TOWARDS A SECOND MONETARY ZONE IN WEST-AFRICA: A TEST FOR LONG-RUN CONVERGENCE

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BEING A THESIS SUBMITTED TO THE SCHOOL OF POSTGRAUATESTUDIES, AHMADUBELLO UNIVERSITY, IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE A WARD OF DEGREE OF MASTER OF SCIENCE IN ECONOMICS, DEPARTMENT OF ECONOMICS, AHMADU BELLO UNIVERSITY, ZARIA.

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DECLARATION

I hereby declare that the work in this thesis entitled **"Towards a Second Monetary Zone in West-Africa: A Test for Long-Run Convergence"** has been performed by me in the Department of Economics under the supervision of Dr. Aliyu Rafindadi Sanusi and Dr. Peter P. Njiforti. The information derived from the literature has been duly acknowledged in the text and a list of references provided. No part of this thesis was previously presented for another degree or diploma at any university.

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CERTIFICATION

This thesis entitled "**Towards a Second Monetary Zone in West Africa: A Test for Long-Run Convergence"** meets the regulations governing the award of Master of Science of Ahmadu Bello University, and is approved for its contribution to knowledge and literary presentation.

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DEDICATION

This research work is dedicated to Allah (SWT), and in the loving memory of my late mother and to all those who strive for the well-being of human kind. The work is also dedicated to all my lovely ones.

ABSTRACT

The study investigates the possibility of the WAMZ member countries converging towards the formation of a second monetary arrangement within the West African sub-region by 2015. In this line targets were set for the member countries to be met in order to ensure a strong and viable unification. Hence, the precondition for the take-off requires that atleast three countries must satisfy atleast three primary and secondary criteria. However, despite past efforts towards this project continuous postponements have been the tradition. The work applies cointegration techniques to search for long-run convergence among the five countries; Gambia, Ghana, Guinea, Nigeria and Sierra Leone. Data on all the criteria; budget deficit/GDP ratio, inflation rate, budget deficit financing/tax revenue, gross external reserves, domestic arrears, tax revenue/GDP ratio, wage bill/tax revenue ratio, public investment/tax revenue, real interest rate and real exchange rate were analysed to test for their co-movement. The findings show that, base on the prevailing situation and taking things as they were, the countries are most likely to meet the set targets for the commencement of this project by 2015. It therefore implies that, a second monetary zone is feasible on or before the set date especially if the countries put more efforts and discipline.

Table of Contents

Title page.....i

Declaration.....ii

Certification.....iii

Dedication.....iv

Acknowledgement.....v

Abstract.....vi

Table of Contents.....vii

List of Tables.....ix

Chapter One.....1

1.0 Background of the Study.....1

1.1 Statement of the Problem.....3

1.2 Objectives of the Study.....5

1.3 Research Questions.....5

1.4 Justification.....6

1.5 Research Hypothesis 7

1.5 Scope of the Study.....7

1.6 Organization of the Study.....7

Chapter Two.....8

2.1 Introduction.....8

2.2 Conceptual Issues.....8

2.2.1 Concept of Monetary Union.....8

2.2.2 The West African Monetary Zone.....9

2.2.3 Members.....10

2.2.4 Convergence Criteria.....11

2.3 Theoretical Framework.....12

2.4 Theoretical Literature Review.....13

2.4.1 Optimum Currency Areas (OCA).....13

2.4.2 Traditional Approach 14

2.4.3 Modern Approach.....15

2.4.4 The Krugman Specialization Hypothesis.....17

2.5 Empirical Literature.....18

2.6 Overview of Economic and Monetary Integration in West Africa.....25

2.7 The Rational for the West African Monetary Union.....28

2.8 The Performances of the Convergence Criteria.....32

2.8.1 Performances of the Convergence Criteria: Guinea.....32

2.8.2 Performances of the Convergence Criteria: Gambia.....33

2.8.3 Performances of the Convergence Criteria: Ghana.....35

2.8.4 Performances of the Convergence Criteria: Sierra Leone.....37

2.8.5 Performances of the Convergence Criteria: Nigeria.....39

Chapter Three.....42

3.1 Introduction 42

3.2 Nature and Sources of Data.....42

3.3 Method of Data Analysis.....42

3.4 Model Specification.....43

3.4.1 The Co-integration Model and Test Statistics.....43

3.5 Measurements.....45

3.5.1 Likelihood Ratio Test.....46

3.5.2 Unit Root Test.....47

Chapter Four.....48

4.1 Unit Root Test 48

4.2 Analyses of Cointegration Results.....52

4.3 Analyses of Speed of Adjustment.....55

Chapter Five 57

Summary, Conclusion and Recommendation.....57

5.1 Summary.....57

5.2 Outline of Key Findings.....57

5.3 Conclusion.....58

5.4 Recommendations.....58

References.....60

Appendices.....67

List of Tables

Table 2.1 Guinea's Convergence Position 33

Table 2.2 The Gambia's Convergence Position.....35

Table 2.3 Ghana's Convergence Position.....36

Table 2.4 Sierra Leone's Convergence Position.....39

Table 2.5 Nigeria's Convergence Position.....41

Table 4.1: Summary of Unit Root Test Results Primary Criteria.....49

Table 4.2: Summary of Unit Root Test Results for Secondary Criteria.....51

Table 4.3: Budget Deficit/GDP Coint. Result for Gam, Gha, Gui, Nig. and Sie Leo....63

Table 4.4: Inflation Rate Coint. Result for Gha, Gui, Nig and Sie. Leone.....63

Table 4.5: Budget Deficit Financing/Tax Rev. Coint Result for Gam, Gui and Nig...64

Table 4.6: Gross External Reserve Coint. Result for Gam, Gui, Nig and Sie. Leone...64

Table 4.7: Tax Revenue/GDP Coint Result for Gha, Gui, Nig and Sie. Leone.....65

Table 4.8: Wage Bill/Tax Revenue Coint. Result for Gam, Gha, Nig, and Sie. Leone...66

Table 4.9: Public Investment/Tax Revenue Coint. Result for Gam, Gha and Gui.....66

Table 4.10: Real Interest Rate Coint. Result for Gam and Sierra Leone.....66

List of Appendices

Appendix I: Unit-Root Test Results for Gambia.....67

Appendix II: Unit-Root Test Results for Ghana.....72

Appendix III: Unit-Root Test Results for Guinea.....75

Appendix IV: Unit-Root Test Results for Nigeria.....79

Appendix V: Unit-Root Test Results for Sierra Leone.....81

Appendix VI: Lag Length Criteria for Budget Deficit/GDP.....83

Appendix VII: Lag Length Criteria for Inflation Rate.....83

Appendix VIII: Lag Length Criteria for Budget Deficit Financing/Tax Revenue.....84

Appendix IX: Lag Length Criteria for External Reserve.....84

Appendix X: Lag Length Criteria for Tax Revenue/GDP.....85

Appendix XI: Lag Length Criteria for wage Bill/Tax Revenue.....85

Appendix XII: Lag Length Criteria for Public Investment/Tax Revenue.....85

Appendix XIII: Lag Length Criteria for Real Interest Rate.....86

Appendix XIV: Cointegration Test Results for Budget Deficit/GDP.....86

Appendix XV: Cointegration Test Results for Inf. Rate.....88

Appendix XVI: Cointegration Test Results for Budget Deficit Fing/TR.....89

Appendix XVII: Cointegration Test Results for Gross External Reserve.....91

Appendix XVIII: Cointegration Test Results for Tax Revenue/GDP.....92

Appendix XIX: Cointegration Test Results for Wage Bill/Tax Revenue.....94

Appendix XX: Cointegration Test Results for Public Investment/Tax Rev.....95

Appendix XXI: Cointegration Test Results for Real Interest Rate.....97

CHAPTER ONE

1.0 Background of the Study

The conception of the West African Monetary Zone (WAMZ), also known as the second monetary zone in West Africa, reached a higher pedestal following the institutional meetings of the zone in Dakar, Senegal in December 2001. The idea of the second monetary zone was adopted by the summit of the Economic Community of West African States (ECOWAS) in Lome, Togo in December 1999 as a means of fast tracking the integration process of the community. The prospective members of the second monetary zone – including the Gambia, Ghana, Guinea, Liberia, Nigeria and Sierra Leone[1] – signed the Accra Declaration in April 2000, committing themselves to the ideals of a second monetary zone within the integration programme of ECOWAS (Ojo, 2005).

