the macro-economic variables.

Also included in this analysis is the response of growth rate to a positive shock of the interest rate in the two sub-regions. Evidence from both sub regions (row three) reveals that growth rate has a negative response to the shock of the interest rate and statistically insignificant. In WAMZ the shock shows a persistent negative effect on the output growth through the horizon, while in WAEMU the negative effects fade off at the 10^{th} quarter.

The last row of figure 5.1 Shows the responsiveness of the growth rate to one standard deviation in exchange rate of the monetary transmission mechanism in ECOWAS. The shock of exchange rate in WAMZ suggests significant and negative effects. It is also persistent through the period under review. This emphasises the importance of exchange rate to economic growth among the member countries of the monetary zone. On the other hand, in WAEMU the response of the growth to exchange rate variation is initially negative up to the 6^{th} quarter and afterwards positive.

Figure 5.1: Impulse Response of RGDP



Source: Author's computation from results

5.2.5.2 Impulse Responses of inflation rate to shock of monetary policy Instruments

Row one of Figure 5.2 shows the IRFs of the rate of inflation to a standard deviation in real GDP and variables of monetary policy transmission mechanism in the two sub-regions of WAMZ and WAEMU. In row one the response of inflation to a shock of growth rate in the two sub-regions exhibit a negative and insignificant impact, except between the 1st and 4th quarters in WAEMU, where it was initially positive. The implication of the weak and inverse

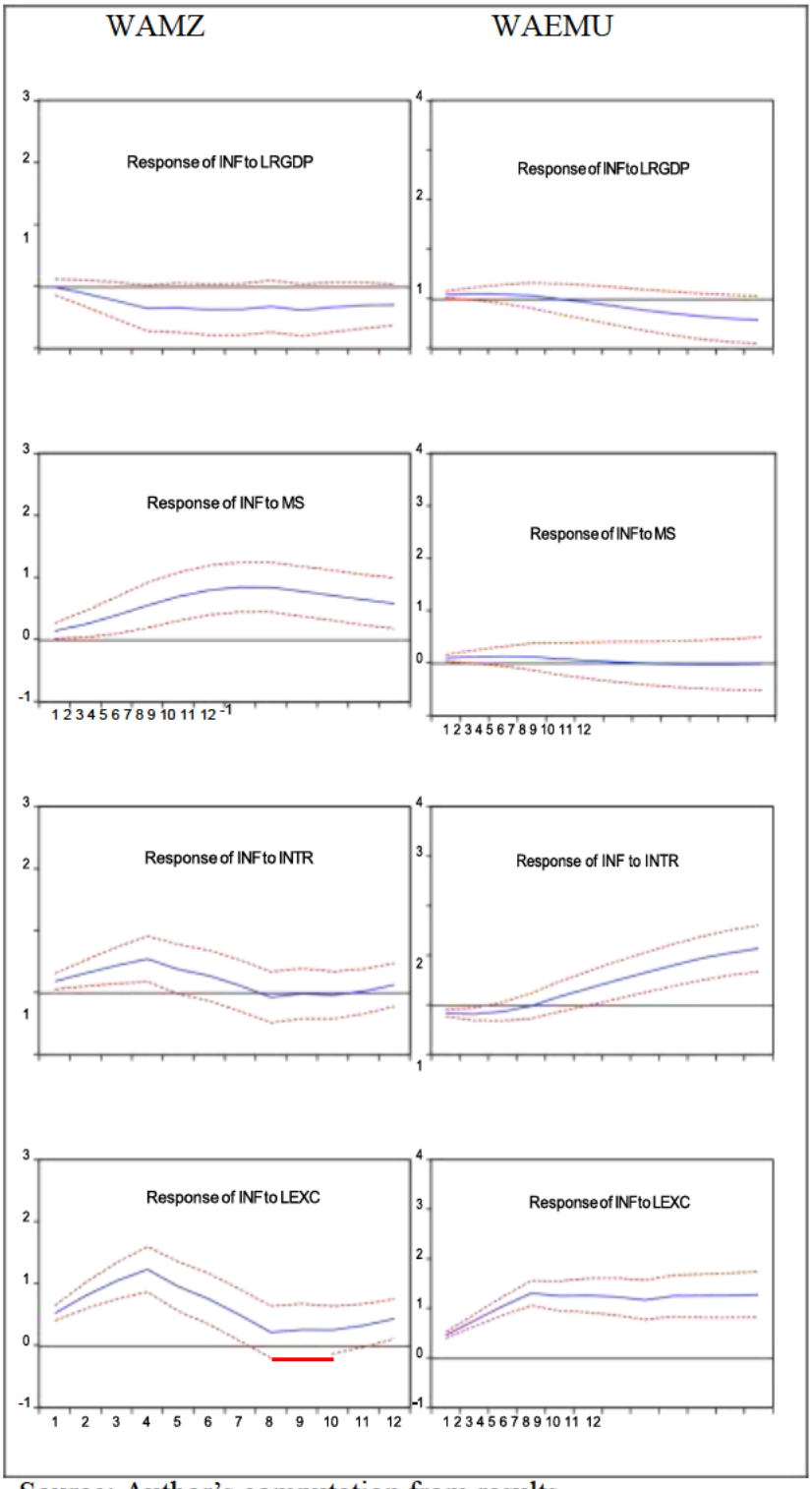
relationship between output growth and inflation, is that output dynamism may not significantly affect general price level in ECOWAS.

In WAMZ (row two, column one), the inflation rate demonstrates a positive and significant response to the shock of broad money supply. In a hump shape, the rising general price level attains the maximum level of 10 percent at the 7th quarters and subsequently declines. This indicates a strong relationship between the two macro-economic variables. On the other hand, the expansionary monetary policy in WAEMU through money supply exhibits an insignificantly positive effects up to the 6th quarters and subsequently falls to near zero after the 6th quarters. This implies that there is a weak relationship between money supply and general price level in this WAEMU as opposed to what is obtained in WAMZ.

The shock of interest rate (row three) leads to an increasing rate of inflation at a statistically significant level in ECOWAS. In WAMZ sub-region, a sharp response is noticed from inception to the 4th quarter by 0.5percent and declines thereafter, while in WAEMU it was initially negative and leads to persistent positive and significant effect after the 4th quarters. The economic inference of this that there is a strong relationship between interest rates and general price level. In other words, interest rates constitute an important macro-economic variable affecting price dynamics with its attendance adverse effects on the welfare of the people of ECOWAS.

In both sub-regions (row four), one standard deviation in the exchange rate impacts a positive and significant effects on the inflation rate. In WAMZ, the inflation rate has a sharp and increasing response to the shock, subsequently declined from 0.4 to 0.02 percent with insignificant effects at the 8th quarter to the end of the horizon. The inflation rate volatility in WAEMU rises to the peak of about 1.0 percent at the 4th quarter and thereafter maintains a stable state. It could be deduced from this result that in both WAMZ and WAEMU, exchange rate constitutes an important economic variable for the control of the general price level. Devaluation of the domestic currency in ECOWAS leads to increased general price level.

Figure 5.2: Impulse Response of Inflation rate



Source: Author's computation from results

In sum, evidence from the impulse responses suggest that the two sub-regions share certain common traits in respect of the monetary policy mechanism, which affect the ECOWAS economy. However, in some instances there are mixed results.

5.2.6 Variance decomposition

The Variance decomposition is an estimation of a percentage shock on a specific variable in relation to the variable's innovations itself and other dependent variables at a forecast period (Raghavan and Silvapulle, 2008). In this study, for the purpose of simplicity, four periods have been selected for analysis (The whole periods are exclusively contained in the annexure). Therefore, the horizon has been allocated into 3, 6, 9, and 12 as shown in tables 5.7 and 5.8. The first two columns contain the period, and the Standard error (S.E) of the respective variable, while other columns show the variance (in percentage) accruing to each shock, which sums up the total row to 100.

5.2.6.1 Variance Decomposition of the RGDP

Table 5.17 indicates the proportional shock of real growth rate to itself and innovations to other monetary policy instruments in both WAMZ and WAEMU. In WAMZ it suggests that through the period in the horizon, the exchange rate takes dominance of the shock effect to output growth, apart from the variable's own shock. The rate of contribution of exchange rate was also at an increasing rate through the periods, ranging from 0.005 percent as at the 3rd period to 0.021 percent in the 12th period.

Similarly, the proportional contributions of the variables in WAEMU to an innovation in real growth rate shows that aside of the variables' contribution, it is dominated by the exchange rate with contributions ranging from 0.42 percent to 0.81 percent in the 3rd and 12th period, respectively. In the two sub-regions, contributions of money supply and interest rate to the fluctuations of the growth rate remain trivial throughout the period.

Table 5.17: Variance Decomposition of RGDP

WAMZ

Period	S.E.	RGDP	INF	M2	INTR	EXCH
3	0.300537	99.99506	4.70E-06	5.12E-05	6.92E-05	0.004811
6	0.617370	99.98052	2.06E-05	0.000214	0.000171	0.019077
9	0.85753	99.97841	2.01E-05	0.000249	0.000158	0.021159
12	1.055666	99.534E-05	5.34E-05	0.000253	0.000154	0.020788

WAEMU

Period	S.E.	RGDP	INF	M2	INTR	EXCH
3	0.287308	99.95678	0.000450	0.000415	0.000586	0.041766
6	0.508082	99.79209	0.002172	0.001990	0.003041	0.200711
9	0.621434	99.44214	0.005799	0.005359	0.005471	0.541234
12	0.747908	99.17106	0.008620	0.007986	0.005081	0.807249

Source: Author's computation from results

5.2.6.2 Variance Decomposition of the General Price level

The decomposition of the general price level (Inflation) in the sub-regions of ECOWAS is shown in Table 5.18. In both sub-regions a greater fluctuation in inflation, after the first quarter, has been accounted for by economic output. This is followed by the exchange rate. For instance, in WAMZ at the 3rd period, the percentage contribution of the growth rate is about 90 percent and 94 percent at the 12th period. The results further suggest the existence of an indirect relationship between the growth rate and the general price level. The contributions of the money supply ranges between 0.03 and 0.07 percent in WAMZ, while in WAEMU its contribution is between 0.22 and 0.44 percent within the period. The relationship between the growth rate and the inflation in this sub-region is inverse, while that of the aggregate money supply and interest rate is direct with effect from the 6th quarter.

Table 5.18: Variance Decomposition of INF

WAMZ

Period	S.E.	RGDP	INF	M2	INTR	EXCH
3	1.704603	90.09823	1.275728	0.073300	0.042329	8.510410
6	4.583603	87.72228	0.216485	0.092057	0.070777	11.89840
9	6.618146	92.92063	0.111274	0.049376	0.045183	6.873538
12	7.856347	94.76826	0.079623	0.035691	0.034459	5.081972

WAEMU

Period	S.E.	RGDP	INF	M2	INTR	EXCH
3	0.911821	47.84640	6.622777	0.448614	0.867536	44 21467
6	3.506018	70.22115	1.083081	0.272388	1.672828	26.75055
9	7.312533	76.53022	0.287760	0.217988	1.487361	21.47667
12	11.59817	76.42148	0.114744	0.221198	1.355462	21.88711

Source: Author's computation from results

In brief, the shocks of the inflation and exchange rate take dominance effect to the economic growth and stability. This implies that the exchange rate plays a significant role in the monetary policy transmission mechanism in ECOWAS countries.

5.3 Presentation of results of the potency of the monetary policy at different regimes of the business cycle, specifically at expansion and contraction regimes – objective three

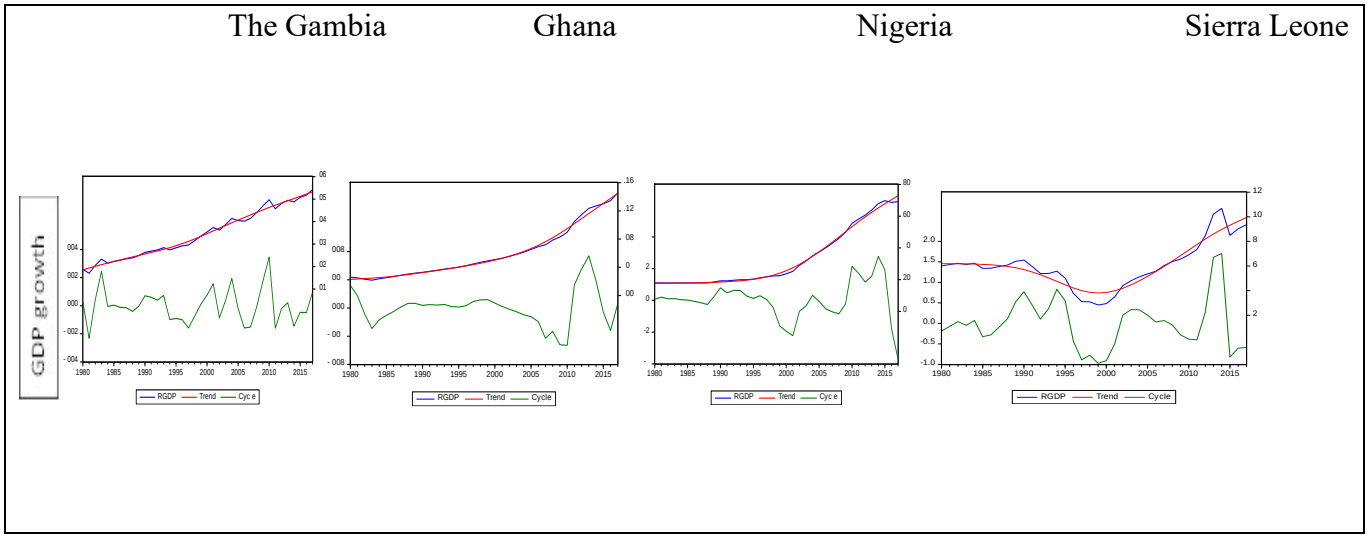
This study ascertains whether there is evidence of a common business cycle. In the empirical results, the study estimated the probability value of each country transiting from regime1 (Recession) to regime 2 (Expansion). Also, the result includes the duration period of staying in each of the regimes. There appears to have common business cycles in the selected countries. Also, there are empirical evidence that suggest that the significance effects of the monetary policy instruments produce mixed effects at expansionary regimes and contractionary.

5.3.1 Business cycles and trends estimates.

The National Bureau of Economic Statistics (NBER) while extending the works of Burns and Mitchell (1946), on the business turning points, identified four Phases of business cycle, expansion, contraction, trough and peak. Thus, following Sims and Zha (2006), with focus on expansion and contraction phases, we de-trended the RDGP of the West African countries, using the Hodrick-Prescott (HP) filtering method for the detection of the cyclical elements of the economic activity of the countries under study to determine whether these countries share a comparable business cycles.

