THE RELATIVE EFFECTIVENESS OF MONETARY AND FISCAL POLICY ON GROWTH IN WAEMU COUNTRIES

BY

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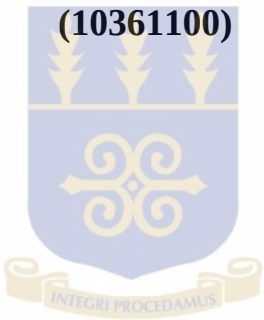

THIS THESIS IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF THE MPHIL ECONOMICS DEGREE.

JULY, 2013

DECLARATION

I, DEDE WOADE ADZOVI GAFA, hereby declare that with the exception of references to other people's work which have been duly acknowledged, this thesis is entirely my own work and that neither a part of this publication nor the whole has been presented for another degree elsewhere.

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DEDICATION

This thesis is dedicated to my Dad, Mathias Teih Gafa, a wonderful and supportive father. Thank you for believing in me.

ACKNOWLEDGEMENT

This thesis could not have been completed successfully without the Almighty God, amazing in his ways, always protecting and providing for his children. Thank you for seeing me through the years.

I express my deepest gratitude and appreciation to my parents (Mathias Teih Gafa and Helene Ahadji) for their prayers, financial support and more importantly for their priceless love. I love you, I honour you and I appreciate all you have done for me. My special thanks to my supervisors Dr. A. D. A. Laryea and Mr. T. O. Antwi-Asare, all of the Department of Economics, University of Ghana, for their invaluable support, constructive criticisms and guidance to make this work a success.

I also express my sincere gratitude to all my colleague Ghanaians from the MPhil Economics (2011-2013) class, for their friendship and support. A special thanks to Rev Philip GAFA, Kabiru Sekoni, Stecy Attiba, Abass Atchabao, LSI Campus ministry, my irreplaceable friends especially those in the United Nations Hall and my lovely brother and sisters for their contribution throughout my academic career.

This acknowledgement will be incomplete without my mentioning of Emmanuel Nii Abbey and Richard Osei Bofah for their time, comments and priceless support throughout this work. Lastly, the prayers and other forms of support from relatives, friends and well-wishers who are too many to list here are highly acknowledged.

ABSTRACT

In order to promote sustainable economic growth, there is a need for WAEMU countries to implement an appropriate policy mix. The study empirically analyses the relative effectiveness of monetary and fiscal policy on economic growth in WAEMU countries. The investigation of the relative effect of both policies was done in an unrestricted vector autoregressive VAR framework which was based on a modified version of the St Louis model. The VAR model was analysed using the Impulse Response Functions (IRFs) and Variance decompositions (VDCs). The results showed that in WAEMU countries, the effect of fiscal policy on growth is more important and lasting relative to monetary policy. However, due to the differences in their macroeconomic structure, the effect of both policies on growth in terms of sign and magnitude differs from one country to the other.

Promoting growth in WAEMU countries would therefore require the implementation of reforms to improve the quality of public spending. Furthermore, economic reforms to improve liquidity trading, strengthen financial intermediation and reduce excess liquidity in the financial market would help increase the effectiveness of monetary policy in the zone.

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LIST OF ABBREVIATIONS

ADF:	Augmented Dickey Fuller
AIC:	Akaike Information Criteria
ARDL:	Autoregressive Distributed Lag
ARMA:	Autoregressive Moving Average
BCEAO:	Banque Centrale des Etats de l'Afrique de l'Ouest
CFA:	Communauté Financière Africaine
CPI:	Consumer Price Index
ECM:	Error Correction Model
FPE:	Final Prediction Error
HIPC:	Heavily Indebted Poor Countries
HQ:	Hannan Quinn information criteria
IRFs:	Impulse Response Functions
LR:	Likelihood Ratio
MDRI:	Multilateral Debt Relief Initiative
OAPEC:	Organisation of Arab Petroleum Exporters Countries
OLS:	Ordinary Least Square
PP:	Phillips-Perron
SC:	Schwarz Criteria
UEMOA:	Union Economic et Monetaire Ouest Africaine
UMOA:	Union Monetaire Ouest Africaine
VARs:	Vector Autoregressions
VDCs:	Variance Decompositions
VECM:	Vector Error Correction Model
WAEMU:	West African Economic and Monetary Union
WAMU:	West African Monetary Union

CHAPTER ONE

INTRODUCTION

1.1 Background

One of the government's roles is to promote economic growth with macroeconomic stability. In economic theory several instruments of macroeconomic policy were developed with the aim of helping government in achieving its objectives. The two main macroeconomic policies are fiscal policy and monetary policy.

For years scholars have recognized the role that both policies play in the process of growth and development. Monetary policy has occupied an important place in economic analysis since the beginning of the twentieth century. After the great depression of the 1930s it lost its relative importance as an economic policy instrument and following the Keynesian revolution gave way to the pursuit of fiscal policy as a tool to raise employment and output in the economy (Vaish, 2005). Consequently, in the 1940's and 1950's, economists considered monetary policy as relatively ineffective (Gordon, 1981).

The second half of the 20th century however, saw the revival of the belief in the potency of monetary policy. Through the contribution of Friedman and other economists, monetary theory regained its place in economic literature. The debate between Keynesians and Monetarists was initiated and fiscal and monetary policies were often seen as two instruments that can have important effects on economic activities.

In the past two decades fiscal policy occupied an inferior position to monetary policy in both developed and developing countries. Government's focus was rather on fiscal prudence, debt sustainability and the fiscal rules designed to achieve such sustainability (Blanchard et al, 2010).

The West African Economic and Monetary Union (WAEMU, also known as UEMOA from its name in French, Union Economique et Monétaire Ouest Africaine)

was created in 1994. It is an organization of 8 (eight) west African countries namely Benin, Burkina Faso, Cote d'Ivoire, Mali, Niger, Senegal, Togo and Guinea Bissau, which joined later in 1997. These countries share the CFA Franc (the African Financial Community franc) as a common currency initially pegged to the French franc in 1948 and pegged to the Euro since 1999.

Monetary policy in WAEMU is conducted by the region's central bank BCEAO (Banque Centrale des Etats de l'Afrique de l'Ouest). The main objective of BCEAO is to pursue price stability by maintaining inflation rate below 2%.

Fiscal policy, on the other hand allows some flexibility at the national level. It however faces the constraints of public deficit and public debt accumulation. In 1994 the CFA franc was devalued by 50% due to macroeconomic imbalances which characterized the economies of the zone at that time. After the devaluation, the choice of the optimal policy mix has become a great concern of the countries in the zone. In 1999, the "Pact of Convergence, Stability, Growth, and Solidarity" was adopted by the conference of WAEMU's Heads of state in the context of a regional convergence pact in which convergence criteria were set regarding budgetary and other macroeconomic policies. As part of these criteria, the countries are required to keep the inflation rate below 3%, total public debt below 70% of nominal GDP and the ratio of the fiscal balance to nominal GDP at zero percent or more. The convergence criteria were adopted in order to strengthen economic stability and to increase growth through regional integration.

More than a decade after the devaluation and despite the various reforms that have been implemented with the aim to reinforce the consistency and the convergence of national fiscal policy and the common monetary policy so as to improve the effectiveness of economic policies in the union and promote economic growth in the

region, growth performance in the WAEMU is still low. What have therefore been the effects of monetary and fiscal policy on economic growth in the WAEMU countries?

The choice of the optimal policy mix to use is determinant not only in the pursuit of macroeconomic stabilization but also in promoting economic growth. Several researchers have been interested in evaluating the role monetary and fiscal policy play in developing countries, and over the years, various empirical studies have analyzed the relative importance of monetary and fiscal policies on economic growth. However there are still disagreements about the effectiveness of such policies. Some researchers support the Keynesians view that monetary policy has little effect on output and should be used as backup to fiscal policy, while others support Monetarists who do not believe in government intervention, but rather believe in the potency of monetary policy in affecting output demand which alter nominal GDP.

Among the researchers who have been interested in evaluating the impact that monetary and fiscal policies have on output growth in developing countries are: Bynoe (1994), Jayaraman (2001)**,** Ajisafe and Folorunso (2002), Ali et al (2008), Jordan et al (2000), Jawaid et al (2010), Adefeso and Mobolaji (2010), Kone (2000) and so on. Most of these studies used a modified version of St Louis single equation model in their analysis. The St Louis model was introduced by Anderson and Jordan in 1968 in United States. The model is a monetarist model in which output is affected directly by monetary variables rather than indirectly through interest rate as it is believed in the Keynesian framework.

1.2 Problem Statement

Since their independence in the 1960's, WAEMU countries are striving to achieve sustainable economic growth and development. The poor growth performance of the zone over the recent years is often attributed to the ineffectiveness of monetary and fiscal policy undertaken. Indeed, it has been argued in literature on currency unions that inappropriate monetary policy and constraints on national fiscal policy can deteriorate the economy of the member countries.

As an institution serving some of the poorest countries in the world, WAEMU's central bank BCEAO has been criticized for its implementation of monetary policy without any concern for economic growth and development (Combey & Nubukpo, 2010). Its objective to maintain inflation below 2% is seen by economists as unduly restrictive, since studies revealed that the optimal threshold inflation rate of the zone is 8.1% (Combey & Nubukpo, 2010). According to Nubukpo (2011) these countries are paying a high social price, which is economic growth, for the degree of price stability they are experiencing.

Furthermore, there have been other criticisms concerning the fiscal policy implemented in the zone especially concerning the quality of government spending and the relevance of the convergence criteria adopted in the context of the regional convergence pact. Concerning relevance of the convergence criteria, Nubukpo (2011) argued that efforts to adhere to the criteria especially the required balanced budget criterion can be counter-productive, leading the economy to recession. He also argued that the compliance to the balanced budget criterion in the short run will tend to create disequilibrium in the long run; because it prevents government investment expenditures that can generate growth.

The problem then is the inappropriate monetary-fiscal policy mix in WAEMU countries. Schlesinger (1960) stated that: "By stressing the connections between fiscal policy, monetary policy, and the rate of growth, the economist may help to clarify the true policy alternatives which confront the nation's decision-maker" p (277). Therefore, the present study aims at giving a better understanding of the connections between fiscal, monetary policy and economic growth in WAEMU countries. The research questions the study is going to address are the following: Is there any relationship between monetary policy, fiscal policy and economic growth in WAEMU countries? What is the relative importance of these policies in the growth process of each of these countries?

1.3 Research Objectives

The overall goal of this study is to test and compare the relative effect of monetary and fiscal policy on growth in Togo, Côte d'Ivoire, Senegal, Niger, Mali, Burkina Faso and Benin[1].

Specifically, the study aims at addressing these following objectives:

- Estimate the short and long-run effect of monetary and fiscal policy on economic growth.
- Determine the relative importance of monetary and fiscal policy shocks on economic growth.

1.4 Justification of the Study

In the context of WAEMU countries, there have been actually very few empirical studies regarding the relative effectiveness of monetary and fiscal policy on output growth. To date, at least to the researcher's knowledge there is only one study on the effectiveness of fiscal and monetary policy in WAEMU countries and that is Kone

[1] Guinea Bissau has been omitted in the analysis because it joined WAEMU only in 1997.

(2000). Kone (2000) in his study, analysed the relative efficacy of both policies on economic growth using an error correction model (ECM) based on a modified version of St Louis single model equation. The St Louis equation also known as the A-J equation was published in 1968 by Anderson and Jordan. After its publication, the work of Anderson and Jordan was subjected to various criticisms (Batten and Thornton, 1986); among those are the endogeneity problems. Goldfeld and Blinder (1972), as mentioned by Senbet (2011) found that the endogeneity of policy could severely bias the estimates of the reduced form equation and the bias can be reduced if policy responds to economic activity with a lag. Senbet (2011) argued that by considering all variables as endogeneous in a VAR framework this issue is solved. Therefore, unlike Kone (2000), a vector autoregression (VAR) approach is used in this study to evaluate the dynamic impacts of fiscal and monetary policy on growth. The use of this method solves the endogeneity problems (Senbet, 2011) and accounts for the feedback from the economy to the policy variables (Kretzmer, 1992). This research is particularly interested in the short and long-run dynamics of the system which are estimated in the VAR framework. The impact of hypothetical changes in these policies on output is estimated through the impulse response functions (IRFs).

The present study therefore intends to contribute to the existing literature on the relative effectiveness of monetary and fiscal policy on growth in WAEMU countries.

1.5 Organisation of the Study

The study will be organised as follows. Chapter two presents the Overview of WAEMU countries' economy which covers both fiscal and monetary policy arrangements. Chapter three discusses the existing theoretical and empirical literature in support of the studies. Chapter four provides the methodology and data used for the

study. Chapter five covers the empirical results and analysis and finally, chapter six is the summary of the findings, their implications with policy recommendations.

CHAPTER TWO

THE WAEMU ECONOMY

2.1 Introduction

This chapter presents a brief historical review of WAEMU economy and also discusses the macroeconomic performance of WAEMU countries from the 1960's, along with the description of the fiscal and monetary framework of the zone.

2.2 Overview of WAEMU

The West African Economic and Monetary Union (WAEMU, also known as UEMOA from its name in French, Union Economique et Monétaire Ouest Africaine) created in 1994 is an organisation of 8 West African countries (eight) namely Benin, Burkina Faso, Cote d'Ivoire, Mali, Niger, Senegal, Togo and Guinea Bissau who joined later in 1997. These countries share a common currency which is the CFA Franc (the African Financial Community franc) and a common monetary policy since their independence in 1960 through the West African Monetary Union (WAMU, or UMOA from its name in French, Union Monétaire Ouest Africane). WAEMU was created to replace WAMU after the devaluation in 1994 to promote greater economic and social integration and to serve as a basis for development policy making and implementation.

The CFA franc was initially pegged to the French franc in 1948 and has been pegged to the Euro since 1999 with a fixed parity of 1 euro= 655.957 Francs CFA. The convertibility of the currency is guaranteed by the French treasury and as a counterpart, the Central Bank has to maintain 50% of its official reserves in the operations account. A common monetary policy is conducted by the region's central

bank, BCEAO (Banque Centrale des Etats de l'Afrique de l'Ouest). The economy of these countries is agricultural based. The Union produces and exports cash crops such as cocoa, coffee, timber, onions, sesame seeds and Arabic.

WAEMU countries are differentiated in terms of their macroeconomic structure. The Union is composed of both semi-industrialized economies (Côte d'Ivoire and Senegal) and some of the world's poorest economies (Niger, Togo, Mali, and Guinea Bissau). Senegal is the most industrialized country of the union with 27.4% of industry value-added as share of GDP, followed by Cote d'Ivoire with 22.9% industry value-added as share of GDP as for the year 2010. Niger, Togo, Mali, Benin, Guinea Bissau and Burkina Faso however have a high share of agriculture value-added.

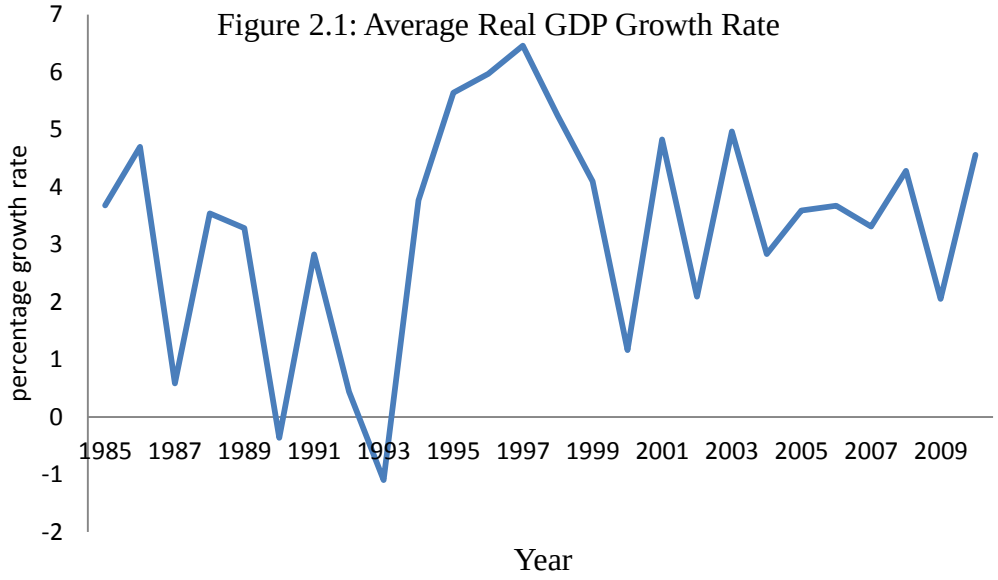
2.3 Trend in WAEMU GDP Growth

After their independence in 1960's, governments of then WAMU countries took an active role in economic decision making by the creation of public institutions and investments in economic and social infrastructure. The economies were characterised by favourable terms of trade, rise in income, increasing consumption and investment and supply of cheap foreign financing. Over the period 1961-1969, the average GDP growth of these countries varied between 2% in Mali and 9.1% in Togo.

In the 1970's, there was an increase in government intervention in the zone due to the increase in commodity prices especially for cocoa and coffee in 1974. Governments of the then WAMU countries undertook heavy investments and channelled resources to activities that they felt were at the forefront of development

through credit allocation. This was done in order to promote rapid industrialisation in the context of import-substitution programmes. Most of these government expenditures were financed through external borrowing. In 1976, GDP of the zone was growing at nearly an average rate of 6.2% as shown in Figure 2.1 and as shown in Table 2.1, Cote d'Ivoire and Togo were growing at an average rate of 7.6% during the period 1970-1979.

Figure 2.1: Average Real GDP Growth Rate



Note: Guinea Bissau was not considered
Source: Author's computation using WDI, 2012

In the context of weak economic integration and lack of policy coordination, the formulation of expansionary fiscal policy by the countries in the zone led to fiscal imbalances when the commodity prices later decreased. In response to these external shocks, governments did not cut their expenditures but rather relied on external financing from financial institutions and donors, leading to a rapid accumulation of external debt.

Furthermore, in the early 1980's the economic state of these countries worsened due to a series of external shocks. First in 1986-1988, the collapse of commodity prices

especially cocoa, cotton and coffee led to the deterioration of the terms of trade of the zone in 1987.

The price of coffee and cocoa fell by 62% while the price of cotton fell by 33% on the international market (Nubukpo, 2012). As a result, export volumes of these countries fell drastically reducing fiscal revenue and the ability to pay for imports. Since these countries were dependent on commodity exports, the fall in export volumes affected their growth pattern. In addition, the inability of governments of these countries to reduce their spending led to a further increase of public deficit.

Also, foreign borrowing became expensive due to rising international interest rates and there was a sudden curtailment of foreign lending. As a result, there was an increase in public debt leading to debt unsustainability. Furthermore, due to the over-valuation of the CFA, the free capital movement which characterised the zone led to capital flight which worsened the economy of these countries. Agricultural exports suffered loss of competitiveness on the international market (Grimm, 1999).

Table 2.1: Average of the Real GDP Growth rate

	Benin	Burkina Faso	Côte d'Ivoire	Mali	Niger	Senegal	Togo	**WAEMU**
1961-1969	3.1%	3.6%	8.7%	2%	2.9%	1.3%	9.1%	**4.4%**
1970-1979	2.3%	3.3%	7.6%	5.2%	2.2%	3%	7.6%	**3.8%**
1980-1994	3.4%	3.4%	-0.2%	0.8%	0.03%	1.9%	1.4%	**1.5%**
1995-1999	5.1%	7.6%	5.4%	5.8%	3.7%	4.5%	6.2%	**5.5%**
2000-2010	4.2%	5.6%	0.7%	5.5%	4%	4%	1.9%	**3.7%**

Source: Author's computation using WDI, 2012

As shown by Table 2.1, the average GDP growth rate of WAMU decreased from 3.8% during the period 1970-1979 to 1.5% during the period 1980-1994. Most of these countries experienced a fall in their GDP growth rate with Côte d'Ivoire, Mali and Togo having an average growth rate of -0.2%, 0.8% and 0.03% respectively during the sub-period 1980-1994. Figure 2.1 shows a drop in real GDP growth rate between 1991 and 1993 and the average GDP growth rate of the zone was -1.1% on the eve of the devaluation.

The then WAMU countries were therefore forced to devalue in order to stimulate exports, discourage imports, increase external competiveness and promote economic recovery and growth. The CFA Franc was thus devalued by 50% in 1994. After the devaluation these countries decided to promote greater coordination and harmonisation of economic policies (monetary, fiscal and trade policy). They agreed to move towards higher integration by the establishment of a customs union and the creation of an economic union.

The creation of WAEMU in 1994 after the devaluation of the CFA franc was based on 4 main objectives such as the coordination and integration of national macroeconomic policies, creation of a common market, harmonisation of regulations and consolidation of common sectorial policies. The countries agreed to pursue prudent fiscal policies in order to support the common exchange rate regime. Based on this vision, WAEMU established a multilateral surveillance committee in 1999 and in the same year adopted a convergence pact.

With the 1994 devaluation, followed by stabilization and structural adjustment programmes, the member countries experienced a strong expansion; output, exports and investment increased. During the period 1995-1999, the real GDP grew and the

average GDP growth of the zone was 5.5% as shown in table 2.1 thus a rise of about 4 percentage points on average as compared to the period 1980-1994. The figure 2.1 shows that the GDP growth rate reached its highest level in 1997 with an average rate of 6.5%. There was also a substantial reduction of fiscal imbalances, and the overall deficit (including grants) declined from 8.6% of GDP in 1993 to 2.5% of GDP during 1994-1998 (IMF 2003).

This recovery later tapered off. Figure 2.1 shows fluctuations in GDP growth rate between 1997 and 2010. During the period 2000-2010, as shown by table 2.1, Cote d'Ivoire and Togo scored on average the lowest growth rates of the zone which are 0.7% and 1.9% respectively. This is due to the vulnerability of the countries to external shocks. During the period 2000-2010, WAEMU countries were affected by the deterioration of terms of trade (mainly due to decrease in the price of raw materials), the slowdown of the world economy (global financial crisis) and the political uncertainties especially in Cote d'Ivoire and Togo.

2.4 Monetary Policy Framework

The monetary policy in the WAEMU zone is conducted by the Central Bank of West African Countries (BCEAO). BCEAO has been in existence since the 1960's with the gaining of independence of France's former West African colonies. It was originally dominated by France until the early 1970's when it secured responsibility for issuing currency and overseeing the functioning of the zone. The BCEAO's Board of Directors which determines the monetary and credit policies is composed of eighteen (18) designated members and two (2) representatives from the French government. The Board appoints a Governor for a six years mandate and a Vice-Governor with a five year mandate. There is a national agency in each member

country within which exists a national committee of credit which determines the volume of currency to be printed and the allocation of credits under the supervision of the Board (Nomsi, 2003).

The primary objective of the Central Bank of West African Countries is to ensure price stability and promote sustainable economic growth by helping in policy implementation. However, since the 1980s, its monetary policy has been reoriented towards the single goal of price stability (Diallo, 2008).

The monetary policy implementation was subjected to various reforms (1975, 1989 and 1993) in terms of administrative procedures and monetary regulation. Prior to 1989, monetary policy was based on direct policy instruments such as direct credit control, interest rate ceiling and sectorial credit control. However, since the financial liberalization with the co-operation and support of the World Bank and IMF, the Central bank has adopted indirect market-based instruments in October 1989. Its actions are mainly based on the use of indirect liquidity regulating instruments in order to consolidate monetary stability and contribute to non-inflationary financing of growth.

In October 1993 and July 1996 there were reforms pertaining to the central bank interventions on the interbank market through interest rate policy. These reforms concern repo tender procedures for both liquidity injections and withdrawals (Nomsi, 2003). Also in 2010, the Central Bank statutes were improved to ensure the independence of the bank in the conduct of monetary policy in order to enhance its credibility (Guillaumont, 2012).

The main instruments are interest rate policy, reserve requirements, actions trough permanent refinancing windows (the pension window and the rediscount

window) and open market operations on the monetary and the interbank markets. In its interventions on the monetary and interbank market, the BCEAO applies its key rates namely the discount rate, the repurchasing (repo) rate, the tender rate and the BCEAO Treasury bills rate. BCEAO carries out cash injection operations through weekly and monthly calls for tender. In 2010, the central bank did average cash injection of 117.6 billion CFA francs and the minimum bid rate for weekly calls for tenders was fixed at 3.25% (BCEAO, 2010).

The monetary policy conducted by the central bank of West African states faces many challenges, including the need to fight against inflation, which is driven mainly by the volatility of commodity prices on international markets. Moreover, because of the substantial macroeconomic differences among its members, the challenge for the BCEAO is that no single monetary policy may be suitable for all its member countries at once (Valdovinos and Gerling, 2011).

Therefore, to account for the different structural characteristics such as price and credit developments, and liquidity positions of the countries the BCEAO was relying on the use of differentiated reserves requirements by countries. For example on the 16th March 2010, the reserve requirement applicable to the banks were lowered in Benin from 9% to 7%; were raised from 5% in Guinea Bissau and Togo and unchanged in the other countries of the Union (7% in Burkina Faso, Mali, Senegal and 5% in Côte d'Ivoire). These reserve requirement coefficients were made uniform at 7% in all the countries on the 16th December 2010 (BCEAO, 2010). However, since 16th December 2010 the reserve requirement coefficients were made uniform in order to put an end to the existing distortions of competition in the monetary market. Moreover, the same interest rate policy is applied to all the countries in the zone.

The effectiveness of the monetary policy of BCEAO (the use of the indirect instruments) have been hampered by the excess liquidity of the banking system as a result of the limited private sector credit expansion, the absence of a well-developed interbank market and financial system, and also the uncertainty and asymmetric information that characterize the environment.

2.5 Fiscal Policy Framework

Unlike monetary policy which is conducted at the regional level, fiscal policy is conducted at the national level and is the main instrument of government intervention in WAEMU countries. These governments affect their economy through indirect taxation, custom duties and budget policies.

Fiscal developments in WAEMU countries can be divided into three periods. First, in the 1960's and early 1970's government of these countries implemented expansionary fiscal policy because of the increase in commodity prices in 1974. The terms of trade improvement caused by the first oil shocks led to an increase in export revenues. As a result of the increase of the public sector revenues, governments of these countries increased their expenditures by investing in infrastructures and creating enterprises in the mining, manufacturing and energy industries. The terms of trade improvement were thought as permanent and governments failed to cut down expenditures when the commodity prices later decreased (Mbemba, 2011). The high level of government expenditure led to fiscal deficit which was financed externally from financial institutions and donors. Secondly, during the period mid-1970 and 1980's, the international interest rate rose and commodity prices declined on the international market. This worsened the fiscal position of these countries by raising their indebtedness. Finally, the deterioration of terms of trade of major export

commodities in the mid-1980's resulted in high indebtedness and the accumulation of external and domestic payment arrears. Consequently, in the 1990's, the countries were forced to devalue the CFA Franc and to implement structural adjustment programmes.

Structural adjustment programmes that followed the devaluation emphasized the need for fiscal discipline, limited exceptional financing and required repayment of internal and external arrears from all WAEMU countries (Rosenberg, 1995).

To ensure a proper coordination between fiscal policy implemented at the national level and the regional monetary policy, and also to ensure fiscal discipline in the zone, WAEMU countries adopted the "Pact of Convergence, Stability, Growth, and Solidarity" in December 1999 by the Conference of Head of States of WAEMU.

The establishment of a set of rules pertaining to the public finances, real sector, the balance of payment and the common currency as part of the policy framework under the convergence, Stability and solidarity pact in 1999 emphasizes the need for WAEMU countries to strengthen convergence of their economy, enhance solidarity among countries, reinforce macroeconomic stability and accelerate economic growth.

Out of a total of eight convergence criteria, four were specified as primary criteria and the other four as secondary criteria. As part of the primary criteria, the WAEMU countries are required to keep the ratio of the basic fiscal balance to 0 per cent or more, maintain inflation below 3 per cent, keep the overall debt-to-GDP ratio below 70 per cent and to ensure the non-accumulation for domestic and external payment arrears.

The secondary criteria require WAEMU countries to maintain the ratio of wage bill to tax revenue below 35 per cent and the external current account deficit

excluding grants to 5 per cent of GDP. Also, as part of the secondary criteria, the ratio of domestically financed public investment to tax revenue should be at least 20 per cent and the tax-to- GDP ratio should be at least 17 per cent.

In addition, WAEMU adopted the medium term convergence programmes in the late March 2001. These programmes were designed to ensure compliance of the convergence criteria by the end 2002

The progress of WAEMU countries towards convergence was hindered by the difficulties encountered in the effective implementation of the various regional reforms.

More than one decade after the adoption of the convergence, stability and solidarity pact, compliance of governments with the WAEMU fiscal convergence framework is poor. The target date, 2002 for the compliance to the criteria was therefore extended to 2005 and later to 2013.

In 2011, among the primary criteria, the balanced budget and the inflation criterion were fulfilled by minority of these countries. However, there was an improvement regarding the indebtedness criterion as a result of the debt relief that was granted to Togo and Guinea-Bissau in the context of the HIPC (Heavily indebted poor countries) Initiative and MDRI (Multilateral Debt Relief initiative). On the other hand, most countries did not meet the second criteria.

Fiscal policy in WAEMU countries faces various constraints such as budget deficit financing, public debt with the risk of debt unsustainability and the erosion of tax base. Being part of a monetary union prevents WAEMU countries to finance their budget deficit simply by printing money. Thus the main sources of financing available to these governments are mainly the accumulation of external arrears,

external sources of finance, statutory advances from the central bank and the issuance of securities on the regional capital market. The statutes of BCEAO however limit its statutory advances to government to at most 35 per cent of the previous year's fiscal revenue (IMF, 2012) in order to prevent excessive recourse to central bank financing of budget deficits.

CHAPTER THREE

LITERATURE REVIEW

3.1 Introduction

This chapter encompasses theoretical and empirical literature on the effectiveness of monetary and fiscal policies on economic growth. The theoretical review summarises the various economic theories behind the role of both policies in an economy, while the empirical review covers the findings of the relevant empirical works from both developed and developing countries.