However, in Bamako-Mali in December 2000, five countries[2] formally launched the second monetary zone as the West African Monetary Zone with the main objective of launching a monetary union in 2003, one year ahead of the ECOWAS goal of launching the single monetary zone in the sub-region. The agreement on the establishment of WAMZ contained other critical decisions viz; the establishment of a common central bank, the introduction of a single currency for the zone in 2003 and the setting up of an interim institution - the West African Monetary Institute (WAMI). This is to make

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[1] *With Cape Verde as an observer*
[2] *Excluding Liberia and Cape Verde*

necessary preparations for the emergence of the common central bank and the introduction of the common currency of the zone (Obaseki, 2005).

The desire to evolve a common currency for the ECOWAS sub-region has been in the offing since the birth of the regional integration body in 1975. This was considered expedient given the fact that there exists in the sub region one of the oldest monetary union that has a single currency (CFA Franc) for the Franco-phone West African Countries known as Union Economique et Monetaire Ouest Africaine (UEMOA). This informed the setting up of the West African Monetary Zone (WAMZ), the proposed second monetary zone for the non-UEMOA as a prelude approach to the ultimate unification and adoption of the common ECOWAS currency (see Balogun, 2007).

The quest for an ECOWAS common currency is further encouraged by the success story of European Monetary Union (EMU) which adopted the Euro as its common currency in 1999. It is the general belief that Europe's path to monetary union could be adopted to expedite the ECOWAS common currency project, as it conforms to the theoretical literatures on regional integration sequencing, which metamorphosed from Free Trade Area (FTA) through Customs Union (CU) and Common Market (CM) to Monetary Union (Balassa, 1964). This approach requires that intending members of a monetary union must meet some defined Optimum Currency Area (OCA) criteria which focus on macroeconomic convergence of the intending member countries.

The policy approach to the realization of WAMZ, so far, seems to draw essentially from the traditional OCA theories that business cycle synchronization and macroeconomic convergence make a currency area an optimal monetary arrangement, other things

being equal (Balogun, 2008). This is because it reduces the scope for asymmetric policy response to disturbances hitting the union-wide economy (Bayoumi and Eichengreen, 1992). However for about nine years, the proponents of WAMZ have experimented with this approach but have failed to meet the specified convergence criteria. The inability of the member countries to implement policies towards the attainment of the ECOWAS single market objective and WAMZ convergence criteria led to the postponement of the launching of the WAMZ monetary union to December, 1st 2009 (Obaseki, 2005). This view is supported by Ojo (2005) who believes that there has to be a change in strategy if the objective of WAMZ is to merge with UEMOA to form a West African Common Currency. This is due to the fact that the UEMOA has no robust historical antecedents like the EU, especially of successful intra-regional trade integration, but have had a common currency in place for several years (Cobham and Robson, 1993).

One may therefore inclined to agree with the self validating-theory of Fidrmuc (2001), that the best institutional device to guarantee a credible policy commitment to a monetary union is to have the monetary union itself in place. In other words, a currency area can be a self validating optimal policy regime, even when monetary unification does not foster real economic integration and intra-industry trade. This is evident from UEMOA's experience that monetary union may nonetheless become optimal ***ex post***, even though individual countries that join it do not meet the optimality criteria ***ex ante***. This is more in conformity with the vast literatures on endogenous optimal currency area which argues that monetary union in itself could act as a catalyst of business cycle synchronization (Frankel and Rose, 2001). Hence, the above among others calls for

investigation of the performance of the convergence variables for the feasibility of the actualisation of the WAMZ project.

1.1 Statement of the Problem:

According to the macroeconomic convergence criteria, countries exposed to similar shocks and business cycles or possessing mechanisms for the absorption of similar asymmetric shocks may find it optimal to adopt a common currency. Much of the literature focus on four inter-relationships between the members of the potential optimum currency area as observed by Frankel and Rose (1998) these are; the extent of trade, the similarity of the shocks and cycles, the degree of labour mobility and the system of fiscal transfers. The greater the linkages are between the countries using any of the four criteria, the more suitable they are for a common currency. These four criteria have been encapsulated in a number of primary and secondary quantitative targets that intending members of WAMZ must comply with prior to the commencement of the project. The primary quantitative targets include the attainment of; (a) single digit inflation, (b) budget deficit (excluding grants) to GDP ratio of less than 4 percent, (c) central bank deficit financing of not more than 10 percent of previous year's tax revenue, and (d) external reserves to cover at least 6 months of imports. On the whole, while the number of primary convergence criteria targeted were 4, only 1 was met in 2001 and 2002; 2 in 2003; 3 in 2004 and 2005. The targets for the secondary convergence criteria specified to compliment the primary ones are that; (a) the level of domestic arrears should be equal to zero, (b) tax revenue to GDP ratio of at least 20

percent, (c) government wage bill to tax revenue ratio of no more than 35 percent, (d) public sector investment to tax revenue ratio of at least 20 percent, (e) real interest rate to be greater than zero percent, and (f) the real exchange rate movement to be within the band of ±15 percent. While the secondary convergence targeted criteria were 6, 3 were met in 2001; 2 in 2002; and 3 were met in 2003 to 2006 (see tables 2.1 to 2.5).

However, the precondition for the take off required that a minimum of 3 countries must satisfy at least 3 primary and 3 secondary convergence criteria. The best attainment so far is that while three countries met 3 secondary convergence criteria, only 2 of them met the primary criteria which are considered a sine-qua-non, for the commencement of the programme. Hence at their ninth summit in Abuja, the Authority of Heads of State and Government of the WAMZ took a decision leading to yet another postponement of the launching of the WAMZ project from December 2009 to another date in 2015. Indeed, there are concerns within policy and academic circles that there is no likelihood that up to 3 countries would meet these criteria given the didactic actions and apparent lack of policy co-ordination among members (see for instance Nnanna, 2007). These concerns over the slim prospects for macroeconomic convergence are significant given the little trade relations among WAMZ member countries. For example the average share of WAMZ intra-trade in total ECOWAS trade was 2.76 percent from 2001 to 2005, with a peak of 3.22 percent in 2003. This level of trade integration is too low relative to that of the EU before the launching of the euro, which stood at 29.68 percent in the period 1992–1999, with a peak of 32.30 percent in 1999 (see Eurostat,

2006). Consensus has also emerged suggesting that shocks affecting the West African states are mostly country-specific shocks i.e. asymmetric (Tapsoba, 2009). Other features of the OCA theory such as the degree of labour mobility and the existence of a fiscal transfer system have also been found to be very low in the region (Dupasquier et al, 2005). In light of the above problems, this study seeks to empirically examine the feasibility of forming a sustainable WAMZ by 2015.

1.2 Objectives of the Study

The main objective of the study is to investigate the possibility of WAMZ forming a monetary union based on the behaviour of the convergence criteria. Other specific objectives are:

a. To study the nature and performance of the major macroeconomic variables (convergence criteria) for the proposed individual member countries.

b. To determine whether or not these countries would meet the convergence criteria and how long it would take them to meet the criteria.

c. To proffer policy recommendations based on the findings.