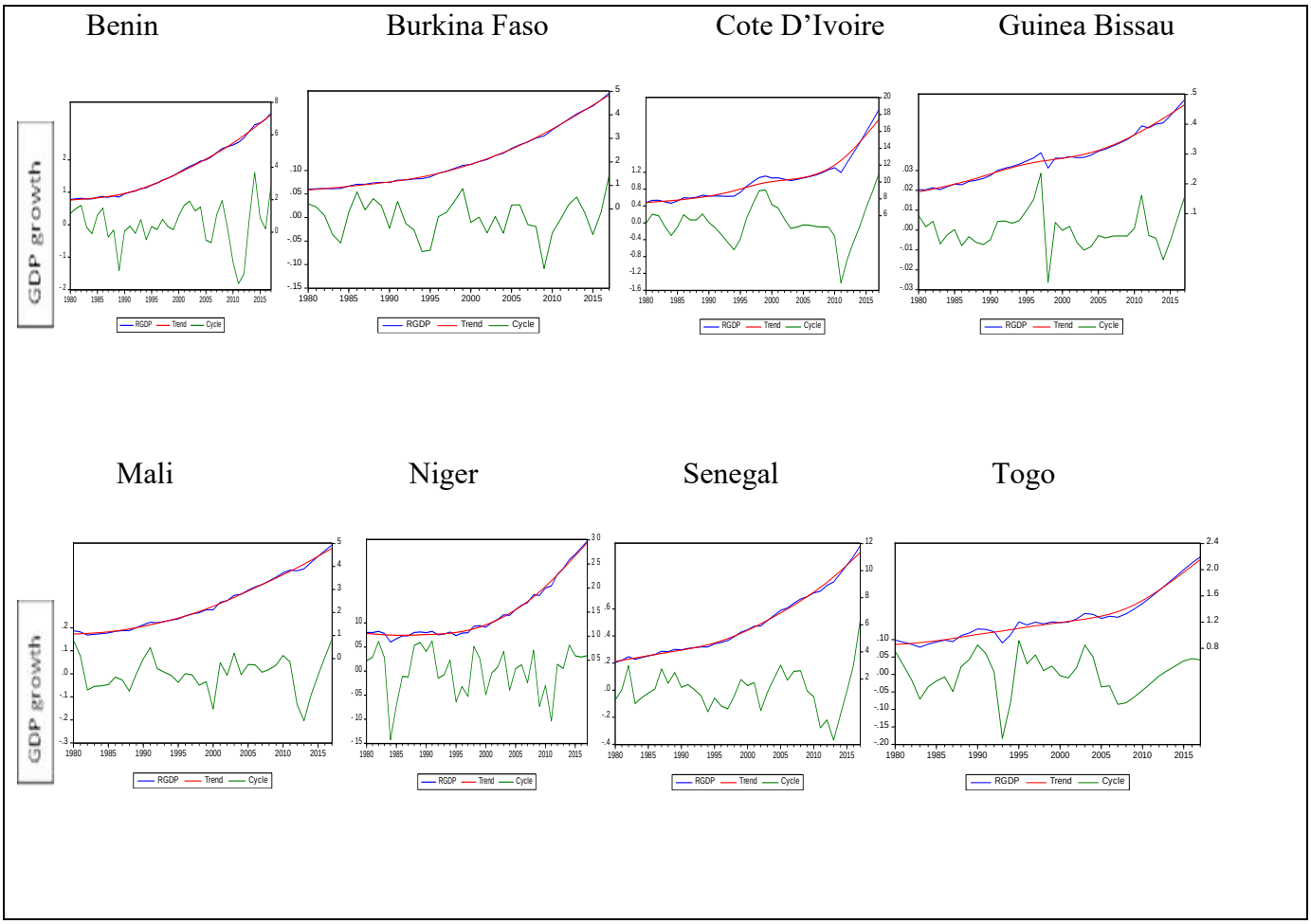
The results in figure 5.3 and 5.4 show sequence of business cycles and volatility, using a Multivariate MSM with quarterly time series data for the 12 countries. These countries comprise of a separated analysis of 4 from WAMZ and 8 from WAEMU for the period 1980-2020 within ECOWAS sub region. The results suggest that the business cycles in these countries are characterized by two different phases of growth rates: a contractionary (recession) and expansionary (boom) regimes.

Figure 5.3: WAMZ- Hodrick-Prescott Filter



Source: Author's computation from results

Figure 5.4: WAEMU- Hodrick-Prescott Filter



Source: Author's computation from results

5.3.2 TRANSITION PROBABILITY RESULTS ESTIMATES.

The estimates for the ECOWAS economy are as presented in Table 5.19, which comprises the regime switching with noteworthy features on the transition probability. In each of the 4 countries in WAMZ the mean growth is positive, ranging from 0.03 in Gambia to 7.72 percent in Nigeria. This corresponds to the expansionary phase in the sub region. The probability of staying in expansion is relatively high. For example, Gambia has 0.87 expansion as against 0.45 contraction probability. On the contrary, the probability of staying in recession is relatively low across the countries in this sub region. The only outlier in WAMZ is Nigeria with 7.7 mean and a standard deviation of 18.10. Meanwhile, the dominant volume of the economy might have accounted for this.

In the second row of table 5.19, the subregion of WAEMU shows that the mean real growth rate in Cote d'ivoire, Guinea Bissau, Senegal and Togo are negative, ranging from -2.6 in Cote d'ivoire to -0.05 in Guinea Bissau. This state corresponds to the recession period in WAEMU. Other countries in the WAEMU have significantly positive mean growth. However, each of these countries has more probability of staying at expansion regime than contraction regime. For instance, the result depicts that Cote d'ivoire has 0.97 probability of staying at expansion as against recession of 0.42, while in Togo has the likelihood of staying in expansion with probability of 0.95 than in recession of 0.61

Table 5.19: Transition Probability

Sub-region	Country	Mean	SE	SD	AIC	Log likelihood	Contraction Probability	Expansion Probability
WAMZ	Gambia	0.029530	0.017785	0.035530	-6.68	510.03	0.453703	0.874792
	Ghana	0.238656	0.040269	0.227193	-4.62	357.58	0.749396	0.933132
	Nigeria	7.724002	8.097596	18.10725	2.21	-147.67	0.887243	0.957303
	Sierra Le	0.064245	0.065273	0.148958	-5.50	422.96	0.766095	0.953621
WAEMU	Benin	0.081543	1.155861	2.358856	-0.07	21.25	0.669290	0.897885
	Burkina F	0.477569	0.958537	2.561086	0.81	-43.85	0.405182	0.872743
	Cote D	-2.626063	9.344039	19.70249	3.11	-213.88	0.415631	0.966338
	Guinea B	-0.058302	0.137952	0.303061	-5.72	439.20	0.648051	0.918877
	Mali	0.386421	0.393872	1.225439	0.66	64.97	0.796461	0.939924
	Niger	0.109791	1.848074	3.847852	0.33	-8.24	0.820024	0.934837
	Senegal	-0.855750	6.843563	14.91491	3.37	-233.22	0.571248	0.933348
	Togo	-0.178513	1.122356	2.348231	-0.97	87.79	0.611784	0.951564

Source: Author's computation from results

The results from the estimates of the transition probability suggest that member countries of WAMZ have higher probability of staying at expansion regime than contraction regime. The expansion probability rages from 0.87 to 0.96, while the contractionary probability ranges between 0.45 to 0.88. This implies that the expansion period dominates each of the business cycle. Similarly, in WAEMU, results depict that member countries in this union have longer periods of expansion than contraction regimes.

The results showing the effectiveness of each of the policy instruments at each regime indicated their efficacy is greater at recession than at expansion (Detail results in appendix3).

5.3.3 Expected duration result estimates.

In line with the submission of Burns and Mitchell (1946) that duration is a crucial step in the identification of business cycle in an economy, hence we estimated the expected duration of each phase of the business cycle in each country of the region as reported in table 5.20.

In WAMZ (Rows 1 & 2) the contraction period ranges between 1.89 and 8.8 quarters. The results further suggest a contractionary period average period of 4.7 quarters and expansionary average period of 17.0 quarters. The length of the business cycle ranges between 9.8 to 32.3 quarters.

Table 5.20: Expected Duration

Sub-Region	Country	Contraction P(s(t) =1)	Expansion P(s(t) =2)	Avg length of cycle Business
WAMZ	Gambia	1.830507	7.986704	9.8
	Ghana	3.990364	14.95494	18.9
	Nigeria	8.868661	23.42081	32.3
	Sierra Leone	4.275246	21.56139	25.8
Avg-WAMZ		4.7	17.0	21.7
WAEMU	Benin	3.023796	9.792837	12.8
	Burkina Faso	1.681186	7.858141	9.5
	Cote D'Ivoire	1.711248	29.70739	31.4
	Guinea Bissau	2.841324	12.32701	15.2
	Mali	4.913067	16.64555	21.6
	Niger	5.556297	15.34606	20.9
	Senegal	2.332350	15.00333	17.3
	Togo	2.575886	20.64566	23.2
Avg. WAEMU		3.1	15.9	19.0
Avg ECOWAS		3.6	16.3	19.9

Source: Author's computation from results

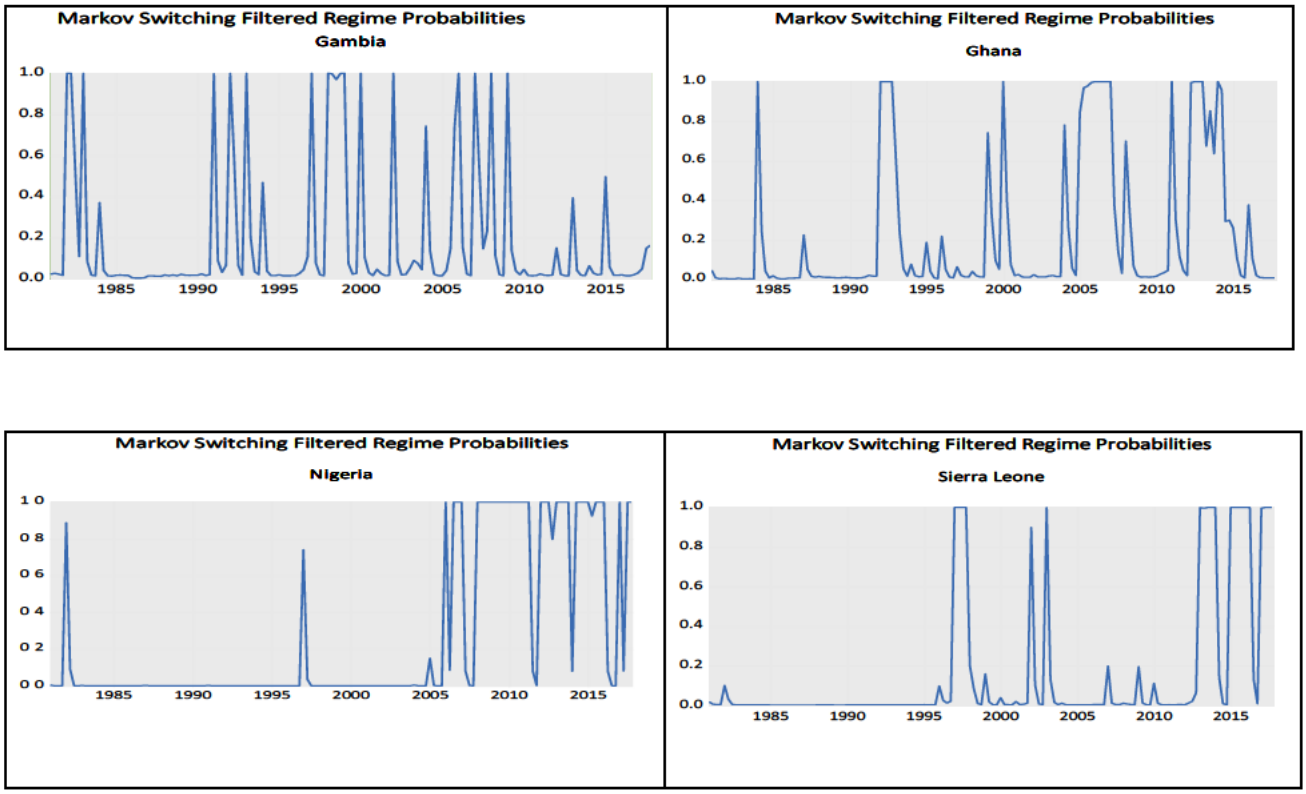
In WAEMU (Table 5.20, Rows 3 &4), similar to what is obtained in the WAMZ, all the countries in this subregion have higher expansion phases than contraction phases within the sampled period. The contraction period ranges between 7.9 to 29.7 quarters. On the average, the expected average duration period in WAEMU is estimated to 3.1 quarters and 15.9 quarters for recession and boom regimes, respectively

In sum, the results corroborate the transmission probabilities of more expansion than contraction periods, while the policy instruments are more effective at recession than expansion regime. Furthermore, within the region of ECOWAS, the results suggest an average contraction phase between 1.7 and 29.7 quarters, while the expansion phase is between 7.8 and 29.7 quarters. The duration of the business cycle is estimated at 9.5 – 32.3 quarters**.**

5.3.4 The filtered regime probabilities

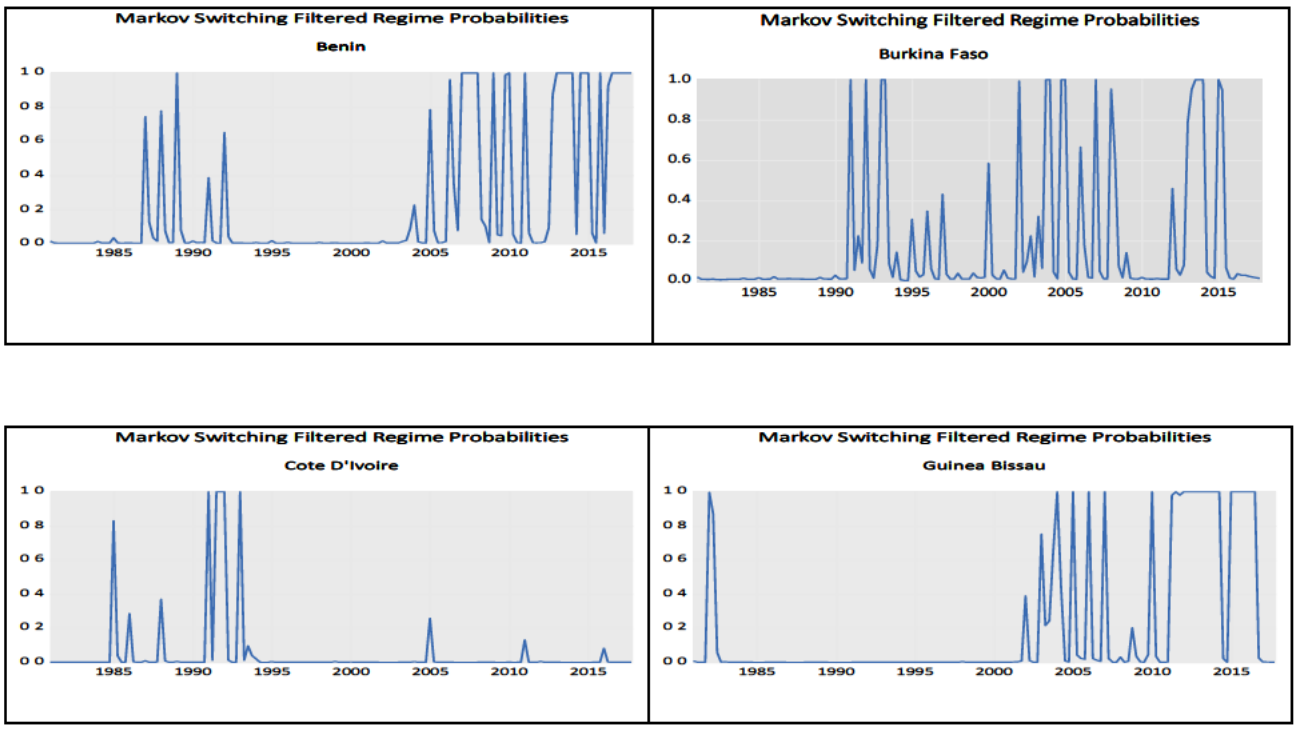
Considering the contractions and expansion of the business cycles across all the countries under review, the results of the filtered regime probabilities are available in figures 5.5 & 5.6, showing series of contractions and expansion regimes in the economic activity of each country.