The Literature review is divided in three sections. The first section discusses the theoretical underpinnings which are relevant for the study. The second section provides the findings of selected empirical literature. The last section presents the conclusion derived from theoretical and empirical literature.

3.2 Theoretical Review

3.2.1 Monetary and Fiscal Policy Debate

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

Prior to the Keynesians revolution, economic theory was based on the classical economic theory and monetary policy was considered as the important tool to achieve stability and full employment in the economy (Vaish, 2005).

The classical model assumes perfect competition, flexible prices and full information. It has its foundation in Say's law which says that "supply creates its own demand". Say's law is based on the belief that workers receive income from labour in order to purchase the output produced. Therefore, the production of output generates income for its consumption. The law "supply creates its own demand" implies that aggregate expenditure must be equal to output, meaning that market forces do not lead to a prolonged deficiency of demand and unemployment (Snowdon and Vane, 2005). Based on Say's law and the assumption of flexible prices, wages and interest rate, the classical economists argued that the economy will automatically return to its full employment equilibrium. This implies that there is a self-correcting mechanism and left alone, the economy will move towards full employment.

Consumption, investment and savings in the classical model are function of interest rate. Households do not spend all their income. When interest rate is high, they will be willing to replace present consumption with future consumption by saving more. Thus, households' consumption responds negatively to interest rate. Savings are equivalent to the supply of loanable funds and are positive function of interest rate. Investment which represents the demand for loanable funds by firms in the capital market is negatively related to interest rate. At the equilibrium, households' savings equal the capital investment. The classical model is therefore based on the idea that investment is determined by the real forces of thrift and the marginal productivity of capital.

In the classical theory, aggregate demand does not play an important role in the determination of output level. The classical aggregate supply curve is perfectly

inelastic. This implies that real output and employment are supply-determined and therefore affected by population, technology and capital formation. Following an increase in the quantity of money, households will spend the excess money balances to acquire goods and services, therefore creating an excess demand in the goods market. This leads to an increase in the price level. Thus the quantity of money determines the price level but does not affect the real sector. According to the classical economists, in the long-run, the quantity of money is neutral. Consequently, an expansionary monetary policy is completely ineffectual (Snowdon and Vane, 2005).

However, monetary policy is quite important in the classical system because it prevents the fluctuation of wages and prices. Classical economists believe that unemployment is due to wage rigidity. Thus, in order to prevent shifts in savings propensities or investment prospects from requiring wage and price changes, money supply should be kept stable since price level and aggregate demand are determined by the quantity of money (Ackley, 1961). On the other hand, from classical views, government intervention will bring distortions in the economy even though it has an important role in providing a legal framework and sustaining national defence.

After the great depression of the 1930s, and throughout the 1940s and 1950s, fiscal policy became the major macroeconomic policy instrument. This development in economic theory and policy followed the publication of Keynes's book "*The General Theory of Employment, interest rate and money*" in 1936. Keynes's theory showed the ineffectiveness of monetary policy to remedy depression or unemployment and advocated the use of fiscal policy (government's tax and spending policies) (Vaish, 2005).

Keynesian theory unlike the classical model is based on the assumptions that prices and wages are inflexible. Investment decisions are seen to be independent of savings decisions and interest rate in the Keynesian model is not determined by real forces of thrift and marginal productivity of capital but is a monetary phenomenon (Snowdon and Vane, 2005). In the Liquidity preference function derived from Keynes's liquidity preference theory, demand for real money balances is a function of income and interest rate. Therefore, the transmission mechanism of monetary policy in the Keynesian model is indirect. A change in money supply leads to a change in interest rate which alters investment. The shift in investment then affects nominal GDP.

As a result, the only way monetary policy can affect the economy in the Keynesian view is through the interest rate and its effectiveness depends on the interest elasticity of the speculative demand for money. Keynesian economists believe that even though money plays an important role in the determination of the level of income and unemployment, monetary policy is more ineffective, the more interest-elastic demand for speculative cash balance is. The Keynesians argued that, if the economy is operating at a level where speculative demand for money is perfectly interest elastic, a change in money supply does not lower interest rates, and thus does not increase output.

In the Keynesian system, monetary policy is not seen as the important means of stimulating the economy. However, it advocates the positive role of fiscal policy as a policy tool to stimulate output and economic growth, rejecting the idea that balanced budget was always desirable for government (Landreth, 1976).

It was only in the mid- 1950s that supporters of monetary policy questioned Keynes' theory based on the results from empirical research to test the effectiveness of monetary policy. The revival of monetary policy was made possible by the contributions of various economists. Led by Milton Friedman, the monetarist school showed that "money does matter" (Vaish, 2005).

Monetarism has its origins in classical economics. The monetarist school believes that the demand for money is interest inelastic. As a result, changes in money supply directly lead to changes in aggregate demand which affect nominal GDP. Therefore, monetarists believe in a more direct monetary transmission mechanism.

On the contrary, if government decides to increase government spending by selling bonds to the public, interest rates will rise leading to a reduction of private investment by as much as government spending increased. It means that increase in government investment will tend to crowd out private investment; fiscal policy in the long run will have no effect on the equilibrium income level. Hence according to the monetarists, changes in money supply determine the levels of output, employment in the short run; and economic growth can only be achieved through a forceful push of an expansionary monetary policy.

The high inflation and unemployment of the 1970's in the west led to the emergence of a new development in economic theory named the new classical economics. The new classical economists criticised the Keynesians and the monetarists' assumptions concerning price expectations.

The new classical model unlike the classical model is based on the assumption of imperfect information and on the rational expectation hypothesis. Expectations are rational when they are formed by using all available relevant information concerning

the variable being predicted. The New classical views see aggregate demand as unimportant in the determination of output level even in the short run. Changes in aggregate demand will not affect real output because they are predictable. Thus, only unanticipated changes in aggregate demand due to unanticipated monetary and fiscal policy actions or policy actions that are not fully anticipated, have short run effects on real output and unemployment.

From modern macroeconomic theory, both fiscal and monetary policies play important roles as stabilization policy tools. Robert Mundell in 1971 suggested that monetary and fiscal policies should be used together to achieve macroeconomic stability and growth by using monetary policy to control inflation and fiscal policy to affect the supply side of the economy. According to Mundell, monetary policy should aim at external objectives while fiscal policy aims at preserving internal stability. Also, in his work "Monetary- Fiscal policies and growth objectives", Schlesinger (1960, p. 277) stated that "Although some economists may prefer on the basis of value judgments to emphasize fiscal policy, while others would prefer monetary policy, the connection between the two instruments can be ignored by none. Fiscal policy works through its influence on monetary conditions, while the tone of monetary policy is determined by the fiscal situation."

3.2.2 Theory of Optimum Currency Areas

Introduced by Robert Mundell in 1961, the term optimum currency area is used to characterise a group of countries that have a complete benefit from their participating in a currency area. The theory of optimum currency area contains three (3) different approaches namely the traditional approach, the cost-benefit approach and the modern or new approach.

The traditional approach is based on a set of criteria which delimit the appropriate domain of currency area. These criteria are characteristics that cause a country to gain from belonging to a currency area. The first criterion is that of the international factor mobility which is directly linked to the degree of financial integration criterion. The traditional approach stipulates that countries with high factor mobility can gain from participating in a currency union as compare to countries with low factor mobility. This is because for countries with high factor mobility, when there is disequilibrium in the balance of payment, there is an international adjustment caused by the migration of labour from one country to the other. It eliminates the payment imbalances without the need for exchange rate changes. Similarly, countries with a high degree of financial integration, meaning that capital can easily flow between these countries; can profitably belong to a currency area.

Another criterion is the degree of openness criterion (ratio of tradables to non-tradables) which was added by McKinnon (1963) (cf. Ninsin, 2009, p 118). It is argued that countries with high degree of trade openness will profit from a currency area because in these countries changes in exchange rate is a remedy for balance of payment imbalances to affect internal prices. Following depreciation, the change in relative prices will cause resources to move from non-tradables to tradables creating problems to the economy. In this case, movements in exchange rate will not eliminate existing imbalances but further deteriorate the economy.

Product diversification criterion was introduced by Kenen (1969) (cf. Ninsin, 2009, p 119). He argued that participating in a currency union will be possible for countries with a well-diversified national economy. On the other hand, a country with low product diversification needs flexible external rate to eliminate balance of

payment imbalances caused by variations in exports. A well-diversified economy benefits from the offsetting effects which render their total exports more stable than that of a less diversified economy.

The next criterion is based on the similarity in the rate of inflation. In order to avoid balance of payment disequilibria that can be caused by variation in terms of trade countries in a currency area should have similar inflation rate. The similarity of inflation rate is therefore a condition for participating in a currency area.

Moreover, the need for a complete economic integration accompanied by some political integration is identified as a criterion for an optimum currency area.

The second approach is the cost-benefit approach which looks at both the costs and the benefits of being part of a currency area. A number of benefits have been identified. Among these, the elimination of speculative capital flows between countries; saving on exchange reserves (international reserves), which are no more used for transactions with the partner countries; higher integration of economic policies and economic integration; monetary credibility which leads to stable inflation and the elimination of transaction costs in changing currency. Also, in negotiations with outside parties, the single currency carries more weight (Gandolfo, 2002). As part of the costs it has been identified that in a currency area, there is a loss of autonomy in terms of monetary and exchange rate policy for all the countries and a single monetary policy may not be suitable to all member countries. Also, joining a currency area may put constraints on national fiscal policy for the interest of the majority. Thus, fiscal policy can become ineffective. Moreover, the risk of high capital flow from one country to another, with relatively low labour mobility has been identified as a cost of joining a currency area.

The modern approach examines two issues namely the effects of shocks and reputational considerations. In analysing the effects of shocks the focus was on the capability of fixed and flexible exchange rate to absorb shocks.

In the reputational considerations, it was argued that a currency area membership increases credibility of monetary policy and therefore reduces the costs of disinflation. Credibility is important in a sense that the public's expectations about the future pursuit of policies are consistent with policy makers' announcement on the pursuit of these policies. Thus by fixing its exchange rate with respect to a low inflation country, a country with high inflation increases its credibility (Gandolfo, 2002).

3.3 Empirical Review

Researchers have been interested in estimating the importance of macroeconomic policies in terms of their effects on economic activities. In economic literature, with the recent availability of quantitative data, various empirical studies have been conducted to evaluate the effect of monetary and fiscal policy on growth both in developed and developing countries. The findings of these empirical studies are outlined below.

3.3.1 Monetary Policy and Growth

Amarasekara (2008) examined the effects of monetary policy on real GDP growth in Sri Lanka. The analysis was based on a Vector autoregressive (VAR) framework, including both recursive VAR methodology based on the Cholesky decomposition of matrices and semi-structural VAR methodology.

The semi-structural VARs impose identification restrictions only on the policy block. The results of the VAR were analysed using the impulse response functions (IRFs) and forecast error variance decomposition. The study tested the hypotheses of "whether output growth and inflation declines following a contractionary monetary policy shock, whether the reaction of output growth to monetary policy is faster than the reaction of inflation to monetary policy, whether money shock contracts following an increase in interest rates, whether the exchange rate appreciates following an increase in the interest rate" (Amarasekara, 2008, p.10). To measure the monetary policy, the study used three different proxies which are: the movement of interest rates, money growth and exchange rate.

From the recursive VAR analysis, the study revealed that following a positive innovation in interest rate, GDP growth and inflation decrease while the exchange rate appreciates. When money growth and exchange rate are used as policy indicators, GDP growth remains positive following an exchange rate appreciation and innovations in reserve money growth do not show any significant results. However, as expected, an exchange rate appreciation has an immediate impact on the reduction of inflation.

Moreover it was found that interest rate innovations are persistent, supporting the view that the monetary authority adjusts interest rates gradually, while innovations in money growth and exchange rate appreciation are not persistent. It also emerge from the study that for most sub-samples, inflation does not decline following a contractionary policy shock; innovations to money growth raises the interest rate; when inflation does respond, it reacts to monetary innovations faster than GDP

growth does; and exchange rate appreciations almost always lead to an increase in GDP growth.

The results from the semi-structural VARs showed that none of the sub-samples since 1978 can be identified with a particular targeting regime. It was further shown that the interest rate, monetary aggregates and the exchange rate contain important information in relation to the monetary policy stance.

Amarasekara (2008) further estimated a monetary policy index for Sri Lanka. The results displayed that unanticipated monetary policy forms a smaller portion of monetary policy action in comparison to anticipated monetary policy. It was also observed that a decline in GDP growth is associated with anticipated policy with a short lag, while reductions in inflation are associated with both anticipated and unanticipated components of monetary policy with a longer lag of 28 to 36 months.

Qayyum (2006) investigated the linkage between the excess money supply, growth and inflation in Pakistan. The study used the Quantity Theory of money to formulate the theory of determination prices and deduced the model below:

$$g_p = \beta_0 + \beta_m g_m + \beta_v g_v + \beta_y g_y + \mu$$

Where g_p is inflation, g_m is the money growth, g_v is the velocity growth, g_y is the real GDP growth, μ is the error term.

The model was estimated using Autoregressive Distributed Lag (ARDL) approach introduced by Pesarans Shin (1995, 1997). The study showed that there is a positive association between money supply and inflation. It also revealed that money supply growth at first round affects real GDP growth and at the second round it affects inflation in Pakistan. From the analysis, the excess money supply has been an

important contributor to the rise in inflation. Therefore, the study supports the monetarist view that inflation in Pakistan is a monetary Phenomenon. The author concluded that the policies to boost output growth through money supply in Pakistan only have a short-run effect on real output but generate inflation.

Similarly, Onyeiwu (2012) used the Ordinary Least Square (OLS) estimation technique to analyse the impact of monetary policy on economic growth employing annual data over the sample period from 1981 to 2008 in Nigeria. The study employed three multiple regression models with the liquidity ratio, money supply and cash ratio as exogenous variables in all the models, while GDP, inflation rate and BOP are the dependent variables in model one (1), two (2) and three (3) respectively. The models are specified as followed:

$$gdp = a_0 + a_1 L_r + a_2 M_2 + a_3 C_r + u_i \qquad (1)$$

$$inf = b_0 + b_1 L_r + b_2 M_2 + b_3 C_r + u_i \qquad (2)$$

$$bop = c_0 + c_1 L_r + c_2 M_2 + c_3 C_r + u_i \qquad (3)$$

Where gdp is gross domestic product, L_r is Liquidity ratio, C_r is cash ratio, M_2 is broad money supply and u_i is the error term.

A cointegration test was further conducted on the three models.

The analysis revealed that monetary policies play crucial role in influencing the level of productivity in Nigeria. Also the study unveiled that the adoption of various policy measures by the Central Bank has no significant impact on inflation therefore inflation is not a monetary phenomenon in Nigeria but is rather attributable to the structural rigidity in the country.

Because monetary policy in WAEMU countries is essentially based on the use of leading rates (money market rate and pension rate) by the Central Bank, Nubukpo (2002) analysed the impact of monetary policy on inflation and economic growth in WAEMU countries using changes in the central bank's leading rates as the main measure of monetary policy. The methodology was based on the Kahn and Knight (1991) model from which two main equations were derived:

$$(1)\ \mathrm{D}\ (\log \mathrm{IPC}) = \mathrm{H}(\mathrm{D}(\mathrm{IM}), \mathrm{D}(\mathrm{IPS}), \mathrm{D}(\log\mathrm{PIBR}), \mathrm{D}(\log\mathrm{PIBR}*), \mathrm{D}(\log\mathrm{IPM}))$$

$$(2)\ \mathrm{D}(\log\mathrm{PIBR}) = \mathrm{F}(\mathrm{D}(\mathrm{IPS}), \mathrm{D}(\mathrm{IM}), \mathrm{D}(\log\mathrm{INVTOTR}), \mathrm{D}(\log\mathrm{IPC}))$$

The equation (1) is the equation of inflation and the equation (2) is a growth equation. Where (IM) is the money market rate, (IPS) is the pension rate, (PIBR) is real GDP, $(\mathrm{PIBR}*)$ is potential GDP, (IPM) is foreign prices, (IPC) is the inflation rate.

Both equations were estimated for each country and for the Union using VAR framework. The study included four dummy variables (1992, 1994, 1995, 1999) in order to control for political instability in Togo and Mali, its consequences on Burkina Faso, the joint impact of the drought of 1997 and the slowdown of economic growth in Côte d'Ivoire, power outages in Senegal, strong drop in demand in Niger and finally the devaluation of the CFA in 1994 for all the countries.

The study essentially argued that a positive shock on the leading rate negatively affects economic growth.

The estimation of the growth equation revealed that the Central Bank interest rate policy has a significant but weak impact on the economic activities in the zone. Additionally, based on the findings that the responses to exogenous shocks in both equations are different from country to the other, Nubukpo (2002) concluded that

there is heterogeneity among the WAEMU countries in terms of their capability to reach the long run equilibrium level in response to a monetary policy implementation.

3.3.2 Fiscal Policy and Growth

Abdu-Bader and Abdu-Qarn (2003) investigated the relationship between government expenditure and economic growth in Egypt, Israel and Syria. The paper tested for causality within a bivariate system of government expenditure and economic growth; and within trivariate system of share of government civilian expenditures in GDP, military burden and economic growth. According to the authors, by separating government spending into productive and unproductive spending their findings provide adequate empirical basis for policy analysis.

They therefore modelled the relationship between real GDP growth, share of government civilian expenditures in GDP, and military expenses using a vector error-correction (VEC) model and tested for the direction for granger causality between the variables. In order to further support its findings, the study used impulse response functions and variance decomposition to access the effect of each variable on growth rate of real GDP.

From the bivariate system of government spending and growth, the results showed a bi-directional causality from government spending to growth for Israel and Syria and a unidirectional short-run causality from economic growth to government spending for Egypt. Within the trivariate framework, it was found that military expenditure negatively affects economic growth in all the countries. The government expenditures have positive effect on economic growth in Israel and Egypt but

negatively affect growth in Syria. The results from the variance decomposition and the impulse response functions supported the findings from the Granger causality analysis.

Angelopoulos and Philippopoulos (2007) undertook an empirical investigation of the link between fiscal policy and economic growth in Greece. Unlike Abdu-Bader and Abdu-Qarn (2003), this paper focused on the growth effects of size, composition and quality or efficiency of the public sector. The estimation was done in three main stages using the Ordinary Least Squares estimation procedure. First, the authors run regressions to analyse the effect of the overall size of public sector on growth by using different proxies such as the government consumption share in GDP, total government expenditures as a percentage of GDP and total tax revenue as a percentage of GDP. Secondly, disaggregated fiscal policy data was used. wages and salaries, subsidies and other transfers, capital expenditures, goods and services, total tax revenues, overall budget balance in the public sector, all as a share of GDP; effective tax rates on labour income, on capital income and on consumption are the variables included in the regressions to measure the growth effect of the composition of the public sector. Finally, the study run regressions using an intuitive index with a sufficiently long time series dimension to measure the quality of public infrastructures in evaluating the effect of the quality of public sector on growth.

The study included four dummy variables to capture the four regimes that characterized the Greek economic history over the period 1960-2000 namely, the autocratic regime (1960-1973), the beginning of the democratic era (1974-1979), the period of high spending and heavy borrowing (1980-1993) and the "Maastricht Treaty" period (1994-2000).

The study evinced that larger sizes of the public sector hamper growth. There is also evidence that government wages and salaries and transfers both as a share of GDP hinder growth. However, public sector investment positively affects growth. The authors also found that the larger size of the public sector does not encourage growth only when the measure of government efficiency deteriorates relative to the previous year.

Based on their findings, the study came up with the conclusion that even though growth in Greece is hindered by public sector spending, not all the expenditures are harmful to economic growth. The authors pointed out that it was necessary to look beyond the size of public sector and that its composition and efficiency are equally important.

Taiwo and Abayomi (2011) focused on the trends as well as the effects of government expenditure on the growth rate of real GDP in Nigeria. They used the OLS technique to estimate annual data from 1970 through 2008. The study was based on the following model:

$$\mathrm{GDP} = \alpha_0 + \beta_1 \mathrm{REC} + \beta_2 \mathrm{CAP} + \mu$$

Where REC is the recurrent expenditure, CAP is the capital expenditure and μ is the error term.

Both variables are measures of fiscal policy. The paper unveiled that with the assumptions of no corruption and embezzlement in the system, there is a positive relationship between real GDP and recurrent and capital expenditure in Nigeria.

For WAEMU countries, Ouattara (2007) addressed empirically the causality between government expenditures, corruption and economic growth. The study used

Granger causality technique to analyse panel data of the 8 countries covering the period 1980 to 2004. The two equations cited below were estimated:

$$croi_{it} = a_0 + a_1 croi_{it-1} + a_2 dep_{it} + a_3 cor_{it} + a_4 ouv_{it} + a_5 imp_{it} + m_t + l_t + n_{it}$$

$$dep_{it} = b_0 + b_1 dep_{it-1} + b_2 croi_{it} + b_3 idep_{it} + b_4 sdet_{it} + b_5 cor_{it} + d_t + y_t + h_{it}$$

Where croi is economic growth, dep is government expenditure, cor is corruption measured by the governance indicators derived from Kaufman and al (2003) (cf. Ouattara , 2007, p.148), ouv is the degree of openness, imp is political instability, idep is direct investment abroad, sdet is debt service and m_t, l_t, n_{it}, d_t, y_t, h_{it} are error terms. Finally the author estimated the growth elasticity of public expenditures using the formula:

$$e_j = \frac{dy}{dG}\frac{G}{y} = \frac{dy}{y}\frac{G}{dG}$$

The paper unveiled that there is bidirectional causality between economic growth and government expenditures. The results also showed that there is bidirectional causality between corruption and government spending and a unidirectional causality from corruption to Economic growth. A strong negative correlation was found between growth, corruption and political instability, corruption and political instability were positively correlated and there was a positive correlation between GDP growth, government expenditures and trade openness.

Similarly, Hounkpodote and Bationo (2009) examined the causality between public expenditures and growth in WAEMU countries. But unlike Ouattara (2007), their analysis was done for each of the countries using time series data ranging from 1967 to 2007. The study analysed the implication of fiscal coordination and used

cointegration analysis leading to Vector error correction (VEC) in the estimation. The study also used Toda-Yamamoto (1995) causality test.

Based on the findings, the WAEMU countries were divided in two groups. For the first group composed of Côte d'Ivoire and Benin, the results showed that there is a unidirectional causality from GDP to government expenditures and that in the long-run, government expenditures is affected by output in both countries.

The second group is composed of Burkina Faso, Mali, Niger and Senegal. For this group, the results pointed out that there is a unidirectional causality from government expenditure to GDP. In the long-run, public spending has a positive and significant impact only in Burkina Faso and Mali. The results for Niger and Senegal were insignificant. Furthermore, no causality was revealed for Togo. The paper also evinced a strong heterogeneity of the response time of growth to shocks in government expenditure and the response time of government expenditures to economic growth in the WAEMU countries.

The authors therefore advised that authorities should consider a new model of fiscal coordination integrating this heterogeneity, especially the adoption of a new more flexible fiscal standard for each country.

3.3.3 Monetary, Fiscal Policy and Growth

In the 1960's in the United States, the debate concerning the potency of two macroeconomic policy tools namely monetary policy and fiscal policy was initiated by Friedman and Meiselman. In their work published in 1963 they concluded that fiscal policy is ineffective in affecting output in the United States. After this finding which contradicts the existing conventional wisdom of that time

when fiscal policy was considered the most effective policy tool, researchers have been interested in contributing to the debate (Batten and Thornton, 1986).

In 1968 Anderson and Jordan published the St Louis equation also known as the A-J equation in the United States. The model is a monetarist model in which output is directly affected by a change in monetary policy (Raj and Siklos, 1986) as opposed to the Keynesian model where monetary policy affects output indirectly through interest rate. It established a relationship between change in Nominal GNP, monetary and fiscal policy, where fiscal and monetary actions are the explanatory variables. As proxies for fiscal actions, they used nominal high-employment government expenditures and receipts, and high employment budget surplus. Money stock and changes in monetary base were used as proxies for monetary policy. The original A-J equation is in first difference form which provides estimates for multipliers (Anderson and Jordan, 1968). In their estimations, Anderson and Jordan regressed quarter-to quarter changes in GNP on quarter to quarter changes in fiscal and monetary variables. The original A-J single equation model is stated as:

$$\Delta Y = \alpha + \sum_{i=0}^{3} \beta_i \, \Delta M_{t-i} + \sum_{i=0}^{3} \gamma_i \, \Delta E_{t-i} + \mu_t$$

Where, Y, M and E denote nominal GNP, the money stock (M1) and nominal high-employment government expenditures and receipts, respectively; u_t is the disturbance term.

Using data from 1953: II to 1968: II, they concluded that only monetary policy is significant and has a more predictable, permanent and lasting effect on the US's nominal GNP; fiscal policy however was statistically insignificant. Since its publication, the reduced form A-J model was subjected to various criticisms. Based

on the concept, economists argued that there is no theory underlying the reduced-form A-J model. And as a result, appropriate restrictions cannot be derived (Teigen, 1975). Also, the St Louis equation has been criticised in terms of the procedure based on three major grounds. First of all, economists underscore that the model omits other important explanatory variables resulting in misspecification problems (Batten and Thornton, 1986). Secondly, it was argued that because the St Louis model is a reduced form equation, there is a problem of simultaneous equation bias which means that the exogenous variables are not statistically independent. Moreover, in 1974, Blinder and Solow argued that, the failure of the model to control for the feedback from the economy to monetary policy could mislead researchers in their conclusions (Kretzmer, 1992).Thus, the use of ordinary least squares (OLS) estimation procedure by Anderson and Jordan was inappropriate. Finally, the use of Almon lag technique in the determination of the lag structure was criticised (Batten and Thornton, 1986). De Leew and Kalchbrenner (1969) argued that the variables used as proxies for fiscal and monetary policies by Anderson and Jordan in their work are not statistically independent thus inappropriate. Therefore by using different proxies taking the question of statistical independence of the exogenous variables into account, they found a larger and significant fiscal policy multiplier. De Leew and Kalchbrenner (1969) have shown in their work that the choice of variables affects the weights of fiscal and monetary policy (cf. Elliot, 1975, p.183).

Batten and Thornton (1986) argued that there is no evidence to support these various criticisms of the A-J model. They confirmed the results of Anderson and Jordan using the original A-J data and testing for misspecification and simultaneous-equation bias. In addition, the dominance of monetary policy in United States has been confirmed by Carlson (1978) who tried to answer Friedman (1977)'s conclusion

that the St Louis equation believes in Fiscal policy. According to Carlson, Friedman's estimations suffer from heteroscedasticity problems which were solved by the re-estimation of the equation in a rate-of-change form. The equation was therefore redefined as followed:

$$\dot{Y}_t = c + \sum_{i=0}^{4} m_t \dot{M}_{t-1} + \sum_{j=0}^{4} e_t \dot{E}_{t-1}$$

Where$\dot{Y}_t$, $\dot{M}_t$ and $\dot{E}_t$ are the rate of change in total spending (GNP), money supply and high employment Federal expenditures.

Other studies also support the monetarist conclusion in the case of the US economy. This is the case of Kretzmer (1992) who used a Vector autoregressive analysis in order to account for the feedback and quarterly data from 1950 to 1991. The paper applied causality test, variance decomposition and impulse response functions to access the relative effectiveness of monetary and fiscal actions. In the results, the study agreed with the previous researchers on the effectiveness of monetary policy as compared to government expenditures but points out the fact that monetary policy has become less effective overtime.

Similar to Kretzmer (1992), Snyder and Bruce (2001) using a more general error correction vector-autoregression approach, examined the relative effectiveness of monetary and fiscal policy in the US economy. They used M2 and the federal Funds rate to measure the monetary policy and marginal income tax rates and government spending to measure fiscal policy. They also confirm the monetarist view with the results by concluding that monetary policy is relatively more effective than fiscal policy.

Again, Senbet (2011) also agrees with the Kretzmer (1992), using Granger causality tests and VAR models on a relatively long period of quarterly data (1959: I to 2010: II). The results from both models indicate the effectiveness of monetary policy in affecting output. As monetary variables, Senbet (2011) used Federal Funds rate and non-borrowed reserves and actual government expenditures as fiscal variable.

Other researchers applied the St Louis equation to other developed countries. This is the case of Batten and Haffer (1983) who did a cross-country comparison on the effectiveness of fiscal and monetary policy using data from 6 developed countries such as Canada, France, Germany, Japan, United Kingdom and United States.

They used a modified version of the St Louis Equation where the variables were in growth rate form and where export growth was included as an exogenous variable. They argued that the original St Louis equation assumes that the economy is a relatively "closed" which is not true for other countries which are opened to trade. Therefore, according to Batten and Haffer (1983), for these countries whose exports account for a large proportion of their output since the foreign sector is affected by monetary and fiscal actions affect foreign sector. They argued that as the economy becomes more open, the correlation between external and domestic affects GNP. Therefore, export growth was included to control for the foreign trade effect.

The following functional relationship was specified in the study and estimated using unrestricted Ordinary Least square (OLS) estimation procedure

$$\dot{Y}_t = \propto_0 + \sum_{i=0}^{J} m_t \dot{M}_{t-t} + \sum_{i=0}^{K} g_t \dot{G}_{t-1} + \sum_{i=0}^{L} e_t \dot{EX}_{t-1} + \varepsilon_t$$

Where Ẏ is the GNP growth, Ṁ is the growth of the narrow money, Ġ is the federal government expenditures, and ĖẊ is the merchandise exports. The study concluded that monetary policy has a consistent and lasting effect in all the countries.

In the context of developing countries, many studies confirm the monetarist view by concluding monetary policy is more effective than fiscal policy. This is the case of Bynoe (1994) who examined empirically the relative importance of fiscal and monetary policy in the context of five African countries; Ghana, Kenya, Nigeria, Sierra Leone and Tanzania using the St Louis-type reduced-form equation used by Batten and Haffer (1983). The annual time series data were taken during the period 1965-1990. Monetary policy was found to be relatively more effective in all the five countries.