1.3 Research Questions

The following research questions therefore become relevant to the study.

i. What has been the nature and performance of the major macroeconomic variables for the individual countries?

ii. Could these countries ever meet those criteria to enable the formation of WAMZ by 2015?

1.4 Justification of the Study

ECOWAS, being one of the regional groupings in Africa, constitutes a geographical area larger than Western Europe. It is the most heavily populated of all the African sub-regions with about 295.34million people and a regional GDP of above 106 billion dollars (Asante, 2001 and ECOWAS, 2009). The Community comprises–until the recent withdrawal of Mauritania–all the sixteen countries of West Africa and therefore has the special feature of transcending linguistic division bequeathed to the sub region by former colonial powers. While this provides a large potential market, the realization of this potential is at present limited by the low income per-capita in the sub region. ECOWAS, which is perhaps the most visible and certainly the most studied of the current experiments in regional integration in sub-Sahara Africa, includes, some of the richest and most popular countries in Africa; several of which possess immense mineral resources. It also includes most of the poorest countries in Africa. Therefore findings of the study will inform the proponents of the proposed WAMZ whether the above will impede or accelerate the feasibility of establishing WAMZ.

Also, with the unfavourable macroeconomic convergence criteria performance in the WAMZ member countries over the referenced period, despite some elements of commitment to achieve convergence shows that the road to economic convergence has been bumpy for all the members. Thus, the findings of the study will therefore reveal both the nature and the extent of the bumps to the realization of WAMZ. The study is also an attempt to add to the stock of empirical knowledge concerning economic and monetary integration. Such a study is not only an empirical matter worthy of independent investigation but a matter of considerable concern especially with the increasing interests and studies in this area.

Equally, the efforts and resources committed so far in such a project necessitate in-depth and continues studies as time goes-bye. Finally, studies based on the optimum currency area literature for instance Ogunkola (2003), Patillo (2004) which focus on asymmetries of shocks and fiscal distortions associated with independent monetary policy pursuits in the region show that countries that were very different with respect to fiscal distortion would be unattractive partners for monetary union, because the central bank would produce undesirable outcomes for one or both of them. Hence the study will enable us either validate or falsify such studies.

1.5 Research Hypothesis

The hypothesis that will be tested in the study is;

Ho a = 0: The WAMZ member countries would not meet the convergence criteria.

Hi a ≠ 0: The WAMZ member countries would meet the convergence criteria.

1.5 Scope of the Study

The scope of the study will be the second monetary zone in West Africa (The WAMZ), while the period to be covered is between the years 1985 to 2009.

1.6 Organization of the Study

The study will be organized into five chapters; chapter one will include the introduction aspect of the study, statement of the problem, objective, justification and the scope of the study. Chapter two will cover the review of relevant literature both theoretical and empirical studies. Chapter three focuses on the research methodology which will include the model specification and sources of data. Chapter four will embody presentation analysis and interpretation of the findings based on the econometric techniques that will be employed in the study. Chapter five will contain the summary of the findings, conclusion and recommendation.

CHAPTER TWO
LITERATURE REVIEW AND THEORITICAL FRAMEWORK

2.1 Introduction

This chapter reviews the related literature; conceptual issues within the ECOWAS and monetary integration as well as theoretical literature framework and empirical literature are reviewed. An overview of economic and monetary integration in West Africa is also reviewed. The chapter concludes with a review of the performance of the macroeconomic convergence and the requirements for the establishment of a second monetary Zone.

2.2 Conceptual Issues.

2.2.1 *Concept of Monetary Union*

The concept of monetary union within a region appears to be interpreted differently by different scholars. The definition given by Werner (1970) is among the first interpretations of monetary integration in the modern times (Rwakunda, 2004). It identifies a first set of conditions, called "necessary conditions" by Delors (1989), to define a monetary union:

- Within the area of monetary union, currencies must be fully and irreversibly convertible into one another;
- Per value must be irrevocably fixed;
- Fluctuation margins around these parities must be eliminated;
- Capital movements must be completely free.

The second set of conditions identified by Werner (1970) concerns the centralization of monetary policy. This in particular should involve all decisions concerning liquidity, interest rates, intervention on the exchange markets, management of reserves, and the fixing of currency parities vis-à-vis the rest of the world.

Corden (1972) describes monetary integration as an institutional or legal monetary link between states. He also defined this institutional structure as an exchange rate union; others are more flexible, defining monetary integration in terms of a variety of institutional arrangements.

However, Gros and Thygesen (1990), argue that since there are different interpretations of monetary union, there are different degrees of monetary integration that approximate to different interpretations of monetary union.

In trying to conceptualize Monetary Union, Osaka and Ukeje (2003) viewed it as an area within which exchange rates bear an immutable relationship to each other. Such that if there are several currencies in the integrating zone, these currencies must be fully convertible one into the other at permanently fixed exchange rates, thereby effectively creating a single currency. This could be affected through an exchange rate mechanism such as the effective European Exchange Rate Mechanism or the ineffectual ECOWAS Exchange Rate Mechanism. They further observed that a full blown monetary union is usually characterized by a common currency, common monetary and fiscal policies, a common pool of foreign exchange reserves, a harmonized credit policy and a common monetary authority or central bank.

According to Itsede (2003), monetary union is any zone where a single monetary authority prevails and inside which a common currency or currencies which are fully convertible at immutably fixed exchange rates circulate freely. He further gave several opportunities and advantages from membership in a monetary arrangement. These include; significant reduction in transactions costs of intra-regional trade, enhancement of efficiency in domestic and regional resource allocation, enhanced seignorage gains and improvement in fiscal discipline among others.

2.2.2 The West African Monetary Zone (WAMZ).

The agreement of the WAMZ and the status establishing it were signed in Bamako in December 2000 by the member states, except Liberia that requested for more time to study them. With this critical action taken, the monetary union mechanisms of the zone were expected to take off in January 2003. The WAMZ was expected to merge with CFA zone in January 2004 in accordance with the ECOWAS monetary cooperation programme, thus creating the long-awaited single monetary zone in the sub-region.

The West African Monetary Zone (WAMZ) programme, designed to usher in a second monetary union of five countries (The Gambia, Ghana, Guinea, Nigeria and Sierra Leone; with Cape Verde and Liberia as observers) in West Africa, has been implemented from 2000 to date. The objective of the WAMZ is to establish a monetary union characterised by a common central bank and a single currency to replace the existing five national currencies. The concept of the second monetary zone was endorsed in December 1999 by the Authority of Heads of State and Government of the Economic Community of West African States (ECOWAS) to facilitate the achievement of

the goal of a single monetary zone in the sub -region, following a prolonged delay in its realisation due to economic and political problems. It was envisaged that the successful launching of the second monetary zone would facilitate the merger with the CFA zone to usher in the ECOWAS single currency. The West African Monetary Institute (WAMI) was set up to prepare member countries for the second monetary union, by implementing the WAMZ programme, consisting of a set of macroeconomic convergence criteria that member countries were to attain, and building the architecture of the WAMZ. The successful implementation of the programme would pave way for the launching of the common currency of the zone, (to be called the Eco; see Ojo, 2004).

2.2.3 Members

Five countries are members of the WAMZ. They are: The Gambia, Ghana, Guinea, Nigeria and Sierra Leone. The WAMZ came into existence on 15th December, 2000 when the five countries signed the Articles of Agreement of the zone at the Second Summit of the WAMZ Heads of State and Government held in Bamako, Mali.