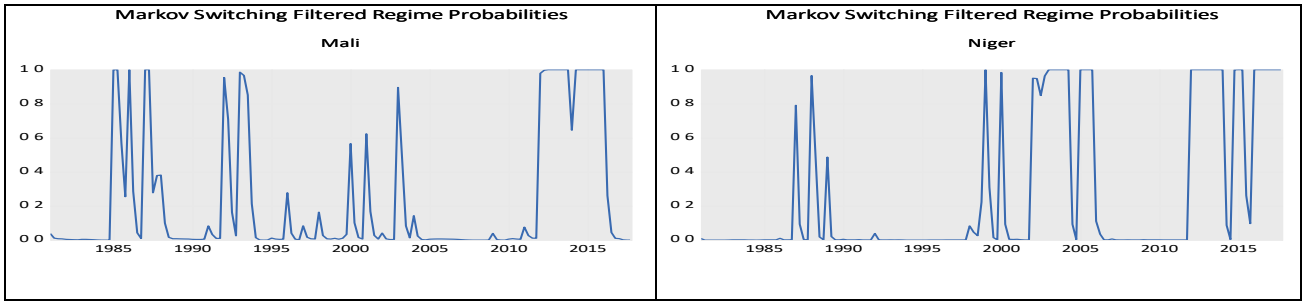
Figure 5.5: WAMZ Filtered Regime Probabilities

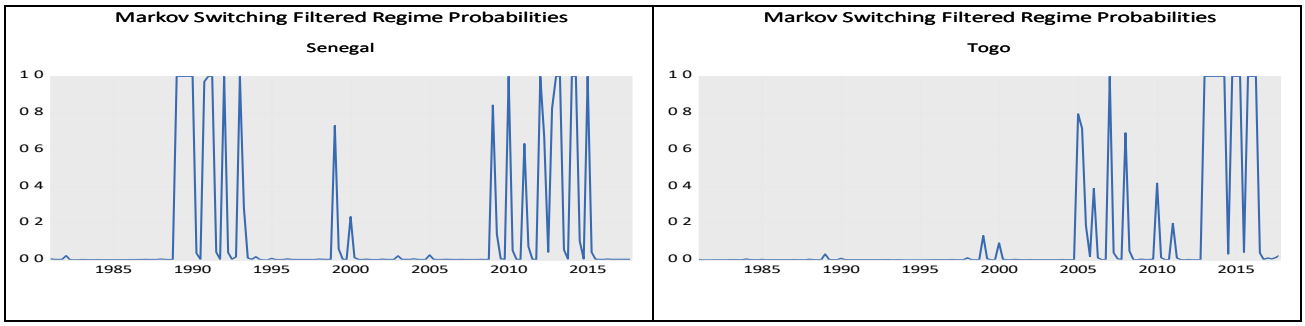


Source: Author's computation from results

Figure 5.6: WAEMU Filtered Regime Probabilities







Source: Author's computation from results

Conclusively, this chapter has considerably presented, and analysed the results obtained from the empirical observations, relative to each objective of this study. Again, the results were discussed in relation to earlier empirical findings, leading to the inferences drawn in our next chapter.

CHAPTER SIX

DISCUSSION OF EMPIRICAL RESULTS

This chapter is devoted for the discussion of the empirical results presented in the previous chapter. The analysis is done in the context of the empirical findings in the preceding chapter and drawing pertinent inferences therefrom. The discussions are made relative to each of the objectives of this study. The first section, 6.1 discusses the determinants of monetary policy rate. The second section 6.2 relates to the effects on monetary policy shocks on growth. Also, section 6.3 deals with the results third objective, which is the impact of monetary policy at two regimes of the business cycle. The last segment forms the concluding part of this chapter.

6.1 Discussions of results on determinants of the monetary policy rate in ECOWAS (objective 1).

As stated earlier, one of the objectives of this study is to investigate the determinants of the monetary policy rate in ECOWAS. In this study our preliminary examination commenced from the test for the existence of unit root (stationarity) using the IPS and ADF tests. The use of the two approaches is for the purpose of comparison and validating results (see Frimpong, 2012; Demetriades and Fielding, 2012; among others). Before the panel model estimation, this study tested for the heterogeneity and homogeneity (cross country) using standard unit root test. The test is grounded on the usual coefficient pair-wise correlation of the residual of OLS which is derived from ADF regressions. The Null hypothesis suggest a cross sectional neutrality and asymptotical distribution being a two-tailed normal distribution (Bildirici and Kayıkçı 2013). Results show the variables employed are non- stationary and are integrated of order one i.e. I(1) at 5% significant levels. None of the variables are integrated of I(2), which complies with Pesaran et al. (2001) on ARDL modeling.

Having specified the order of integration of the variables, we progressed to Panel cointegration tests. We employed the common cointegration tests, namely Kao, Pedroni and Fisher tests. Their peculiar importance was also considered. For instance, Pedroni considers heterogeneity using parameters that permits variations across sampled members. Results reported for both WAEMU and WAMZ showed validation for rejection of null hypothesis of 'no co-integration' between policy rate and determinant variables employed in the model. It is therefore evidence in the panel data sets suggesting long run relationship amongst the variables. This is further buttressed by the results obtained from cointegration test of Pedroni residual (WAEMU) with the assumption of no deterministic trend shows that 7 out of 11 statistical tests are significant.

Similarly, in WAMZ 6 out of 11 statistical tests are also significant. These further buttressed the cointegration results of variables obtained from other models.

The results from the estimates revealed that in WAEMU macro-economic variables of **the** exchange rate, inflation rate, and gross domestic product exert a significant positive impact on the policy rate in the long run. This implies that the volatility of the policy rates depends largely on the upward movement of the exchange rate, inflation rate and gross domestic product in member countries of the monetary union. However, in the short run the lagged periods of the Federal funds rate and the global oil price wield significant negative effects on the policy rate. The implication of this is that, with a delayed period of policy variations, there is significant inverse relationship between the exogenous variables of the federal funds rate and policy rate in WAEMU member states. This is similar to what is obtained for the oil price. This is likened to the results of Balke et al., (2002) and Jim (2008). This inverse relationship, which demonstrates a counterintuitive analysis may not be unconnected with the non-floating exchange rates being operated by the union, coupled with the negative impact of externalities (discussed in section 1.1of this study). However, the relationship may disappear depending on the economic regime as opined by Yang and Hamori, (2014) that the spillover effect from US monetary policy influences the Association of Southeast Asian Nations (ASEAN) stock markets only during the tranquil period, but disappears during economic crisis.

In WAMZ on the long run, global oil price (GPR), exchange rate (EXC), inflation rate (INF) and gross domestic product (GDP) exert significant positive influence on policy rate. Comparatively, this pattern of relationship is similar to Giovanni et al., (2009), which emphasized direct relationship between policy rates and macroeconomic variables. However, this is contrary to the findings of Habanabakize and Mezer (2018). In the sort run the Combined overview of short run effect for WAMZ countries revealed that the determinant variables insignificantly affect policy rate.

On the cross-sectional analysis of the variables employed in this study, results show that the short run variables including federal fund rate, global oil price, trade openness, exchange rate, inflation rate, and gross domestic product are core determinants of policy rate for each of countries in the WAEMU. This result is similar to Adu and Marbuah (2011) and Booth and Ciner (2000), whose findings also show positive and significant relationship between these selected macroeconomic variables.

In WAMZ the summary of the result showed that determinant variables such as federal fund rate, global oil price, trade openness, exchange rate, inflation rate and gross domestic product has significant short run influence on policy rate of most of the WAMZ countries except in the case on Gambia where only federal fund rate and trade openness exert significant effect on policy rate. This implies that rise in the prices of these variables have strong impact on the variations in the policy rates in member countries of WAMZ.

6.2 Discussions of results on effects of monetary policy shocks on economic growth in ECOWAS (objective 2).

The findings from the estimate shows that in WAMZ the relationship between inflation and growth is inverse and significant while in WAEMU it has both positive and negative effects. (Mixed effects). The growth rate was initially positive and thereafter remains negative. The preliminary rise in growth rate arising from inflation rate could be attributed to asymmetric information in the economy. When the stakeholders, specifically, the producing firms are only restricted to the information relating to their products relative to the general price level, then output may initially be increased to augment the relative price increases due to delay in information. Eventually when they have access to full information regarding increase in the general price level, output will decline and subsequently return to the equilibrium level (Romer, 2012). In sum, inflation exert a negative impact on the real output growth. The inverse relationship is typically re-affirming the theoretical literature of non-linear relationship between the growth rate and inflation, similar to Vinayagathasan (2013) on 32 Asian countries.

The results also suggest a positive but insignificant relationship between broad money supply and growth across the two sub regions. The theoretical expectation of an expansionary monetary policy is to trigger growth as affirmed in the economic literatures like Aragon and Portugal, (2009); Fiado, (2016) and Noqueira, (2009). However, in this case of ECOWAS the shock has a marginal impact on growth. Even though it is positive in WAEMU, but statistically not distinguishable from zero in WAMZ sub-region over the whole forecast horizon. This indicates that shocks of monetary policy do not impact on real output growth. This is similar to Patnaik *et al*.'s (2011) on monetary policy shocks in Emerging markets economies. It is also in alignment with the results of Cheng (2006), whose estimations on Kenya economy suggests that monetary policy has little effects of real output growth because of structural weaknesses of the financial sector, thereby hindering the monetary policy transmission mechanism. In another dimension, the magnitude of these effects might have been absorbed by the hike in

inflation rate or may be attributed to the monetary policy framework in each country (Mallick and Sousa, (2012).

The effects of a shock of interest rates on growth indicates an insignificant and negative effects on economic growth, both in WAMZ and WAEMU. This result is in accord with the findings of Kim (1999); Cheng (2006), and Kevin (2006), that changes in interest rate is not a stimulus to economic performance and does not have significant impact on output. The effects fade off in WAEMU after a while and subsequently tending to the equilibrium. In Keynesian theorists' view interest rate as the standard channel of monetary transmission, the multiplier effects of an increase in interest rate will reduce the cost of capital, resulting to high cost of investment. This further leads to upsurge in aggregate demand and output is enhanced. Thus, contrary to monetarists, the investment decisions and consumer behaviors are influenced by the real interest rate and not the nominal interest rate (Mishkin, 1996).

Furthermore, the results from the estimates of the effects of the shock of exchange rates on growth suggests a significant effect on growth in WAMZ and insignificant effects in WAEMU. As documented in the literature that an overvalued domestic currency may initially lead to increase in output, but with the risk of financial crisis, which may eventually result into the depreciation of the rate exchange and decline in output (Berument and Pasaogullari, 2003**).** In WAMZ the response of the growth rate is persistently negative to the shock and significantly affect the real economy. This might have been accounted for by the autonomy of this sub-region on their exchange rate determination. Exchange rate is a stimulant to economic growth in term of investments, foreign direct investment (FDI) and subsequently exports. Countries with flexible exchange rate system, particularly real exchange rate depreciation, are associated with more rapidly growing economy (Edwards and Yeyati, 2003 and (Hausmann, et al., 2005).

Conversely, in WAEMU the response of the growth rate is mixed. It was initially negative and fades off thereafter. The negative effects of the exchange rate shock demonstrated in this result is parallel to Kamin and Roggers' (2000). The neutrality of this effects in not unconnected to the fixed exchange rate of the monetary union.

Another aspect of this analysis is on the effects of the monetary policy on inflation rate in ECOWAS. The response of inflation to a shock of growth rate in both sub-regions exhibit a negative and insignificant impact. Theoretically, the relationship between the economic growth and inflation has been a controversial issue for a long time between the structuralists and the monetarists. The monetarist argued that inflation has a retarding effect on the economic growth,

whereas the structuralists opined that inflation is not counterproductive to the achievement of economic growth (Idris and Bakar, 2017 and Than, 2015). The outcome of our estimates therefore suggests a nonlinear relationship among the duo, which evidently supports the monetarists**.**

In WAMZ the inflation rate demonstrates a positive and significant response to the shock of broad money supply, as against the findings of Kim and Roubini (2000). This further re-affirms the quantity theory of money that under the assumption of a constant velocity of transaction and output, the change in the stock of money supply will have a direct relationship with the general price level. However, in this case of the WAEMU the response of inflation to expansionary monetary policy was initially insignificantly positive and subsequently falls to near zero. The increase in the growth rate might have absorbed further increase in inflation rate. Also, the central control of money supply by the monetary union of the CFA member countries through BCEAO might have accounted for the inconsequential effects.