The same result was found by Ajisafe and Folorunso (2002) and confirmed by Adefeso and Mobolaji (2010) in the case of Nigeria. The former used time series data for the period 1970-1998. A modified St Louis equation, where monetary policy is measured by money supply M2 and M1 and Government budget deficit is used as proxy for fiscal policy, was estimated through cointegration and error correction techniques. And the latter is a re-examination with the same estimation procedure. The sample the study inquired covered the period 1970-2007. Unlike Ajisafe and Folorunso (2002), the degree of trade openness rather than exports is used as a variable to capture the trade openness while the same variables were used for monetary and the fiscal policy.

Similarly, Rahman (2005) used the unrestricted VAR framework introduced by Sim's (1980) seminal work, based on the St Louis Equation and the Variance Decomposition an impulse response functions in the case of Bangladesh. The paper

argued that the unrestricted VAR approach allows feedback and dynamic interrelationship among all the variables of the model and helps in forecasting and policy analysis. The outcome from the IRFs suggested that monetary policy alone has a significantly positive impact on real output growth and that there is no real impact of fiscal policy on economic growth. Similarly the results of the VDCs showed that monetary policy explain more of the forecast error variance of output growth. Also, the paper used a "Monetary-fiscal game" under oligopolistic framework to justify the coordination and the corporation between monetary and fiscal authorities after the prisoner's dilemma.

Additionally, Ali et al (2008) studied the relative significance of fiscal and monetary policy in the case of south Asian countries. Using an Autoregressive distributed lag model (ARDL) a co-integration test and ECM; they concluded monetary policy a more powerful tool than fiscal policy. Furthermore, in the case of Pakistan, the monetarist view was confirmed by Saquib et al (1987), by Jawaid et al (2010) and also by Mahmood and Sial (2012). Jawaid et al (2010) investigated the comparative effect of fiscal and monetary policy on economic growth, using time series data for the period 1981-2009. In the model used, money supply was used as a proxy for monetary policy and fiscal balance was used as a proxy for fiscal policy. The paper applied Johansen and Juselius (1990) cointegration procedure and the results showed that monetary policy is more effective than fiscal policy in Pakistan. Unlike Jawaid et al (2010), Mahmood and Sial (2012) used the Autoregressive Distributed Lag Model technique to arrive at the same results.

On the other hand, some empirical studies rather support the Keynesian view and have shown the effectiveness of fiscal policy over monetary policy.

Chowdhury (1986) examined monetary and fiscal policy impact on the economic activities in the growth rate version of the St Louis equation in the case of Bangladesh. The model includes current and lagged values of monetary, fiscal and foreign trade variables. The optimal lag length was determined using the minimum final prediction error criterion as discussed by Hsiao (1981) (cf. Chowdhury, 1986, p.102). The regression results of the equation showed that growth in government expenditures has a greater impact on growth in nominal income than growth rate in money supply. Similarly, the results of the dynamic analysis of the model using impulse response Functions suggested that a shock to government expenditures has a relatively lasting effect on nominal income as compare to a shock to money supply.

Awad & Alsowaidi (2000) who by estimating the St Louis equation similar to that proposed by Anderson and Jordan (1968) using Ordinary Least Square procedure in the case of Qatar concluded that public spending has a greater impact on growth as compare to monetary policy.

Also, Jordan et al (2000) rather than estimating the conventional St Louis single equation model used a modified St Louis co-integration four-equation vector-autoregressive system in the context of three Caribbean economies (Barbados, Guyana and Trinidad and Tobago). The data used in the study, ranged from 1963 to 1997. Government expenditure and net domestic assets were used as proxies for fiscal and monetary policy respectively. From the results, Government expenditure as opposed to the monetary policy was revealed more significant for Barbados and Trinidad and Tobago. However, in Guyana, neither fiscal nor monetary policy was significant.

Furthermore, other studies show that both policies are important in affecting output level and economic growth. This is the case of Mahmood and Sial (2012) who used an autoregressive distributed lag model technique for Pakistan and found that both monetary and fiscal policy play a significant role in Economic growth. Again, Fatima and Iqbal (2003) did a cross-country comparison of the effectiveness of fiscal and monetary policy on economic growth, using annual data from India, Pakistan, Thailand, Malaysia and Indonesia.

The paper used cointegration, Hsio version of Granger causality and error correction representation in their estimation. The Error correction model suggested that while monetary policy is effective in Indonesia, Pakistan and India, both fiscal and monetary policy are effective in explaining economic growth of Thailand and Malaysia. They therefore concluded that, depending on the nature of the economy, the effectiveness of the policies differ from country to country.

In the context of WAEMU countries, Kone (2000) tried to provide empirical evidence of the relative effectiveness of monetary and fiscal policy on economic growth, except Guinea-Bissau, using an error correction model based on the modified version of the St Louis equation. The annual time series data were taken from 1962-1995. Government expenditure, Gross domestic product, money supply M1 and M2 and exports are used. The analysis was done both in real and nominal terms.

The results suggested that monetary policy is more effective in Mali, Cote d'Ivoire and Burkina-Faso, with the long term effect greater than the short term effect. In the case of Niger, in the short run, none of the policies have a significant effect but in the long run, fiscal policy is significant. However in Togo, the fiscal

policy is more effective than the monetary policy both in the short and the long term. The results obtained for Senegal and Benin are not satisfactory.

3.4 Conclusion

From the theoretical point of view, it is observed that some schools of thought believe that only monetary policy plays a significant role in determining the output level and that government intervention are ineffectual. This is the case of classical economics and monetarism. On the other hand, Keynesians believe in the effectiveness of fiscal policy.

New classical economics however, criticised the Keynesians and monetarists assumption concerning price expectations and based on the rational expectation hypothesis, argue that only unanticipated monetary and fiscal policies affect output.

Empirical researches on the relative effectiveness of monetary and fiscal policy give different results and conclusions depending on the country studied. In WAEMU, empirical evidence showed that monetary policy is more effective in Mali, Cote d'Ivoire and Burkina Faso. And fiscal policy has a greater effect on growth in Togo. In the case of Niger, both policies are ineffective in the short run but in the long run only fiscal policy is significant.

Most of the studies undertaken, even though they applied different estimation methods, used a modified version of the St Louis equation in their analysis. But since these studies reached different conclusions, these results cannot be generalised in developed and developing countries.

CHAPTER FOUR

METHODOLOGY

4.1 Introduction

The present chapter introduces the methodology applied to achieve the objectives of the study. It aims at presenting the procedures and the various steps followed in the estimation. The chapter is divided in three main parts namely the model specification, data and sources and the estimation technique. The estimation technique includes the various steps in the estimation: unit root test, test for cointegration, the VAR (Vector Autoregressive) model, determination of lag length, Impulse Response functions and Variance decompositions.

4.2 Model Specification

Anderson and Jordan, in 1968 published the A-J equation also known as the St Louis equation, to analyse the importance of monetary and fiscal policies on nominal GNP in United States. The results showed that the influence monetary policy on nominal GNP is more certain, stronger and worked faster than fiscal impulses.

After the publication of Anderson and Jordan's work, economists questioned the validity of the results obtained from the reduced-form A-J equation. This is the case of Modigliani and Ando (1976), De Leew and Kalchbrenner (1969), Gramzish (1971), Corrigan (1970) (cf. Batten and Thornton, 1986, p.9) who believed that the use of the St Louis equation leads to biased and inconsistent results.

In order to correct the flaws of the original St Louis model especially the endogeneity problem and the constrained Almon lag, various researchers such as Kretzmer (1992), Snyder and Bruce (2001), Rahman (2005), Jordan et al (2000), Senbet (2011) etc. used the Vector autoregressive (VAR) approach in their analysis.

By considering all the variables as endogenous, the VAR model solves the issue of endogeneity and controls for the feedback from the economy to the policy variables (Kretzmer, 1992). Therefore VAR estimation gives better results as compared to the OLS estimation.

In 1983, Batten and Haffer in their work on other developed countries argued that in open economies, the conceptual misspecification of the St Louis equation poses a statistical problem in open economies since monetary and fiscal policies in these countries affect foreign sector. They therefore suggested the inclusion of external influences in the St Louis model by adding another variable to control for the foreign trade effect.

In line with the researchers mentioned above and based on the fact that WAEMU countries are "open" economies, highly dependent on export of commodities and raw materials; and that monetary and fiscal actions in the zone are mainly determined by the level of economic activity and external influences, total exports are included as explanatory variable in the original St Louis equation and a VAR approach is used in the estimations.

The modified version of St Louis equation used in the study is as follows:

$$LGDP_t = \alpha + \sum_{i=0}^{p} \beta_i \, LM2_{t-i} + \sum_{i=0}^{p} \gamma_i \, LGE_{t-i} + \sum_{i=0}^{p} \delta_i \, LX_{t-i} + \mu_t$$

Where LGDP is natural log of real GDP, LM2 is Log of Real money supply, LGE represents the natural Log of Real government expenditure, LX represents the natural Log of real export and μ is the error term.

Furthermore, since the devaluation of 1994 constitutes an important event in the economic history of the WAEMU countries and led to various reforms in terms of policy framework so a dummy variable is included to capture that policy issue.

4.3 Data and Sources

Annual data on Real Government expenditure (GE), real money supply (money and quasi-money) M2, Real gross domestic product (GDP) , Consumer Price Index (CPI) and real export (X) from 1971 through 2011 are used for the estimation. The data are obtained from the Central Bank of West African Countries (BCEAO) database.

The variables are defined as followed:

Consumer Price index (2008=100): the Consumer Price Index (CPI) represents an average change in prices of a representative basket of goods and services purchased by households yearly in each WAEMU country.

Real money supply (M2): the real money supply is CPI adjusted broad money (M2). It includes currency in circulation, sight deposits, time deposits and deposits in National and Postal account. The real money supply is used as a proxy for monetary policy.

Real Government Expenditure (GE): Real government expenditure is CPI adjusted total government expenditures. It is comprised of current and capital expenditure. Real government expenditure is used as a proxy for fiscal policy.

Real export (X): Real export is CPI adjusted exports of goods and services. This does not include the export of factors of production. Real export is used to capture the foreign trade effect.

Real GDP: the Real Gross domestic product is CPI adjusted GDP. It refers to the annual value of goods and services produced within each country. It is equal to the sum of all inputs, including imported intermediate goods.

4.4. Estimation Technique

4.4.1 Test for Stationarity

In the time series literature, various unit root tests exist. However, in the present study, Augmented Dicker Fuller (1981), Phillip-Perron (1988) and Ng and Perron (2001) tests are used to test the stationarity of the variables used in the estimation. If the variables are found to be integrated of order one or non-stationary, cointegration is the appropriate tool to analyse the relationship between the variables. However, if the variables are found to be stationary, a VAR in levels is estimated.

4.4.2 Test for Cointegration

The presence of presence of non-stationary variables implies that there is a possible existence of cointegrating relations. Johansen (1988) and Johansen and Juselius (1992) developed multivariate method of testing for cointegration that explicitly used the vector autoregressive (VAR) and the vector error correction (VECM) framework. Thus, Johansen (1988) cointegration test is utilised to determine a linear combination of the variables and the order of cointegration. This test is based on two different likelihood ratio tests such us the “trace” and ‘maximum eigenvalue” log likelihood statistics.

In addition to the Johansen cointegration test, the study also used the Autoregressive Distributed Lag (ARDL) bounds testing approach to cointegration.

One important advantage of the ARDL approach is that it can be applied even when the variables are I(0).

4.4.3 Impulse Response and Variance Decompositions

In order to analyse the dynamic properties of the system, Variance Decompositions (VDCs) and Impulse Response functions (IRFs) are used. The impulse response function traces the reaction of a dynamic system in response to an exogenous impulse. It gives the i^{th} period response of each variable when the system is shocked by one standard deviation shock. The shock is transmitted to the variables in the model through the vector error correction (VEC) mechanism.

The VDCs show the dynamic behaviour of the model by providing information about the portion of the variance in forecast error for each variable caused by shocks to other variables. The forecast error is derived from the variation in the current and future values of the innovations to each endogenous variable in the model. The variance decomposition therefore provides information about the relative importance of each random shock in affecting the variables in the VAR.

4.5 Conclusion

This chapter presented the methodology used in the study. The model used is a modified version of the St Louis equation, derived from the original St Louis equation developed by Anderson and Jordan. This equation is based on the monetarist model in which output is affected directly by monetary policy. Annual data on real GDP, real money supply, real government expenditure and real export, all CPI adjusted, from 1971 to 2011 for Cote d'Ivoire, Benin, Burkina Faso, Mali, Niger, Senegal and Togo were used in the study. Unit root tests (stationarity tests)

were conducted using ADF, PP and Ng-Perron tests, followed by the Johansen cointegration test and the ARDL bounds test. Then, the long-run and the short-run dynamics among the variables in each of the countries were analysed using a VAR and a VECM. Moreover, the analysis of the VAR model was done using the impulse response functions and the variance decompositions.

CHAPTER FIVE

RESULTS AND DISCUSSIONS

5.1 Introduction

This chapter presents and discusses the empirical findings of this study. The results from the various tests and the econometric estimation of the VAR model for the effectiveness of fiscal and monetary policy are analysed.

5.2 Unit Root Test

The time series properties of each variable were examined using Augmented Dickey Fuller (ADF), Philip Perron (PP) and Ng-Perron tests are conducted in order to determine the order of integration of each variable. It is important to note that before testing for unit root, all the variables are transformed to logarithm forms in order to normalise and linearize the data.

The line graphs of all the variables for each of the countries are reported in Appendix A. It can be seen from the graphs that for Cote d'Ivoire and Togo there is no linear trend in the variables; thus the ADF, PP and Ng-Perron tests for these two countries were conducted with intercept and no trend. However, for Mali, Senegal, Niger, Benin and Burkina Faso most of the variables exhibit a clear positive linear trend. As a result, for these countries unit root tests for all the variables were conducted with intercept and trend.

The results of ADF and PP and Ng-Perron tests for all the variables at their levels and their first difference are presented in seven tables below. The decision from the ADF and the PP tests was based on the P-values of both statistics and the decision

from the Ng-Perron test was made by comparing the test statistics to the critical values.

Unit Root Tests (ADF, PP and Ng-Perron tests of unit root)

Table 5.2: Unit Root Tests: Results for Cote d'Ivoire

	ADF			PP			Ng-Perron	
Variable	Without Trend	Prob	**Decision at 5%**	Without Trend	Prob	**Decision at 5%**	MZ_t statistic	**Decision**
LGDP	-1.293242	0.6234	**NS**	-1.263092	0.6372	**NS**	-0.25218	**NS****
LGE	-2.695829	0.0838	**NS**	-2.275297	0.1846	**NS**	-0.92166	**NS****
LX	-1.531664	0.5075	**NS**	-1.582716	0.4820	**NS**	-0.64374	**NS****
LM	-1.187410	0.6705	**NS**	-1.386798	0.5791	**NS**	0.12541	**NS****
DLGDP	-6.398953	0.00	**I(0)**	-6.406868	0.00	**I(0)**	-3.08623	**I(0)****
DLGE	-4.030003	0.0033	**I(0)**	-4.140745	0.0024	**I(0)**	2.78588	**I(0)****
DLX	-6.745938	0.00	**I(0)**	-6.747834	0.00	**I(0)**	-3.09554	**I(0)****
DLM	-5.158677	0.0001	**I(0)**	-5.158677	0.0001	**I(0)**	-3.07777	**I(0)****

Source: Author's computation

Note: NS denotes the variable is Non-Stationary and I (0) means that the variable is stationary.***denotes decision at 1%, ** denotes decision at 5% and *denotes decision at 10%.

Table 5.3: Unit Root Tests: Results for Benin

	ADF			PP			Ng-Perron	
Variable	Trend & Constant	Prob	Decision	Trend & Constant	Prob	Decision	MZ_t statistic	Decision
LGDP	-3.518676	0.0512	**NS**	-2.845062	0.1906	**NS**	-2.12971	**NS****
LGE	-2.456700	0.3467	**NS**	-2.367222	0.3902	**NS**	-1.89344	**NS****
LX	-3.292036	0.0826	**NS**	-2.177498	0.4886	**NS**	-2.43457	**NS****
LM	-3.046339	0.1330	**NS**	-2.724066	0.2329	**NS**	-2.45552	**NS****
DLGDP	-7.623676	0.00	**I(0)**	-7.475857	0.00	**I(0)**	-3.06028	**I(0)****
DLGE	-7.629267	0.00	**I(0)**	-7.684997	0.00	**I(0)**	-3.03813	**I(0)****
DLX	-4.951874	0.0015	**I(0)**	-5.031143	0.0011	**I(0)**	-4.28786	**I(0)****
DLM	-6.888136	0.00	**I(0)**	-7.843338	0.00	**I(0)**	-3.09278	**I(0)****

Source: Author's computation

Note: NS denotes the variable is Non-Stationary and I (0) means that the variable is stationary.***denotes decision at 1%, ** denotes decision at 5% and *denotes decision at 10%

Table 5.4: Unit Root Tests: Results for Burkina Faso

	ADF			PP			Ng-Perron	
Variables	Trend & Constant	Prob	Decision	Trend & Constant	Prob	Decision	MZ_t statistic	Decision
LGDP	-4.204811	0.0100	**I(0)**	-4.171900	0.0109	**I(0)**	-2.76364	**I(0)***
LGE	-2.734922	0.2289	**NS**	-2.694208	0.2443	**NS**	-2.14725	**NS****
LX	-1.937274	0.6166	**NS**	-1.780840	0.6952	**NS**	-1.95642	**NS****
LM	-3.871185	0.0227	**I(0)**	-3.763851	0.0293	**I(0)**	-2.38899	**NS****
DLGDP	-	-	-	-	-	-	-	-
DLGE	-6.754693	0.00	**I(0)**	-7.221479	0.00	**I(0)**	-3.10071	**I(0)****

(Table continued)

DLX	-5.903089	0.0001	**I(0)**	-7.359072	0.00	**I(0)**	-4.37178	**I(0)****
DLM	-	-	-	-	-	-	-3.04577	**I(0)****

Source: Author's computation

Note: NS denotes the variable is Non-Stationary and I (0) means that the variable is stationary.***denotes decision at 1%, ** denotes decision at 5% and *denotes decision at 10%

Table 5.5: Unit Root Tests: Results for Mali

	ADF			**PP**			**Ng-Perron**	
Variables	Trend & Constant	Prob	Decision	Trend & Constant	Prob	Decision	MZ_t statistic	Decision
LGDP	-1.842204	0.6652	**NS**	-1.955722	0.6069	**NS**	-1.63544	**NS****
LGE	-1.713511	0.7262	**NS**	-3.050518	0.1319	**NS**	-1.72732	**NS****
LX	-1.712847	0.7259	**NS**	-3.290659	0.0824	**NS**	-2.68635	**NS****
LM	-1.990360	0.5887	**NS**	-2.117535	0.5207	**NS**	-1.88457	**NS****
DLGDP	-7.060989	0.00	**I(0)**	-7.259109	0.00	**I(0)**	-3.03787	**I(0)****
DLGE	-10.015446	0.00	**I(0)**	-10.05496	0.00	**I(0)**	-2.73953	**I(0)***
DLX	-8.657867	0.00	**I(0)**	-14.44360	0.00	**I(0)**	-3.05550	**I(0)***
DLM	-5.875410	0.0001	**I(0)**	-5.873034	0.0001	**I(0)**	-3.05564	**I(0)****

Source: Author's computation

Note: NS denotes the variable is Non-Stationary and I (0) means that the variable is stationary.***denotes decision at 1%, ** denotes decision at 5% and *denotes decision at 10%

Table 5.6: Unit Root Tests: Results for Niger

	ADF			PP			Ng-Perron	
Variable	Trend & Constant	Prob	Decision	Trend & Constant	Prob	Decision	MZ_t statistic	Decision
LGDP	-2.167748	0.4938	**NS**	-2.260811	0.4446	**NS**	-1.32539	**NS****
LGE	-1.954332	0.6077	**NS**	-1.949059	0.6104	**NS**	-1.71565	**NS****
LX	-2.348553	0.3996	**NS**	-2.208676	0.4721	**NS**	-2.02028	**NS****
LM	-2.765271	0.2179	**NS**	-2.599766	0.2825	**NS**	-2.34245	**NS****
DLGDP	-6.168007	0.00	**I(0)**	-6.228491	0.00	**I(0)**	-3.10017	**I(0)****
DLGE	-6.321832	0.00	**I(0)**	-6.322071	0.00	**I(0)**	-3.04163	**I(0)****
DLX	-6.777190	0.00	**I(0)**	-7.210594	0.00	**I(0)**	-3.10085	**I(0)****
DLM	-8.453192	0.00	**I(0)**	-8.830582	0.00	**I(0)**	-2.94862	**I(0)****

Source: Author's computation

Note: NS denotes the variable is Non-Stationary and I (0) means that the variable is stationary.***denotes decision at 1%, ** denotes decision at 5% and *denotes decision at 10%

Table 5.7: Unit Root Tests: Results for Senegal

	ADF			PP			Ng-Perron	
Variable	Trend & Constant	Prob	Decision	Trend & Constant	Prob	Decision	MZ_t statistic	Decision
LGDP	-1.984436	0.5918	**NS**	-1.937617	0.6164	**NS**	-0.98792	**NS****
LGE	-0.788181	0.9581	**NS**	-1.735463	0.7166	**NS**	-1.88949	**NS****
LX	-1.832057	0.6698	**NS**	-3.042619	0.1339	**NS**	-2.51916	**NS****
LM	-0.486405	0.9801	**NS**	-1.282118	0.8781	**NS**	-1.41753	**NS****
DLGDP	-7.270037	0.00	**I(0)**	-7.243288	0.00	**I(0)**	-3.07929	**I(0)****
DLGE	-10.60338	0.00	**I(0)**	-10.60338	0.00	**I(0)**	-2.68508	**I(0)***
DLX	-10.44649	0.00	**I(0)**	-12.00420	0.00	**I(0)**	-2.84153	**I(0)****

(Table continued)

DLM	-9.589131	0.00	**I(0)**	-8.980037	0.00	**I(0)**	-2.81183	**I(0)***

Source: Author's computation

Note: NS denotes the variable is Non-Stationary and I (0) means that the variable is stationary.***denotes decision at 1%, ** denotes decision at 5% and *denotes decision at 10%

Table 5.8: Unit Root Tests: Results for Togo

	ADF			**PP**			**Ng-Perron**	
Variable	Without Trend	Prob	Decision	Without Trend	Prob	Decision	MZ_t statistic	Decision
LGDP	-0.689709	0.8379	**NS**	-0.546111	0.8712	**NS**	-0.06527	**NS****
LGE	-2.295942	0.1782	**NS**	-2.374683	0.1551	**NS**	-0.65061	**NS****
LX	-1.765422	0.3916	**NS**	-1.954039	0.3052	**NS**	-0.19938	**NS****
LM	-1.189537	0.6696	**NS**	-1.161021	0.6817	**NS**	0.76183	**NS****
DLGDP	-5.782650	0.00	**I(0)**	-5.891876	0.00	**I(0)**	-3.09993	**I(0)****
DLGE	-6.000525	0.00	**I(0)**	-6.000205	0.00	**I(0)**	-3.10571	**I(0)****
DLX	-10.66237	0.0000	**I(0)**	-22.01453	0.0001	**I(0)**	-2.86972	**I(0)****
DLM	-7;324908	0.0000	**I(0)**	-7.226866	0.00	**I(0)**	-3.07723	**I(0)****

Source: Author's computation

Note: NS denotes the variable is Non-Stationary and I (0) means that the variable is stationary.***denotes decision at 1%, ** denotes decision at 5% and *denotes decision at 10%

The results of the ADF and PP tests showed that all the variables are stationary after first difference, thus integrated of order one (I (1)) for all the countries except for Burkina Faso. With respect to Burkina Faso, both the ADF and the PP tests rejected the null hypothesis of unit root for the naturel log of GDP (LGDP) and the natural log of money supply (LM2) at levels while the other variables namely LX and LGE are stationary after first difference. This implies that LGDP and LM are integrated of order zero, I (0) and LX and LGE are integrated of order one, I (1).

The results of the Ng-Perron test confirmed the ADF and PP tests' results in the case of Cote d'Ivoire, Benin, Niger and Togo at 5% level of significance. With respect to Burkina Faso, the results from the Ng-Perron test showed that except for LGDP, all the variables are integrated of order one. LGDP was found to be stationary at levels (I(0)) at 10% level of significance. With respect to Mali, the results showed that in addition to LGDP and LM2 which are integrated of order one at 5% level of significance, LGE and LX are also stationary at first difference but at 10% level of significance. Finally, in the case of Senegal, all the variables are stationary at first difference with DLGE and DLM2 being stationary at 10%.

The presence of non-stationary variables means that there is a possible existence of long-run relation among the variables. Therefore, cointegration is verified for Cote d'Ivoire, Benin, Mali, Niger, Senegal and Togo by using the Johansen's cointegration test and the Autoregressive Distributed lag (ARDL) bounds testing approach. Moreover in order to avoid the problem of spurious regressions, the first difference of the variables should be used in the estimation of the VAR process.

Since some of the variables are I (0) in the case of Burkina Faso, cointegration cannot be tested among the variables using the Johansen's cointegration test. As a result, ARDL bounds testing approach is used for Burkina Faso and a VAR is estimated using the stationary variables.

5.3 Testing for Structural Stability

Given that WAEMU countries experienced devaluation in 1994 accompanied by major changes in macroeconomic policies especially fiscal and monetary policy, there is a possibility of a structural break in the data used in the estimations. There is a structural change when the values of the parameters of the model do not remain the

same through the entire time period (Gujarati, 2004). In order to find out whether a structural change has occur or not in the data, the Chow Breakpoint test was used in the study. The results of the test are reported in Table 5.9.

Table 5.9: Chow Breakpoint Test

Country	F-statistic	Prob. F(3,35)	Log likelihood ratio	Prob. Chi-Square(3)	Decision
Cote d'Ivoire	10.99849	0.000031	27.22781	0.000005	**Reject H0**
Benin	30.36896	0.000000	52.55306	0.000000	**Reject H0**
Burkina Faso	7.746366	0.000427	20.87757	0.000112	**Reject H0**
Mali	5.067491	0.005095	14.78937	0.002006	**Reject H0**
Niger	8.510577	0.000223	22.46061	0.000052	**Reject H0**
Senegal	3.287243	0.03195	10.17772	0.017114	**Reject H0**
Togo	4.261348	0.011475	12.76509	0.005173	**Reject H0**

Source: Author's computation

The results showed that there is a structural change by rejecting the null hypothesis of parameter stability for all the countries at 5% level of significance. The presence of a structural break requires the inclusion of a dummy variable named Dummy to allow the marginal effects in the model to be different across the subsamples.

5.4 Cointegration Test

Given that for Cote d'Ivoire, Benin, Mali, Niger, Senegal and Togo all the variables are found to be I (1), the Johansen's cointegration test is used to determine the number of cointegrating relationships among the variables. If the variables are

cointegrated, there exists a stationary linear combination which is called the cointegrating equation. This equation represents the long run equilibrium relationship among the variables. In order to determine the number of cointegrating equations, the trace and the Maximum Eigenvalue test statistics are examined. Especially, the calculated Trace and Maximum Eigenvalue test statistics are compared to the critical values at 5% level of significance to decide the existence of one or more cointegrating equations. The P-values are also used to confirm the results. The results of both tests are reported in the six Tables below.

Johansen's Cointegration test (Trace and Maximum Eigen Value Results)

Table 5.10: Johansen's Cointegration test: Results for Cote d'Ivoire

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.	Max-Eigen Statistic	0.05 Critical Value	Prob.
None	0.699431	95.69836	69.81889	0.0001**	45.67893	33.87687	0.0013**
At most 1	0.498209	50.01942	47.85613	0.0309**	26.20374	27.58434	0.0743
At most 2	0.349658	23.81568	29.79707	0.2083	16.34979	21.13162	0.2051
At most 3	0.178111	7.465897	15.49471	0.5241	7.453679	14.26460	0.4370
At most 4	0.000321	0.012218	3.841466	0.9118	0.012218	3.841466	0.9118

Source: Author's computation

Note: ** denotes rejection of the null hypothesis at 5%.

Table 5.11: Johansen's Cointegration test: Results for Benin

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.	Max-Eigen Statistic	0.05 Critical Value	Prob.
None	0.739527	117.2343	88.80380	0.0001**	51.11974	38.33101	0.0011**
At most 1	0.500635	66.11458	63.87610	0.0320**	26.38785	32.11832	0.2131
At most 2	0.430052	39.72673	42.91525	0.1006	21.36396	25.82321	0.1741
At most 3	0.246256	18.36276	25.87211	0.3201	10.74271	19.38704	0.5400
At most 4	0.181701	7.620059	12.51798	0.2843	7.620059	12.51798	0.2843

Source: Author's computation

Note: ** denotes rejection of the null hypothesis at 5%.

Table 5.12: Johansen's Cointegration test: Results for Mali

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.	Max-Eigen Statistic	0.05 Critical Value	Prob.
None	0.699252	94.68955	88.80380	0.0176**	45.65630	38.33101	0.0061**
At most 1	0.421836	49.03325	63.87610	0.4576	20.82009	32.11832	0.5867
At most 2	0.307955	28.21316	42.91525	0.6093	13.98798	25.82321	0.7235
At most 3	0.234068	14.22519	25.87211	0.6390	10.13315	19.38704	0.6046
At most 4	0.102090	4.092035	12.51798	0.7287	4.092035	12.51798	0.7287

Source: Author's computation

Note: ** denotes rejection of the null hypothesis at 5%.

Table 5.13: Johansen's Cointegration test: Results for Niger

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.	Max-Eigen Statistic	0.05 Critical Value	Prob.
None	0.620755	93.23000	88.80380	0.0230**	36.84380	38.33101	0.0733
At most 1	0.562357	56.38620	63.87610	0.1816	31.40138	32.11832	0.0610
At most 2	0.298499	24.98482	42.91525	0.7906	13.47224	25.82321	0.7665
At most 3	0.217134	11.51258	25.87211	0.8444	9.302185	19.38704	0.6930
At most 4	0.056509	2.210391	12.51798	0.9543	2.210391	12.51798	0.9543

Source: Author's computation

Note: ** denotes rejection of the null hypothesis at 5%.