2.2.4 Convergence Criteria

Convergence criteria are a set of targets for some macroeconomic indicators that countries entering into a common economic and monetary arrangement are required to satisfy. This is necessary to reduce, if not avoid, the negative externalities that may arise from asymmetry in the use of economic policy. The need to intensify coordination and adopt policies that will prepare countries willing to form a common monetary zone

requires the adoption of certain basic macroeconomic and other related economic policy harmonization mechanization. There has always been the need to adopt convergence criteria in order to minimize over a time period the degree of divergence among the economies of the countries intending to undertake monetary and economic cooperation. For instance, at the stage of the implementation of the European Union, members were enjoined to eliminate all capital controls. Under the Maastricht Treaty, countries are required to comply with five convergence criteria before acceding to the monetary union. These are in the areas of fiscal deficit, inflation, interest and exchange rates. In furtherance of the objective of monetary integration, the Authority of Head of State and Government of ECOWAS at its 22nd summit in Lome in 1999 adopted the following set of macroeconomic convergence criteria including;

- Ratio of budget deficit (excluding grant) /GDP (Commitment basis) of less than or equal to 4 percent by year 2002.
- Inflation rate of 5 percent by 2003
- Central bank financing of budget deficit be limited to 10 percent of pervious year's tax revenue by the year 2003 and
- Gross reserves to be greater than or equal to 6 months of imports by the year 2003.

However at the Ghana/Nigeria bilateral economic meeting held in Accra between December 20 and 21 1999, it was agreed that these primary criteria be adopted subject to their implementation in two phases, beginning with the following bench marks.

- Single digit inflation rate by 2000

- Gross reserves to cover at least 3 months of imports by 2000.
- Central bank financing of budget deficit to be limited to 10 percent of previous year's tax revenue by the year 2000.
- Budget deficit/GDP ratio (to be determined later). The technical committee later proposed 5 percent for 2000.

In addition the above primary criteria, another set of requirements in the form of secondary criteria include;

- Prohibition of new domestic arrears and liquidation of all existing arrears.
- Tax revenue/GDP ratio to be equal or more than 20 percent.
- Wage bill/total tax revenue to be equal to or less than 35 percent.
- Public investment/Tax revenue ratio to be equal to or more than 20 percent.
- Real exchange rate stability to be maintained by each country. The exact rate will, however, be determined within the context of the of the ECOWAS exchange rate mechanism and
- Maintenance of positive real interest rates.

2.3 Theoretical Framework

The Hypothesis of Endogeneity of Optimum Currency Area provides a more compatible theoretical ground for analysing the articulated problems that characterised the formation of the WAMZ. Rooted in the theory is the elimination of cost from exchange rate volatility, Mongelli (2002) notes that "the intuition behind the hypothesis of endogeneity of OCA is that monetary integration reduces trading costs beyond the elimination of the costs from exchanging rate volatility (that can be to some extent

hedged)". He maintains that "amongst others, it precludes future competitive devaluation, fosters trade and financial integration, facilitates foreign direct investment and the building of long-term relationships and might over time encourage forms of political integration". Taken to an extreme, this paradigm suggests that a group of countries adopting a single currency might develop into an "optimum currency area" ***ex-post*** even if they don't constitute one ***ex-ante*** (Rose, 2000 and Frankel and Rose, 1998). In a context of globalization and increasing openness and interdependence of the world economy, this assertion, if true, would offer support for a scenario of monetary integration as a continuing process. Taking the Mundell – Fleminng model as a starting point, Gross and Steinher (1997) question this generally accepted proposition. The authors reach the conclusion that the cost of fixing the exchange rate increases with higher openness ratios in the case of external shocks, given the fact that the cost of an inadequate exchange rate is higher when the external sector is more important. But given that openness diminishes the impact of an internal shock on domestic demand or production, the cost of fixing the exchange rate, in this case diminishes with openness. The implication of this conclusion for policy formulation is that in order to evaluate the cost of abandoning flexible exchange rates, it is not sufficient to analyse the degree of openness of an economy: the importance of external shocks should also be considered. In other words, the cost of losing the exchange rate as a policy instrument for macroeconomic adjustment would be greater for an economy with a high degree of openness as well as industrial and export structures that are very different form those of the rest of the region, than for a country that also possesses a

different export structure but that is relatively closed. From a dynamic perspective, this suggests that it is not only relevant to monitor the degrees of openness, but also the degrees of structural convergence/divergence between countries.

2.4 Theoretical Literature Review

2.4.1 Optimum Currency Areas (OCA)

The theory of optimum currency areas (OCA) explores the criteria as well as the costs and benefits of entering or forming a common currency area. In addition, the OCA theory can be viewed as a tool for finding an answer to the question on how to choose the optimal exchange rate regime. It is worth mentioning, however, that there is no widely accepted index to indicate unambiguously whether a country should join a currency area or not. Infact, there is no standard theory of optimum currency areas but rather several approaches to it (Mundell 1961). These approaches are:

a. Traditional approach and

b. Modern approach

2.4.2 Traditional Approach.

In the early 1950s, the most influential paper regarding the choice of exchange rate regime was "The Case for Flexible Exchange Rate" by Friedman (1953) and most of the debate was on the pros and cons of flexible exchange rates (see Broz, 2005). That time was characterized by the Bretton Woods exchange rate regime (which included pegged but adjustable exchange rates) and capital controls, forced by many countries. Even though some papers about the choice of the exchange regime already existed (for example Friedman, 1953 and Meade, 1957), the first time that someone used the phase

optimum currency area was Mundell (1961). When he published his seminar paper entitled "The Theory of Optimum Currency Areas". This was also the first time someone had suggested that a currency area should be a region, whose borders need not necessarily coincide with state borders (Broz, 2005). He tried to answer the questions on when countries should have their own currencies and what the appropriate domain of a common currency area is. At that time, this was more of academic questions since it was hard to imagine that the national currency would be abandoned in favour of some other regime. But nowadays, especially since the European Union embarked on a monetary unification process, the OCA theory has got a new impulse. Mundell (1961) emphasised the factor mobility, especially - the labour mobility - price and wage flexibility as mechanisms to cope with idiosyncratic demand shocks as a crucial criterion in forming an OCA. He argued that if the exchange rate regime within a region causes unemployment in one part of the region, or if it forces another part of the same region to accept inflation as the cure for unemployment, then this regime is not optimal. Hence, if labour mobility or price and wage flexibility is present in an economy (region), there is no need for changes in its exchange rate. On the other hand, McKinnon (1963) based his thesis on the degree of openness; stating that the more open an economy is in terms of trade flows, the more beneficial it is to join monetary union. In another valuable study, Kenen (1969) contends that diversification should be a larger concern than labor mobility. He hints that homogeneity is not always optimal because a country with a fixed currency would better withstand asymmetric shocks if it had a diversified economy and relied on more than one commodity for income. However, he stops short

of refuting Mundell's original theory completely because he does not go on to consider the larger implications of heterogeneity, namely whether a group of countries could benefit from sharing a common currency if they were diverse collectively but each had a homogenous economy.

Even though Mundell (1961), McKinnon (1963) and Kenen (1969) are considered to be the most important authors from the traditional phase, a few more authors also contributed to the OCA theory also deserve to be mentioned. This second wave includes Corden (1972), who defines a currency area as a complete exchange-rate union, argues that joining a common currency area with a group of partner countries causes a loss of direct control over the monetary policy and exchange rate. The loss is important if one believes that the monetary policy is effective, at least in the short-run. Ishiyama (1975) was one of the first to acknowledge that there should not be only one criterion in determining OCA; he also proposed that it is in the interest of each country to evaluate the costs and benefits of entering a common currency area. Also, he identifies other criteria to consider, such as differences in inflation rates and wage increases among the countries forming the common currency area that result from different social preferences. Tower and Willet (1976) suggested that inclusion of new criteria shows power of OCA analysis, not as a specific theory but as an approach focusing on the factors that influence the relative costs and benefits of fixed and flexible exchange rates for each individual country. The second wave of contributors broadly analysed existing OCA criteria, while also introducing new insights into the theory.