Furthermore, the effects of the shock of interest rate on the inflation rates in ECOWAS as demonstrated in the results show positive and significant effects in both the WAMZ and WAEMU. In both sub-regions this is an indication of idiosyncratic evidence**,** as it appears there is presence of price puzzle within the forecast horizon. This is because the contractionary monetary policy through positive innovation in interest rate leads to increase (instead of decrease) in inflation rate period (See Bernanke and Blinder, 1992; Cheng, 2006; and Boivin and Giannoni, 2006). These effects could be linked to the rising inflation rates in the region, which absorbed the contractionary monetary policy.

Also, the impact of the exchange rate on the general price level is significantly positive in ECOWAS region. This indicates that exchange rate is a vital policy instrument in the control of inflation in both WAMZ and WAEMU sub-regions. It implies that currency devaluation triggers inflation rates. ECOWAS countries are relatively import dependent countries, which makes them to be susceptible to inflation. Boivin et al (2010) and Mishra et al, (2011) suggested that certain factors are accredited to the operations of the exchange rate channel, which includes openness, size of the economy, degree of capital mobility, interest rate sensitivity and level of disbursements between domestic and imported goods. In the case of ECOWAS, the exchange rate policy may be another major driver to be considered, as the exchange rate is dominated by both fixed and flexible exchange rate system. Our results suggest that inflation rate is relatively higher in WAEMU, which operates fixed exchange rate, and this

further corroborates (Aghevli et al, 1991 and Gosh et al, 1995) that countries with fixed (pegged) exchange rate usually experience higher inflation rate. while countries adopting flexible exchange rate experienced relatively lower rate of interest, as the monetary authority has the power to control the exchange through discretional policy.

It is evident from the results of the variance decomposition that exchange rate, among other economic variables, contributes the largest proportion to the economic growth. This implies that exchange rate has a strong relationship with Growth in ECOWAS. Generally, there is an inverse relationship between the economic growth and inflation as well as interest rate. The results further show that economic output constitutes the greater percentage in the variation of the general price level. This is followed by the exchange rate. The contributions of the broad money supply and interest rates remain considerably low.

In totality, these estimates suggest that the interactive effects of monetary policy channels are overwhelmingly homogenous and insignificant on sustainable economic growth and economic stability for ECOWAS.

6.3 Discussions of results on the potency of the monetary policy at different regimes of the business cycle in ECOWAS (objective 3).

The analysis of this section starts with the business cycles of each of the countries graphically illustrated in the last chapter. This is followed by the estimation of the transition probability and expected duration of each regime. The last segment discusses the filtered regime probabilities, graphically demonstrated in the preceding chapter.

On the business cycle and trends, a visual outlook of the graphs in both sub regions the results suggest that the countries in ECOWAS appear to have similar trends and business cycles, though with varying degrees of volatilities. The appearance of a common business cycles may not be unrelated with the effects of the global great depression of 2008 and the commodity price fall of 2014 (with their succeeding economic recessions) captured in the cycles during which ECOWAS member states were not excepted. Also, the relatively fixed exchange rates adopted in WAEMU might have accounted for the common growth trend. The appearance of the growth trend in Sierra Leone appears to be relatively distinct due to weak economic structure. This is affirmed by the AEO (2022) that “Sierra Leone’s financial sector is underdeveloped but generally sound with a capital-adequacy ratio of 41.8% against a regulatory minimum of 15%. The country has high levels of poverty (56.8% in 2018), of

income inequality, and of youth unemployment (70%) attributable to slow growth and lack of economic diversification

Generally, the occurrence of high volatility of the cycle in the countries demonstrates the inflation rate. The results further demonstrate that these countries' business cycles are characterized by two distinct growth rate phases: A recession regime and an expansion growth regime as opposed to some countries with three growth rate phases: a recession regime, a moderate growth regime and a high growth regime (see Medhioub, 2015).

On the Transition probability results estimates, it could be inferred generally that ECOWAS have more probability of staying in expansion phase than at contraction phase. This is similar to what is obtained in, developing countries (Male, 2010), euro area (Peersman and Smets (2001) and BRICS countries (Kutu and Ngalawa, 2016), where average duration periods are greater during expansion regime than recession period. The result further indicates that the monetary policy is more effective during recession than expansion phase. This is reflected in the probability values of the policy instruments, as nearly all the variables have significant probability values of less than 1% across the countries in the analysis.

With respect to the expected duration of each regime in ECOWAS, the Comparative analysis of the results indicates that Nigeria and Sierra Leone appear to perform much better than others in this sub-region with their respective expansion periods of 23.4 and 21.6 quarters, in comparison to the sub regional average of just 17.0 quarters. Nigeria, being the most populous and largest economy in the sub region of West Africa, contributing about 70% of the GDP in the region. From the result, Nigeria has greater probability of staying in expansion than in recession regime and this might have accounted for the significant proportion of the country's economic growth. Similarly, these two countries are also better off with average length of business cycle being above the group average, while Gambia appears to be worse off than others within WAMZ countries, with the shortest phase of expansion and average business cycle duration

In WAEMU On the average, the expected average duration period in WAEMU is estimated to 3.1 quarters and 15.9 quarters for recession and boom regimes, respectively. The results further suggest that the average length of a business cycle is about 19.0 quarters, which is relatively lower than what is obtained in WAMZ. Other notable results include: The result shows the outstanding performances of Cote d'Ivoire, Mali, and Togo than other counties in the WAEMU countries, with average expansion phase of 29.7, 16.6 and 20.6 quarters respectively, vis-à-vis

the sub-regional average of 15.9 quarters. It also appears that Cote d'Ivoire, Mali and Niger are better than other WAEMU countries with estimated average length of expansion phase and business cycle above the group average., while Burkina Faso appears to be worse than others within the group with the shortest average expansion period and business cycle duration. Meanwhile, Cote d' Ivoire being the most dynamic in the global economies with the highest growth rate in the WAEMU as at 2018. The country constitutes the motor of the sub region, accounting for about 40 percent of WAEMU's wealth (World Bank 2019).

The filtered regime probabilities of the business cycles across all the countries in this study show series of contractions and expansion regimes in the economic activity of each country, with evidence of high volatility. This is in concordance with the findings of Loaya and Hnatkovska (2004) that estimate a high volatility rate in 40 developing countries. It further buttressed the transition probability results earlier analysed. Even though there are heterogenous timing of the recession and contraction phases and turning points, however, the estimate depicts some relatively synchronous recessions and expansions as well as peaks and troughs. For instance there are generic periods of relatively long expansion in the early 8os to late 80s and 2010 -2012 to the period of high growth rate experienced in the West African countries (ADB, 2018). On the other hand, the recession periods 1991- 1993and 2009 are reflections of the global economic crisis and the recent commodity price fall of 2014.

As a recap from this chapter, we have extensively discussed the empirical results obtained in chapter four of this study, in line with the respective objectives. The discussion has led to some verdicts which are used to draw inferences for this study. Discussions of the findings in each objective of this study has been compared with prior empirical results and inferences are drawn accordingly. It is on these bases that some relevant conclusions and recommendations are in the next chapter.

CHAPTER SEVEN

SUMMARY, CONCLUSIONS AND POLICY RECOMMENDATIONS

The summary of the entire thesis is contained in this chapter as well as the major conclusions and policy recommendations. As the research works remains open, areas of further studies are herein identified. Also, limitations to this are highlighted as well as contributions to knowledge and extant literature are contained in this chapter.

7.1 Summary and conclusions

In the past two decades, much attention has been drawn on the need to design appropriate policy measure for economic stabilization with much focus on short run macroeconomic stabilization and enhancement of economic growth. Thus, designing a suitable stabilization policy requires the prerequisite knowledge of the of the characteristics of the macroeconomic fluctuations in the short run/long run. However, there are little attention to the understanding of monetary policy fluctuations, particularly in the developing economies.

Hence, this study generally intends to examine the monetary policy shocks and economic growth in ECOWAS region. Specifically, three basic objectives were to be achieved under the main objective including the investigation of the determinants of the monetary policy rates in ECOWAS, examining the transmission mechanism through which monetary policy shocks affect economic growth in ECOWAS and finally assess of the potency of the monetary policy at different regimes of the business cycle, specifically at expansion and contraction regimes. Due to availability of data, this study covers 12 out of 15 countries in the region, covering the period 1980(1) to 2020(4). This sample period was chosen after 5 years of the existence of the economic integration.

The model of the region is divided into two separate sub-regions, according to their monetary union viz: WAMZ with 4 countries and WAEMU with 8 countries. The transmission mechanism, the economic outlook and monetary policy of each of the member states were briefly examined. Sequentially, related theoretical and empirical literatures reviews were made. Related empirical literatures were reviewed in line with the nexus between monetary policy and some salient macroeconomic variables. The appraisal of the literature revealed that most studies focused more of the advanced and emerging markets than the developing economies like ECOWAS. This further enhanced the relevance of this study as more countries in the global World are striving towards economic integration and more specifically the intended monetary union of ECOWAS.

The Noteworthy results derived from the determinants of monetary policy rate using the ARDL **r**evealed that for WAEMU countries, the determinants of policy rate on the long run include exchange rate (EXC), inflation rate (INF) and gross domestic product (GDP), and that in the short run when viewed from the group perspective only federal fund rate (FFR), federal fund rate lagged by a period FFR(-1), and global oil price lagged by a period GPR(-1) exert significant influence on policy rate of countries in the West African Economic Monetary Union. However, when consideration is given to the reality of each country in the WAEMU group on the short run, result established that all determinant variables identify in this study (FFR, GPR, EXC, TOP, INF, and GDP) exert significant influence on the direction of policy rate for most of the WAEMU countries covered in the study.

What is most important for this study is the level of significance of determinant variables identified and not necessarily the direction since monetary policy rate is a two-dimensional metric depending on the course of the economy and the position for action of the policy makers in favour of either expansionary or contractionary policy framework. Hence this study concluded that for WAEMU determinants of monetary policy on the long run are exchange rate, inflation rate and gross domestic product, while in the short run federal fund rate, global oil price, trade openness, exchange rate, inflation rate and gross domestic product both in their immediate and one period lag forms are considered as core determinants of monetary policy rate across the WAEMU cross-sections.

This study concludes that for West Africa monetary Zone (WAMZ) countries, determinants of policy rate on long run include among others, global oil price, exchange rate, inflation rate and gross domestic product. While in the short run for most the WAMZ countries especially, federal fund rate, trade openness, exchange rate, inflation rate and gross domestic product are core determinants of policy rate.

The PSVAR analysis of the effect of monetary policy shocks on economic growth is the sub region of ECOWAS economies revealed by the results of the estimates that: Except exchange rate, shocks of the monetary policy instruments do not have significant effect on the economic growth of ECOWAS. However, they significantly impact economic stability in the region. Similarly, inflation rate and exchange rate statistically affect the real growth rate. The results also show that the price stability is significantly being influenced by the monetary policy of interest rate and both anticipated and the unanticipated exchange rate shocks. Finally, the result further suggests the presence of price puzzles and no linear relationship exists between growth

rate and inflation, which is also corroborated by the variance decomposition**.** This estimates further substantiate the dynamic roles played by the monetary policy in the economic growth and stability in ECOWAS region.

In the second objective, this study employs Panel Structural VAR (PSVAR) model to examine the monetary policy shocks effect on economic growth in the two sub-regions of ECOWAS. The PSVAR provides significant results for ECOWAS economy. As revealed by the results of the estimates the shocks of the monetary policy instrument of interest rate and exchange rate does have significant effect on the economic growth and economic stability of ECOWAS. Similarly, inflation rate and exchange rate statistically affect the real growth rate. The results also show that the price stability is significantly being influenced by the monetary policy of interest rate and both anticipated and the unanticipated exchange rate shocks. Finally, the result further suggests the presence price puzzles and no linear relationship exists between growth rate and inflation, which is also corroborated by the variance decomposition**.** This estimates further substantiate the dynamic roles played by the monetary policy in the economic growth and stability in ECOWAS region.

In another strand, this study examined the asymmetric effects of monetary policy in the classical cycles in 12 member countries of ECOWAS. This study employed Markov switching model and quarterly data spanning from 1980 to 2020 for Two-phase Regime. We investigated whether these countries have similar business cycles. We further examined the probability of stirring from one policy regime to another (recession and expansion regimes) and estimate the duration of the each of these regimes.

Our results suggest that these countries demonstrate to have similar business cycles, Also, the countries are characterized with higher probability of staying longer at expansion than contraction. Hence the economies stay more in expansion regime than recession regime. This is further buttressed by their longer average duration period of expansion regime than the contraction regime.

Again, the average contraction and expansion periods are lower in WAEMU than in WAMZ. Thus, the amplitudes of the business cycles are greater in the countries in WAEMU than WAMZ particularly the contraction phase than expansion phase. The shorter business cycles in these economies cannot be unconnected with the fact that the monetary authority of these countries with fixed exchange rate cannot autonomously control their monetary policy.

On the aggregate, the results from the Markov switching model further revealed that ECOWAS appears to have an average business cycle of 9.5 – 32.3 quarters, varying from country to country. This re-affirms the findings of Rands and Tarp, (2002) that business cycles in developing countries have a relatively shorter periods than the developed countries and are diverse across countries.

In addition, the analysis further documents that average duration period for recession period is 3.6 quarters, which is comparatively lesser than 3.5 quarters in OECD (Calderon and Fluentes, 2010). Also, the expansion regime is on the average is 16.3quarters. which is greater than the findings of Male (2010), estimated 8.3 for developing countries.

7.2 Policy Recommendations

Arising from the findings and conclusion of this study, it might be expedient to draw some recommendations for efficient monetary policy with a view to enhancing the economic growth and economic stability.

For objective 1:

Consideration of the policy rate determinants: The results from the estimates revealed that in WAEMU macro-economic variables of exchange rate, inflation rate and gross domestic product exert significant positive impact on the policy rate in the long run. Therefore, to ensure long run stability in the policy rate among the WAEMU countries, determinant variables should be given close attention, so that course for potent structure can be designed and incorporated into the economic structure and policy frameworks accordingly.

Also in WAMZ the results revealed that on the long run, global oil price (GPR), exchange rate (EXC), inflation rate (INF) and gross domestic product (GDP) exert significant positive influence on policy rate. Hence, to ensure effective monetary policy rate among the WAMZ countries, especially on the long run, the role of determinant variables such as global oil price, exchange rate, inflation rate and gross domestic product should not be undermined by the policy makers, institutional developers, and other stakeholders in these countries. Indeed, economic diversification and inflation targeting would go a long way to stabilise the policy rate.