Table 5.14: Johansen's Cointegration test: Results for Senegal

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.	Max-Eigen Statistic	0.05 Critical Value	Prob.
None	0.715439	130.3259	88.80380	0.0000**	47.75870	38.33101	0.0032**
At most 1	0.677078	82.56723	63.87610	0.0006**	42.95307	32.11832	0.0016**
At most 2	0.446598	39.61416	42.91525	0.1030	22.48349	25.82321	0.1300
At most 3	0.259627	17.13067	25.87211	0.4053	11.42283	19.38704	0.4707
At most 4	0.139470	5.707844	12.51798	0.4983	5.707844	12.51798	0.4983

Source: Author's computation

Note: ** denotes rejection of the null hypothesis at 5%.

Table 5.15: Johansen's Cointegration test: Results for Togo

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.	Max-Eigen Statistic	0.05 Critical Value	Prob.
None	0.732764	94.38437	69.81889	0.0002**	50.14570	33.87687	0.0003**
At most 1	0.460414	44.23867	47.85613	0.1051	23.44420	27.58434	0.1553
At most 2	0.306103	20.79448	29.79707	0.3706	13.88640	21.13162	0.3744
At most 3	0.159386	6.908074	15.49471	0.5884	6.597663	14.26460	0.5378
At most 4	0.008135	0.310411	3.841466	0.5774	0.310411	3.841466	0.5774

Source: Author's computation
Note: ** denotes rejection of the null hypothesis at 5%.

From Table 5.10 and Table 5.11, it can be seen that with respect to Cote d'Ivoire and Benin, the trace test statistic rejected the null hypothesis that there is no cointegration and the hypothesis that there is at most one cointegrating equation. On the other hand the maximum eigenvalue test statistic rejected only the null hypothesis that there is no cointegrating relationship and failed to reject the hypothesis that there is at most one cointegrating equation. In the case of Mali and Togo the results show one cointegrating equation. Both test statistics rejected the hypothesis that there is no cointegrating equation and failed to reject the hypothesis that there is at most one cointegrating equation at 5% level of significance. Thus there is a stable long-run relationship among the variables. With respect to Senegal, the results of both tests show that there are 2 cointegrating equations. Finally, in the case of Niger the tests failed to reject the null hypothesis that there is no cointegrating equation.

The results of the ARDL bounds tests for each country are reported in Table 5.16. It can be seen that in the case of Cote d'Ivoire Burkina Faso and Senegal, both the F-statistic and the W-statistic lie between the bounds. The ARDL bounds test results

for these countries are therefore inconclusive. With respect to Benin, Niger and Togo the results showed that the null hypothesis of no level effect cannot be rejected at 5% and 10% level of significance, meaning that there is no cointegration relationship among the variables. Finally, in the case of Mali, the null hypothesis of no level effect is rejected thus; there is a long-run relationship among the variables.

Table 5.16: The ARDL Bounds testing Approach

Country	F-statistic	W-statistic	Decision at 5%
Cote d'Ivoire	4.0947	20.4735	Inconclusive
Benin	1.6171	8.0856	Do not reject H0
Burkina Faso	4.0026	20.0128	Inconclusive
Mali	6.6597	26.6386	Reject H0
Niger	2.956	14.7799	Do not reject H0
Senegal	4.0605	20.3027	Inconclusive
Togo	0.7355	3.6775	Reject H0

Source: Author's computation

After comparing the results from both tests, the long-run analysis was done based on the Johansen's cointegration test since it produced more coherent and meaningful results as compared to the ARDL bounds test. Thus, one cointegrating relationship was considered for Cote d'Ivoire, Benin, Mali and Togo. In the case of Senegal, two cointegrating equations were considered and a VAR in first difference form is estimated for Niger.

5.4.1 Long-Run Estimates

In order to establish the long-run equation, the cointegrating coefficients reported based on the normalisation $\beta' S_{11} \beta = I$ [2] where $S_{11} = T^{-1} \sum_{t=1}^{T} r_{1t} r_{1t}'$ [3] are examined. The normalisation was done on LGDP and LX for Senegal, and LGDP for Benin, Mali, Senegal and Togo. The long-run equations coefficients are presented in Table 5.17.

Table 5.17: Cointegrating Equations

	Cote d'Ivoire	Benin	Mali	Senegal		Togo
Variables	**LGDP**	**LGDP**	**LGDP**	**LGDP**	**LX**	**LGDP**
LGDP	-1	-1	-1	-1	0	-1
LGE	0.367615 (0.11963) [-3.07293]	1.754178 (1.90774) [-0.91951]	-1.013247 (0.11509) [8.80357]	2.188178 (0.35001) [-6.25173]	3.90983 (0.60918) [-6.41818]	-2.302736 (0.51231) [4.49478]
LX	0.339187 (0.1424) [-2.38196]	10.30086 (1.24994) [-8.24107]	-0.200862 (0.07116) [2.82271]	0	-1	-4.753815 (0.77154) [6.16146]
LM2	0.228948 (0.19718) [-1.16111]	-9.800414 (4.01173) [2.44294]	0.494044 (0.08964) [-5.51134]	-1.694776 (0.29428) [5.75912]	-3.011447 (0.51218) [5.87970]	4.019163 (0.70778) [-5.67857]
DUMMY	0.295851 (0.07315) [-4.04436]	-6.523141 (1.56603) [4.16540]	0.211488 (0.04336) [-4.87709]	0.151317 (0.06286) [-2.40720]	0.798398 (0.10941) [-7.29763]	0.808716 (0.21469) [-3.76683]
TREND	-	-0.526562 (0.224) [-2.35073]	0.092763 (0.01429) [-6.49093]	0.020751 (0.00442) [-4.69434]	-0.019944 (0.00769) [2.59226]	-
INTERCEPT	0.417915	57.19905	-1.935651	14.00991	21.95125	-22.14553

Source: Author's computation

Note: standard error in parenthesis ( ) and t-values in brackets [ ]

[2] The columns of β contain the cointegrating vectors and β is usually called the matrix of cointegrating coefficients.

[3] Where T represents the sample size and r_{1t} is the residual obtained from the regression of ΔY_t on $(\Delta Y_{t-1}, \Delta Y_{t-2}, \ldots, \Delta Y_{t-p+1})$. Y_t is a m×1 vector of I(1) variables for t = 1,2….. T.

The results reported in Table 5.17 show that in the case of Cote d'Ivoire, money supply and real government spending have a positive effect on Real GDP in the long run. But the elasticity associated with money supply is insignificant. The positive effect of money supply and government expenditure is consistent with the results of Kone (2000). However, the elasticity associated with government expenditure is greater than that of money supply. This contradicts the conclusion of Kone (2000) concerning relative effectiveness of monetary and fiscal policy in Cote d'Ivoire. Moreover, export has a significant and positive effect on real GDP in the case of Cote d'Ivoire. This implies that export expansion positively affects growth in the long run which is consistent with the results by Kone (2000) in the case of Cote d'Ivoire.

With respect to Benin, the model showed that the elasticity associated with money supply is negative and significant. A percentage increase in money supply causes GDP to fall by 9.8%. This implies that money supply has a negative effect on real GDP in the Long run. The effect of government expenditure was found to be positive but insignificant. Besides, export positively affects real GDP in the Long run.

The fiscal policy variable has an unexpected negative sign in Mali and Togo. This result implies that government expenditure can have a significant "crowding out" effect in these countries (Orsmond, 1992). The results for Mali however are consistent with the conclusion of Kone (2000) that in Mali, government expenditure and money supply are significantly explaining the movement in growth of the long run. Government spending contributes negatively to growth, while money supply contributes positively to growth. The same result was found for Togo. Orsmond

(1992) and Bynoe (1994) also found a negative relationship between government expenditure an economic growth in Ghana and in Kenya.

For Senegal, the long-run elasticity of output with respect to real government expenditure and the long run elasticity of export with respect to real government expenditure are positive and highly significant. On the other hand the effect of money supply is unexpectedly negative and significant both on real GDP and export. Thus money supply in the long run has a negative effect on real GDP and real export in Senegal.

Real export was significant in all the five countries which contradict the results of Kone (2000) that in the long run exports affect growth only in Cote d'Ivoire and Togo. In Table 5.17 it is seen that exports in the long run positively affect growth in Cote d'Ivoire, Benin and Senegal. However in Togo and Mali, the coefficients have an unexpected negative sign, implying a negative effect of real export on growth in these countries. Furthermore, the devaluation was found to have a positive and significant impact on the long run growth of all the countries except for Benin where the coefficient is negative. With respect to Benin, Mali and Senegal, the results show that the trend is significant implying that the variables have a long memory which means that a particular random innovation has a long term effect.

In summary, fiscal policy has a positive effect on growth in Cote d'Ivoire, Benin and Senegal but its effect is negative in Mali and Togo. On the other hand, the effect monetary policy in the long run is positive in Cote d'Ivoire, Mali and Togo. However the results for Benin and Senegal do not carry the expected positive sign. This can attributed to the presence of excess liquidity in the financial market of these countries.

The findings in terms of the sign of the impact of monetary and fiscal policy for Cote d'Ivoire and Mali are in line with the study of Kone (2000). Also, the findings with respect to Benin and Senegal are similar to Kone (2000) who found a negative long-run relationship between monetary policy and growth. In the case of Togo the results do not correspond with that of Kone (2000).

5.4.2 Short Run Estimates

Now, to be able to determine the short-run behaviour of the variables for Cote d'Ivoire, Benin, Mali, Senegal and Togo their error correction model (ECM) is examined. The Granger representative theorem states that if two or more variables are cointegrated then an error correction model can be expressed such that the error correction term derived from the long-run equilibrium is incorporated in order to tie the short run and the long run dynamics of the model. The error correction term also known as the adjustment parameter represents the speed of Adjustment from the short-run to the long run; and it is expected to be negative and significant. The larger the speed of adjustment, the greater the response of the dependent variable to the previous period's deviation from long run equilibrium. Thus, the faster is the convergence of the dependent variable.

The results of the Vector Error Correction Model are presented in Table 5.18 to 5.21.

Table 5.18: Vector Error Correction Model Estimates for Cote d'Ivoire

Error Correction:	D(LGDP)	D(LGE)	D(LM2)	D(LX)
CointEq1	-0.482486***	-0.246775	0.110987	0.290442
	(0.13392)	(0.18569)	(0.22040)	(0.31866)
D(LGDP(-2))	-0.232832	-0.176157	-0.616993**	-0.557475
	(0.18605)	(0.25796)	(0.30620)	(0.44269)
D(LGE(-2))	-0.535373***	-0.17017	0.574193*	0.293937
	(0.19072)	(0.26445)	(0.31389)	(0.45382)
D(LM2(-1))	-0.030442	-0.004142	0.285972	0.786363**
	(0.15419)	(0.21379)	(0.25376)	(0.36689)
D(LX(-1))	-0.244636**	0.100549	0.191182	-0.3401
	(0.11950)	(0.16569)	(0.19666)	(0.28433)
C	0.034472**	0.017943	0.026219	0.016841
	(0.01436)	(0.01991)	(0.02363)	(0.03416)
R-squared	0.526294	0.338426	0.265478	0.268181
Adj. R-squared	0.325880	0.058529	-0.045281	-0.041435
F-statistic	2.626037	1.209110	0.854289	0.866172
Log likelihood	52.23211	39.81319	33.29985	19.29112
Akaike AIC	-2.117479	-1.463852	-1.121045	-0.383743
Schwarz SC	-1.600347	-0.94672	-0.603912	0.133389

Source: Author's computation

Note: *** denotes significant at 1%, ** denotes significant at 5% and * denotes significant at 10%. Standard errors in parenthesis ( ).

From Table 5.18, it is seen that for Cote d'Ivoire in the short run, the previous year's value of exports have a negative effect on real GDP. Also, the previous year's changes in government expenditure negatively affect growth but have a positive effect on money supply. Furthermore, previous year's variations in money supply impact export growth positively. The speed of adjustment of economic growth in the long run is 48.25% per year which implies that about 48% of the disturbance in the short run is corrected each year.

Table 5.19: Vector Error Correction Model Estimates for Benin

Error Correction:	D(LGDP)	D(LGE)	D(LX)	D(LM2)
CointEq1	0.026484***	-0.01226	0.039997**	-0.019059
	(0.00585)	(0.01249)	(0.01550)	(0.01199)
D(LGDP(-1))	-0.515691***	-0.276146	-0.034233	0.207562
	(0.18001)	(0.38427)	(0.47677)	(0.36881)
D(LGE(-1))	-0.082494	-0.386356***	-0.23964	-0.328237
	(0.09853)	(0.21034)	(0.26098)	(0.20188)
D(LX(-1))	0.136579**	0.003180	0.435485**	-0.020978
	(0.06611)	(0.14113)	(0.17511)	(0.13546)
D(LX(-2))	0.230983***	-0.0561	-0.100914	-0.300216*
	(0.08257)	(0.17626)	(0.21869)	(0.16917)
D(LM2(-2))	-0.045333	0.501108**	-0.084419	0.221023
	(0.09370)	(0.20002)	(0.24816)	(0.19197)
D(DUMMY(-1))	-0.11996*	0.239077	-0.22241	-0.080641
	(0.06906)	(0.14743)	(0.18291)	(0.14150)
C	0.032042**	0.021937	0.052662	0.076095**
	(0.01601)	(0.03418)	(0.04241)	(0.03281)
R-squared	0.610313	0.374574	0.448703	0.355944
Adj. R-squared	0.445445	0.109971	0.215462	0.083459
F-statistic	3.701838	1.415608	1.923775	1.306287
Log likelihood	62.36085	33.54361	25.34756	35.10375
Akaike AIC	-2.650571	-1.133874	-0.702503	-1.215987
Schwarz SC	-2.133439	-0.616742	-0.185371	-0.698854

Source: Author's computation

Note: *** denotes significant at 1%, ** denotes significant at 5% and * denotes significant at 10%. Standard errors in parenthesis ( ).

For Benin the error correction term is significant but does not carry the expected negative sign implying the adjustment will cause the system to gradually deviate from the equilibrium. The results showed that in the short run, the present value of real GDP is negatively affected by its previous year's value. In addition, in the short run, real GDP growth is positively affected by the previous years' growth in exports; thus confirms their long run relationship.

Table 5.20: Vector Error Correction Model Estimates for Togo

Error Correction:	D(LGDP)	D(LGE)	D(LX)	D(LM2)	D(DUMMY)
CointEq1	-0.052305**	-0.166361***	-0.274666*	-0.113052**	-0.043029
	(0.02607)	(0.03617)	(0.05169)	(0.04256)	(0.04945)
D(LGDP(-1))	0.401611	1.153738***	0.616052	0.073383	-0.473667
	(0.25514)	(0.35387)	(0.50575)	(0.41642)	(0.48385)
D(LX(-2))	-0.195973*	0.457321***	0.158988	0.217312	-0.01921
	(0.11528)	(0.15988)	(0.22851)	(0.18815)	(0.21861)
D(LM2(-2))	0.024968	-0.179399	-0.699631**	-0.355232	-0.488103
	(0.15250)	(0.21151)	(0.30229)	(0.24890)	(0.28920)
C	0.011067	0.024077	0.066840*	0.063717**	0.078829**
	(0.01757)	(0.02437)	(0.03483)	(0.02868)	(0.03332)
R-squared	0.339984	0.651593	0.690759	0.381435	0.359108
Adj. R-squared	0.060747	0.504190	0.559927	0.119734	0.087962
F-statistic	1.217544	4.420486	5.279722	1.457524	1.324408
Log likelihood	48.47274	36.04191	22.47160	29.85663	24.15417

Source: Author's computation

Note: *** denotes significant at 1%, ** denotes significant at 5% and * denotes significant at 10%. Standard errors in parenthesis ( )

With respect to Togo, the previous year's changes in export growth negatively affect growth but positively affect government expenditure. The positive relationship between export growth and fiscal policy in Togo implies that export represent a significant share of public revenue. Furthermore, previous year's variations in money supply have a significantly negative effect on export growth.

Table 5.21: Vector Error Correction Model Estimates for Mali

Error Correction:	D(LGDP)	D(LGE)	D(LX)	D(LM2)
CointEq1	-0.639927***	-0.16301	-2.133725***	-0.063353
	(0.19141)	(0.30645)	(0.39627)	(0.20099)
D(LGDP(-1))	0.158363	-0.502971	1.353344***	-0.176718
	(0.18595)	(0.29770)	(0.38495)	(0.19525)
D(LGDP(-2))	0.181984	-0.38538	0.683160**	0.168249
	(0.16186)	(0.25914)	(0.33509)	(0.16996)
D(LGE(-1))	0.272315	-0.528984	1.640122***	-0.146837
	(0.19494)	(0.31210)	(0.40358)	(0.20469)
D(LGE(-2))	-0.003961	-0.145956	1.008567***	0.129432
	(0.15246)	(0.24409)	(0.31564)	(0.16009)
D(LX(-2))	-0.086432	0.021800	-0.260945**	-0.151138**
	(0.05906)	(0.09455)	(0.12226)	(0.06201)
D(LM2(-1))	0.062743	-0.21088	-0.457658	0.432590**
	(0.15439)	(0.24718)	(0.31962)	(0.16211)
D(LM2(-2))	-0.28113*	-0.18523	-1.189843***	-0.243484
	(0.15464)	(0.24758)	(0.32014)	(0.16237)
C	0.033290	0.182524***	-0.069792	0.058237*
	(0.02978)	(0.04768)	(0.06165)	(0.03127)
R-squared	0.593957	0.516320	0.707549	0.581624
Adj. R-squared	0.422170	0.311685	0.583820	0.404619
F-statistic	3.457518	2.523136	5.718538	3.285913
Log likelihood	57.70027	39.81642	30.04901	55.84533

Source: Author's computation

Note: *** denotes significant at 1%, ** denotes significant at 5% and * denotes significant at 10%. Standard errors in parenthesis ( ).

In the case of Mali, previous year's changes in money supply have a significantly negative effect on growth in the short-run. Export growth is positively affected by previous year's variations in real GDP growth and government expenditure. But it is negatively affected by its previous year's variations and changes in money supply.

Also, the results from table 5.20 and table 5.21 showed that the speed of adjustment is fast for Mali (64%) and slow (5.23%) for Togo.

The estimation of the Vector Error correction model showed that the adjustment term for Senegal is insignificant. Hence, the results for this country were not reported.

5.5 Estimation of the VAR Model

The VAR model is estimated for all the countries namely Cote d'Ivoire, Benin, Burkina Faso, Mali, Niger, Senegal and Togo. In order have valid results from the impulse Response and the Variance Decomposition, the appropriate VAR model needs to be estimated. To choose the optimal lag length, Lag-length selection criteria such as sequential modified LR test statistic (LR), Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Information Criterion (SC), and Hanna-Quinn information criterion (HQ) were employed. After the selection of the appropriate lag length to include in the model, residual tests of the residuals namely autocorrelation LM test, Multivariate Jarque-Bera normality test, White's heteroscedasticity test, and stability test were conducted in order to ensure of the validity of the impulse response functions and variance decompositions.

5.5.1 VAR Diagnostic Tests

From the lag length test, it is shown that out of the six criteria, five selected 0 lag order as the optimal lag length to include in the VAR process in the case of Cote d'Ivoire, Benin and Niger. However, including no lag in the specification of VAR model can be inappropriate. Therefore, after meticulous examination of different lag lengths by estimating the VAR at each lag and diagnosing whether the resulting residuals are white noise or not, the study included two lags for Cote d'Ivoire and three lags for Benin and Niger. With respect to Mali and Burkina Faso, two and four lags respectively were selected as recommended by sequential modified LR test statistic (LR). For Senegal, the various selection criteria came up with different results. But after examination of the different lag lengths, two lags were chosen, as recommended by Akaike Information criterion (AIC). Furthermore, in the case of Togo, LR, FPE and AIC recommended the inclusion of one lag. However, results

from the heteroscedasticity test showed that the residuals are heteroscedastic at 5% when only one lag is included in the VAR model therefore 3 lags were chosen for Togo. The results of the VAR lag length criteria are reported in Table 5.22 to Table 5.28.

VAR Lag Order Selection Criteria

Table 5.22: VAR Lag Order Selection Criteria: Results for Cote d'Ivoire

Lag	LogL	LR	FPE	AIC	SC	HQ
0	128.2483	NA*	1.18e-08*	-6.902685*	-6.726738*	-6.841275*
1	140.0286	20.28832	1.50e-08	-6.668258	-5.788525	-6.361208
2	149.3908	14.04326	2.25e-08	-6.29949	-4.715971	-5.7468
3	161.2287	15.12613	3.12e-08	-6.068259	-3.780954	-5.269928
4	176.3594	15.97137	3.95e-08	-6.019969	-3.028877	-4.975998

Source: Author's computation

Table 5.23: VAR Lag Order Selection Criteria: Results for Benin

Lag	LogL	LR	FPE	AIC	SC	HQ
0	120.2671	NA*	1.84e-08*	-6.459281*	-6.283334*	-6.397871*
1	128.7811	14.66307	2.81e-08	-6.043394	-5.163661	-5.736344
2	143.3457	21.84693	3.15e-08	-5.963651	-4.380132	-5.41096
3	160.6453	22.10503	3.22e-08	-6.03585	-3.748545	-5.237519
4	171.7435	11.71476	5.11e-08	-5.763527	-2.772436	-4.719556

Source: Author's computation

Table 5.24: VAR Lag Order Selection Criteria: Results for Burkina Faso

Lag	LogL	LR	FPE	AIC	SC	HQ
0	1.553791	NA	1.35e-05	0.135901	0.311847	0.197311
1	80.88915	136.6331	4.02e-07	-3.382731	-2.502998*	-3.075680*
2	93.45630	18.85072	5.04e-07	-3.192017	-1.608498	-2.639326
3	103.9183	13.36812	7.53e-07	-2.88435	-0.597045	-2.08602
4	136.6034	34.50096*	3.60e-07*	-3.811302*	-0.82021	-2.767331

Source: Author's computation

Table 5.25: VAR Lag Order Selection Criteria: Results for Mali

Lag	LogL	LR	FPE	AIC	SC	HQ
0	129.7306	NA	1.09e-08	-6.985031	-6.809085*	-6.923621*
1	145.3320	26.86914	1.12e-08	-6.962889	-6.083156	-6.655839
2	167.0171	32.52762*	8.47e-09	-7.278727	-5.695208	-6.726036
3	184.9736	22.94438	8.34e-09*	-7.387420*	-5.100114	-6.589089
4	194.3577	9.905528	1.45e-08	-7.019874	-4.028783	-5.975903

Source: Author's computation

Table 5.26: VAR Lag Order Selection Criteria: Results for Niger

Lag	LogL	LR	FPE	AIC	SC	HQ
0	69.46310	NA*	3.10e-07*	-3.636839*	-3.460892*	-3.575429*
1	80.85728	19.62332	4.03e-07	-3.38096	-2.501227	-3.07391
2	94.20423	20.02042	4.84e-07	-3.233568	-1.650049	-2.680878
3	114.3127	25.69422	4.23e-07	-3.461819	-1.174514	-2.663489
4	123.2345	9.417442	7.57e-07	-3.068585	-0.077494	-2.024614

Source: Author's computation

Table 5.27: VAR Lag Order Selection Criteria: Results for Senegal

Lag	LogL	LR	FPE	AIC	SC	HQ
0	150.6853	NA	3.40e-09	-8.149184	-7.973238*	-8.087774*
1	168.9625	31.47743*	3.01e-09*	-8.275696	-7.395963	-7.968646
2	185.4724	24.76483	3.04e-09	-8.304023*	-6.720504	-7.751333
3	193.1371	9.793707	5.30e-09	-7.840948	-5.553643	-7.042617
4	215.4682	23.57175	4.50e-09	-8.192677	-5.201586	-7.148706

Source: Author's computation

Table 5.28: VAR Lag Order Selection Criteria: Results for Togo

Lag	LogL	LR	FPE	AIC	SC	HQ
0	119.6766	NA	1.90e-08	-6.426476	-6.250529*	-6.365066*
1	136.1118	28.30514*	1.87e-08*	-6.450656*	-5.570923	-6.143606
2	146.3412	15.34407	2.67e-08	-6.130066	-4.546547	-5.577375
3	160.4789	18.06481	3.25e-08	-6.026604	-3.739298	-5.228273
4	178.4494	18.96895	3.52e-08	-6.13608	-3.144989	-5.092109

Source: Author's computation

To check if the lag length was appropriately selected for each country, the autocorrelation LM test was performed to test residual serial correlation up to the

specified lag order. The LM test is asymptotically distributed as χ^2 under the null hypothesis of no serial correlation at lag order h (h=1… 12). The results of the autocorrelation LM tests are reported in Appendix C.

From the results it can be seen that we fail to reject the null hypothesis of no serial correlation at 10% level of significance at any of the lags for all the countries.

In Table 5.29 is summarized the results of the Jarque-Bera normality test and the White's heteroscedasticity test. The Jarque-Bera statistic has a χ^2 distribution under the null hypothesis of normally distributed residuals while the White's test is a test of the null hypothesis of no heteroscedasticity against heteroscedasticity. The results summarized in Table 5.29 show that, for all the countries, we reject the hypothesis of heteroscedasticity at 5% level of significance, which implies that the residuals are not heteroscedastic. In addition, with the exception of Burkina Faso and Togo, based on the p-values, we fail to reject the null hypothesis that the residuals are normally distributed. Thus in the case of the two countries (Burkina Faso and Togo), the residuals resulting from the VAR are not normally distributed.

Table 5.29: Diagnostic tests: Normality and Residual heteroscedasticity tests

Country	Multivariate Normality (Jarque-Bera test)	Heteroscedasticity (Chi-square)	Decision
Cote d'Ivoire	7.572778 (0.4763)	157.3337 (0.5448)	Residual normal and homoscedastic
Benin	14.42678 (0.0713)	244.2164 (0.4123)	Residual normal and homoscedastic
Burkina Faso	29.16705 (0.0003)	322.8959 (0.4441)	Residual not normal and homoscedastic
Mali	12.56045 (0.1279)	154.0024 (0.6187)	Residual normal and homoscedastic
Niger	13.58122 (0.0934)	259.7247 (0.1822)	Residual normal and homoscedastic
Senegal	9.693136 (0.2872)	187.4202 (0.0681)	Residual normal and homoscedastic
Togo	17.55444 (0.0310)	242.7437 (0.4383)	Residual not normal and homoscedastic

Source: Author's computation
Note: p-values are in parenthesis ( )

The stability test based on the inverse roots of the characteristic AR polynomial was also performed to verify the suitability of the specified VAR. the VAR is said to be stable if all roots lie inside the unit root circle. The AR graphs for all the countries are displayed in Appendix D. From the Figure D.1 to D.7, it can be seen that all the roots lie inside the unit root circle for all the countries. This implies that the VAR process for each of the countries is stable.

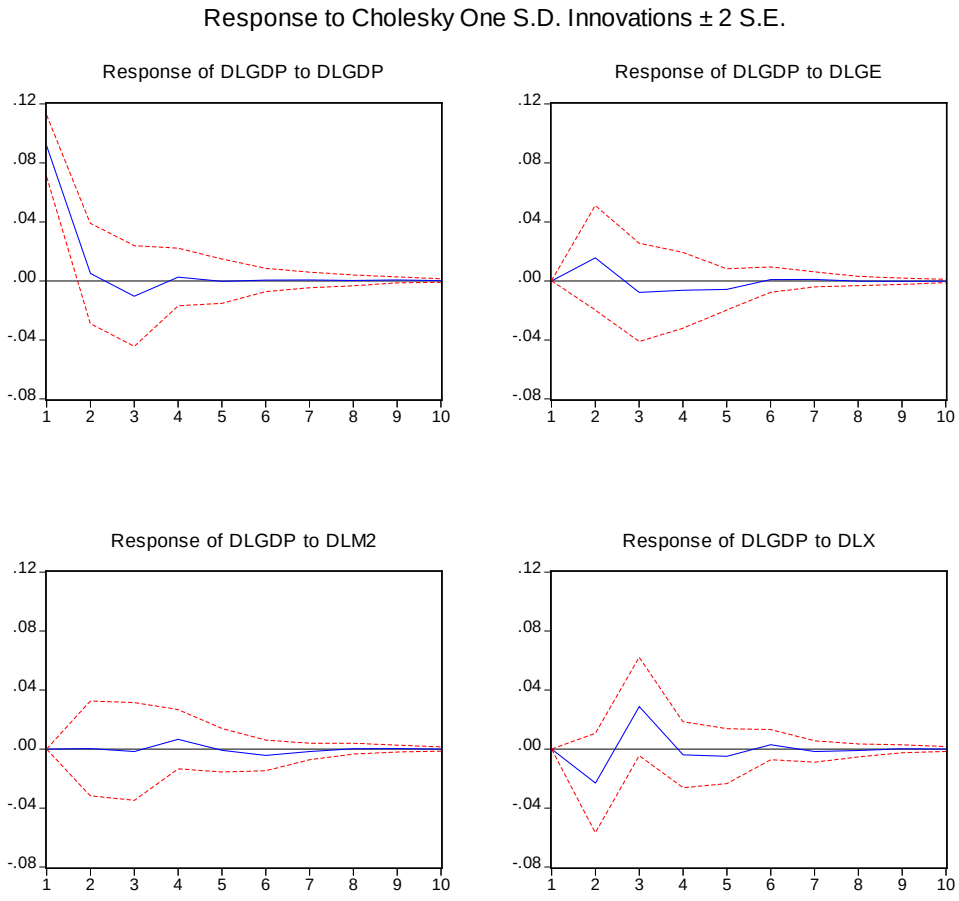
5.6 Impulse Response

In order to trace the effect to a one-time shock to one of the innovations on current and future values of the endogenous variables, the study employed the impulse response function. The Cholesky ordering was used to transform the impulses. It uses

the inverse of the Cholesky factor of residual covariance matrix to orthogonalize the impulses.

The estimated IRFs are presented in different graphs in Appendix E. But in order to help the discussion, selected IRFs from the VAR model of each country are reported below. The various graphs show the response of real GDP growth to shocks in GDP itself, fiscal policy, monetary policy and exports.