2.4.3 Modern Approach

After the initial impulse in the 1960s and the first half of 1970s, it could be said that there was a slow down in research about he optimum currency areas. Most likely, the reason was a lack of practical examples of monetary unification, especially in the developed world (Horvath, 2003). But the theory had its rebirth in the 1990s with the birth of the European Monetary Union, when more and more researchers became interested again in the OCA theory. Many of them had in mind a large experiment that was about to happen, but new insights were needed in order to find out if the European Union is, as a mater of fact, an optimum currency area. Beside developments on the international monetary scene, Tavlas (1993) cited another important factor in the revival of interest in the OCA theory and that is the developments in macro theory. In his words, "These developments have allowed the original optimum-currency-area approach to be cast in a new light". As there was progress in economic research, the OCA theory had also to be revised. De Grauwe (1992) calls these new theoretical developments the "new" theory of optimum currency areas..There are many issues that the modern approach of optimum currency area deals with; they are, effectiveness of monetary policy, credibility of monetary policy, endogeneity vs. specialization hypothesis of optimum currency areas, correlation and variation of shocks; character of shocks, effectiveness of exchange rate adjustments, labour market institutions, synchronization of business cycles and political factors. Corden (1972) argued that joining a currency area causes a loss of direct control over the monetary policy and exchange rate. Some new views have amended this judgment. Alesina, Barro and

Tenreyero (2002) argue that the costs of giving up monetary independence are the lower the higher the association of shocks between countries becomes. A special issue has arisen in recent years and that is the endogeneity vs. specialization hypothesis. As Frankel and Rose (1997) point out, theory shows that increased trade in common currency area can cause either increased industrial specialization between regions in the goods in which they have comparative advantage, leading to asynchronous business cycles resulting in industry specific shocks, or else increased trade may result in increased correlation between their business cycles if common demand shocks prevail or if intra-industry trade accounts for most of the trade.

The difference therefore between traditional and modern view is that traditionalists emphasized more potential costs while the modern view is more prone point to the benefits of common currency areas.

2.4.4 The Krugman Specialization Hypothesis

This hypothesis based upon Krugman (1993) and Krugman and Venables (1996) is rooted in trade theory that a single currency will allow for the exploitation of economies of scale and new literature on economic geography, that postulates a U – shaped relation between integration and geographic concentration. In this literature, very high and very low trading costs favour dispersion of production. When trading costs fall and obstacles to trade fade, firms will be encouraged to exploit increasing returns by relocating and thereby altering the industrial structure. Krugman (1991 and 1992), Bertola (1993) and Rauch (1994) argue that at this stage any external economy leading to increasing return will produce a concentration of some industries in any country that

enjoys even a small advantage over the others. To the extent that monetary integration might expedite industry concentration and eventually national specialization, a "common" shock to a specific sector or industry will asymmetrically affect the countries in which that industry is located. Kalemli-Ozcan, et al (2001) provide empirical evidence that private risk sharing enhances specialization in production. More integrated, inter-regional and international financial markets allow regions and countries to insure against idiosyncratic shocks, permitting them to reap the gains from specialization. The single currency will not affect other trading costs such as differences in conventions, languages and legal systems. According to Bertola (1993) "at the theoretical level, if increasing returns to scale are as important as recent models of endogenous growth suggest, and if they may be exploited along geographical dimensions as well as over time, then removal of obstacles to factor re-allocation may well lead to concentration of production and growth in privilege regions... . Geographic concentration of production and growth may indeed be necessary to exploit the scale economies made possible economic integration".

The major criticism of the "Krugman specialization hypothesis" is that it has a bearing on the costs from monetary integration. Mongelli (2002) notes that if countries become more specialized and vulnerable to asymmetric shocks, and output fluctuations start diverging, then each member country might feel a higher cost from the loss of the direct control over its nominal exchange rate and national monetary policy. The intensity and speed with which it displays this effect will depend on a variety of factors including amongst others, the availability of human capital, knowledge-related

variables, R & D expenditure, product cycles, the share of intra- and inter-industry trade, the effective mobility of factors of production including labour as well as cultural, linguistic and other historical barriers. Specialization could be hastened by the implementation of the single market programme and the cut back of state subsidies and various privileges for national enterprises.

2.5 Empirical Literature

After the initial impulse in the 1960s and the first half of 1970s, it could be said that there was a slow down in the literature about economic and monetary integration as essentially predicated on the theory of Optimum Currency Area (OCA). Most likely, the reason was a lack of practical examples of monetary unification, especially in the developed world. But the literature on Economic and Monetary Integration had its rebirth in the 1990s when the scale had fallen out of people's eye following the birth of the European Monetary Union when more and more researchers become interested again in the OCA theory. Thus, many studies on economic and monetary union have been carried out over the last few decades, more than ever before, as a result of the increasing wind of regional integration.

To assess the benefit-cost ratio of implementing common currency for a pair of countries, Horvath and Lubos (2002) used OCA–indices for the Czech Republic, EU, Germany and Portugal. Comparing the structural similarities of the Czech Republic, Portugal and German economy, they found that Czech Republic is closer to that of Germany and the results are reversed when the EU economy is considered as a bench mark. They therefore recommended that although the monetary integrations are

primarily political projects, the economic arguments should not be forgotten to know whether the benefit out weight the costs.

In his work, Schweickert (2001) compares transition economies with a reference group (Greece, Portugal, Spain) by a "comparative indicator", where he tries to catch Maastricht criteria, institutional development, development of capital markets and OCA criteria. He shows that adopting of the euro will bring more net benefits for transition economies than for the reference group from the view of the OCA theory. On the other hand, transition economies were doing worse compared by the other indicators than the reference group.

Onwioduokit (2001) examines the costs and benefits of economic and monetary integration in the West African sub-region. The study observed that the analysis of the costs and benefits of economic and monetary integration in West Africa favoured a quick implementation in an orderly and well-focus manner. Overall, the study is of the view that sustained economic growth in the economies of the countries in the sub-region would ultimately determine their ability to join a single monetary zone. The research ends on the note that although the theories of optimum currency area do not entirely favour monetary integration on the basis of the current economic relations among the countries in the sub-region, the desired political will which has been demonstrated in the on-going project to establish WAMZ by 2003 is a catalyst that would surmount perceived technical difficulties.

Frankel and Rose (1996) investigated economic structure and the decision to adopt a common currency. Using a quadratic time trend and the three quarterly dummies with Hodrick-Prescott (HP) filter, they found that;

a. If trade links between Sweden and the rest of Europe strengthen in the future, then Sweden's income will become more highly correlated with European income.
b. A naïve examination of historical data gives a biased picture of the effects of EMU entry on Sweden.
c. EMU membership is more likely to make sense for Sweden than it does today. He recommended that to accept that the OCA framework is the right one to use in making an optimal choice of exchanging rate regime is not the same as saying that most countries in fact use the OCA framework to make their choice.

Lombaerde (2003) examined the implications of the mode of OCA formation. Exploring content analysis, he found the followings:

a. That the idea of a monetary union with an incremental number of participating countries is not a logical outcome of OCA theory.
b. Consistent with Kenen's thesis, a gradual process of monetary integration among economies with given industrial structures might not be optimal because currency area may require a minimum scale (a minimum number of members) in order to guarantee inter-industry labour mobility.

c. For a group of economies characterized by divergent industrial development patterns, the theory of optimum currency area does not yield time-consistent recommendation about the suitability of monetary integration.