For objective 2:

Noteworthy monetary policy instruments: It could be inferred from the PSVAR analysis that monetary policy instruments of interest rate, exchange rate, and rate of inflation remain vital macroeconomic variables to be considered in the course of the monetary integration of the ECOWAS and other monetary policy decisions.

Discouragement of Currency Devaluation: As a result of the significant impact of the exchange rate on growth and inflation in ECOWAS member states (shown in figures 5.1 and 5.2), adequate cautions must be taken by the monetary authorities on any policy measures that devalues the domestic currency with a view to enhancing growth, as it may contemporaneously lead to rise in inflationary rate.

For objective 3:

Elongation of the duration of the expansionary regime: From the analysis of assessing the effectiveness of monetary policy in a two-phase business cycle regime, the result suggests monetary policy instruments are more potent during recession/contraction than at expansion/boom phase. We therefore recommend that these countries can formulate similar monetary policies that can elongate the duration of the expansionary regime and shorten the recession regime, with due considerations to the phase of the business cycle in ECOWAS. However, such policies must be taken with some considerations that the resultant consequences of Strict contractional policy may not be pleasant, as it may work contrary to their expectations. This may further lead to economic stagnation, increasing unemployment, currency depreciation, hike in prices among others. On the other hand, stringent expansionary monetary policy like low interest rate and reduced inflation rate, may not enhance economic stability.

7.3 Major contributions to knowledge and literature

From our findings, this study therefore contributes to the existing literature in numerous ways;

i. It is an innovation on monetary policy shocks and economic growth in ECOWAS. No known study has extensively analysed the monetary policy shocks and economic growth nexus in the region. Nearly all related studies have focused more on the advanced countries.
ii. This study covers the recent topical global economic recessions, during which West African countries were not excluded.

iii. It provides further empirical evidence on how domestic and external macroeconomic variables impact monetary policy in ECOWAS. The practical implication of considering external factors in modelling for ECOWAS economy shall assist in the generation of possible results for a more reliable economic analysis and forecast.

iv. It provides further empirical evidence on how domestic and external macroeconomic variables impact monetary policy in ECOWAS. The practical implication of considering external factors in modelling for ECOWAS economy shall assist in the generation of possible results for a more reliable economic analysis and forecast.

v. The employment of Markov switching VAR for the examination of monetary policy shocks at different regimes of the business cycle is a novelty to the extant literature. Indeed, to the knowledge of this study, there is no known study that has been carried out to investigate and analyse monetary policy shocks and economic growth in ECOWAS region, using Markov switching model. Moreover, most existing studies were more of country specific which might not be very good for generalisation in ECOWAS as carried out in this study to bridge the gap.

vi. The employment of Markov switching VAR for the examination of monetary policy shocks at different regimes of the business cycle is a novelty to the extant literature. Indeed, to the knowledge of this study, there is no known study that has been carried out to investigate and analyse monetary policy shocks and economic growth in ECOWAS region, using Markov switching model. Moreover, most existing studies were more of country specific which might not be very good for generalisation in ECOWAS as carried out in this study to bridge the gap.

vii. Lastly, the robustness of this study, particularly the comparative analysis of the estimates from WAEMU (CFA) and WAMZ (non-CFA) countries of West Africa region is another way by why this study is distinguished from the existing literature.

7.4 Limitation of the study

The achievement of the three set of objectives formulated for this study, it was done not without its limitations. Particularly, there are lack of data and/or inadequacies of some observations or not available in their required periods. Also, due to unavailability of data, this study covers 12 out of 15 countries in the region, Notwithstanding, the analysis includes Nigeria, Ghana, Seirra Leone, and Senegal that account for about 90% of the GDP of ECOWAS. The unavailability

of software to run the Panel Markov switching model was another notable constraint. Hence, the study employed the alternative series analysis, which was compiled corresponding to the sub-regions.

7.5 Areas for further research

As a result of some limitations confronted during this study, embarking on further research in this area or related area would not only build on the existing results, but be addition to the frontiers. In the first instance, area of further research on monetary policy shocks in ECOWAS, could be on methodology. For instance, the use of Dynamic Stochastic General Equilibrium (DSGE) for the estimation would create room for good comparative analysis. Similarly, the use of Factor-Augmented Vector Autoregressive (FAVAR) method submitted by Bernanke (2005) to conduct a related study as an alternative to SVAR model, as it gives more room to for inclusion of more variables without the problem of degree of freedom.

Furthermore, **t**he analysis of the regime switching in this study is restricted to the classical approach of the business cycle, according to Burns and Mitchell (1946), with much emphasis on the relative expansion and contraction, consecutive periods (with duration) of the cycle. However, the Typical Approach which deals with turning points (peaks and troughs) of the business cycle is a gap yet to fill. Also, this study is limited to Two-Regime, hence the extension of the study to the Three-Regime Markov switching modelling for economic region of ECOWAS is another important area for future consideration.

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APPENDICES

APPENDIX 1- Objective 1

Cointegration Test -WAEMU

Kao Residual Cointegration Test
Series: INTR FFR GPR TOP EXC INF GDP
Date: 01/22/22 Time: 17:54
Sample: 1980Q1 2020Q4
Included observations: 1216
Null Hypothesis: No cointegration
Trend assumption: No deterministic trend
User-specified lag length: 1
Newey-West automatic bandwidth selection and Bartlett kernel

	t-Statistic	Prob.
ADF	-6.370641	0.0000
Residual variance	0.000296	
HAC variance	0.000500	

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RESID)
Method: Least Squares
Date: 01/22/22 Time: 17:54
Sample (adjusted): 1980Q3 2020Q4
Included observations: 1200 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID(-1)	-0.066403	0.007469	-8.890166	0.0000
D(RESID(-1))	0.356439	0.026258	13.57444	0.0000

R-squared	0.167830	Mean dependent var	0.001016
Adjusted R-squared	0.167136	S.D. dependent var	0.020499
S.E. of regression	0.018708	Akaike info criterion	-5.118062
Sum squared resid	0.419289	Schwarz criterion	-5.109579
Log likelihood	3072.837	Hannan-Quinn criter.	-5.114866
Durbin-Watson stat	2.115635		

Pedroni Residual Cointegration Test
Series: INTR FFR GPR TOP EXC INF GDP
Date: 01/22/22 Time: 17:51
Sample: 1980Q1 2020Q4
Included observations: 1216
Cross-sections included: 8
Null Hypothesis: No cointegration
Trend assumption: No deterministic trend
User-specified lag length: 1
Newey-West automatic bandwidth selection and Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	2.157605	0.0155	2.135834	0.0163
Panel rho-Statistic	0.657463	0.7446	0.650144	0.7422
Panel PP-Statistic	0.037818	0.5151	0.028338	0.0013
Panel ADF-Statistic	-2.581344	0.0049	-2.595799	0.0047

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	1.725982	0.9578
Group PP-Statistic	0.819207	0.0037
Group ADF-Statistic	-2.619199	0.0044

Cross section specific results

Phillips-Peron results (non-parametric)

Cross ID	AR(1)	Variance	HAC	Bandwidth	Obs
1	0.845	0.000563	0.000532	11.00	151
2	0.901	0.000365	0.000435	10.00	151
3	0.916	0.000315	0.000482	6.00	151
4	0.939	0.000291	0.000668	5.00	151
5	0.905	0.000391	0.000700	4.00	151
6	0.860	0.000459	0.000637	1.00	151
7	0.852	0.000341	0.000341	9.00	151
8	0.908	0.000410	0.000675	2.00	151

Augmented Dickey-Fuller results (parametric)

Cross ID	AR(1)	Variance	Lag	Max lag	Obs
1	0.827	0.000555	1	--	150
2	0.857	0.000296	1	--	150
3	0.880	0.000249	1	--	150
4	0.913	0.000210	1	--	150
5	0.865	0.000317	1	--	150
6	0.835	0.000362	1	--	150
7	0.781	0.000267	1	--	150
8	0.871	0.000333	1	--	150

JOHANSEN FISHER TEST

Johansen Fisher
Panel
Cointegration
Test
Series: INTR FFR GPR TOP EXC INF GDP
Date: 01/22/22 Time: 17:56
Sample: 1980Q1 2020Q4
Included observations: 1216
Trend assumption: Linear deterministic trend
Lags interval (in first differences): 1 1

Unrestricted Cointegration Rank Test (Trace and Maximum Eigenvalue)

Hypothesized No. of CE(s)	Fisher Stat.* (from trace test)	Prob.	Fisher Stat.* (from max-eigen test)	Prob.
None	53.60	0.0000	39.37	0.0010
At most 1	23.14	0.0001	16.40	0.0056
At most 2	11.84	0.0048	11.54	0.0251
At most 3	6.864	0.9758	3.748	0.9993
At most 4	7.050	0.9723	3.942	0.9990
At most 5	10.91	0.8150	8.781	0.9221
At most 6	21.50	0.1600	21.50	0.1600

* Probabilities are computed using asymptotic Chi-square distribution.

Cointegration Test - WAMZ

Kao Residual Cointegration Test
Series: INTR FFR GPR TOP EXC INF GDP
Date: 01/22/22 Time: 18:00
Sample: 1980Q1 2020Q4
Included observations: 608
Null Hypothesis: No cointegration
Trend assumption: No deterministic trend
User-specified lag length: 1
Newey-West automatic bandwidth selection and Bartlett kernel

	t-Statistic	Prob.
ADF	-5.416045	0.0000
Residual variance	0.030524	
HAC variance	0.023283	

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RESID)
Method: Least Squares
Date: 01/22/22 Time: 18:00
Sample (adjusted): 1980Q3 2020Q4
Included observations: 600 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.

RESID(-1)	-0.117759	0.015765	-7.469816	0.0000
D(RESID(-1))	0.355308	0.038086	9.329051	0.0000

R-squared	0.166668	Mean dependent var	0.002513
Adjusted R-squared	0.165274	S.D. dependent var	0.196610
S.E. of regression	0.179629	Akaike info criterion	-0.592517
Sum squared resid	19.29543	Schwarz criterion	-0.577861
Log likelihood	179.7552	Hannan-Quinn criter.	-0.586812
Durbin-Watson stat	2.060408		

Pedroni Residual Cointegration Test
Series: INTR FFR GPR TOP EXC INF GDP
Date: 01/22/22 Time: 18:00
Sample: 1980Q1 2020Q4
Included observations: 608
Cross-sections included: 4
Null Hypothesis: No cointegration
Trend assumption: No deterministic trend
User-specified lag length: 1
Newey-West automatic bandwidth selection and Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	-0.017833	0.5071	0.366492	0.3570
Panel rho-Statistic	0.151675	0.5603	0.383539	0.6493
Panel PP-Statistic	-0.313667	0.0069	0.215620	0.0054
Panel ADF-Statistic	-3.898753	0.0000	-1.833583	0.0334

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	1.135919	0.8720
Group PP-Statistic	0.794570	0.0066
Group ADF-Statistic	-1.380652	0.0037

Cross section specific results

Phillips-Peron results (non-parametric)

Cross ID	AR(1)	Variance	HAC	Bandwidth	Obs
1	0.792	0.167162	0.125573	19.00	151
2	0.888	0.011167	0.014045	1.00	151
3	0.876	0.003691	0.004503	7.00	151
4	0.927	0.006234	0.012110	5.00	151

Augmented Dickey-Fuller results (parametric)

Cross ID	AR(1)	Variance	Lag	Max lag	Obs
1	0.724	0.150404	1	--	150
2	0.852	0.010259	1	--	150
3	0.832	0.003235	1	--	150
4	0.906	0.005447	1	--	150

Johansen Fisher Panel Cointegration Test
Series: INTR FFR GPR TOP EXC INF GDP
Date: 01/22/22 Time: 18:01
Sample: 1980Q1 2020Q4
Included observations: 608
Trend assumption: Linear deterministic trend
Lags interval (in first differences): 1 1

Unrestricted Cointegration Rank Test (Trace and Maximum Eigenvalue)

Hypothesized No. of CE(s)	Fisher Stat.* (from trace test)	Prob.	Fisher Stat.* (from max-eigen test)	Prob.
None	91.55	0.0000	58.39	0.0000
At most 1	44.01	0.0000	16.00	0.0423
At most 2	30.43	0.0002	16.21	0.0395
At most 3	17.96	0.0215	7.602	0.4732
At most 4	14.83	0.0625	6.583	0.5823
At most 5	14.96	0.0599	10.02	0.2639
At most 6	20.70	0.0080	20.70	0.0080

* Probabilities are computed using asymptotic Chi-square distribution.