Figure 5.1: Selected impulse response functions from the VAR model for Cote d'Ivoire

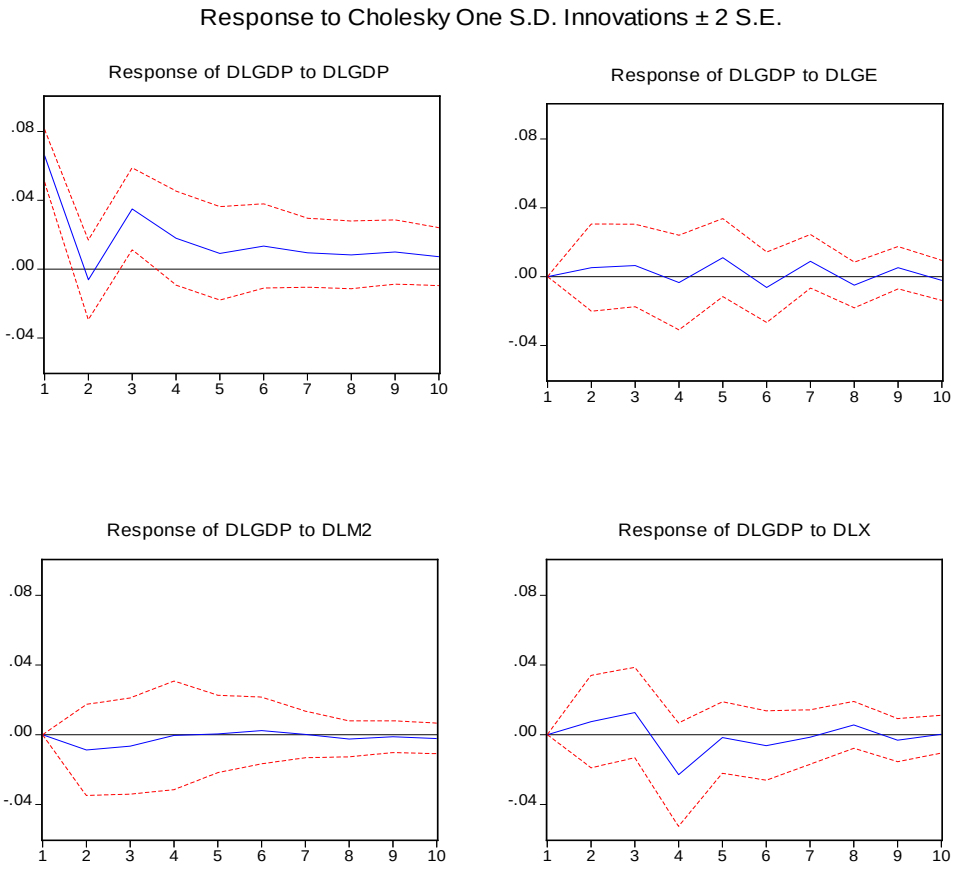


In the case of Cote d'Ivoire, as shown in Figure 5.1, a shock to Real GDP growth at the initial year positively affects growth itself; however it falls drastically and becomes negative between the second and the fourth year and becomes stable after the fourth year. A shock to money supply has virtually no effect on growth while to a

shock to government expenditure, growth responds positively (almost by 1.6%) in the first period. After the second year, the response to shock to government expenditure declines then becomes negative between year three and year six; after which it becomes insignificant. In addition, growth responds positively to a shock to exports only after the second period and becomes insignificant from the fourth period after the shock.

The initial response of GE to a shock to growth is positive. The effect gradually falls and becomes negative from year two to year seven where it becomes insignificant. One standard deviation shock in M2 causes GE to rise during the first two years but the effect declines from year three and becomes insignificant at the fifth period. Moreover, the effects of a shock to export on both GE and M2 are positive during the first four periods but become virtually insignificant after year four. With respect to export, the effect of a shock to M2 is positive from year one to year three. During this period, the shock gradually declines to become negative after the third year; after which it becomes insignificant.

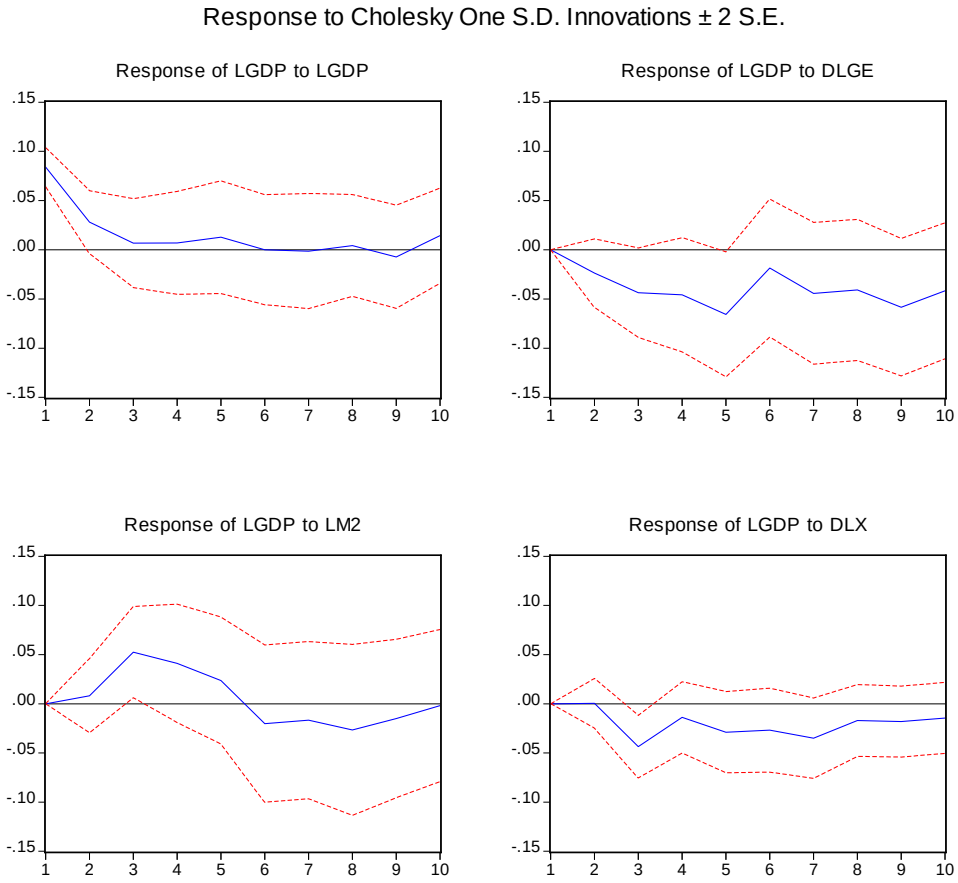
Figure 5.2: Selected impulse response functions from the VAR model for Benin



With respect to Benin, in Figure 5.2 it can be seen that a shock to government expenditure has a virtually positive effect on growth. A shock to money supply appears to have a negative effect on growth between year one and year four. The results also show a positive impact of a shock to exports on growth, which declines after the third year and become negative up to the seventh period. Besides, the impulse response of the real GDP growth owing to one standard deviation shock in the innovations of growth is positive. Though the deviation seems to be closing up from the fifth year, it does not show signs of adjustment to equilibrium. This further confirms the results of the VEC model that a disequilibrium resulting from the short-run will not be corrected in the long-run.

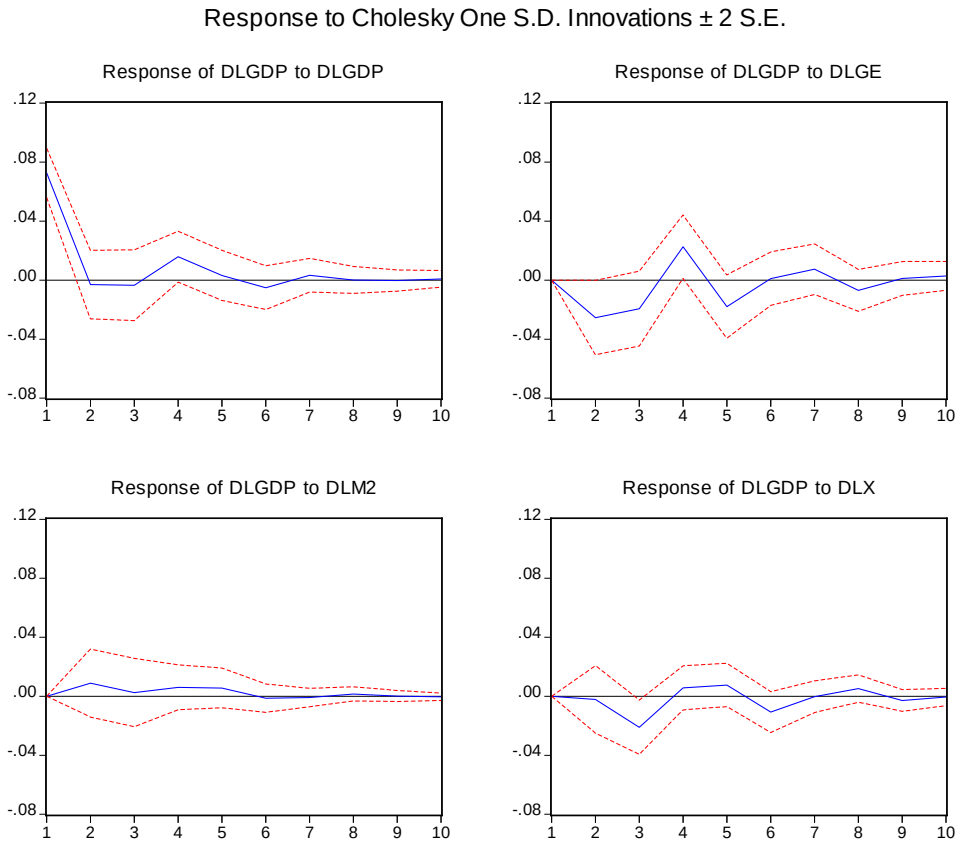
In addition, the response of GE to one standard deviation shock to growth is negative over the period. It however responds positively to a shock to M2 over the first three periods; then the effect falls and becomes negative between year four and year seven and becomes positive but insignificant after the seventh year. With respect to exports, a shock to GE causes a negative response over the first two periods and a positive response from year four to year seven. Also, a shock to M2 has a negative effect on X from year one to year four. However, after that period, the effect becomes positive but gradually falls and becomes negative again at year seven.

Figure 5.3: Selected impulse response functions from the VAR model for Burkina Faso



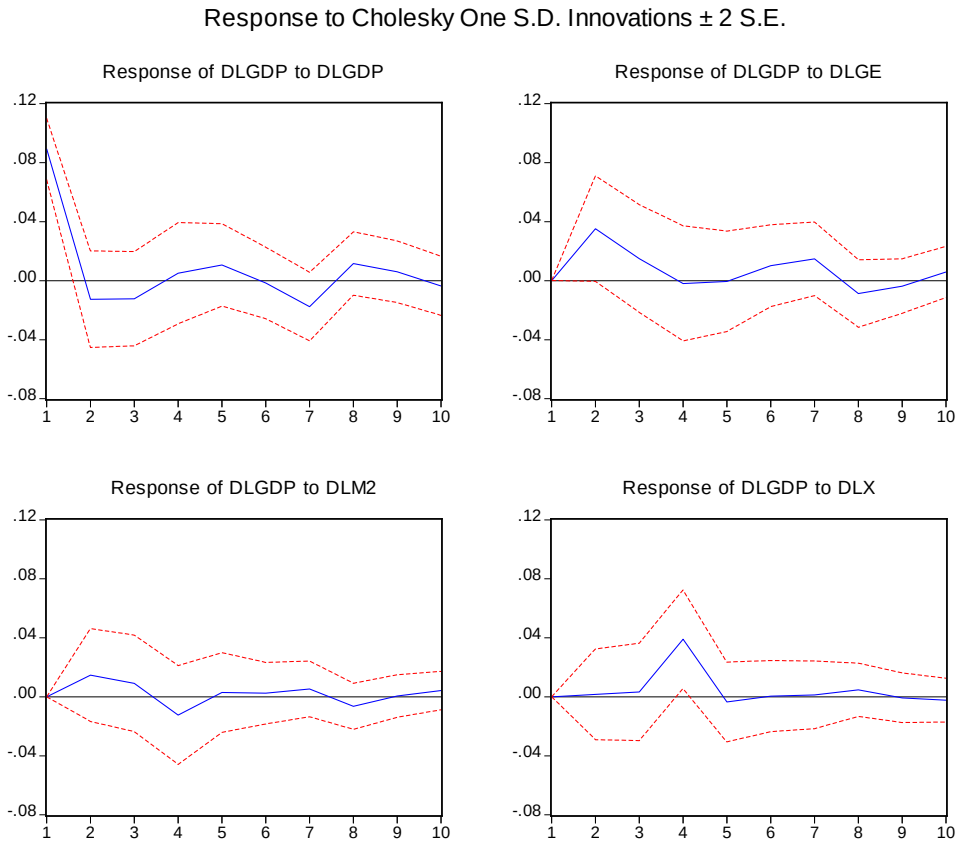
In Burkina Faso, the effect of a shock to government expenditure on real GDP is negative and significant in the short run. In addition, a one standard deviation shock to money supply leads to an increase in real GDP by 0.8% during the first year and by almost 5.2% in year two. However, the effect gradually falls and becomes negative by year six. Besides, a shock to exports has an initially positive but insignificant effect on real GDP in the first year but its effect becomes negative from the second year. It can also be seen in the results that in the short run, growth responds negatively to a shock to exports. A shock to export and M2 have a positive effect on GE from year three to seven and from year two to four respectively. Also, export responds positively to a shock to money supply over first five periods before it becomes insignificant.

Figure 5.4: Selected impulse response functions from the VAR model for Mali



In the case of Mali, a shock to government expenditure causes growth to fall; the effect is negative during the first three years but growth starts rising after year three and the effect becomes positive then turns negative in the fifth year. In addition, real GDP growth responds positively to money supply shock in the initial periods. A shock to real export in the first period is almost insignificant; and it has a negative effect on growth. After year four, it becomes positive; it falls after year six and becomes negative and almost insignificant. In addition, with respect the government expenditure the effect of a shock to export is virtually unstable over the periods. Also, GE responds negatively to a shock to money supply during the first three years and then the effect becomes insignificant. One standard deviation shock to export causes M2 to rise. The positive effect falls and becomes negative after year two but after year four it is positive again. Furthermore, a shock to M2 has a negative effect on export during the first three periods. The effect becomes positive from year four to six; after which it becomes insignificant.

Figure 5.5: Selected impulse response functions from the VAR model for Niger

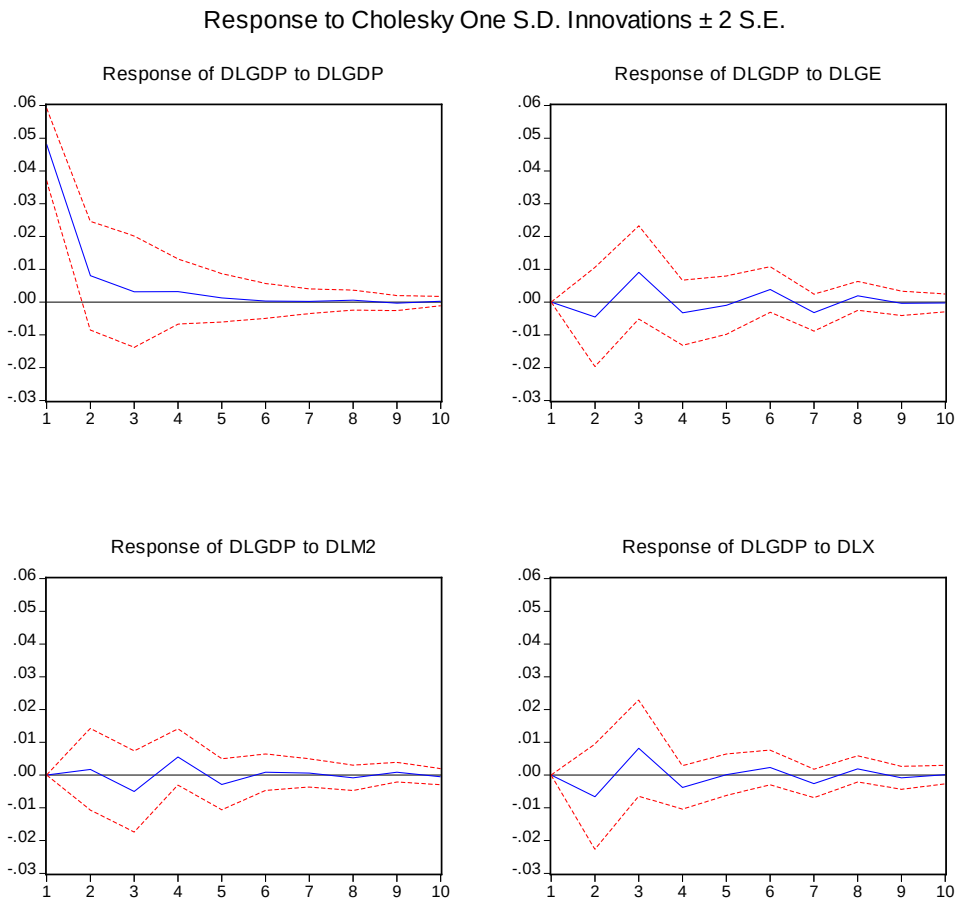


In Figure 5.5, it is shown that a shock to government expenditure in the case of Niger has a positive significant effect on GDP growth between year one and year four, then between year five and year six. A one standard deviation shock to government spending causes 3.5% of the variation in real GDP at year two. Besides, the response of growth to innovations to money supply is positive and significant during the first two periods. One standard deviation shock in Money supply produces 1.5% increase in GDP at year two; its effect gradually falls and becomes negative at year four. Then from year five, it is virtually insignificant.

As a result of innovations to export, government expenditure increases slightly between year one and year two. The effect becomes significantly positive between year three and year five. Also, the initial effect of a shock to government expenditure

on export is negative. But it becomes positive for three periods and negative again between year five and year six. The response of export to innovations to M2 is also negative during the half of the first period but it is positive between year two and three and also between year six and year eight. Moreover, innovations to export appear to have no effect on M2 between year one and year two. The effect is negative between year two and year four and also between year six and year seven; but positive from year four to five and from year seven to eight.

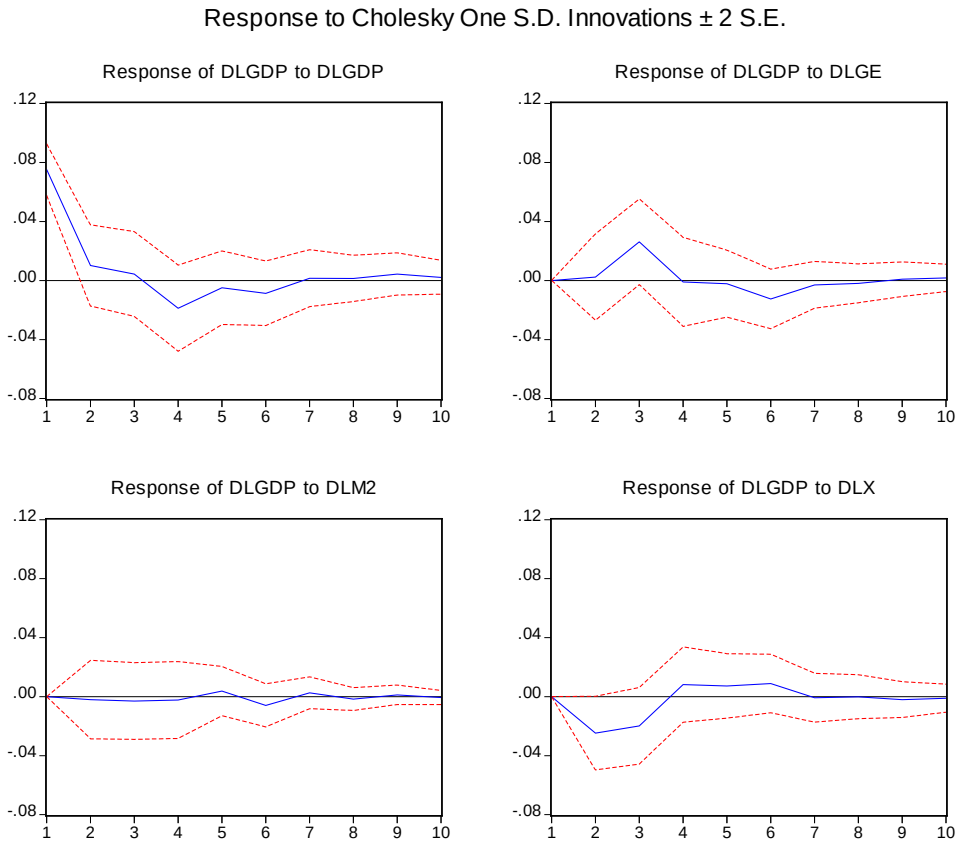
Figure 5.6: Selected impulse response functions from the VAR model for Senegal



In Senegal, the results show that growth responds negatively to innovations to government expenditure in the first period; after which it becomes positive and then negative at the fourth year. On the other hand, a shock to money supply has a

positive but insignificant effect on real GDP growth for the first period. The effect steadily falls and becomes negative by the end of year two then positive again at year four. Besides, a shock to export causes government expenditure to fall. The effect remains negative during the first two periods then becomes positive between year three and year four; after which it becomes virtually insignificant over the rest of the period. Innovations in M2 cause GE to increase. Then the effect declines and become insignificant after year three. Moreover, M2 decreases as a response to a shock to export during the first period. But the negative effect reduces after year two and then becomes positive and negative again just before year four. A shock to M2 has a positive effect on export in the first period. The effect declines and becomes negative from year two to year four; after which it becomes positive again.

Figure 5.7: Selected impulse response functions from the VAR model for Togo



With respect to Togo, as shown by Figure 5.7, a shock to money supply appears to have no significant effect on growth. However, the effect of a shock to government expenditure is positive and significant only for four periods; it becomes negative after the fourth year then becomes insignificant at year eight. The IRFs results also showed that a shock to export is negative and significant during the first four years following the shock. It gradually increases after year three and becomes positive at year four.

With respect to government expenditure, the effect of innovations to M2 is positive in the short run. However, a shock to export causes GE to fall from year one to year four; then the effect becomes positive between year four and six before it becomes insignificant. To a standard deviation shock to GE, M2 responds positively over five periods. Furthermore, the results showed that the effect of a shock to GE on export is unstable over the period. Innovations to M2 have a positive effect on export in the first period. The effect declines and becomes negative from year two to year four; after which it becomes positive again.

The results of the IRFs show that GE shocks have a more lasting effect on growth relative to M2 shocks in all the countries.

5.7 Variance Decomposition

While the IRFs trace the effect of a shock to one variable on another variable in the VAR, the variance decomposition is used to determine information about the relative importance of each random innovation in affecting the variables in the model. The Variance decomposition can be used to compare the size of monetary policy effect on growth and the size of fiscal policy on growth (Kretzmer, 1992). It can also be used to see how the size of the effect has changed over time.

Appendix F provides the diagrams of the variance forecast error decomposition for each of the countries while the Table 5.30 to 5.36 present the results for the 10th period.

Table 5.30: The variance Forecast Error Decompositions for Côte d'Ivoire

Cote d'Ivoire	Number of horizons 10 (Explained by)			
System	DLGDP	DLGE	DLM2	DLX
DLGDP	82.03622	3.653088	0.670928	13.63976
DLGE	10.90075	75.58711	10.32049	3.191653
DLM2	3.831126	24.18330	65.25062	6.734959
DLX	20.77111	8.270869	18.75855	52.19946

Source: Author's computation
Note: Cholesky ordering used is DLGDP DLGE DLM2 DLX

The results of the variance decomposition of real GDP growth for Cote d'Ivoire as shown in Table 5.30 indicates that, in the longer horizon, GDP growth is well explained by itself (82%). The growth rate of government expenditure explains almost 3.7% of GDP growth while growth rate of money supply has almost negligible effect on growth. Besides, innovations to exports account for 13% of the variations in real GDP growth for Cote d'Ivoire. With respect to government expenditure, the largest impact is due to innovations in government expenditure itself, followed by changes in real GDP growth which account for 10.9% of the total variation, and changes in money supply which explains 10.3% of the variation in government expenditure. The results also showed that changes in government expenditure account for 24.2% of the variation in money supply. In addition, the innovations in Real GDP growth explain almost 21% of the total variation in export; while changes in government expenditure are responsible for only 8%.

Table 5.31: The Variance Forecast Error Decompositions for Benin

Benin	**Number of horizons 10 (Explained by)**			
System	DLGDP	DLGE	DLM2	DLX
DLGDP	82.88616	4.827753	1.737898	10.54819
DLGE	11.60855	70.62229	7.960956	9.808195
DLM2	0.975489	25.62231	63.14023	10.26197
DLX	14.75330	1.537480	6.879878	76.82934

Source: Author's computation
Note: Cholesky ordering used is DLGDP DLGE DLM2 DLX

In the case of Benin, 83% of the variation in growth is due to its own shocks. Both fiscal and monetary policies have almost no effect on growth. However, the impact of money supply (2%) is much less than the effect of government expenditure (5%). Innovations to exports explain almost 11% of growth in Benin. Moreover, growth rate of government expenditure and growth rate of real GDP are responsible for 70.6% and 11.6% of the variation in growth of government expenditure respectively. Innovations to fiscal policy account for 27% of the growth in money supply. Furthermore, changes in GE is well explained by its own variations, followed by innovations in growth and innovations in exports which account for 11.6% and 9.8%, respectively. In the M2 system, almost 27% of the variation in money supply is explained by government expenditure. And shifts in exports are responsible for 10.5% change in money supply. Also in the export system, growth of exports themselves accounts for the largest variation (77%); followed by change in real GDP and money supply which account for 15% and 7% respectively.

Table 5.32: The Variance Forecast Error Decompositions for Burkina Faso

Burkina Faso	**Number of horizons 10 (Explained by)**			
System	LGDP	DLGE	LM2	DLX
LGDP	21.59776	46.41781	17.24709	14.73734
DLGE	15.31645	57.83700	18.30252	8.544036
LM2	18.40995	35.52295	37.72894	8.338155
DLX	20.58161	31.74399	17.67182	30.00257

Source: Author's computation
Note: Cholesky ordering used is LGDP DLGE LM2 DLX

For Burkina Faso, the results show that growth rate of real government expenditure explains significantly 46% of real GDP while innovations to money supply account for about 17% of real output. Also, growth rate of real export explains almost 15% of the variation in real GDP. In the money supply M2 system, it can be seen in Table 5.32 that growth rate of government expenditure and money supply are responsible for 36% and 38% of the variation in Money supply in Burkina Faso. Real GDP (18%) and export (8%) on the other hand account for much less. Moreover, shifts in real money supply are responsible for 18% of the variations in government expenditure. Also, growth in exports in Burkina Faso is significantly explained by fiscal policy shocks (32%).

Table 5.33: The Variance Forecast Error Decompositions for Mali

Mali	Number of horizons 10 (Explained by)			
System	DLGDP	DLGE	DLM2	DLX
DLGDP	66.57392	23.36522	1.885325	8.175531
DLGE	8.646313	86.29935	1.313498	3.740838
DLM2	9.432273	14.84280	67.02718	8.697748
DLX	32.12837	1.932550	2.678835	63.26024

Source: Author's computation
Note: Cholesky ordering used is DLGDP DLGE DLM2 DLX

With respect to Mali, it can be seen in Table 5.33 that 67% of the variation in growth is due to its own shocks, monetary policy influences are almost negligible (2%) on growth while innovations to government expenditure account for approximately 23% of the variation in real GDP growth. Besides, export innovations are responsible for only 8% of the variation. In the DLGE system, growth explains almost 7% of change in government expenditure while monetary policy and exports explain only 1% and 3% respectively. In the DLM2 system, among the 4 variables influencing growth rate of money supply, only government expenditure (15%) and money supply itself (67%) have a strong influence on growth in money supply. Export growth accounts for almost 9%, while real GDP growth explains about 9% of the variation. Moreover, government expenditure and money supply are responsible for 2% and 2.7% change in export growth, respectively.

Table 5.34: The Variance Forecast Error Decompositions for Niger

Niger	Number of horizons 10 (Explained by)			
System	DLGDP	DLGE	DLM2	DLX
DLGDP	68.79831	14.75150	4.276280	12.17392
DLGE	16.68463	66.32099	4.113832	12.88055
DLM2	17.23500	18.67743	53.80435	10.28321
DLX	35.93715	21.53269	5.002736	37.52742

Source: Author's computation
Note: Cholesky ordering used is DLGDP DLGE DLM2 DLX

In Niger, the results show that innovations to monetary policy variable have only a slight effect on growth (4%), however fiscal policy and exports innovations account for approximately 15% and 12% in the variation of growth respectively. With respect to government expenditure, innovations to export and real GDP growth account for 13% and 17% of the variation in fiscal policy. Also with respect to monetary policy, growth in money supply is strongly affected by the variations in itself (54%), by the change in government expenditure (19%) and by real GDP growth (17%). Export accounts for 10% of the variation. Furthermore, shifts in real GDP growth account for 36% of the changes in export growth, followed by government expenditure which explains 21% of the growth in exports.

Table 5.35: The Variance Forecast Error Decompositions for Senegal

Senegal	Number of horizons 10 (Explained by)			
System	DLGDP	DLGE	DLM2	DLX
DLGDP	87.16279	5.184616	2.526090	5.126503
DLGE	6.479161	78.38767	4.732207	10.40096
DLM2	14.74306	32.08248	35.61299	17.56148
DLX	2.776085	9.301321	15.28605	72.63655

Source: Author's computation
Note: Cholesky ordering used is DLGDP DLGE DLM2 DLX

In the case of Senegal, fiscal policy and monetary policy innovations have a small impact on growth. Innovations to government expenditure account for 5% of the variation in growth; while a change in money growth explains about 2.5% of the variation. Besides, export innovations account for 5% in the variation. With respect to government expenditure, change in GE itself and export growth are the most influential variables. GDP growth accounts for 6.4%, while money growth explains only 4.7% of the variation. In addition, in the export system, growth in money supply and exports themselves explain about 15% and 73% of the variation respectively. Growth in public spending explains about 9%. In the DLM2 system, innovations in real GDP, in government expenditure, in exports account for almost 15%, 32% and 18% of the forecast error variances of money supply.