He therefore recommended that as OCA theory weakly predicts gradual processes of monetary integration, the optimality of currency areas seem to be very sensitive to the choice of criteria, he suggested the need for additional econometric research capable of establishing a hierarchy among them according to their relevance.

Additionally, the empirical literature relating to different aspects of the convergence criteria in different regions has been quite large. Among others, Haug *et' al* (1999) employed systems-based co-integration techniques to determine which European Union countries would form a successful Economic and Monetary Union (EMU) based on the behavior of the nominal convergence criteria laid down in the Maastricht treaty. Analyzing the 12 original European Union countries together, they reported that an EMU would be successful for all the 12 original EU members unless several countries make significant adjustments in their fiscal and monetary policies.

In their study, Karfakis and Moschos (1990) used the Engle and Granger (1987) bivariate cointegration framework to test for interest rate linkages between Germany and each of the countries: Belgium, France, Ireland, Italy and the Netherlands. Using monthly data from 1979:4 to 1988:11, they found no cointegration in the pairs of interest rates.

Similarly, Hafer and Kutan (1994) adopted the multivariate cointegration framework to test for co-movements of short-term interest rates and money supplies in a group of

five EMS countries. Using monthly data over the period 1979: to 1990:12, they found an evidence of partial policy convergence among these countries.

Likewise, Hofmann and Remsperger (2005) applied the panel of generalized method of moments over the period of 1999Q1-2004Q2 to analyse the inflation differentials in the Euro zone area. Their results suggest that the observed inflation differentials are mainly influenced by differences in cyclical positions and fluctuations of the effective exchange rate combined with a rather high level of inflation persistence, while the proxies of price level convergence does not come out significantly.

Addressing yet another aspect of the OCA, Fidrmuc (2001) studied the endogeneity of the OCA criteria and the role of intra-industry trade. Using a cross-section of OECD countries from 1990 to 1999 and employing Trade Gravity Model he found that intra-industry trade actually causes the convergence of business cycles. The relation between business cycles and bilateral trade intensity tends to be indirect. He therefore recommended that although the result does not fully confirmed the hypothesis that the Central and Eastern European Countries (CEECs) constitute an optimum currency area with the EU now, but it seems that they will fulfill OCA criteria to the same degree as current EU members in future.

In a similar work, Yeyati (2001) studied the impact of a common currency on bilateral trade. Using a gravity model, he found that the link between a common currency and bilateral trade flows is significantly stronger for common currency pairs comprising unilaterally dollarized countries than for members of a multilateral currency union. He

therefore recommended that as contrary to Rose (2000), the use of a common currency is rooted not only in historical and political factors but also to trade.

In the same line, Anyanwu (2003) studied the effects of monetary union on trade and output. Applying the endogenous gravity models similar to Frankel and Rose (2000), his results show that WAEMU countries with the same currency trade about twice as much with each other as countries with different currencies within ECOWAS. The results also show that monetary union among the UEMOA countries leads to a ten-fold increase in their output, which otherwise would have been lost without monetary union. He concludes that the test of endogenously of OCA criteria hypothesis that important beneficial effects follow ***ex-post*** a monetary union through the promotion of trade and central bank credibility is confirmed.

Bukowski (2003) examined the Maastricht convergence criteria and economic growth in the EMU. Using OLS method of estimation, he found the followings;

a. For convergence criteria to be durable, it requires a certain degree of real convergence between member countries of the monetary union.

b. That implementation has been an important factor of macroeconomic stabilization for the EMU countries as well as for the countries planning accession to the union.

c. Implementation of convergence criteria is an important factor of macroeconomic stabilization and sustainable economic growth. He therefore recommended that implementation is an important factor enforcing

macroeconomic stabilization in the EMU countries and the countries which aspire to the EMU accession.

At regional level, Quéré and Coupet (2003) studied the adequacy of monetary arrangements in sub-Saharan Africa. Using a cluster analysis on a sample of 17 sub-Sahara African countries, Ward methodology leading to five country groupings was explored. It is found that the existing CFA franc zone cannot be viewed as an optimum currency area. CEMAC and UEMOA countries do not belong to the same clusters and a "core" of the UEMOA can be defined on economic grounds. The results also support the inclusion of the Gambia, Ghana and Sierra Leone in an extended UEMOA arrangement or the creation of a separate monetary union with the "core" of the UEMOA and Gambia, rather than the creation of a monetary union around Nigeria. Finally, they recommended that the creation of the WAMZ around Nigeria is not supported by the data.

In his work, Nnanna (2004) examined whether the WAMZ member countries tend to convergence. Using content analysis, he found;

(a) That macroeconomic performance in the WAMZ member countries has been generally disappointing over the reference period despite strong political commitment to achieve convergence in order to establish a "fast-track" second monetary union.

(b) The road to economic convergence has been bumpy for all members; to date not a single country has succeeded in meeting the convergence criteria on a sustained basis.

(c) Overall, large swings have characterized the macroeconomic performance of the WAMZ member states. He therefore recommended that while enhance welfare gains will accrue to WAMZ citizens in the long-run, the short-term benefit of the project lies essentially, on improved macroeconomic environment and operational efficiency, which only peer group pressure can force on WAMZ economic managers.

Ojo (2001) examined the emerging vision of the West African Monetary Zone and its implications for the African integration process. The study was undertaken through a comprehensive articulation of the underling theoretical and policy frameworks of the WAMZ. It also surveyed the various forms of monetary integration from loose exchange rate arrangement to a full economic and monetary union. There after, the WAMZ was assessed in respect of the preconditions for monetary integration, especially on optimum currency area. The study further observed that the conditions were absent in the WAMZ but the political will exists to push the process towards the desired high degree of monetary integration through the implementation of appropriate policies. The study therefore observed that the progress that has been made in the execution of the WAMZ project has enhanced ECOWAS integration programmes, but noted the need for all stakeholders to re-assess their roles in the integration process. It recommended that ECOWAS should assert its position, as the umbrella organization for integration in West Africa while the international community should channel its efforts towards the

development of Africa in the context of the integration of the economies of the continent.

Tella and Adesoye (2001) assessed the implementation problems of monetary cooperation within the ECOWAS. Using content approach, they found that low incomes of all the members, the language problem, lack of capacity to manage and control financial integration and non-convertibility of variety of currencies are not enough to delay monetary policy harmonization. Rather the main issues revolve around political will within the context of preference of CFA-zone members to continue to pursue their monetary arrangement within ECOWAS; the desire by other countries to retain their monetary autonomy; and the political instability which often affects continuity of political commitment. The study therefore concludes that without the resolution of these obstacles, particularly the existence of WAEMU with ECOWAS, and the attainment of a region-wide monetary harmonization in ECOWAS will remain difficult.

Wampah (2001) reviews the history of integration efforts in the West African sub-region and examines the factors that have impeded the process of economic integration. The study concludes that lack of political will is a major factor that has hampered the process of economic integration and that the new resolve by some countries in the sub-region to speed up monetary integration can be successful, although the goals are ambitions.