Appendix 2: Objective Two

VAR Estimates- WAMZ

Vector Autoregression Estimates
Date: 09/07/20 Time: 20:48
Sample (adjusted): 1981Q1 2020Q4
Included observations: 592 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	LRGDP	INF	MS	INTR	LEXC
LRGDP(-1)	1.617013	-4.217480	7.207213	-1.870169	-0.106424
	(0.04206)	(6.11209)	(20.7145)	(6.10627)	(0.14101)
	[38.4433]	[-0.69002]	[0.34793]	[-0.30627]	[-0.75473]
LRGDP(-2)	-0.439634	2.293409	-4.607345	2.161838	0.072888
	(0.07928)	(11.5196)	(39.0412)	(11.5087)	(0.26576)
	[-5.54562]	[0.19909]	[-0.11801]	[0.18784]	[0.27426]
LRGDP(-3)	-0.257976	-1.884524	-0.400321	2.745574	0.042039
	(0.07907)	(11.4893)	(38.9383)	(11.4783)	(0.26506)
	[-3.26275]	[-0.16402]	[-0.01028]	[0.23920]	[0.15860]

LRGDP(-4)	0.080744	4.004523	-2.372033	-2.979322	-0.007576
	(0.04139)	(6.01388)	(20.3816)	(6.00815)	(0.13874)
	[1.95097]	[0.66588]	[-0.11638]	[-0.49588]	[-0.05461]
INF(-1)	-9.70E-05	1.208706	0.129535	0.058168	-0.000454
	(0.00030)	(0.04428)	(0.15008)	(0.04424)	(0.00102)
	[-0.31844]	[27.2941]	[0.86308]	[1.31475]	[-0.44405]
INF(-2)	-1.83E-06	-0.246286	-0.062695	-0.011931	0.000421
	(0.00048)	(0.06932)	(0.23494)	(0.06926)	(0.00160)
	[-0.00383]	[-3.55272]	[-0.26685]	[-0.17227]	[0.26324]
INF(-3)	-4.02E-05	-0.185466	-0.052794	0.001863	-0.000193
	(0.00047)	(0.06900)	(0.23386)	(0.06894)	(0.00159)
	[-0.08459]	[-2.68780]	[-0.22575]	[0.02702]	[-0.12110]
INF(-4)	-6.23E-05	0.011933	0.081011	0.001771	0.000451
	(0.00029)	(0.04180)	(0.14168)	(0.04176)	(0.00096)
	[-0.21641]	[0.28546]	[0.57179]	[0.04240]	[0.46726]
MS(-1)	5.85E-05	0.016557	1.267439	0.002713	0.000279
	(8.6E-05)	(0.01254)	(0.04250)	(0.01253)	(0.00029)
	[0.67775]	[1.32038]	[29.8238]	[0.21658]	[0.96398]
MS(-2)	-2.17E-05	-0.003295	-0.277527	-0.001782	-7.78E-05
	(0.00014)	(0.02004)	(0.06792)	(0.02002)	(0.00046)
	[-0.15730]	[-0.16440]	[-4.08604]	[-0.08902]	[-0.16825]
MS(-3)	-1.82E-05	-0.002107	-0.217820	-0.006602	-6.97E-05
	(0.00014)	(0.02002)	(0.06785)	(0.02000)	(0.00046)
	[-0.13244]	[-0.10524]	[-3.21021]	[-0.33010]	[-0.15088]
MS(-4)	4.24E-05	0.015170	0.071257	0.016584	0.000121
	(8.6E-05)	(0.01254)	(0.04250)	(0.01253)	(0.00029)
	[0.49164]	[1.20968]	[1.67660]	[1.32367]	[0.41738]
INTR(-1)	-0.000203	0.045845	0.058878	1.387320	0.001053
	(0.00029)	(0.04216)	(0.14287)	(0.04212)	(0.00097)
	[-0.69881]	[1.08753]	[0.41211]	[32.9412]	[1.08316]
INTR(-2)	9.08E-05	-0.027969	-0.032458	-0.320816	-0.000611
	(0.00049)	(0.07168)	(0.24294)	(0.07161)	(0.00165)
	[0.18401]	[-0.39018]	[-0.13361]	[-4.47979]	[-0.36948]
INTR(-3)	1.37E-05	-0.016412	0.002646	-0.226719	-0.000411
	(0.00049)	(0.07157)	(0.24257)	(0.07150)	(0.00165)
	[0.02778]	[-0.22931]	[0.01091]	[-3.17069]	[-0.24878]
INTR(-4)	4.79E-05	0.001474	0.000190	0.098748	0.000291
	(0.00028)	(0.04114)	(0.13944)	(0.04110)	(0.00095)
	[0.16910]	[0.03583]	[0.00136]	[2.40243]	[0.30690]
LEXC(-1)	-0.011004	3.299832	6.155475	0.723533	1.518058
	(0.01337)	(1.94297)	(6.58493)	(1.94112)	(0.04483)
	[-0.82298]	[1.69834]	[0.93478]	[0.37274]	[33.8662]
LEXC(-2)	0.007614	-1.868839	-2.605509	-0.596815	-0.371375
	(0.02389)	(3.47187)	(11.7665)	(3.46856)	(0.08010)
	[0.31868]	[-0.53828]	[-0.22143]	[-0.17206]	[-4.63655]

LEXC(-3)	0.007452	-0.566213	1.318772	-0.100592	-0.164034
	(0.02387)	(3.46850)	(11.7551)	(3.46519)	(0.08002)
	[0.31218]	[-0.16324]	[0.11219]	[-0.02903]	[-2.04993]
LEXC(-4)	-0.004213	-1.017667	-4.983996	-0.009627	0.016044
	(0.01335)	(1.94045)	(6.57639)	(1.93861)	(0.04477)
	[-0.31547]	[-0.52445]	[-0.75786]	[-0.00497]	[0.35838]
C	0.001726	-2.035777	4.559887	-0.265930	-0.010406
	(0.00342)	(0.49763)	(1.68653)	(0.49716)	(0.01148)
	[0.50405]	[-4.09092]	[2.70372]	[-0.53490]	[-0.90641]
R-squared	0.999981	0.921491	0.898184	0.968656	0.999832
Adj. R-squared	0.999981	0.918741	0.894618	0.967558	0.999826
Sum sq. resids	0.097283	2054.151	23593.96	2050.241	1.093308
S.E. equation	0.013053	1.896698	6.428097	1.894892	0.043758
F-statistic	1522515.	335.1040	251.8587	882.3147	170155.7
Log likelihood	1739.224	-1208.269	-1930.843	-1207.705	1023.101
Akaike AIC	-5.804811	4.152934	6.594063	4.151029	-3.385476
Schwarz SC	-5.649315	4.308430	6.749559	4.306525	-3.229980
Mean dependent	13.49926	5.515139	23.92873	18.11368	1.845979
S.D. dependent	2.962834	6.653705	19.80156	10.52041	3.320734

Determinant resid covariance (dof adj.)	0.000147
Determinant resid covariance	0.000123
Log likelihood	-1534.081
Akaike information criterion	5.537435
Schwarz criterion	6.314915

Lag Order Selection Criteria - WAMZ

VAR Lag Order Selection Criteria
Endogenous variables: LRGDP INF MS INTR LEXC
Exogenous variables: C
Date: 09/07/20 Time: 20:49
Sample: 1980Q1 2020Q4
Included observations: 576

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-9145.350	NA	43256771	31.77205	31.80986	31.78680
1	-2103.977	13936.05	0.001137	7.409644	7.636524	7.498125
2	-1563.048	1061.199	0.000189	5.618222	6.034170	5.780437
3	-1533.646	57.17073	0.000187	5.602937	6.207952	5.838886
4	-1524.424	17.77191	0.000197	5.657721	6.451803	5.967404
5	-1108.302	794.6770	5.07e-05	4.299659	5.282808	4.683076
6	-937.3114	323.5755*	3.06e-05*	3.792748*	4.964965*	4.249899*
7	-931.1633	11.52777	3.26e-05	3.858206	5.219490	4.389091
8	-912.5688	34.54185	3.34e-05	3.880447	5.430798	4.485066

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

VAR Estimates - WAEMU

Vector Autoregression Estimates
Date: 09/08/20 Time: 00:03
Sample (adjusted): 1981Q1 2020Q4
Included observations: 1156 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	LRGDP	INF	MS	INTR	LEXC
LRGDP(-1)	1.496526	-1.043055	24.04413	-0.194060	-0.005137
	(0.02969)	(3.10118)	(43.5945)	(0.53464)	(0.04822)
	[50.4068]	[-0.33634]	[0.55154]	[-0.36298]	[-0.10653]
LRGDP(-2)	-0.372739	0.400970	-8.107585	-0.212433	-0.006750
	(0.05325)	(5.56179)	(78.1843)	(0.95884)	(0.08648)
	[-7.00040]	[0.07209]	[-0.10370]	[-0.22155]	[-0.07805]
LRGDP(-3)	-0.243988	-0.303018	13.56853	0.274384	-0.016459
	(0.05323)	(5.56068)	(78.1687)	(0.95865)	(0.08647)
	[-4.58325]	[-0.05449]	[0.17358]	[0.28622]	[-0.19035]
LRGDP(-4)	0.120269	0.971602	-31.49503	0.129005	0.029331
	(0.02965)	(3.09721)	(43.5386)	(0.53395)	(0.04816)
	[4.05617]	[0.31370]	[-0.72338]	[0.24160]	[0.60903]
INF(-1)	-0.000159	1.538907	-0.214308	0.003767	0.000148
	(0.00032)	(0.03353)	(0.47138)	(0.00578)	(0.00052)
	[-0.49575]	[45.8930]	[-0.45464]	[0.65160]	[0.28425]
INF(-2)	6.90E-05	-0.393986	0.150290	0.001196	-0.000138
	(0.00059)	(0.06123)	(0.86073)	(0.01056)	(0.00095)
	[0.11768]	[-6.43459]	[0.17461]	[0.11333]	[-0.14528]
INF(-3)	-5.91E-05	-0.241185	-0.012654	-0.000212	0.000207
	(0.00059)	(0.06114)	(0.85954)	(0.01054)	(0.00095)
	[-0.10104]	[-3.94447]	[-0.01472]	[-0.02012]	[0.21764]
INF(-4)	0.000110	0.075072	-0.245298	-0.000998	-0.000158
	(0.00032)	(0.03317)	(0.46622)	(0.00572)	(0.00052)
	[0.34747]	[2.26356]	[-0.52614]	[-0.17451]	[-0.30660]
MS(-1)	5.44E-06	-0.002414	1.071099	0.000323	0.000119
	(2.1E-05)	(0.00216)	(0.03041)	(0.00037)	(3.4E-05)
	[0.26275]	[-1.11569]	[35.2170]	[0.86548]	[3.54357]
MS(-2)	-1.03E-06	0.001179	-0.210247	-0.000200	-4.65E-05
	(3.1E-05)	(0.00322)	(0.04529)	(0.00056)	(5.0E-05)

	[-0.03342]	[0.36577]	[-4.64190]	[-0.35963]	[-0.92816]
MS(-3)	1.75E-06	0.001500	-0.159836	-0.000103	-2.64E-05
	(3.1E-05)	(0.00322)	(0.04525)	(0.00055)	(5.0E-05)
	[0.05673]	[0.46601]	[-3.53263]	[-0.18572]	[-0.52745]
MS(-4)	-1.03E-06	-0.003071	-0.089442	0.000373	5.29E-05
	(2.0E-05)	(0.00213)	(0.02997)	(0.00037)	(3.3E-05)
	[-0.05048]	[-1.44072]	[-2.98474]	[1.01631]	[1.59473]
INTR(-1)	-0.000267	0.479174	2.336342	1.334760	0.005478
	(0.00167)	(0.17445)	(2.45234)	(0.03008)	(0.00271)
	[-0.15985]	[2.74674]	[0.95270]	[44.3810]	[2.01926]
INTR(-2)	6.91E-05	-0.263475	-0.491437	-0.250393	-0.004086
	(0.00280)	(0.29242)	(4.11068)	(0.05041)	(0.00455)
	[0.02467]	[-0.90101]	[-0.11955]	[-4.96687]	[-0.89872]
INTR(-3)	-0.000460	-0.028887	-2.141784	-0.200042	-5.37E-05
	(0.00280)	(0.29215)	(4.10693)	(0.05037)	(0.00454)
	[-0.16453]	[-0.09888]	[-0.52151]	[-3.97172]	[-0.01182]
INTR(-4)	0.001579	0.065109	3.839621	0.065426	-0.000391
	(0.00165)	(0.17242)	(2.42371)	(0.02972)	(0.00268)
	[0.95666]	[0.37763]	[1.58419]	[2.20113]	[-0.14579]
LEXC(-1)	0.006972	0.579801	20.27907	0.186325	1.496089
	(0.02078)	(2.17106)	(30.5195)	(0.37429)	(0.03376)
	[0.33542]	[0.26706]	[0.66446]	[0.49782]	[44.3167]
LEXC(-2)	3.39E-05	-0.239036	-8.533526	0.085060	-0.370610
	(0.03725)	(3.89068)	(54.6928)	(0.67074)	(0.06050)
	[0.00091]	[-0.06144]	[-0.15603]	[0.12682]	[-6.12595]
LEXC(-3)	0.009075	0.542727	8.644412	0.271852	-0.250663
	(0.03712)	(3.87765)	(54.5097)	(0.66850)	(0.06030)
	[0.24447]	[0.13996]	[0.15858]	[0.40666]	[-4.15723]
LEXC(-4)	-0.013872	-0.910251	-17.59919	-0.585727	0.097831
	(0.02025)	(2.11481)	(29.7287)	(0.36459)	(0.03288)
	[-0.68517]	[-0.43042]	[-0.59199]	[-1.60655]	[2.97499]
C	-0.020500	-2.373779	-12.36042	0.821326	0.104989
	(0.01465)	(1.53059)	(21.5161)	(0.26387)	(0.02380)
	[-1.39902]	[-1.55089]	[-0.57447]	[3.11262]	[4.41128]
R-squared	0.999867	0.998735	0.793935	0.993921	0.992740
Adj. R-squared	0.999865	0.998712	0.790304	0.993814	0.992612
Sum sq. resids	0.162565	1773.750	350510.8	52.71730	0.428872
S.E. equation	0.011968	1.250110	17.57328	0.215516	0.019439
F-statistic	427416.4	44792.70	218.6489	9278.997	7759.563
Log likelihood	3486.220	-1887.752	-4943.231	144.4423	2925.513
Akaike AIC	-5.995190	3.302340	8.588635	-0.213568	-5.025109
Schwarz SC	-5.903401	3.394128	8.680423	-0.121780	-4.933320
Mean dependent	14.62334	95.72517	14.46649	17.68679	5.178094
S.D. dependent	1.029660	34.83781	38.37584	2.740168	0.226147

Determinant resid covariance (dof adj.)	8.86E-07
Determinant resid covariance	8.08E-07
Log likelihood	-92.96237

Akaike information criterion	0.342495
Schwarz criterion	0.801436

Lag Order Selection Criteria - WAEMU

VAR Lag Order Selection Criteria
Endogenous variables: LRGDP INF MS INTR LEXC
Exogenous variables: C
Date: 09/08/20 Time: 00:04
Sample: 1980Q1 2020Q4
Included observations: 1124

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-13556.49	NA	20772.49	24.13077	24.15312	24.13922
1	-1247.510	24486.55	6.68e-06	2.273149	2.407258	2.323830
2	-242.3063	1990.732	1.17e-06	0.529015	0.774883	0.621930
3	-170.5478	141.4740	1.07e-06	0.445815	0.803441	0.580964
4	-137.9921	63.89496	1.06e-06	0.432370	0.901755	0.609754
5	659.7357	1558.550	2.68e-07	-0.942590	-0.361447	-0.722972
6	1036.927	733.5763	1.43e-07	-1.569265	-0.876364*	-1.307413*
7	1061.965	48.47341	1.43e-07*	-1.569333*	-0.764674	-1.265247
8	1086.098	46.50474*	1.43e-07	-1.567790	-0.651373	-1.221470

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

SVAR- WAMZ

Structural VAR Estimates
Date: 09/07/20 Time: 22:02
Sample (adjusted): 1981Q3 2020Q4
Included observations: 584 after adjustments
Estimation method: method of scoring (analytic derivatives)
Failure to improve after 1 iterations
Structural VAR is over-identified (1 degrees of freedom)