Table 5.36: The Variance Forecast Error Decompositions for Togo

Togo	**Number of horizons 10 (Explained by)**			
System	DLGDP	DLGE	DLM2	DLX
DLGDP	74.35620	10.34736	0.945873	14.35057
DLGE	12.82907	71.05771	3.824545	12.28867
DLM2	18.09786	24.35065	55.56962	1.981867
DLX	28.09492	13.89734	5.808100	52.19964

Source: Author's computation
Note: Cholesky ordering used is DLGDP DLGE DLM2 DLX

Finally the results of the VDCs for Togo indicate that government expenditure and export innovations explain 10% and 14% of the variation in growth, respectively. Monetary policy innovations however have only a slight impact on GDP growth. Moreover, innovations in government expenditure account for 24% of variations in money supply and for 14% of the variations in export growth. It can be also seen in

Table 5.36 that real GDP growth and exports explain about 19% and 12% of the forecast error variances of government expenditure, respectively. Money supply on the other hand accounts for only 3.8% of the total variation.

The results of the variance decomposition showed that in Burkina Faso, Niger and Senegal, both monetary and fiscal policy affect growth significantly. With respect to Cote d'Ivoire, Benin, Mali, Niger and Togo, fiscal policy alone appears to affect growth significantly. Monetary policy's effect is virtually insignificant.

The VDCs analysis also revealed that in all the WAEMU countries, the effect of fiscal policy on growth is relatively more important than the effect monetary policy. The size of fiscal policy's effect is higher in Burkina Faso (46%) and Mali (23%) but smaller in Benin (5%), Cote d'Ivoire (3%), Senegal (5%) and Togo (10%). The results are in line with the findings of Chowdhury (1986) in the case of Bangladesh and also similar to Orsmond (1992)'s observations in his study on Sub-Saharan countries, that fiscal policy is relatively more effective in countries with a rigid exchange rates. In addition, the higher effect of fiscal policy relatively to monetary policy in these countries can be attributed to the underdeveloped financial system of these countries which causes the presence of excess liquidity in the financial market (Founda Owoundi, 2009) and a large size of government sector.

Besides, it was also observed that in all the countries, growth in money supply is highly influenced by growth in government expenditure. These results are significant especially in Benin (25%), Burkina Faso (36%), Cote d'Ivoire (24%), Senegal (32%) and Togo (24%). Foreign sector was found to have higher effect on money supply in Senegal, Niger and Benin.

Furthermore, the results indicated that export is highly affected by shifts in government expenditure in Burkina Faso (32.8%), Niger (22%) and Togo (13%). Also, in all the countries especially in Togo, Senegal, Niger and Burkina Faso export has a relatively strong effect on government spending implying that exports constitute a high share of government revenue in these countries.

5.8 Conclusion

This chapter examined and presented the results of the various tests conducted and the results of the cointegrating VAR estimation. First, the time series properties of the variables were examined for all the countries using the ADF, PP and Ng-Perron tests of unit root. The results showed that in the case of all the countries, except for Burkina Faso that all the variables are integrated of order one, meaning that there is a long run relationship among the variables. Consequently the Johansen cointegration test and the ARDL bounds test was conducted in order to determine the number of cointegrating relations that exist among the variables for each country. The results of the Johansen's test showed the existence of one cointegrating relationship in the case of Cote d'Ivoire, Benin, Mali and Togo. There were two cointegrating equation in the case of Senegal. However, the results showed that there is no cointegration relationship between the variables in the case of Niger. Therefore, the study estimated a VEC model for Cote d'Ivoire, Benin, Mali, Senegal and Togo but a simple VAR was analysed for Burkina Faso and Niger.

In the long run, fiscal policy effect on real GDP is significant in Cote d'Ivoire, Mali, Senegal and Togo but is insignificant in Benin. Whereas its effect was positive in for Cote d'Ivoire and Senegal, a negative effect from fiscal policy to real GDP was observed in the case of Mali and Togo. On the other hand, the effect of monetary

policy (money supply) was significant in Benin, Mali, Senegal and Togo and insignificant in Cote d'Ivoire. In the case of Mali and Togo its effect is positive but for Benin and Senegal it was unexpectedly negative.

The results for the VEC model showed that the error correction term for economic growth is significant and carried the expected sign in the case of Cote d'Ivoire, Mali and Togo; it was insignificant for Senegal. For Benin, the study found a significant error correction term which did not carry the expected negative sign. This implies that the adjustment will cause the system to gradually deviate from the equilibrium.

The findings from the Impulse response functions showed that in the short run monetary policy has almost no effect on growth in Cote d'Ivoire and Togo. Its effect on growth in Burkina Faso, Mali, Niger and Senegal is positive and negative in Benin. It was also observed that in the short run, fiscal policy affects growth positively in Cote d'Ivoire, Niger, Benin, and Togo but negatively in Burkina Faso, Mali and Senegal.

The results from the variance decompositions revealed that the predominant source of variations in GDP growth's forecast errors is attributable to its own shocks in all the WAEMU countries. It is also observed that change in government expenditure and exports seem to be the most effective variables in affecting growth in Burkina Faso, Mali, Niger, Senegal and Togo. Both fiscal and monetary policies are relatively ineffective on growth in Cote d'Ivoire and Benin. However it is observed that in these two countries, fiscal policy is relatively stronger than monetary policy. This can be due to the limited development of the financial system in these countries.

CHAPTER SIX

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This final chapter divided in four sections, presents the summary, conclusions and recommendations and limitations of the study. The first section is a brief summary of the problem, objectives, methodology and findings of study. This section is followed by the overall outcomes regarding the results and findings. The third section represents the policy recommendations to fiscal and monetary authorities in the light of the various findings of the study and the last section gives the various limitations of the study.

6.2 Summary

WAEMU countries are characterised by low economic growth and development which cannot be corrected without the implementation of appropriate policy mix in the region. In order to provide a better understanding of the connections between monetary, fiscal policy and growth in the zone, the study examined the relative effectiveness of fiscal and monetary policy on growth in WAEMU countries (Cote d'Ivoire, Benin, Burkina Faso, Mali, Niger, Senegal and Togo) using a modified version of the St Louis equation, derived from the original St Louis equation developed by Anderson and Jordan. Annual data over the sample period 1971-2011 were used in the estimation and the variables employed are real GDP, real money supply (M2), real government expenditure and real export, all CPI adjusted. With the aim to control for the effect of the CFA devaluation in 1994, a dummy variable was included in the estimation of the VECM.

To investigate the long run and short run effect of both policies in each of these countries, the study used the cointegration, vector error correction (VEC) and vector

autoregressive approaches. The cointegration was based on the Johansen (1988) cointegration approach, the Autoregressive Distributed Lag (ARDL) bounds testing approach of cointegration and the use of VEC model, and the analysis of the VAR model was done using the impulse response functions and the variance decomposition.

From the theoretical point of view, the relative importance of monetary and fiscal policy has been a serious debate between various schools of thought especially between the Keynesians and the monetarists. And even though many studies have been conducted, empirical evidence has generally been mixed and inconclusive, and the results and the conclusions from these studies cannot be generalized to all countries.

The cointegration analysis conducted for all the countries revealed that there is a long run relationship among real GDP, real government expenditure, real money supply, real exports and the devaluation in the case of Cote d'Ivoire, Benin, Mali, Senegal and Togo. No cointegration was found for Burkina Faso and Niger

In Benin, Cote d'Ivoire and Senegal, fiscal policy expansion measured by real government expenditure, in the long run model exhibits a positive relationship with real GDP. The effect is significant in Cote d'Ivoire and Senegal but insignificant in Benin. With respect to Mali and Togo, the relationship is negative and significant.

It is also observed that in the long-run, monetary policy expansion has a positive effect on real GDP in Cote d'Ivoire, Mali and Togo. The results are significant in Mali and Togo but insignificant in Cote d'Ivoire. In the case of Benin and Senegal, the effect does not carry the expected positive sign; which implies that monetary expansion will have a negative effect on growth in these countries.

The results from the VEC model reveal that in the case of Mali, Cote d'Ivoire and Togo about 64%, 48% and 5% of the disturbance in the short run is corrected each year, respectively. With respect to Benin, the speed of adjustment is significant but does not carry the expected negative sign implying that the adjustment will cause the system to gradually deviate from the equilibrium. Also, the empirical evidence for Senegal showed that the adjustment term for Senegal is insignificant.

From the IRFs, it is clear that in WAEMU countries fiscal policy has a more lasting effect on growth. Furthermore, the evidence from the forecast error variance decomposition suggests that in all WAEMU countries, the largest source of variations in real GDP's forecast error is attributable to its own shocks, followed by shocks to government expenditure. Innovations to money supply however have a relatively weak effect on real GDP growth. Besides, it was also observed that in all the countries growth of exports significantly explains real GDP growth and growth in money supply is highly influenced by growth in government expenditure. Furthermore, in the case of Togo, Senegal, Niger and Burkina Faso export has a relatively strong effect on government spending as compare to the other countries.

6.3 Conclusions

The study revealed that in the short run, a change in government expenditure has a positive effect on economic growth in Cote d'Ivoire, Benin, Niger and Togo and a negative effect in Burkina Faso and Mali. This implies that an expansionary fiscal policy will lead to an increase in economic growth in Cote d'Ivoire, Benin, Niger and Togo and a fall in real GDP growth in Burkina Faso and Mali.

Also, in the short run a change in money supply, affects growth positively in Burkina Faso, Niger, Mali and negatively in Benin and Senegal. This means that an

expansionary monetary policy will promote economic growth in the first three countries and have the opposite effect in Benin and Senegal.

The study further shows that in the long run, government spending promotes economic growth in Cote d'Ivoire, Benin and Senegal. In the case of Mali and Togo, its long term effect is negative. This implies that an increase in government expenditure leads to growth in Cote d'Ivoire, Benin and Senegal and inhibits long term growth in Mali and Togo. With respect to monetary policy, the empirical evidence reveals that an increase in money supply will promote growth in Mali and Togo. It can be noted that in Togo and Senegal the impact of a change in government expenditure has on real GDP changes over time. For example in Togo, the implementation of an expansionary fiscal policy may lead to growth in the short-run but will contract the economy in the long run; meaning that an increase in government spending has a crowding-out effect in the economy.

It is therefore clear from the long and short-run estimates that monetary and fiscal policy work differently in the different countries and their impact on real GDP growth in some of the countries changes over time. This can be attributed to the macroeconomic differences that characterise their economic structure.

From the results of variance decomposition, the countries can be divided in to two groups. The first group is composed of Senegal, Niger and Burkina Faso. It is shown that in these countries, the economy is affected by both monetary and fiscal policy. Both policies exert a significant effect on real GDP growth. However, the effect of fiscal policy is greater than that of monetary policy. The second group is composed of Cote d'Ivoire, Benin, Mali and Togo. These economies appear to be affected by fiscal policy shocks. In these four countries, the results showed that

monetary policy is virtually insignificant. Therefore, in WAEMU countries, fiscal policy has a greater effect on economic growth relative to monetary policy.

From the overall analysis, it can be concluded that fiscal and monetary policies have different effects on growth in the different countries. However, the effect of fiscal policy on growth is more important and lasting than the effect of monetary policy in WAEMU countries.

6.4 Recommendations

In examining the relative effectiveness of fiscal and monetary policy in WAEMU countries, the study showed that government expenditure has a positive effect on economic growth in Cote d'Ivoire, Benin, Niger and Senegal and a negative effect in Burkina Faso, Mali and Togo.

Therefore, with respect to Cote d'Ivoire, Benin, Niger and Senegal, easing fiscal policy stance will help to ensure growth in the economy especially in the long-run. In fact, these countries are characterised by serious infrastructures gaps and in this regard public investment and social spending should be encouraged in order to bridge the infrastructure gap especially in transport, energy and boost investment. Governments should however take into consideration the countries' debt sustainability condition so as to avoid accumulation of external debt that can hinder growth. In Burkina Faso, Mali and Togo, governments should maintain a prudent fiscal policy stance since public spending is found to have a negative effect on real GDP growth. For these countries, maintaining fiscal discipline accompanied by a prudent debt policy is essential especially in Burkina Faso which is characterised by high external public debt amounting to 23% of GDP in 2011. With respect to this,

fiscal authorities should regulate the level of public expenditure and fiscal policy should be used mostly to promote investment and for social spending.

Again, since fiscal policy is found to be more effective than monetary policy in affecting real GDP growth, improving the quality of public spending should be part of the growth-enhancing strategies implemented in the zone.

In terms of monetary policy the study reveals that monetary changes have a positive effect on real GDP growth in Niger and Burkina Faso in the short run, and in Mali and Togo in the long-run. As a result, fostering growth in these countries could require a monetary relaxation. BCEAO should therefore increase its liquidity provision through its open market operations and lowering its reserve requirement.

One of the reasons why monetary policy is virtually ineffective in WAEMU can be attributed to the presence of excess liquidity in the financial market (Founda Owoundi, 2009). This could also be one of the reasons why the study finds a negative long-run elasticity associated with money supply in some of the countries. This excess liquidity can be due to the limited development of the interbank market making the access to credit difficult to the private sector. In this regard, the priority of the authorities should be the implementation of reforms that can help improve liquidity trading in the financial market, support the development of the financial market, strengthen financial intermediation and increase access to credit.

In addition, since it was found that exports constitute a high share of government revenue and contribute significantly to growth in all the seven countries, governments should promote competitiveness by upgrading technology and skill in export activities, promote export diversification strategy and develop an efficient trading and transport infrastructure. The countries should also improve foreign trade

both on the international and regional markets by removing constraints on trading across borders; applying the union community directives on the free circulation of goods and people; and reducing transaction costs. This will ensure long term growth in the region.

6.5 Limitations of the Study

The main limitation of the study is the limited availability of annual data and the quality of the data available. Because of the unavailability of data in the case of Guinea Bissau, this country was not considered in the analysis.

One of the limitations of the VAR methodology is that the results of the impulse response functions and variance decompositions can be quite sensitive to both model specification and lag length selection. The study faced a lag selection problem for some of the countries, however the optimal lag included in the estimation with respect to these countries was selected after meticulous examination of different lag length by estimating the VAR at each lag and diagnosing whether the resulting residuals are white noise or not.

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APPENDIX

APPENDIX A : Plots of the variables

Figure A.1 : Cote d'Ivoire

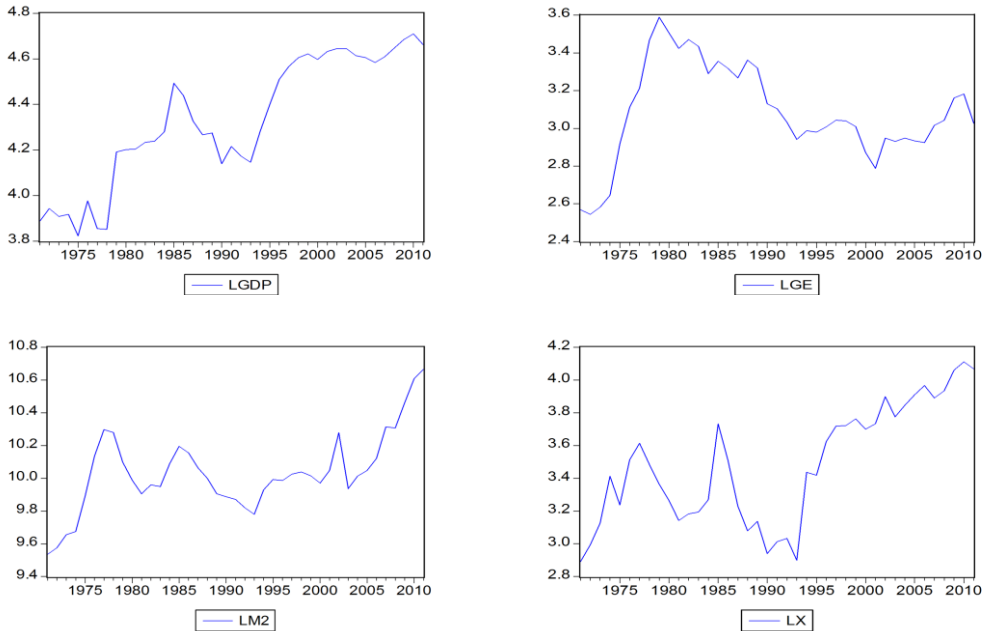


Figure A.2 : Benin

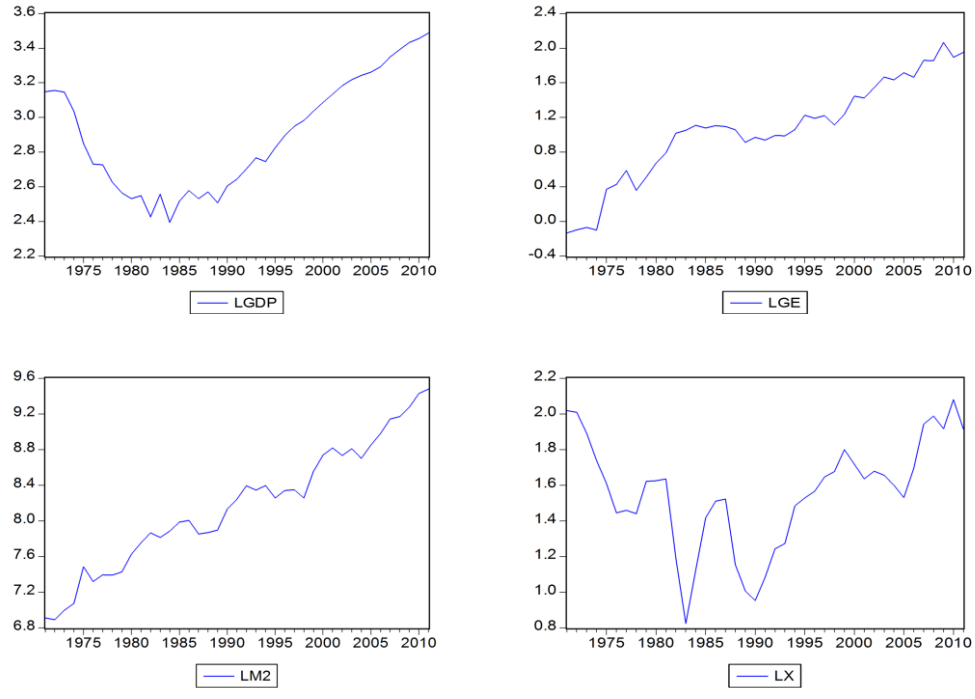


Figure A.3 : Burkina Faso

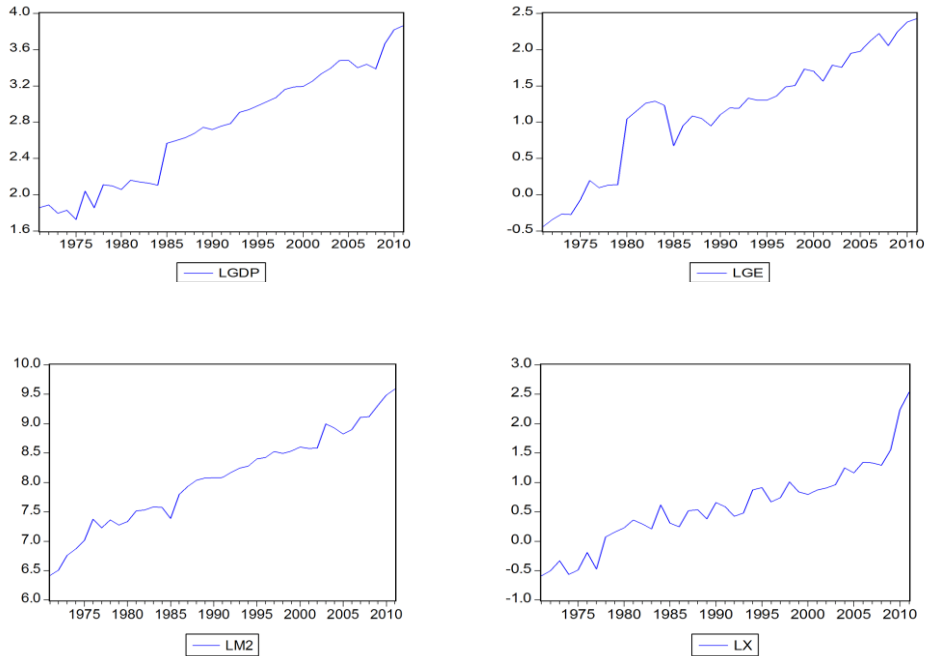


Figure A.4 : Mali

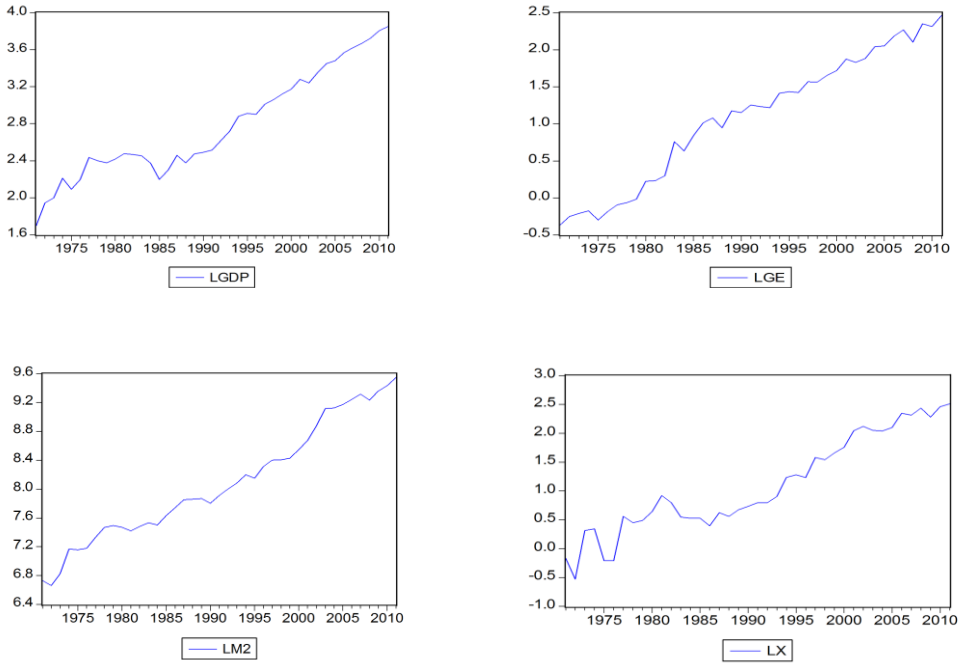


Figure A.5 : Niger

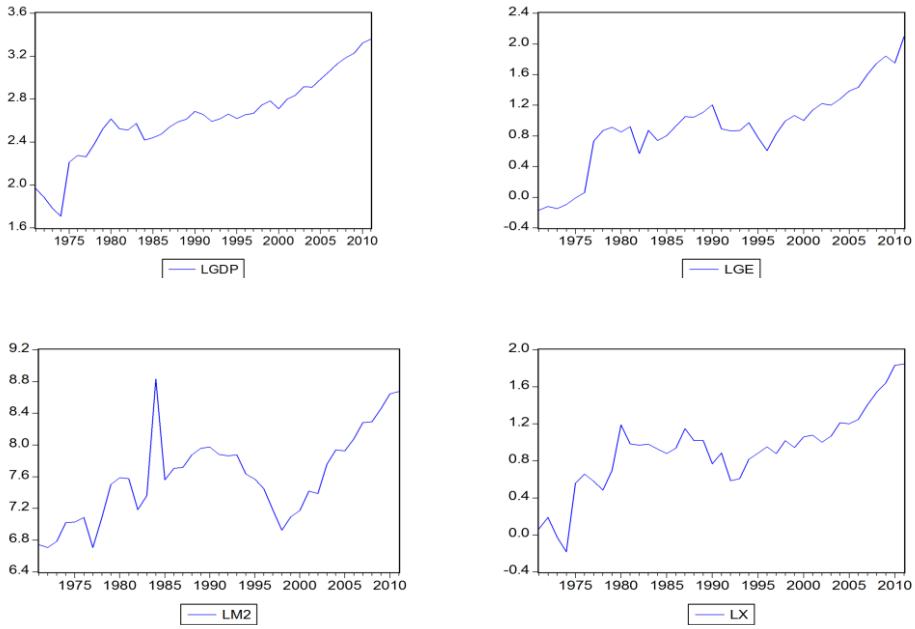


Figure A.6 : Senegal

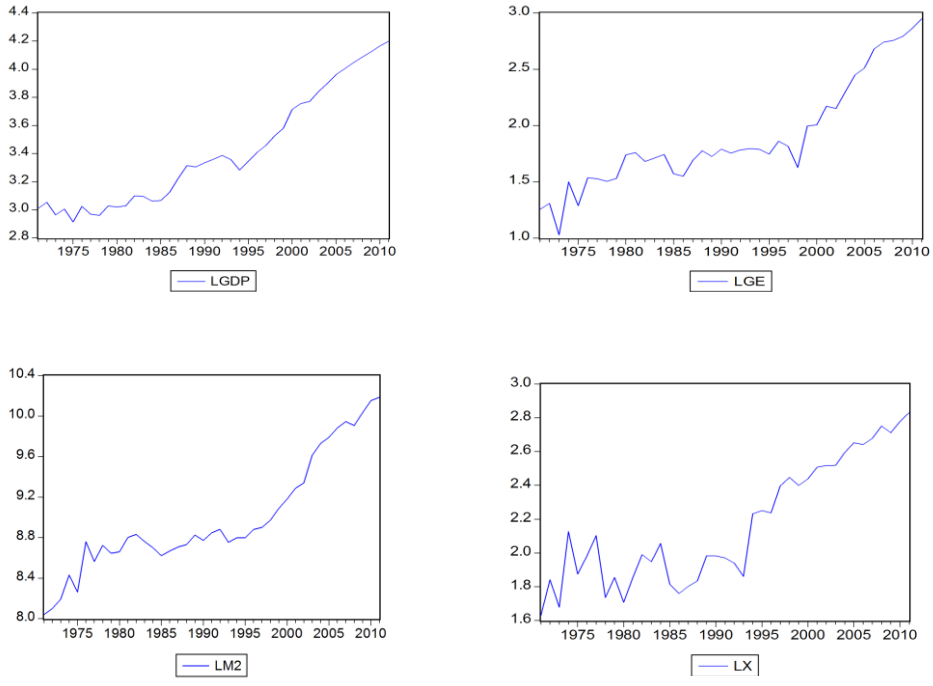
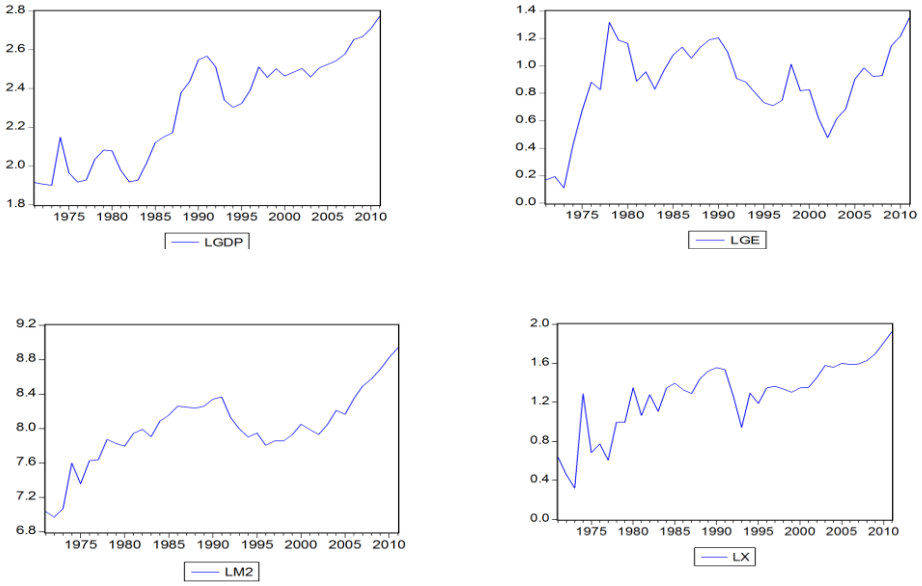


Figure A.7 : Togo



Appendix B : ARDL Bounds Testing approach

Table B.1: Results for Cote d'Ivoire

F-statistic	95% Lower Bound	95% Upper Bound	90% Lower Bound	90% Upper Bound
4.0947	3.9446	5.1272	3.3074	4.3776
W-statistic	95% Lower Bound	95% Upper Bound	90% Lower Bound	90% Upper Bound
20.4735	19.7228	25.6360	16.5368	21.8879

Table 5.10: Results for Benin

F-statistic	95% Lower Bound	95% Upper Bound	90% Lower Bound	90% Upper Bound
1.6171	3.9446	5.1272	3.3074	4.3776
W-statistic	95% Lower Bound	95% Upper Bound	90% Lower Bound	90% Upper Bound
8.0856	19.7228	25.6360	16.5368	21.8879

Table 5.11: Results for Burkina Faso

F-statistic	95% Lower Bound	95% Upper Bound	90% Lower Bound	90% Upper Bound
4.0026	3.9446	5.1272	3.3074	4.3776
W-statistic	95% Lower Bound	95% Upper Bound	90% Lower Bound	90% Upper Bound
20.0128	19.7228	25.6360	16.5368	21.8879

Table 5.12: Results for Mali

F-statistic	95% Lower Bound	95% Upper Bound	90% Lower Bound	90% Upper Bound
6.6597	4.4815	5.6707	3.7291	4.8046
W-statistic	95% Lower Bound	95% Upper Bound	90% Lower Bound	90% Upper Bound
26.6386	17.9261	22.6827	14.9163	19.2182

Table 5.13: Results for Niger

F-statistic	95% Lower Bound	95% Upper Bound	90% Lower Bound	90% Upper Bound
2.9560	3.9446	5.1272	3.3074	4.3776
W-statistic	95% Lower Bound	95% Upper Bound	90% Lower Bound	90% Upper Bound
14.7799	19.7228	25.6360	16.5368	21.8879