Ojo (2001) examines the prospects for achieving the objectives of the second monetary zone in the West African sub-region, and outlines the issues that would have to be addressed by WAMI in the implementation of its work programme. He then suggests

options for resolving them and thereafter appraises the prospect for the WAMZ project. The study reviews the economies of West African states and concludes that the economies of the WAMZ have strong potentials for growth and development owing to rich and expansive resource base. The study also notes that it will take time for the traditional benefits of integration to be realized while the cost would be experienced almost immediately. The study recommends that in order to move towards the medium to long term when the benefits begin to accrue, short-term policy actions would have to be well focused with tight commitments. The study also identifies five major issues that must be addressed to ensure speedy achievement of the objectives of the WAMZ as member countries would have to be convinced of the benefits from the monetary integration process, economic performance of member countries must be strong, monetary policy must be complemented by other policy measures to ensure successful implementation, political and technical issues must be resolved to pave way of the merger of WAMZ and CFA zone while all stakeholders should be convinced about the benefits of the single monetary zone through vigorous sensitization.

2.6 Overview of Economic and Monetary Integration in West Africa

With the success of the European Union in achieving its objective of single currency in 1999, regional economic integration has gained momentum in West Africa. This new impetus has contributed to the current ECOWAS initiative aimed at attaining a second currency in the sub-region. However, economic cooperation in West Africa dates back to the pre-independence era (Balogun, 2007). During this period, various forms of currency arrangements existed between the countries of the region and their colonial

masters. The Anglophone countries in West Africa, namely, Gambia, Ghana, Nigeria and Sierra-Leone operated under a currency board arrangement, with the West African currency board arrangement as the sole institution responsible for the issue and management of currency in the four countries. The Francophone countries had similar arrangement with France; similar arrangement existed in other parts of Africa (Nnanna, 2006).

However, while the Anglophone arrangements were disbanded in the early sixties after independence, the Francophone arrangements were transformed into monetary union. The L' Union Monetaire Ouest African (UMOA) area established for French West Africa in 1962 while the Communauté Economique et Monetaire de L' Afrique Central (CEMAC) covered the French speaking countries in Central Africa. Other more loose forms of Preferential Trade Areas (PTAS) and Monetary Unions exist in other parts of Africa, most of them remnants of the colonial era groupings (Wampah, 2001). Examples are the Common Monetary Area (CMA) of South Africa, the South African Customs Union (SACU), the SADEC and the East African Community (EAC). Some of them have failed; others only exist in name while a few are still active. In West Africa several such groupings have emerged in the past, some for economic and monetary reasons, while others existed purely on political basis. The Ghana–Guinea–Mali Union in the early sixties was one such grouping of political nature. The Mano River Union is a socio-political grouping of three countries (Guinea, Liberia and Sierra Leone).

The UEMOA, being the oldest existing grouping in West Africa was later transformed into an economic and monetary union in 1994. It has been fairly successful in achieving its goals of macroeconomic stability although other aspects of trade liberalization have not been fully achieved. Trade among UEMOA countries is higher than trade among ECOWAS countries although the level is still low (below 20%) compared with the region's total trade (Wampah, 2001). The financial and monetary cooperation between France and its former colonies in West Africa ensured the convertibility of the CFA Franc. The CFA Franc is freely convertible into the French Franc and through this medium the international convertibility of the CFA France is guaranteed. The French treasury provides the external guarantee for the convertibility of the CFA franc as it stands ready to redeem outstanding CFA franc balances held by other monetary authorities. Although the CFA franc has delivered low inflation, growth performance in WAEMU has not been consistently better than other sub-Saharan African countries, and trade among member countries remains relatively low (Masson and Pattillo, 2001). Monetary cooperation continues to be the strong point of the union. A common central bank (BCEAO) is responsible for monetary and exchange rate policies (including reserves management), while there is strict enforcement of convergence criteria and a common external tariff (CET) by the UEMOA secretariat (Sanusi, 2003). The French Treasury also provides a backing for the arrangement. The ECOWAS, established in 1975 by sixteen countries and seen as the most exhaustive grouping in the sub-region was initially established to promote economic cooperation and integration in West Africa (Wampah, 2001). However, its mandate was extended beyond economic cooperation to

other areas such as conflict resolution. The treaty establishing ECOWAS was in 1993 to revamp and strengthen the community in order to broaden and deepen the regional integration process.

In the area of trade liberalization, several protocols were signed to ensure freer and increase levels of trade between member counties. These include abolishing tariff and non-tariff barriers to free movement of people and goods. By 1999, West Africa became in principle a free trade area for all products satisfying the ECOWAS rules of the origin (ECOWAS, 2001). ECOWAS has been engaged in several promotional activities to encourage regional trade such as trade fairs, the first two of which were held in Dakar and Accra.

Inspite of the achievements of ECOWAS, many of its goals still remain elusive. Ojo (2001) observed that several factors have been identified as contributory to the inability to attain monetary union and liberalize trade in West Africa. First, there is the issue of the existence of parallel monetary arrangements in the region. The interests to the UEMOA and non UEMOA countries sometimes tended to diverge. However, the drive towards economic integration in West Africa took an accelerated pace in the 1990s (Nnanna, 2006). In this regard, two developments which affected the dimensions of the path to integration are significant and worthy of note. First, the decision of UMOA countries to foster greater integration of their economies through the formation of the UEMOA by 1994 took place. For better coordination of their macroeconomics, they adopted convergence criteria, established common external tariffs and harmonized taxes, while promoting institutions to further even development across countries. The

second significant development towards sub-regional integration was the decision by non-UEMOA countries to establish a "fast track" approach to monetary integration through the formation of a second monetary zone. This initiative, spearheaded by Nigeria and Ghana was joined by Sierra Leone, the Gambia, Guinea and Liberia. The objective was to establish the West African Monetary Zone by the year 2003 and to merge the two zones into a single monetary zone by 2004.

2.7 The Rationale for the Formation of West African Monetary Union.

The OCA theory which serves as an approach for thinking about monetary integration provides an explanation for the recent monetary integration processes in most of the regions of the globe. This approach can help us to identify and possibly to estimate costs and benefits of adopting a common currency. Madhur (2002) sees the key economic cost from formation of a currency union by a group of countries as the loss of national autonomy in monetary policy. Under a currency union, there is no scope for independent monetary policies by the member countries of the union. However, the cost associated with the loss of monetary independence depends upon how well the individual countries were conducting monetary policy prior to joining the currency union, since many developing countries with open capital accounts have several constraints in the effective conduct of an independent monetary policy. This is especially so in developing countries with thin capital markets and weak central banking institutions. In general, the record of developing countries in conducting independent national monetary policies to minimize cyclical fluctuations in economic activity has been somewhat patchy. This suggests that the economic loss from giving up an

independent monetary policy may not be very large for such countries. On the contrary however, a currency union may in fact, elicit commitment to greater macroeconomic stability from countries that otherwise have a mixed track record in implementing monetary policy prior to joining the currency union (Barro, 2001). It is possible that this benefit will compensate for the loss of monetary policy autonomy.

While emphasizing the major benefits and rationale of a common currency, Madhur (2002) showed that it facilitates trade and investment among the countries of the union (and hence increases income growth within the region) by reducing transaction costs in cross-border business, and removing volatility in exchange rates across the union. Barro (2001) sees a currency like language, thus as common language facilitates effective communication among people; common currency could promote trade and investment among countries. In an environment of different currencies, transaction costs, including the costs of obtaining information about prices, would be higher. This would be a disincentive to trade, commerce and investment.

An acceptable means of payment facilitates trade and in the process enhances the rate of economic growth, and welfare of contracting parties. Currency arrangements, culminating in a common currency, make trade less costly while increased economies of scale are generated. This is because economic and monetary integration requires the elimination of barriers to trade and the adoption of common economic paradigm, which ensures discipline in macroeconomic management. Obaseki and Onwioduokit (2001) maintain that the most important benefit of monetary integration is economy of scale in

production and trade, which results from specialization and which ultimately leads to increased trade among the member countries.