Model: Ae = Bu where E[uu']=I
Restriction Type: short-run pattern matrix
A =

1	0	0	0	0
C(1)	1	0	0	0
C(2)	C(4)	1	C(7)	0
0	0	0	1	C(9)
C(3)	C(5)	C(6)	C(8)	1

B =

C(10)	0	0	0	0
0	C(11)	0	0	0
0	0	C(12)	0	0
0	0	0	C(13)	0
0	0	0	0	C(14)

	Coefficient	Std. Error	z-Statistic	Prob.
C(1)	0.100000	0.041380	2.416609	0.0157
C(2)	0.100000	0.041589	2.404454	0.0162

C(3)	0.100000	0.041965	2.382946	0.0172
C(4)	0.100000	0.041383	2.416445	0.0157
C(5)	0.100000	0.041760	2.394616	0.0166
C(6)	0.100000	0.042147	2.372667	0.0177
C(7)	0.100000	0.053185	1.880222	0.0601
C(8)	0.100000	0.340492	0.293692	0.7690
C(9)	0.100000	0.338677	0.295267	0.7678
C(10)	0.100000	0.002926	34.17601	0.0000
C(11)	0.100000	0.002926	34.17601	0.0000
C(12)	0.100000	0.002927	34.17027	0.0000
C(13)	0.100000	0.004245	23.55582	0.0000
C(14)	0.100000	0.004518	22.13367	0.0000

Log likelihood	-752635.4		
LR test for over-identification:			
Chi-square(1)	1503241.	Probability	0.0000

Estimated A matrix:

1.000000	0.000000	0.000000	0.000000	0.000000
0.100000	1.000000	0.000000	0.000000	0.000000
0.100000	0.100000	1.000000	0.100000	0.000000
0.000000	0.000000	0.000000	1.000000	0.100000
0.100000	0.100000	0.100000	0.100000	1.000000

Estimated B matrix:

0.100000	0.000000	0.000000	0.000000	0.000000
0.000000	0.100000	0.000000	0.000000	0.000000
0.000000	0.000000	0.100000	0.000000	0.000000
0.000000	0.000000	0.000000	0.100000	0.000000
0.000000	0.000000	0.000000	0.000000	0.100000

SVAR - WAEMU

Structural VAR Estimates
Date: 09/08/20 Time: 00:52
Sample (adjusted): 1981Q4 2020Q4
Included observations: 1132 after adjustments
Estimation method: method of scoring (analytic derivatives)
Failure to improve after 1 iterations
Structural VAR is over-identified (1 degrees of freedom)

Model: Ae = Bu where E[uu']=I
Restriction Type: short-run pattern matrix
A =

1	0	0	0	0
C(1)	1	0	0	0
C(2)	C(4)	1	C(7)	0
0	0	0	1	C(9)
C(3)	C(5)	C(6)	C(8)	1

B =

C(10)	0	0	0	0
0	C(11)	0	0	0
0	0	C(12)	0	0
0	0	0	C(13)	0
0	0	0	0	C(14)

	Coefficient	Std. Error	z-Statistic	Prob.

C(1)	0.100000	0.029722	3.364521	0.0008
C(2)	0.100000	0.029872	3.347598	0.0008
C(3)	0.100000	0.030142	3.317653	0.0009
C(4)	0.100000	0.029724	3.364292	0.0008
C(5)	0.100000	0.029995	3.333901	0.0009
C(6)	0.100000	0.030272	3.303342	0.0010
C(7)	0.100000	0.038201	2.617737	0.0089
C(8)	0.100000	0.244563	0.408893	0.6826
C(9)	0.100000	0.243259	0.411085	0.6810
C(10)	0.100000	0.002102	47.58151	0.0000
C(11)	0.100000	0.002102	47.58151	0.0000
C(12)	0.100000	0.002102	47.57351	0.0000
C(13)	0.100000	0.003049	32.79556	0.0000
C(14)	0.100000	0.003245	30.81557	0.0000

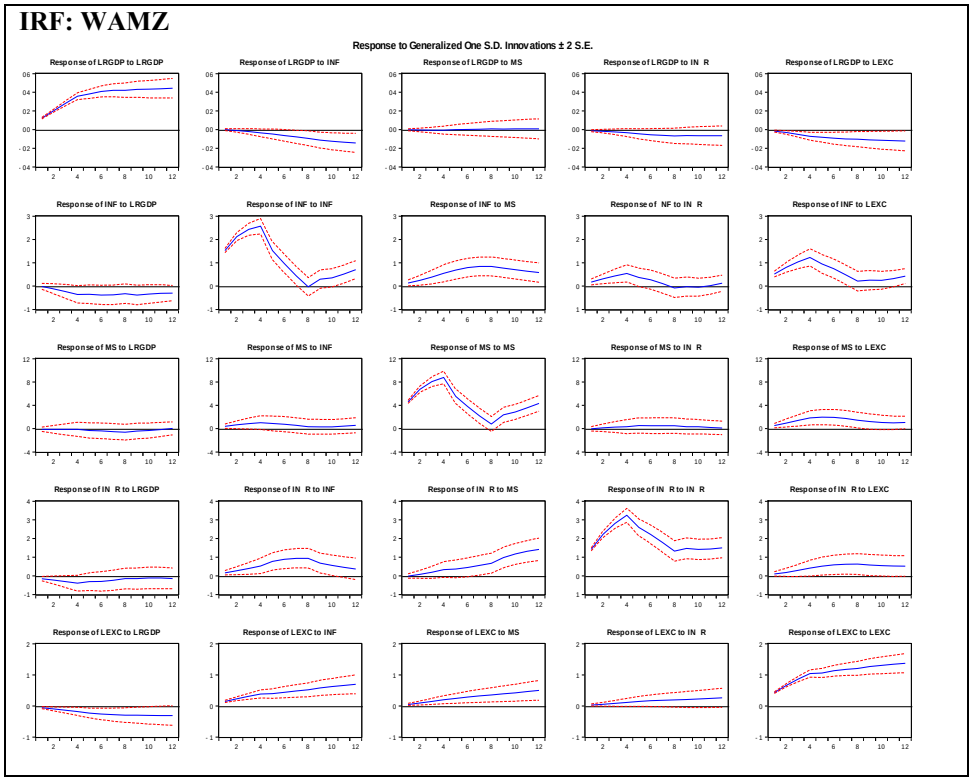
Log likelihood -8965496.
LR test for over-identification:
Chi-square(1) 17932955 Probability 0.0000

Estimated A matrix:

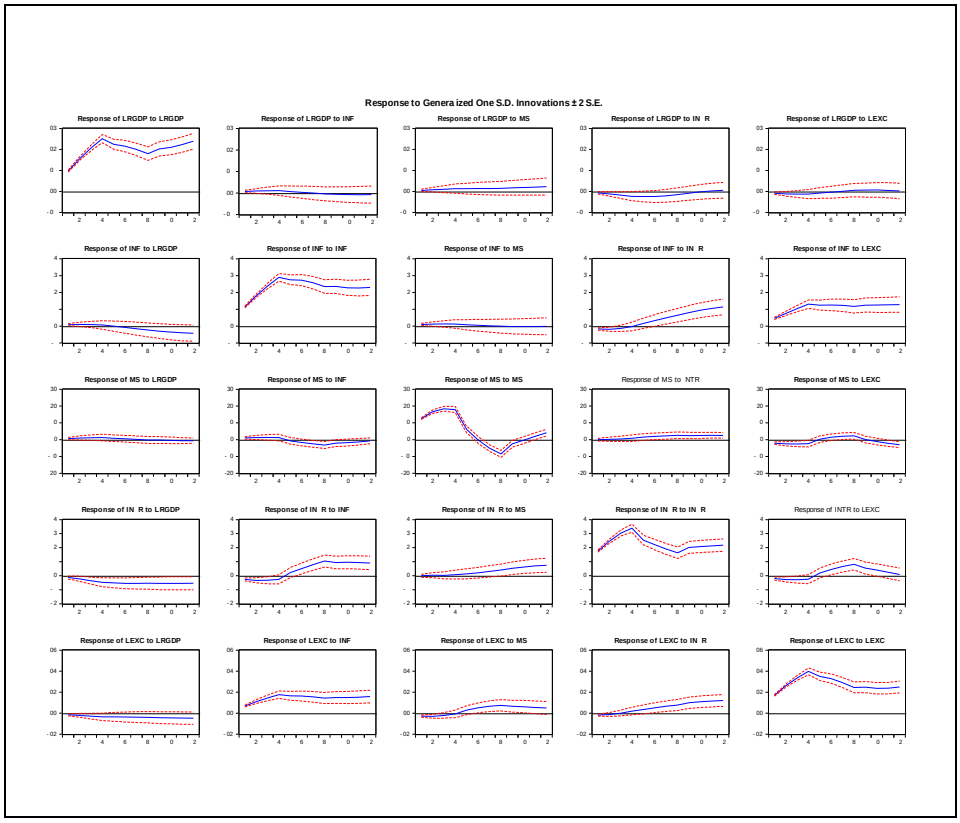
1.000000	0.000000	0.000000	0.000000	0.000000
0.100000	1.000000	0.000000	0.000000	0.000000
0.100000	0.100000	1.000000	0.100000	0.000000
0.000000	0.000000	0.000000	1.000000	0.100000
0.100000	0.100000	0.100000	0.100000	1.000000

Estimated B matrix:

0.100000	0.000000	0.000000	0.000000	0.000000
0.000000	0.100000	0.000000	0.000000	0.000000
0.000000	0.000000	0.100000	0.000000	0.000000
0.000000	0.000000	0.000000	0.100000	0.000000
0.000000	0.000000	0.000000	0.000000	0.100000



IRF: WAEMU



Variance Decomposition- WAMZ

Variance Decomposition of LRGDP:

Period	S.E.	Shock1	Shock2	Shock3	Shock4	Shock5
1	0.100000	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.193586	99.99889	1.25E-07	1.12E-05	2.14E-05	0.001073
3	0.300537	99.99506	4.70E-06	5.12E-05	6.92E-05	0.004811
4	0.418636	99.98906	1.47E-05	0.000115	0.000134	0.010677
5	0.520935	99.98407	2.12E-05	0.000172	0.000158	0.015574
6	0.617370	99.98052	2.06E-05	0.000214	0.000171	0.019077
7	0.705121	99.97869	1.63E-05	0.000238	0.000171	0.020881
8	0.783266	99.97832	1.45E-05	0.000246	0.000161	0.021262
9	0.857531	99.97841	2.01E-05	0.000249	0.000158	0.021159
10	0.926621	99.97864	3.04E-05	0.000249	0.000155	0.020929
11	0.992245	99.97878	4.23E-05	0.000250	0.000153	0.020774
12	1.055666	99.97875	5.34E-05	0.000253	0.000154	0.020788

Variance Decomposition of INF:

Period	S.E.	Shock1	Shock2	Shock3	Shock4	Shock5
1	0.100499	0.990099	99.00990	0.000000	0.000000	0.000000
2	0.762103	90.43835	4.249327	0.045843	0.024817	5.241663
3	1.704603	90.09823	1.275728	0.073300	0.042329	8.510410
4	2.914567	89.28192	0.525771	0.085226	0.050968	10.05611
5	3.749953	86.99337	0.317610	0.101429	0.070925	12.51667
6	4.583603	87.72228	0.216485	0.092057	0.070777	11.89840
7	5.324960	89.50138	0.166123	0.075503	0.063456	10.19354
8	5.885213	91.09325	0.140707	0.062401	0.056109	8.647534
9	6.618146	92.92063	0.111274	0.049376	0.045183	6.873538
10	7.143567	93.90524	0.095670	0.042430	0.039412	5.917246
11	7.539226	94.47988	0.086199	0.038117	0.036149	5.359650
12	7.856347	94.76826	0.079623	0.035691	0.034459	5.081972

Variance Decomposition of MS:

Period	S.E.	Shock1	Shock2	Shock3	Shock4	Shock5
1	0.101326	0.803332	0.991768	97.20321	0.991768	0.009918
2	0.709643	47.68734	0.755829	3.885583	0.450095	47.22115
3	1.827042	44.72522	0.646803	0.659284	0.423780	53.54491
4	3.379277	42.52395	0.607801	0.198810	0.428987	56.24045
5	4.709997	21.97280	0.750265	0.296001	0.547689	76.43324
6	6.044430	15.08121	0.784022	0.405789	0.591406	83.13758
7	7.357080	17.44421	0.750239	0.464355	0.569726	80.77148
8	8.716899	26.91375	0.660468	0.458433	0.498783	71.46857
9	9.229537	28.05248	0.654331	0.450349	0.490560	70.35228
10	9.493362	28.10516	0.657939	0.442812	0.489142	70.30495
11	9.613748	27.41497	0.666224	0.437603	0.494558	70.98664
12	9.876359	29.19137	0.650104	0.416875	0.484930	69.25672

Variance Decomposition of INTR:

Period	S.E.	Shock1	Shock2	Shock3	Shock4	Shock5
1	0.101424	0.006494	0.008018	0.009899	98.98573	0.989857
2	0.236345	37.64886	0.015674	0.003385	60.69905	1.633031
3	0.324914	20.71931	0.082029	0.055247	65.13101	14.01241
4	0.508360	27.75583	0.145526	0.140323	42.76189	29.19643
5	0.650358	19.45857	0.102363	0.286079	31.12210	49.03089
6	0.851747	20.39919	0.068850	0.373802	19.73818	59.41998
7	1.020497	14.66576	0.057653	0.449948	14.20807	70.61858
8	1.210424	15.25953	0.049432	0.465000	10.17270	74.05333
9	1.435207	21.20681	0.093179	0.412766	7.326455	70.96079
10	1.737499	33.77268	0.125368	0.325142	5.053073	60.72374
11	1.997673	40.33349	0.162589	0.273865	3.867419	55.36263
12	2.197475	42.13971	0.213079	0.249280	3.239247	54.15868

Variance Decomposition of LEXC:

Period	S.E.	Shock1	Shock2	Shock3	Shock4	Shock5
1	0.102548	0.635287	0.784305	0.968278	0.784305	96.82782
2	0.189178	1.269497	0.777599	0.958516	0.777281	96.21711
3	0.280487	2.130117	0.768392	0.946929	0.766691	95.38787
4	0.374843	3.052248	0.757870	0.934980	0.755503	94.49940

5	0.456994	5.882849	0.734250	0.904696	0.728281	91.74992
6	0.535773	8.190026	0.713577	0.879798	0.706612	89.50999
7	0.610246	10.24498	0.694091	0.857666	0.687995	87.51527
8	0.680391	12.05591	0.676130	0.838157	0.671940	85.75786
9	0.746866	12.85159	0.664835	0.828608	0.664384	84.99059
10	0.809976	13.47598	0.654970	0.820770	0.658032	84.39024
11	0.870102	13.84121	0.647338	0.815411	0.653474	84.04257
12	0.927677	14.03509	0.641353	0.811659	0.650028	83.86187