Table 5.14: Results for Senegal

F-statistic	95% Lower Bound	95% Upper Bound	90% Lower Bound	90% Upper Bound
4.0605	3.9446	5.1272	3.3074	4.3776
W-statistic	95% Lower Bound	95% Upper Bound	90% Lower Bound	90% Upper Bound
20.3027	19.7228	25.6360	16.5368	21.8879

Table 5.16: Results for Togo

F-statistic	95% Lower Bound	95% Upper Bound	90% Lower Bound	90% Upper Bound
0.73550	3.1991	4.4782	2.6591	3.7945
W-statistic				
	95% Lower Bound	95% Upper Bound	90% Lower Bound	90% Upper Bound
3.6775	15.9955	22.3912	13.2955	18.9726

Appendix C

Table C.1: VAR Residual Serial Correlation LM test

Lags	Cote d'Ivoire	Benin	Burkina Faso	Mali	Niger	Senegal	Togo
1	16.75175 (0.4018)	16.97006 (0.3875)	20.9342 (0.1811)	22.898 (0.1165)	30.72944 (0.0146)	15.73605 (0.4715)	23.32918 (0.1052)
2	9.555394 (0.8888)	9.678113 (0.8829)	11.52366 (0.7761)	16.83454 (0.3964)	16.03215 (0.4507)	27.93709 (0.0322)	18.45882 (0.2977)
3	14.16167 (0.5867)	8.461689 (0.9339)	6.403399 (0.9831)	11.58834 (0.7718)	20.17783 (0.2123)	11.63192 (0.7689)	7.824472 (0.9539)
4	10.80949 (0.8211)	8.981832 (0.9142)	7.997767 (0.9489)	19.2774 (0.2545)	10.9314 (0.8137)	15.41155 (0.4947)	24.04495 (0.0885)
5	14.70224 (0.5465)	8.174341 (0.9435)	10.76941 (0.8235)	16.39551 (0.4257)	18.95605 (0.2709)	13.10877 (0.6648)	16.99075 (0.3862)
6	10.94539 (0.8128)	20.69443 (0.1906)	7.21619 (0.9689)	9.698438 (0.9689)	13.19276 (0.6586)	13.34461 (0.6474)	21.06566 (0.176)
7	9.269197 (0.9019)	11.67654 (0.7659)	18.83748 (0.2772)	10.49979 (0.8393)	16.49631 (0.4189)	12.24859 (0.7267)	9.129542 (0.908)
8	17.49355 (0.3544)	17.04925 (0.3824)	16.81127 (0.3979)	7.593273 (0.9601)	14.32929 (0.5742)	10.79863 (0.8217)	24.97254 (0.0703)
9	13.6881 (0.6219)	9.924059 (0.8706)	12.73163 (0.6923)	19.68617 (0.2347)	23.14152 (0.11)	11.91132 (0.7501)	16.08548 (0.4470)
10	9.055868 (0.9111)	11.53650 (0.7752)	10.13375 (0.8596)	17.32655 (0.3648)	15.27964 (0.5043)	10.94885 (0.8126)	17.45 (0.3571)
11	8.163306 (0.9439)	12.10295 (0.7369)	17.77002 (0.3375)	15.91803 (0.4587)	6.788347 (0.9771)	23.90651 (0.0916)	11.98297 (0.7452)
12	9.965893 (0.8684)	20.81791 (0.1856)	4.685547 (0.9971)	14.91346 (0.531)	9.139422 (0.9076)	13.15416 (0.6615)	10.04157 (0.8644)

Source: Author's computation

Note: p-values are in parenthesis

APPENDIX D: Stability test: Inverse Roots of AR Characteristic Polynomial

Figure D.1 : Cote d'Ivoire

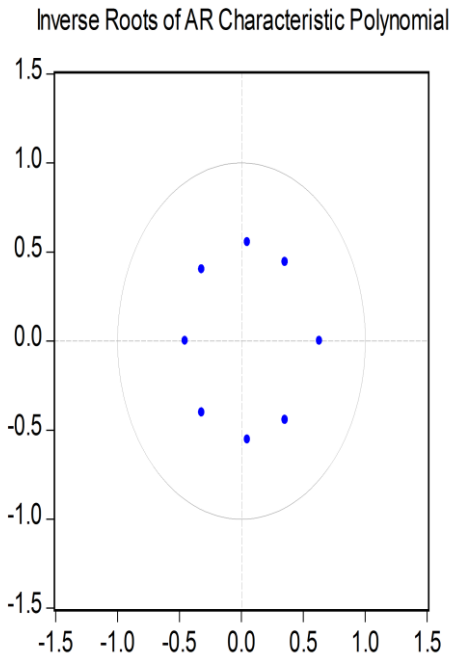


Figure D.2 : Benin

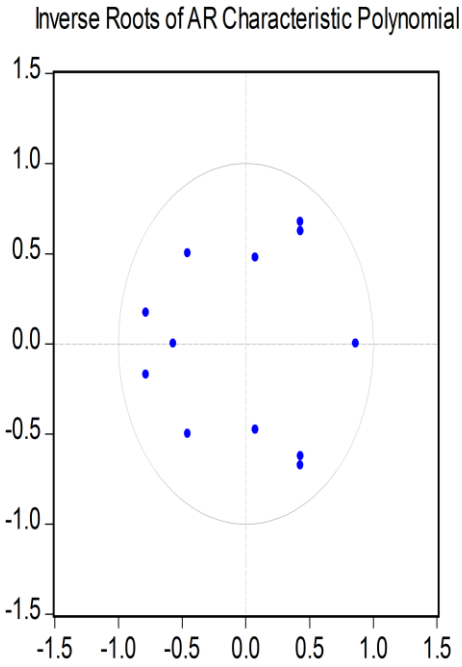


Figure D.3 : Burkina Faso

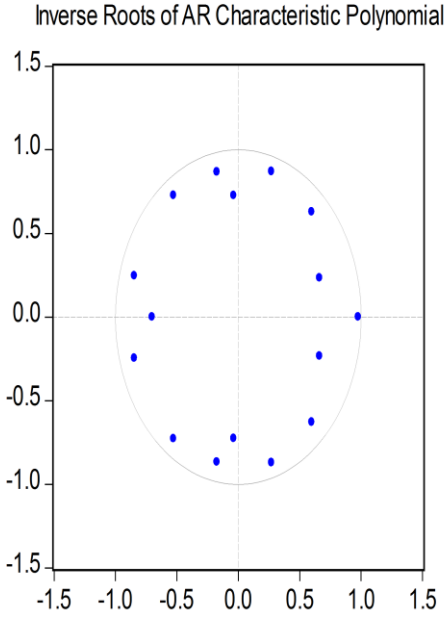


Figure D.4 : Mali

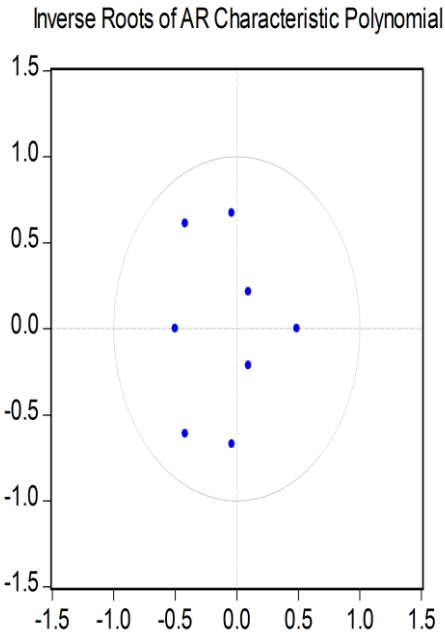


Figure D.5 : Niger

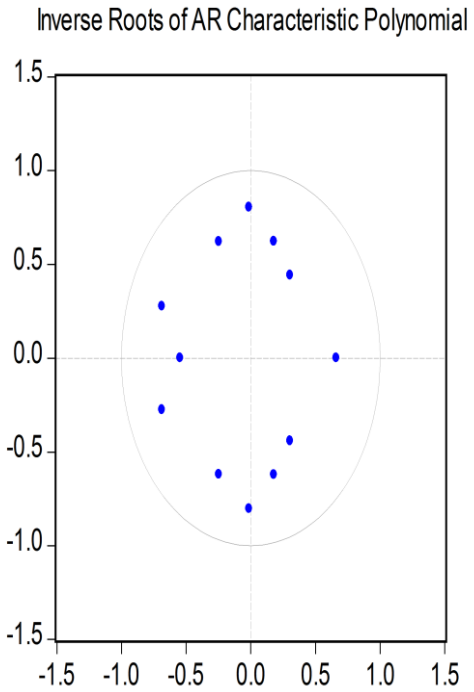


Figure D.7: Senegal

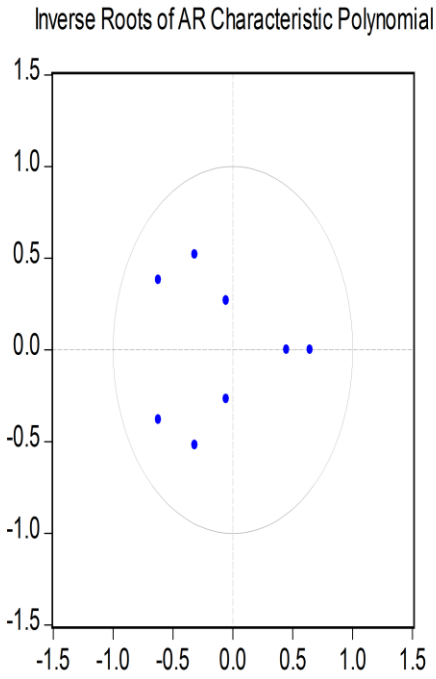
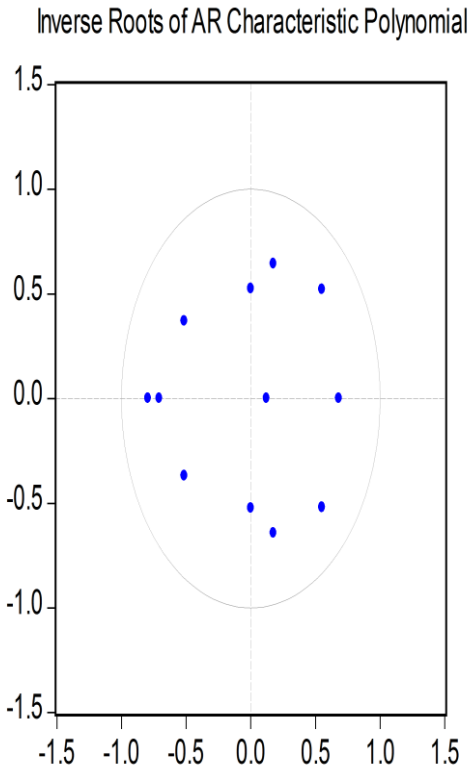


Figure D.6 : Togo



APPENDIX E: Impulse response Functions

Figure E.1: Results for Cote d'Ivoire

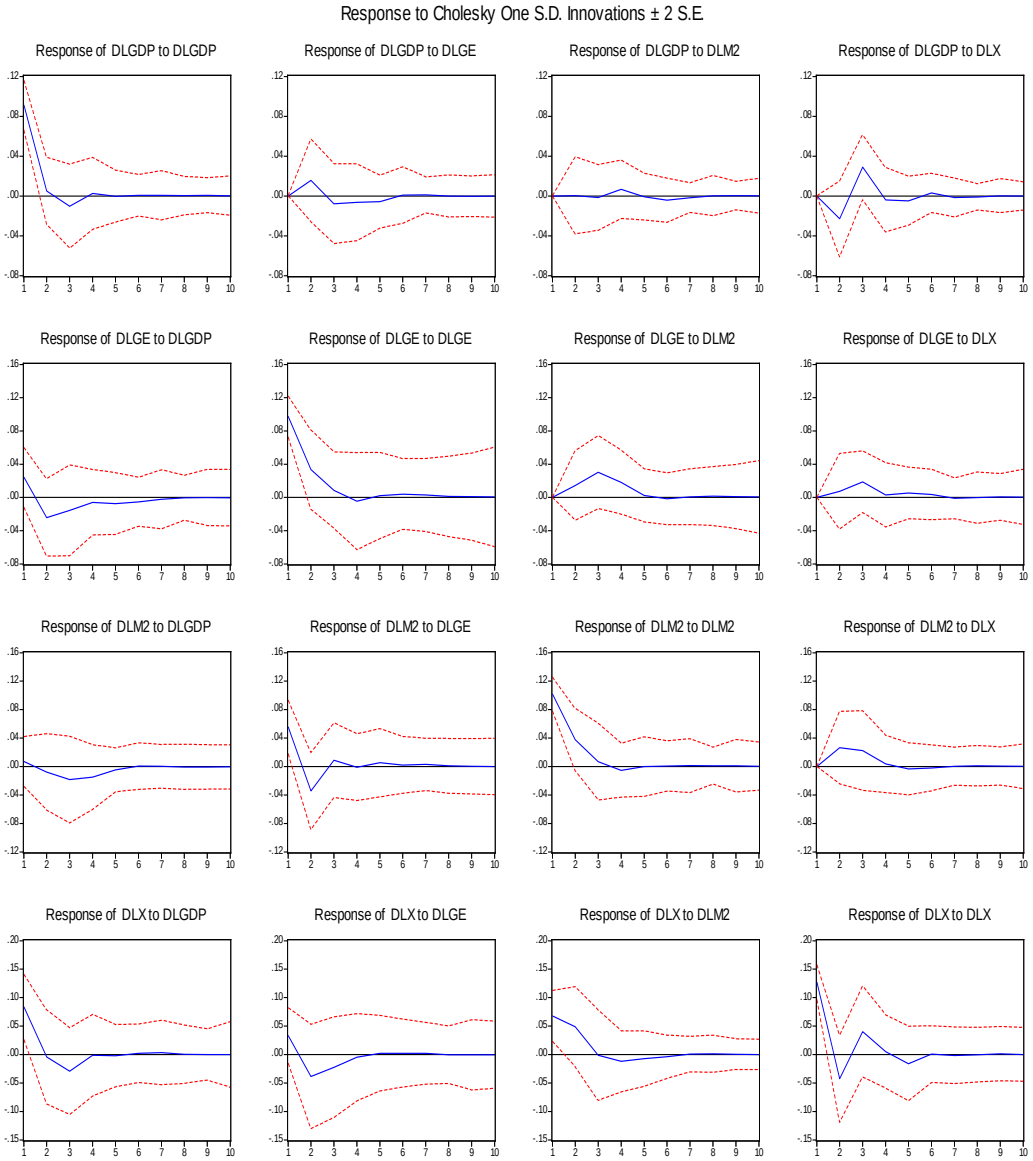


Figure E.2: Results for Benin

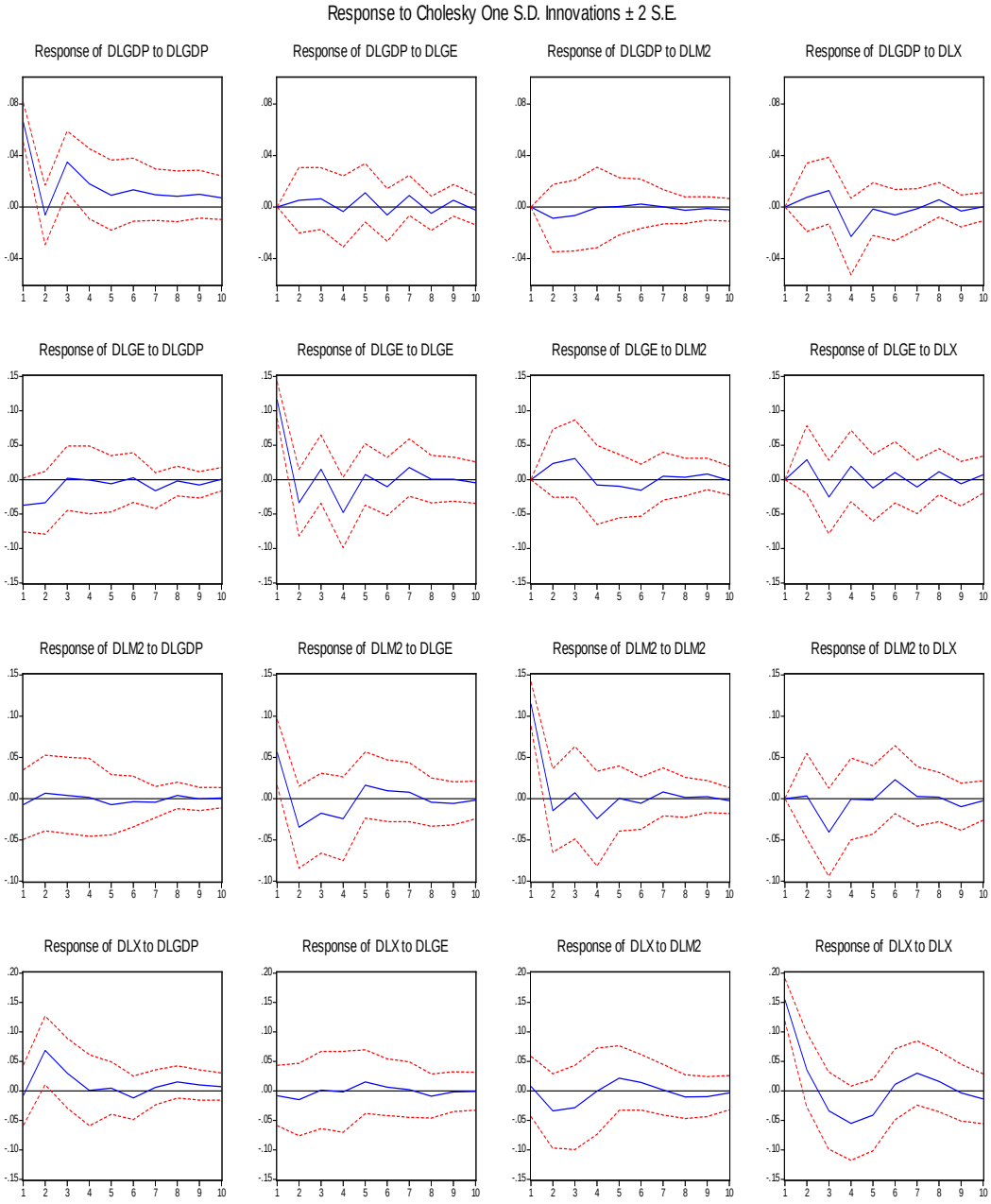


Figure E.3: Results for Burkina Faso

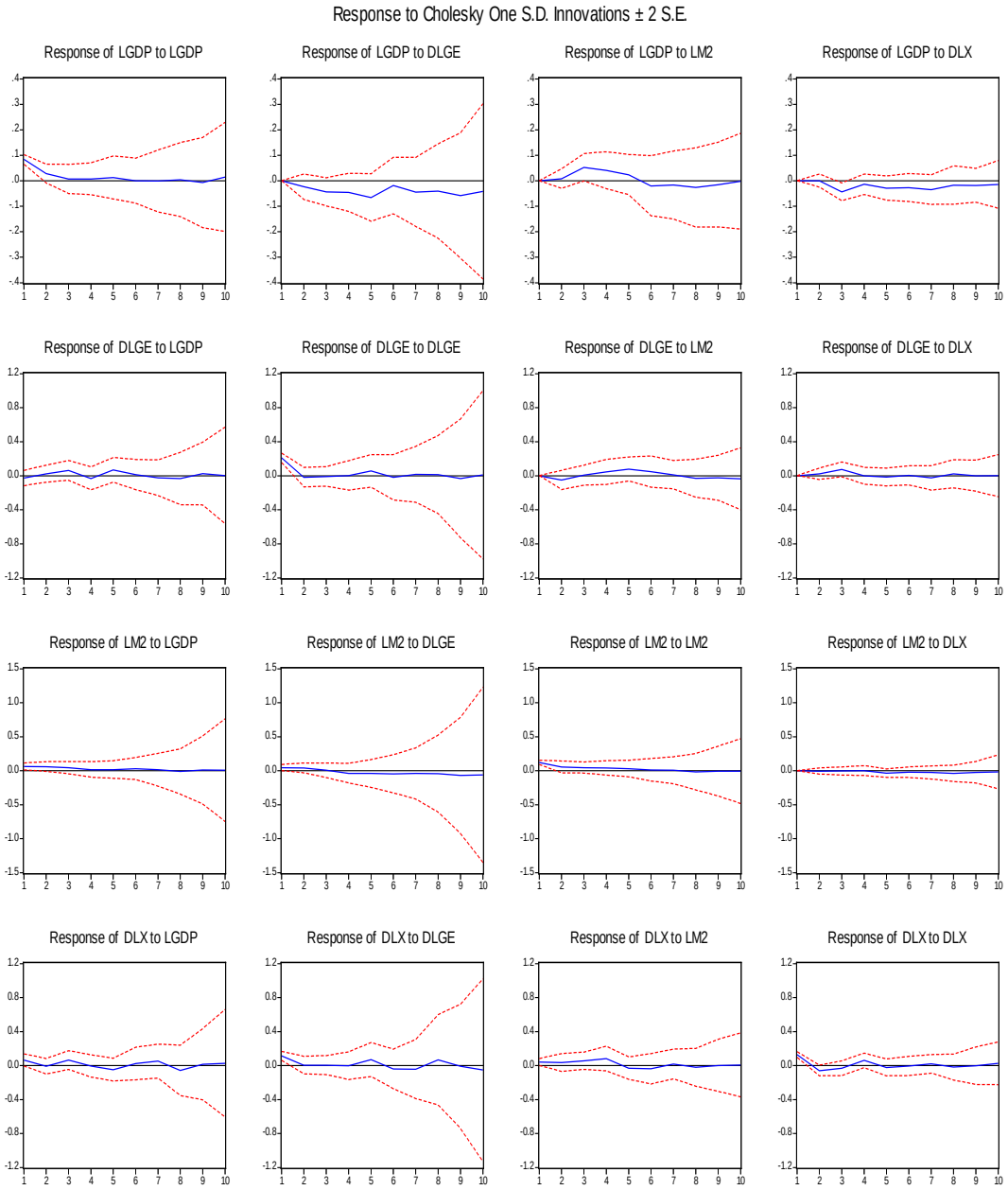


Figure E.4: Results for Mali

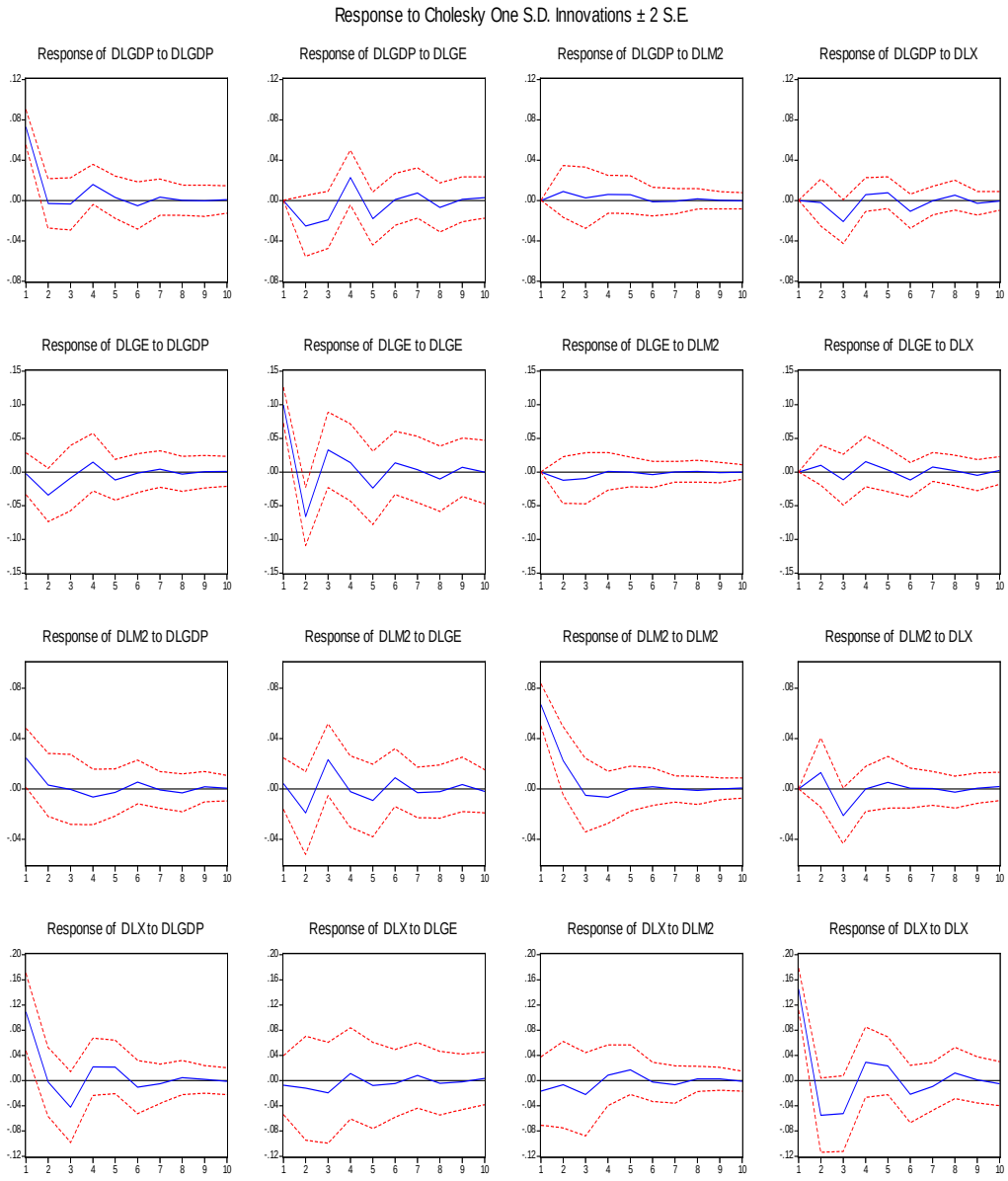


Figure E.5: Results for Niger

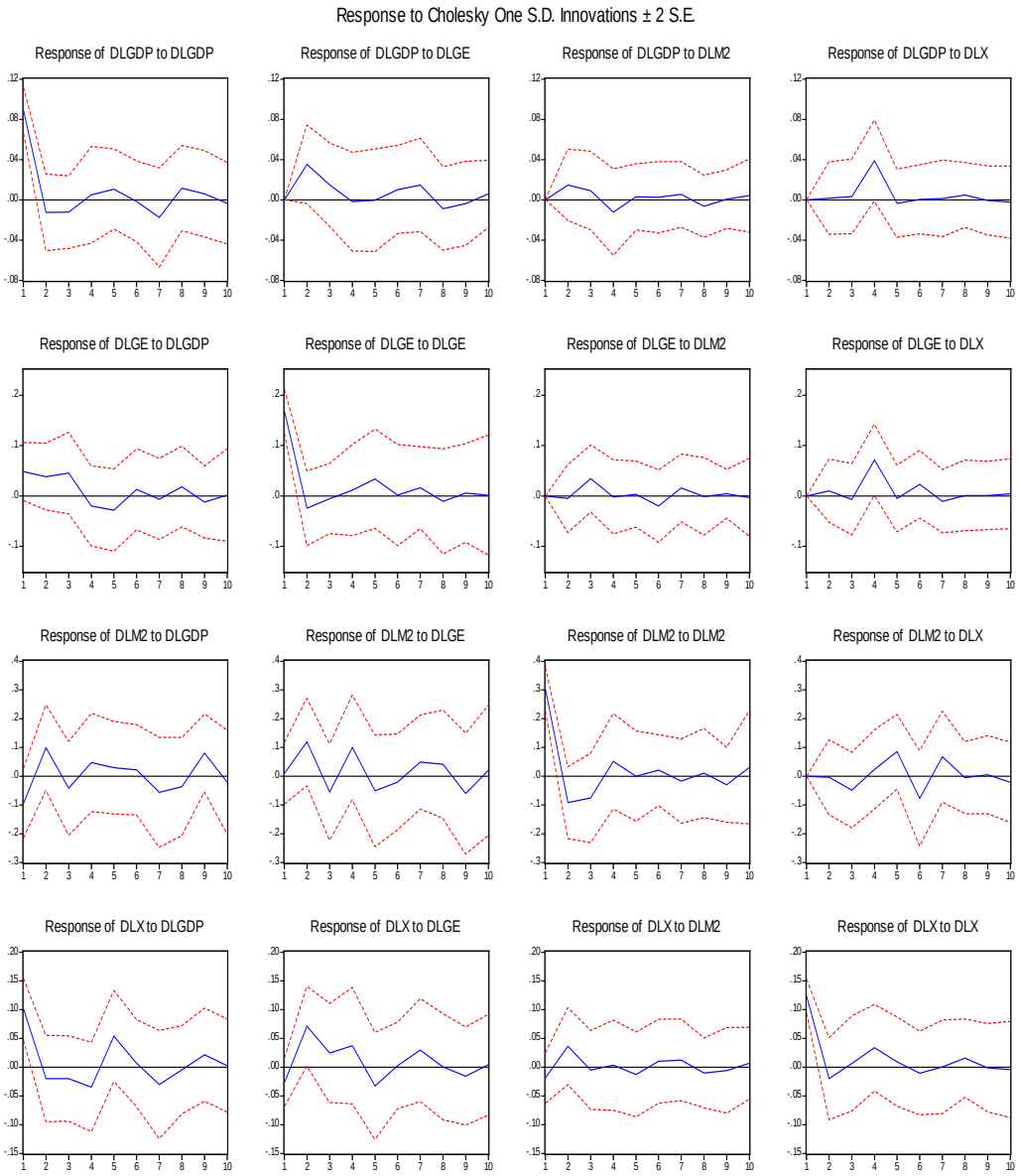


Figure E.6: Results for Senegal

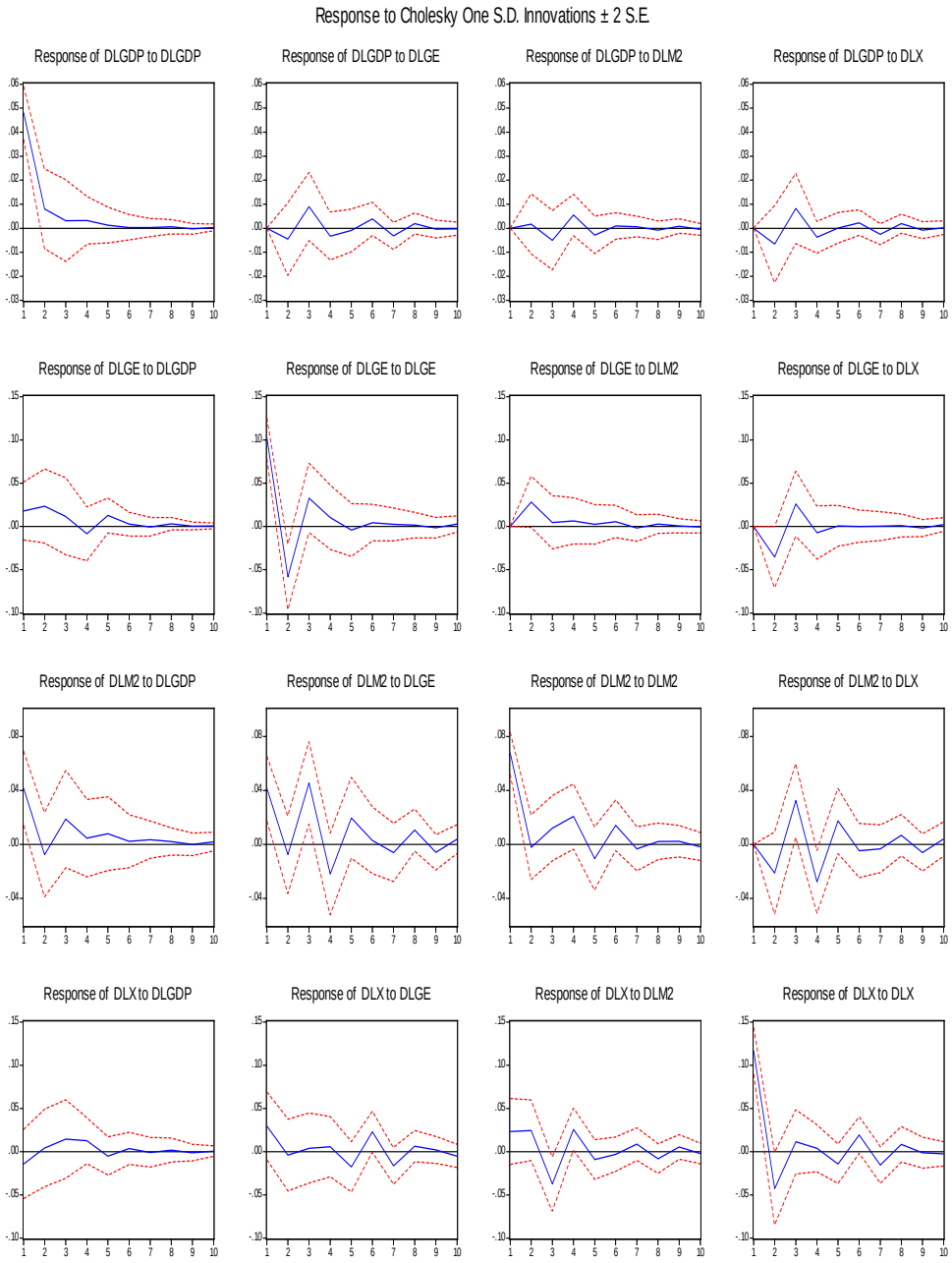
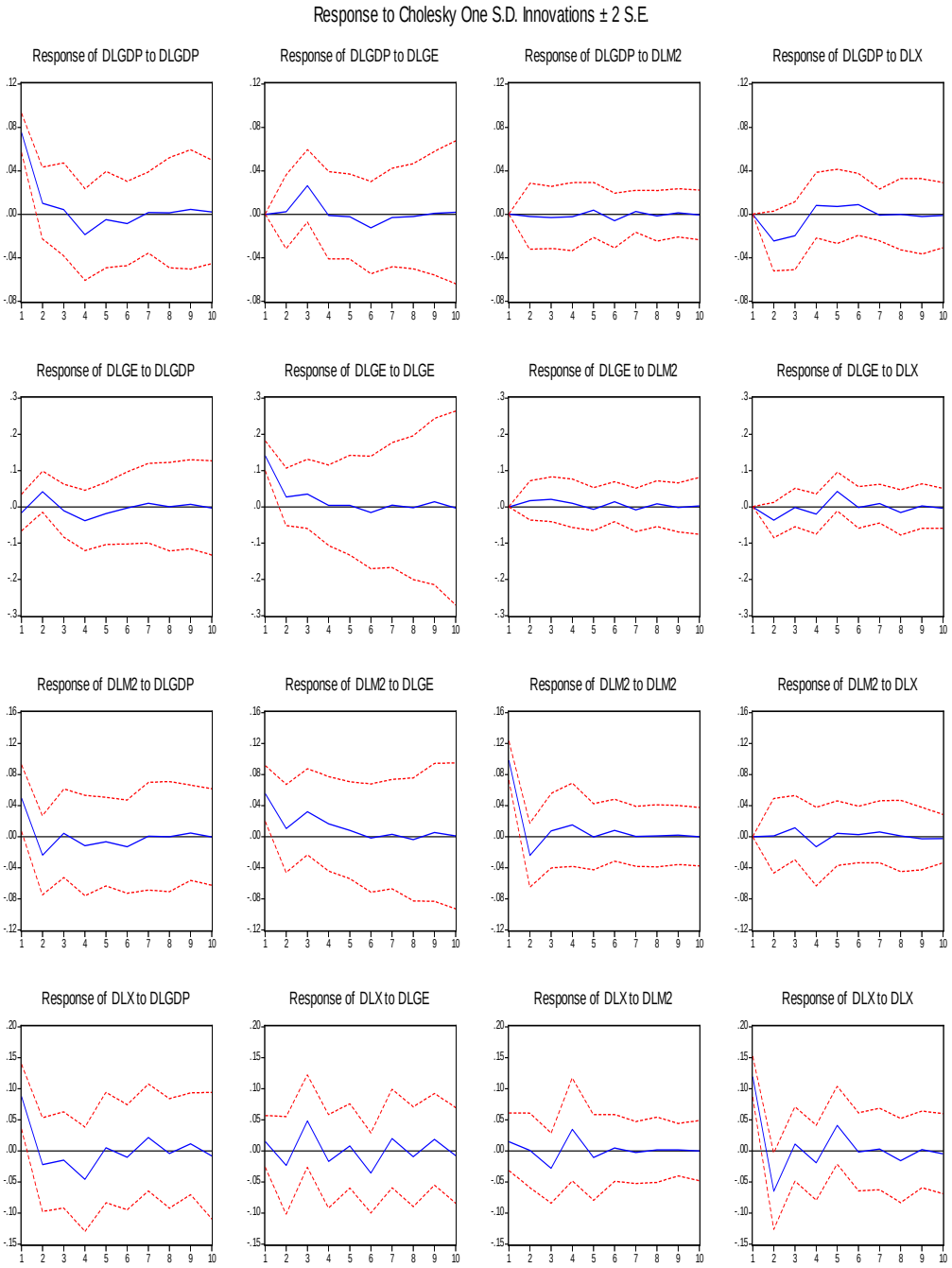


Figure E.7: Results for Togo



APPENDIX F: The variance Forecast Error Decompositions

Figure F.1: Results for Cote d'Ivoire

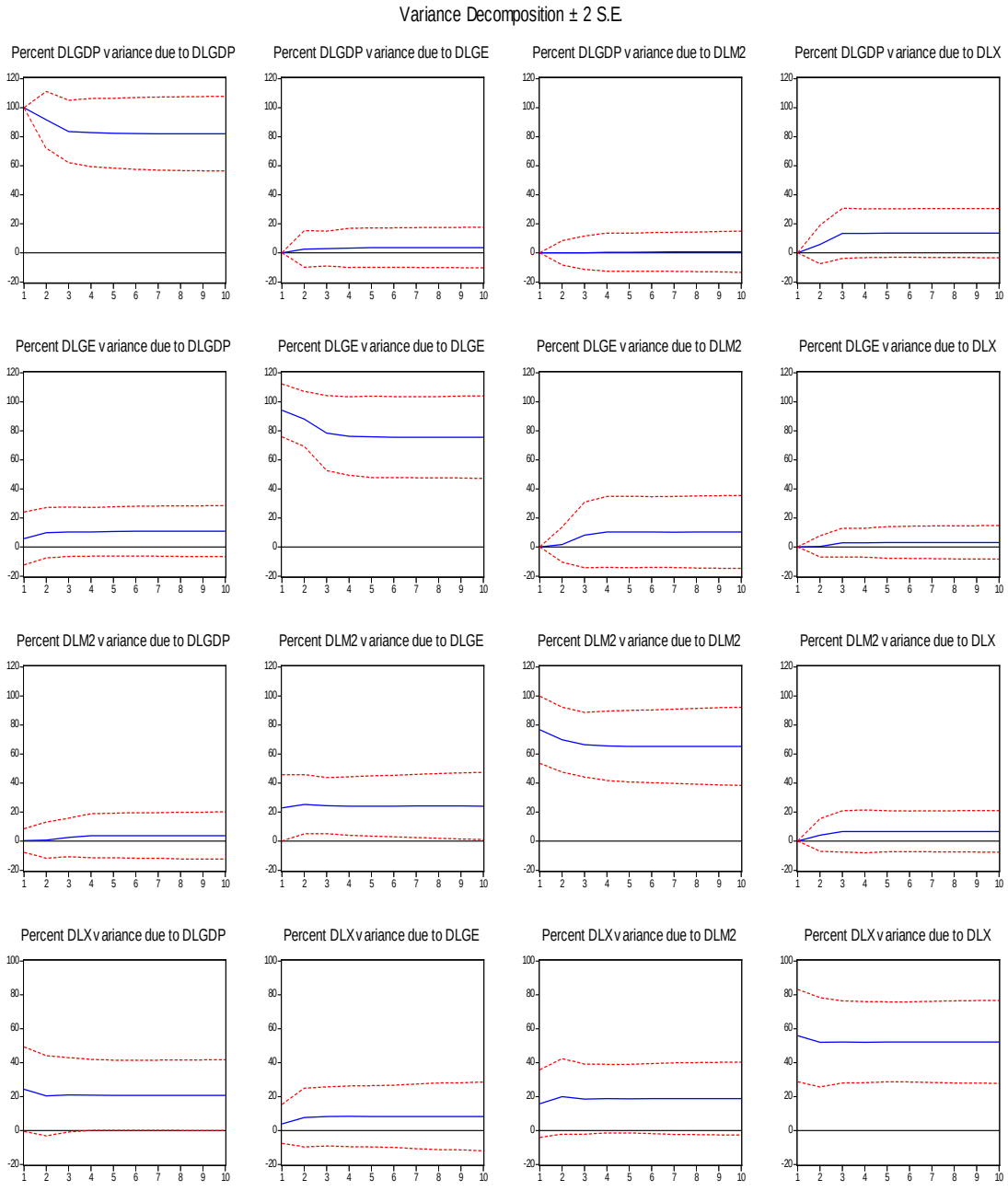


Table F.2: Results for Benin

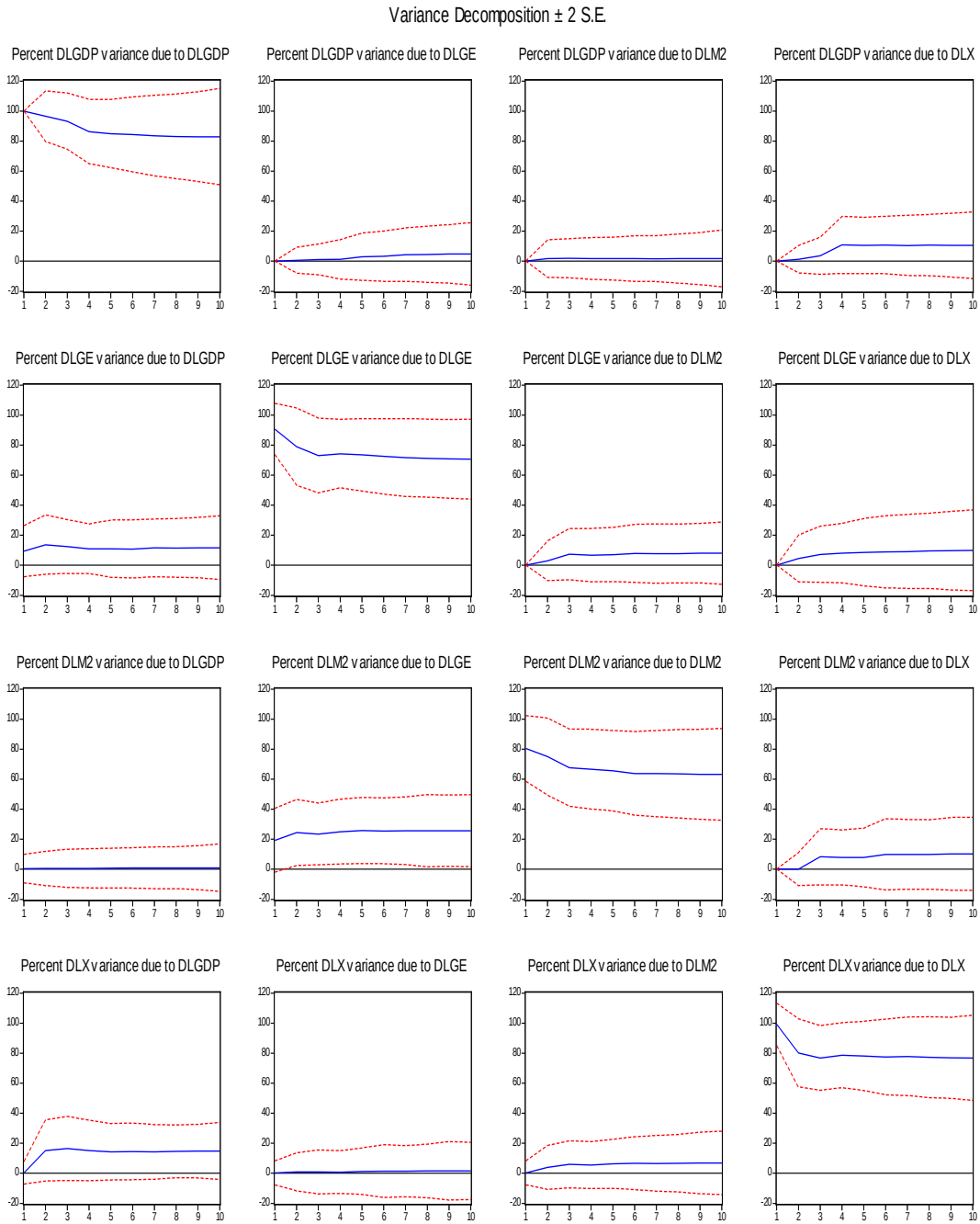


Table F.3: Results for Burkina Faso

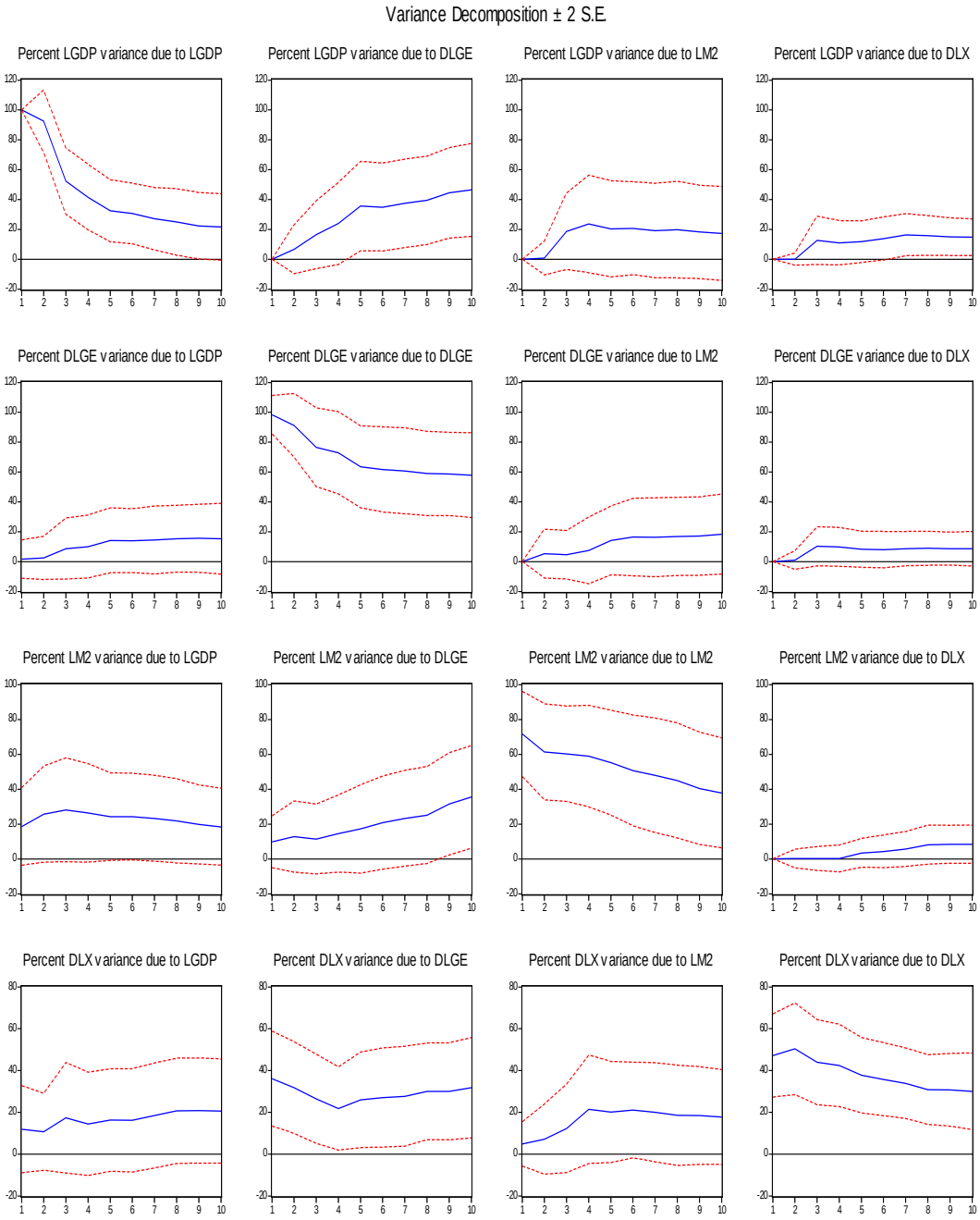


Figure F.4: Results for Mali

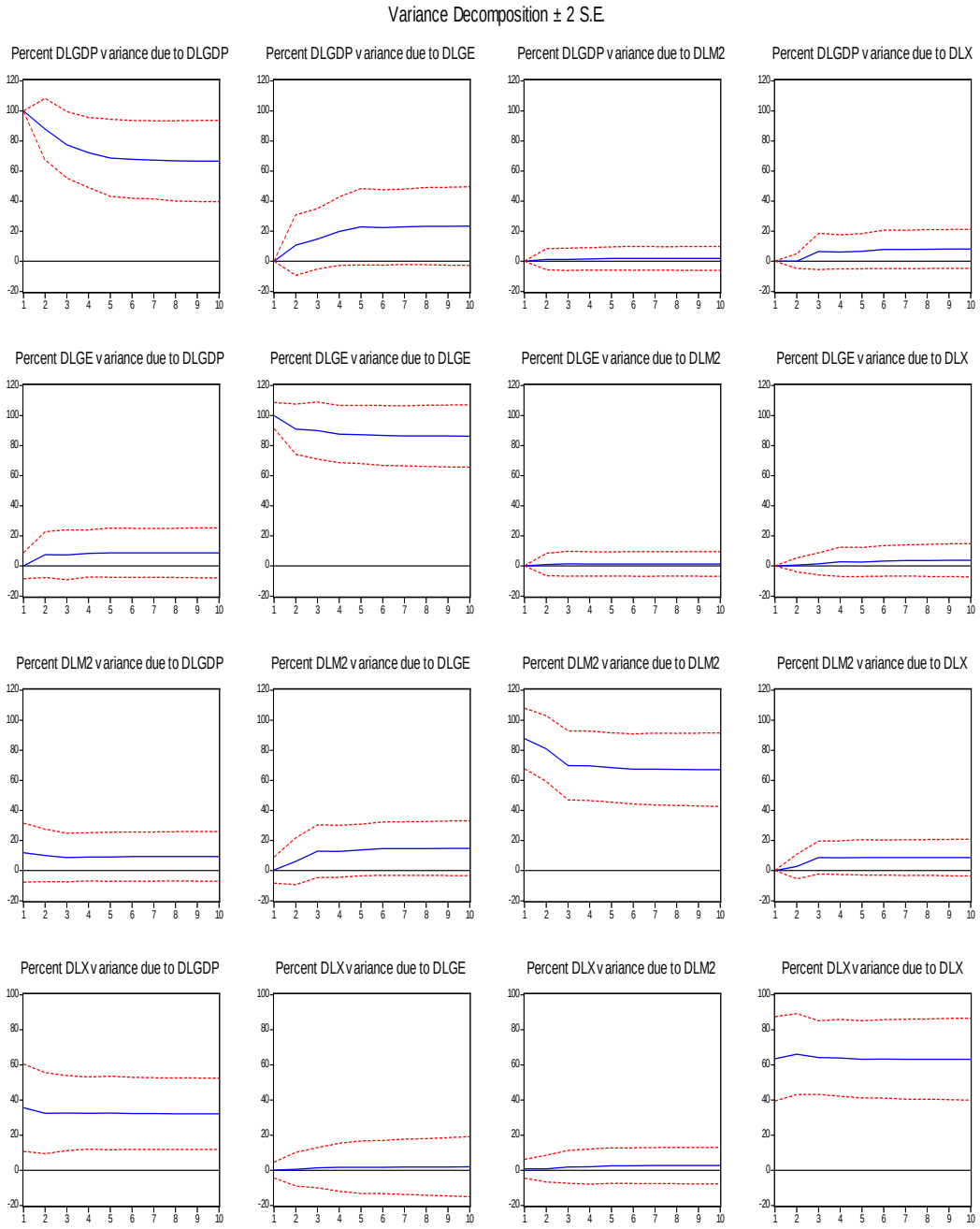


Table F.5: Results for Niger

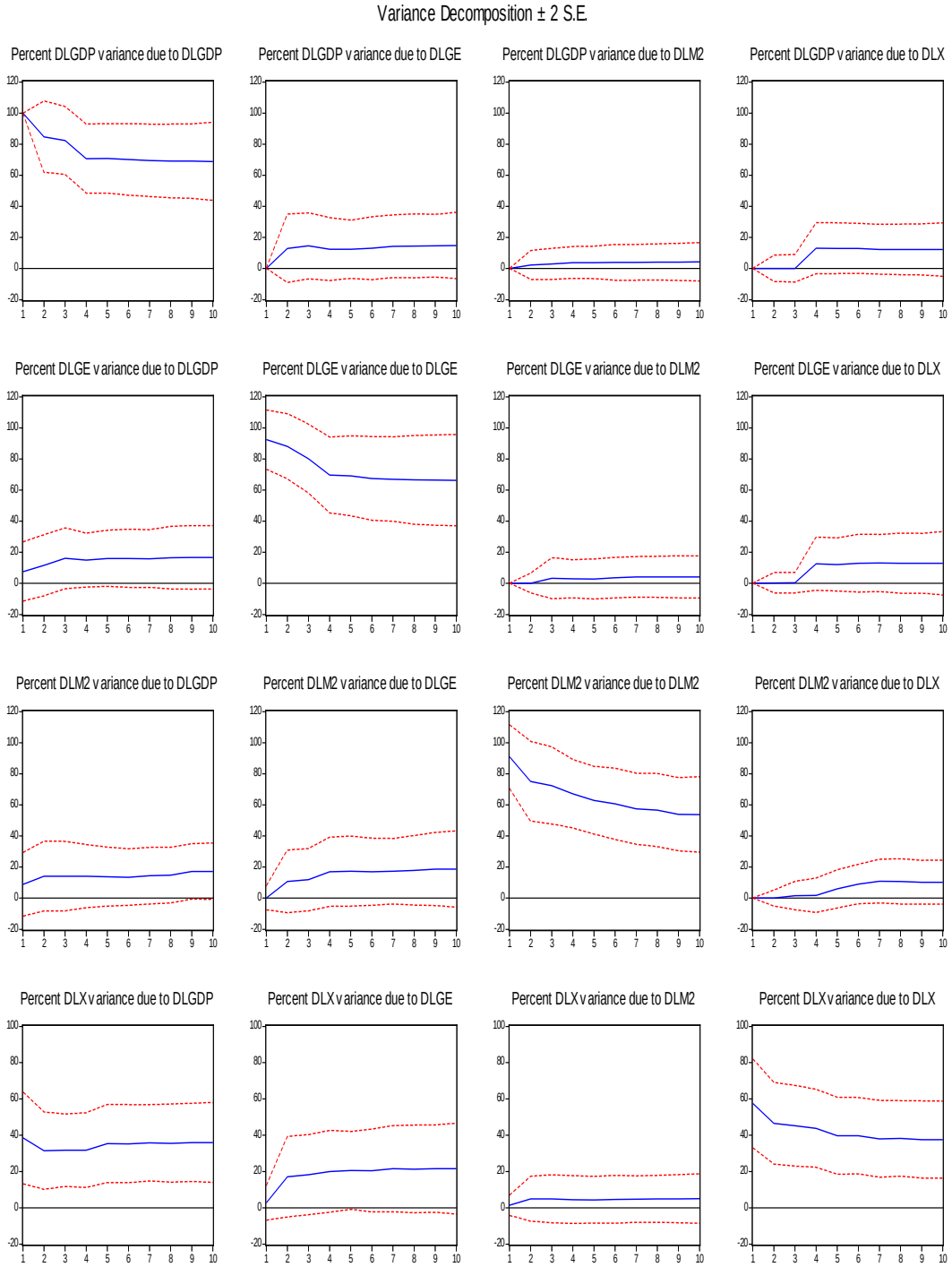


Table F.6: Results for Senegal

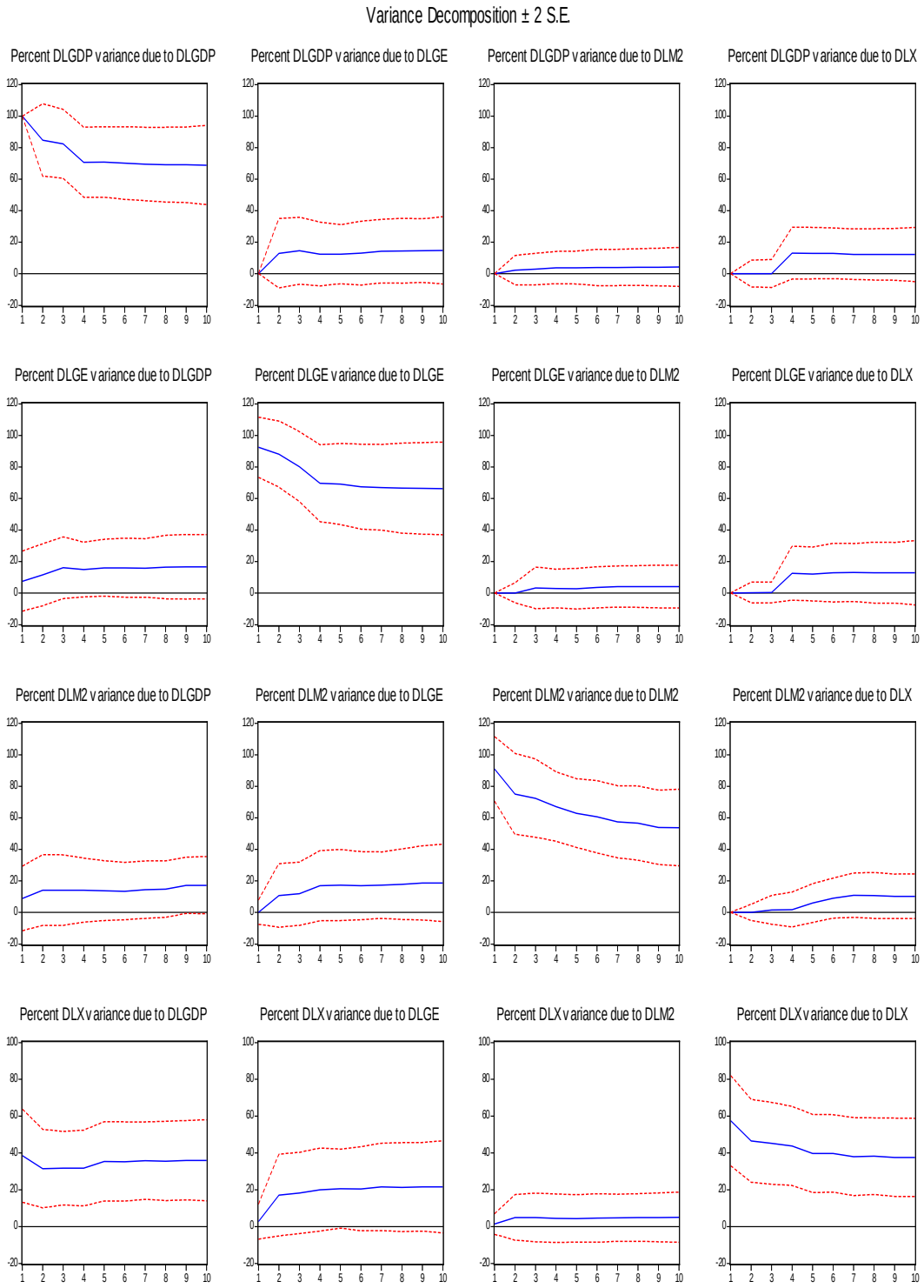


Table F.7: Results for Togo