Factorization: Structural

Variance Decomposition – WAEMU

Variance Decomposition of LRGDP:

Period	S.E.	Shock1	Shock2	Shock3	Shock4	Shock5
1	0.100000	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.190043	99.98819	0.000126	0.000114	0.000135	0.011433
3	0.287308	99.95678	0.000450	0.000415	0.000586	0.041766
4	0.389128	99.91754	0.000858	0.000791	0.001129	0.079681
5	0.454802	99.86140	0.001445	0.001327	0.002041	0.133783
6	0.508082	99.79209	0.002172	0.001990	0.003041	0.200711
7	0.550184	99.69499	0.003183	0.002922	0.004069	0.294840
8	0.582654	99.57194	0.004458	0.004106	0.005022	0.414472
9	0.621434	99.44214	0.005799	0.005359	0.005471	0.541234
10	0.660851	99.31612	0.007099	0.006579	0.005602	0.664605
11	0.702684	99.22468	0.008051	0.007465	0.005438	0.754370
12	0.747908	99.17106	0.008620	0.007986	0.005081	0.807249

Variance Decomposition of INF:

Period	S.E.	Shock1	Shock2	Shock3	Shock4	Shock5
1	0.100499	0.990099	99.00990	0.000000	0.000000	0.000000
2	0.341767	40.84955	25.61443	0.331518	0.754522	32.44998
3	0.911821	47.84640	6.622777	0.448614	0.867536	44.21467
4	1.715749	52.16467	2.855449	0.441192	1.051621	43.48707
5	2.537292	62.95391	1.714608	0.340760	1.474942	33.51578
6	3.506018	70.22115	1.083081	0.272388	1.672828	26.75055
7	4.641648	74.27895	0.681354	0.235482	1.677933	23.12628
8	5.888032	76.80607	0.441323	0.212865	1.614910	20.92483
9	7.312533	76.53022	0.287760	0.217988	1.487361	21.47667
10	8.786067	76.09542	0.199369	0.223698	1.397751	22.08376
11	10.22312	76.09701	0.147503	0.224312	1.357616	22.17356
12	11.59817	76.42148	0.114744	0.221198	1.355462	21.88711

Variance Decomposition of MS:

Period	S.E.	Shock1	Shock2	Shock3	Shock4	Shock5
1	0.101326	0.803332	0.991768	97.20321	0.991768	0.009918
2	3.045939	27.94619	0.771950	0.269039	0.121006	70.89181
3	6.710472	33.77091	0.680333	0.295205	0.058015	65.19554

4	10.74429	37.30514	0.633059	0.333311	0.024600	61.70389
5	20.54432	28.52991	0.734853	0.586516	0.053122	70.09560
6	28.52296	26.23203	0.768862	0.661804	0.048803	72.28850
7	34.62081	24.83262	0.795725	0.704982	0.040758	73.62592
8	38.95643	23.51883	0.825131	0.737525	0.032544	74.88597
9	39.22686	23.40723	0.832258	0.739210	0.081128	74.94017
10	39.40823	23.49702	0.825766	0.736978	0.224604	74.71563
11	40.86084	23.71743	0.802365	0.734816	0.474782	74.27061
12	44.13040	23.80668	0.774289	0.737264	0.726666	73.95510

Variance Decomposition of INTR:

Period	S.E.	Shock1	Shock2	Shock3	Shock4	Shock5
1	0.101424	0.006494	0.008018	0.009899	98.98573	0.989857
2	0.179980	7.050576	0.007858	0.007147	92.24174	0.692684
3	0.290895	28.57457	0.008262	0.004021	71.02645	0.386705
4	0.428311	46.62160	0.005956	0.001872	53.18880	0.181769
5	0.595762	60.02281	0.030698	0.071565	32.60281	7.272109
6	0.787628	64.62622	0.062795	0.143153	20.61864	14.54919
7	0.976741	64.87001	0.089902	0.202654	14.22136	20.61608
8	1.157850	64.17970	0.107456	0.245253	10.49121	24.97638
9	1.284165	66.97054	0.094854	0.230330	9.184443	23.51984
10	1.387604	70.04830	0.081410	0.206163	8.564547	21.09958
11	1.483169	72.99028	0.073999	0.180846	8.232229	18.52264
12	1.575372	75.12589	0.076916	0.162155	8.058831	16.57621

Variance Decomposition of LEXC:

Period	S.E.	Shock1	Shock2	Shock3	Shock4	Shock5
1	0.102548	0.635287	0.784305	0.968278	0.784305	96.82782
2	0.189346	0.549110	0.782255	0.969004	0.712550	96.98708
3	0.280760	0.537637	0.780513	0.968805	0.650054	97.06299
4	0.374617	0.549670	0.778816	0.968344	0.598335	97.10483
5	0.435148	0.644642	0.776281	0.966858	0.562988	97.04923
6	0.482837	0.781164	0.773191	0.965053	0.530801	96.94979
7	0.517312	0.965925	0.769366	0.962884	0.502273	96.79955
8	0.540466	1.217588	0.764868	0.960162	0.478200	96.57918
9	0.562898	1.462105	0.760171	0.957682	0.452320	96.36772
10	0.582109	1.731104	0.755233	0.955033	0.429266	96.12937
11	0.600742	1.999146	0.750328	0.952452	0.407869	95.89020
12	0.620088	2.238054	0.745730	0.950205	0.387495	95.67852

Factorization: Structural

Appendix 3- Objective Three

Regime switching

Gambia

Convergence achieved after 44 iterations

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Regime 1				
INF	-0.006797	0.003033	-2.240819	0.0250
M2	0.000283	0.000134	2.110677	0.0348
INTR	0.000475	0.000524	0.906294	0.0048
EXCR	0.011240	0.001542	7.290925	0.0000
LOG(SIGMA)	-3.301548	0.155638	-21.21301	0.0000
Regime 2				
INF	-0.001546	0.000524	-2.948873	0.0032
M2	3.55E-05	9.36E-05	0.378697	0.0049
INTR	-0.000304	0.000129	-2.356265	0.0185
EXCR	0.012612	0.001207	10.44705	0.0000
LOG(SIGMA)	-5.620981	0.082358	-68.25079	0.0000

Ghana

Convergence achieved after 68 iterations

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Regime 1				
INF	-0.023035	0.002453	-9.390056	0.0000
M2	0.001800	0.000392	4.594276	0.0000
INTR	0.000466	0.000966	0.482948	0.6291
EXCR	-0.030569	0.006959	-4.392462	0.0000
LOG(SIGMA)	-2.592222	0.140947	-18.39153	0.0000
Regime 2				
INF	-0.009433	0.000400	-23.60827	0.0000
M2	-0.000408	0.000229	-1.782209	0.0747
INTR	0.002585	0.000855	3.023072	0.0025
EXCR	-0.007486	0.004924	-1.520420	0.1284
LOG(SIGMA)	-4.515536	0.080972	-55.76649	0.0000

Nigeria

Convergence achieved after 73 iterations

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Regime 1				
INF	-3.375594	0.260343	-12.96594	0.0000
M2	-0.093864	0.009461	-9.921162	0.0000

Sierra Leone

Convergence achieved after 49 iterations

Variable	Coefficient	Std.Error	z-Statistic	Prob.
Regime 1				
INF	0.007916	0.001538	5.148335	0.0000
M2	0.003376	0.000468	7.217530	0.0000

INTR	-0.677286	0.098330	-6.887906	0.0000
EXCR	4.048907	0.466571	8.678012	0.0000
LOG(SIGMA)	2.690028	0.121216	22.19205	0.0000
Regime 2				
INF	-0.078640	0.016041	-4.902520	0.0000
M2	0.013994	0.001948	7.183368	0.0000
INTR	-0.030737	0.017399	-1.766629	0.0373
EXCR	-0.196332	0.092598	-2.120259	0.0340
LOG(SIGMA)	-1.823370	0.072063	-25.30236	0.0000

INTR	-0.006998	0.002076	-3.371856	0.0007
EXCR	0.012865	0.005134	2.505848	0.0122
LOG(SIGMA)	-1.870450	0.161030	-11.61557	0.0000
Regime 2				
INF	-2.98E-05	0.000249	-0.119966	0.0045
M2	-0.000184	0.000105	-1.753558	0.0025
INTR	-0.000223	0.000319	-0.699916	0.0440
EXCR	0.005775	0.001442	4.006336	0.0001
LOG(SIGMA)	-4.966093	0.070915	-70.02844	0.0000

Benin

Convergence achieved after 59 iterations

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Regime 1				
INF	0.214343	0.043714	4.903259	0.0000
M2	-0.036469	0.002171	-16.79817	0.0000
INTR	-0.045345	0.029828	-1.520210	0.0085
EXCR	0.172837	0.084563	2.043872	0.0410
LOG(SIGMA)	0.817142	0.129231	6.323107	0.0000
Regime 2				
INF	-0.001550	0.013229	-0.117134	0.0068
M2	-0.005204	0.001177	-4.422223	0.0000

Burkina Faso

Convergence achieved after 75 iterations

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Regime 1				
INF	-0.468060	0.074888	-6.250128	0.0000
M2	-0.046010	0.003051	-15.08003	0.0000
INTR	0.116108	0.049959	2.324045	0.0201
EXCR	-0.232812	0.149049	-1.561986	0.0083
LOG(SIGMA)	0.734322	0.153804	4.774391	0.0000
Regime 2				
INF	0.041609	0.029538	1.408666	0.0489
M2	-0.035256	0.002615	-13.48057	0.0000
INTR	0.077153	0.039508	1.952816	0.0508
EXCR	-0.124514	0.116775	-1.066273	0.0063
LOG(SIGMA)	-1.978647	0.099163	-19.95356	0.0000

INTR	-0.060586	0.026570	-2.280243	0.0226
EXCR	0.194239	0.074839	2.595432	0.0094
LOG(SIGMA)	-2.781574	0.076000	-36.59969	0.0000

Cote D'ivoire

Convergence achieved after 90 iterations

Variable	Coefficient	Std. Error	z-Statistic	Prob.
		Regime 1		
INF	-3.540369	0.908061	-3.898825	0.0001
M2	0.902988	0.086507	10.43828	0.0000
INTR	2.066635	1.022141	2.021869	0.0432
EXCR	-3.386765	2.575732	-1.314874	0.1886
LOG(SIGMA)	3.615770	0.263898	13.70139	0.0000
		Regime 2		
INF	-0.783399	0.236315	-3.315059	0.0009
M2	-0.028336	0.011954	-2.370323	0.0178
INTR	0.181683	0.170428	1.066041	0.0064
EXCR	-0.292262	0.513034	-0.569673	0.0289
LOG(SIGMA)	-0.368669	0.063794	-5.779080	0.0000

Guinea Bissa

Convergence achieved after 52 iterations

Variable	Coefficient	Std. Error	z-Statistic	Prob.
		Regime 1		
INF	0.013326	0.002011	6.626065	0.0000
M2	0.001211	9.11E-05	13.28951	0.0000
INTR	-0.002042	0.000269	-7.603172	0.0000
EXCR	0.017488	0.002645	6.612890	0.0000
LOG(SIGMA)	-1.233155	0.140964	-8.748025	0.0000
		Regime 2		
INF	0.000101	0.000135	0.751587	0.0323
M2	7.20E-06	7.10E-06	1.014901	0.3102
INTR	-0.000269	0.000182	-1.477659	0.0195
EXCR	0.002443	0.001619	1.509123	0.0313
LOG(SIGMA)	-5.579139	0.072978	-76.44977	0.0000

Mali

Niger

Convergence achieved after 60 iterations

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Regime 1				
INF	0.059385	0.053799	1.103826	0.2697
M2	-0.077278	0.010328	-7.482184	0.0000
INTR	0.243727	0.043102	5.654697	0.0000
EXCR	-0.538801	0.126775	-4.250050	0.0000
LOG(SIGMA)	-0.371815	0.134232	-2.769940	0.0056
Regime 2				
INF	-0.063493	0.014817	-4.285229	0.0000
M2	-0.005308	0.001331	-3.989217	0.0001
INTR	0.056556	0.018129	3.119678	0.0018
EXCR	-0.123737	0.052247	-2.368295	0.0179
LOG(SIGMA)	-2.665238	0.074215	-35.91247	0.0000

Convergence achieved after 99 iterations

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Regime 1				
INF	-1.483439	0.064821	-22.88509	0.0000
M2	0.047382	0.002994	15.82331	0.0000
INTR	0.182939	0.049818	3.672123	0.0002
EXCR	-0.799544	0.143338	-5.578017	0.0000
LOG(SIGMA)	1.168030	0.121102	9.645002	0.0000
Regime 2				
INF	0.002291	0.010794	0.212202	0.8319
M2	-0.008889	0.001816	-4.895408	0.0000
INTR	0.022299	0.025333	0.880213	0.3787
EXCR	-0.012596	0.071079	-0.177215	0.8593
LOG(SIGMA)	-2.656276	0.078954	-33.64325	0.0000

Senegal

Convergence achieved after 55 iterations

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Regime 1				
INF	-4.584607	0.735723	-6.231433	0.0000
M2	0.300594	0.047778	6.291475	0.0000
INTR	0.598039	0.216662	2.760234	0.0058
EXCR	-2.511883	0.689340	-3.643895	0.0003
LOG(SIGMA)	2.836368	0.167150	16.96903	0.0000

Togo

Convergence achieved after 49 iterations

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Regime 1				
INF	0.577905	0.081644	7.078375	0.0000
M2	0.040885	0.006573	6.220364	0.0000
INTR	-0.231996	0.032446	-7.150204	0.0000
EXCR	0.653740	0.100140	6.528288	0.0000
LOG(SIGMA)	1.127790	0.184508	6.112431	0.0000

Regime 2				
INF	0.662516	0.133839	4.950084	0.0000
M2	0.033705	0.017650	1.909592	0.0562
INTR	0.019341	0.168939	0.114487	0.0089
EXCR	-0.065223	0.508737	-0.128206	0.8980
LOG(SIGMA)	-0.620609	0.066702	-9.304213	0.0000

Regime 2				
INF	0.025566	0.011464	2.230102	0.0257
M2	-0.003967	0.001772	-2.238640	0.0252
INTR	0.008182	0.020446	0.400202	0.0290
EXCR	0.021392	0.061348	0.348699	0.7273
LOG(SIGMA)	-2.686257	0.068088	-39.45287	0.0000