Thus, the importance of monetary union cannot be over stated (Tella and Adesoye, 2001). As such, the analysis and discussion so far suggest that the attainment of economic and monetary union in West Africa is a desirable objective and hence necessary (Soyibo, 1998). The main argument in support is that the working balances in convertible currencies can be reduced because convertible currencies are used only for settlement of net balances at the end of each transaction period (Quirk and Evans, 1995). Another major attraction of monetary integration is its trade-creating potential (in both goods and services) within and beyond the constituent states by removing some of the payments obstacles to trade (Itsede, 2002).

Rose (2001) found that currency unions are more open and more specialized than non-currency union countries of comparable size. More directly, he examines international trade patterns and found that trade between members of a currency union is indeed much higher than trade between comparable countries with their own currencies, by a factor of over three. With regards to real exchange rates and deviations from purchasing power parity, he noted that the volatility of real exchange rates is lower for members of currency unions than for countries with independent currencies and thus concluded that members of a common currency area are more economically integrated than non-currency union members even though not as much as those that are fully politically integrated.

Fielding and Shields (2003) noted that the widening of monetary union in West Africa could entail two benefits for the new member states. Firstly, the autonomy of a trans-national central bank could make low inflation a time-consistent monetary policy goal. Secondly, the common currency could lead to a greater degree of macroeconomic integration especially in areas such as increased trade volumes or lower relative price variability that can reasonably be expected to increase welfare. Since monetary union precludes any nominal exchange rate fluctuations, and thus should facilitate more trade within and beyond the constituent states by removing some of the payments obstacles to trade.

Moreover, the use of a common currency will eliminate currency transactions costs in international trade (De Grauwe, 2000), so trade volumes ought to increase. These include the union's regime of a stable exchange rate of the common currency. In such a fixed exchange regime, costs of money conversion and forward cover required in a flexible exchange system are eliminated. The common currency thus constitutes a reliable anchor for businessmen in their trade contracts and position - taking on trade issues generally. It is thus, not surprising that a great many economists and policy makers themselves have at one time or another blamed the low level of intra-ECOWAS trade on payments difficulties owing to the existence of inconvertible sub-regional currencies, widely fluctuating exchange rates, and competitive regional production profiles, amongst others (Osaka and Ukeje 2002).

Discussions about the merits of monetary integration to any participating country has largely centered on short-term adjustment in the internal and external disturbances, which has focused on developed countries (Tower and Willet, 1976). Thus, Robson (1983) asserted that developing countries like those in the West African sub-region need to consider the long-term implications of their participation in a monetary union. Short-run adjustments are usually less costly because the multiplier effects of the disturbance on output and price level are smaller. However, with increase in international trade arising from integration, the economies of participating countries become more open in terms of the share of their exports in GNP. The more open the economy, the larger the export and import elasticities and the smaller the induced changes in domestic spending because of the leaks to the external sector when an exchange rate is fixed. In their argument however, Devan and de Melo (1987) observed that when adjusting to a disturbance in the short-term, the superiority of a monetary union over fixed or crawling exchange rate regimes should be attributed to the probability of using the exchange rate to adjust. Thus, whichever exchange rate arrangement is chosen, countries in monetary arrangement are usually expected to benefit from a reduction in the impact of internal and external shocks as the effects of any shock will tend to spread across the participating countries.

The ECOWAS main report by the Technical Committee on Monetary Issues (2000) asserted the most important benefit of monetary integration and adoption of a single currency is the elimination of currency inconvertibility and its tendency to limit to trade, economic, social and political interaction between countries that are otherwise

contiguous. This has tended to reduce the bargaining power as well as the influence of the developing economies at bilateral and multilateral negations. It went on to state that a single currency arrangement helps improving the domestic and regional resources allocation, improved productivity through free factor mobility, increased trade and investment flows and higher productivity as well as increased resource savings from pooling of external reserves and centralization of monetary policies.

Ojo (1983) identified two important issues regarding the rationale for monetary (and financial) cooperation in developing countries. The first is the mobilization of human and financial resources. The second entails the strengthening of the negotiating capacity of the developing countries vis-à-vis industrial countries. The capacity for collective negotiation cannot be gained without cooperation in monetary matters.

2.8 The Performances of the Convergence Criteria

2.8.1 Performance under Macroeconomic Convergence: Guinea

The Macroeconomic Convergence Report (2007) shows that five numbers of criteria were met from 2003 to 2006, which later fell to three in 2007. In addition, almost all the profile of criteria worsened. This situation stems from the counter performances in budget revenue collection. Particularly, the budget deficit which has been following a positive trend since 2004 worsened significantly by more than 5 percentage points, rising from a ratio of 15.6% of GDP in 2006 to 20.7% in 2007.

In relation to primary criteria for example, two targets were achieved against three in 2006. The criterion on budget deficit has remained problematic. As regards secondary criteria, the relatively high level of primary expenditures of tax revenue was not conducive for the attainment of positive results. This explains the gaps being observed as far as the ratios relating to the wage bill and internally funded investments are

concerned. In the same vein, the weaknesses in tax administration do not allow for adequate mobilization to boost tax pressure level. Only the criterion regarding real exchange rates was achieved by Guinea in 2007 (see, table 2.1 below).

However, the economic and financial programme, for which the Guinea Bissau Authorities are seeking, aims to improve governance, boost economic growth and ensure the sustainability of public finances and external accounts. In this regard, GDP growth would settle at 4.3% in 2008 against 2.5% in 2007. This would be fuelled by increased production in the primary and secondary sectors to help improve the public finance situation in 2008 and thus enhance the level of convergence.

Table 2.1: Guinea's Convergence Position

	Target	2001	2002	2003	2004	2005	2006	2007	2008	2009
Primary criteria										n/a
Budget Deficit/GDP	≤ 4%	-5.2	-17.3	23.0	32.3	23.9	15.6	20.7	17.1	n/a
Inflation rate	≤ 5%	12.1	6.1	0.7	2.2	0.3	3.2	9.3	2.7	n/a
Budget deficit financing/Previous year tax revenue	≤ 10%	7.3	-6.1	0.0	0.0	0.0	0.0	0.0	0.0	n/a
Gross External Reserves	≥ 6	8.3	n/a	6.0	6.6	8.3	8.4	8.0	7.8	n/a
Secondary criteria										
Tax Revenue/GDP	≥ 20%	16.7	20.7	8.6	7.7	11.2	11.0	10.6	11.2	n/a
Wage Bill/tax Rev.	≤ 35%	100.3	107.4	111.9	137.3	116.2	102.2	104.8	100.5	n/a
Public Invest./Tax Rev.	≥ 20%	5.7	5.1	4.2	4.2	6.0	2.2	12.2	3.3	n/a
Real Interest Rates	≥ 0	-4.7	2.3	2.8	1.3	3.2	0.3	-5.8	0.8	n/a
Real Ex. Rate Stability	± 5%	2.0	2.3	1.6	1.6	-1.8	1.3	-0.4	0.1	n/a
Total No. of Criteria Met		**4**		**5**	**5**	**5**	**5**	**3**	**5**	

Source: WAMA, BCEAO.

2.8.2 Performance under Macroeconomic Convergence: Gambia

Gambia's performance under the convergence criteria remained encouraging in 2007 according to the Macroeconomic Convergence Report (2007). The country sustained six out of the seven targets met in 2006, having lost compliance on inflation. The achievement comprised two primary and four secondary benchmarks. Performance on each of the primary and secondary criteria follows;

The Gambia sustained the budget deficit below the required maximum limit of 4.0 percent of GDP. Inflation, which had been contained in 2005 and 2006, began to accelerate during the year under review from 1.4 percent in December 2006 to 6.0 percent by end of 2007. The central bank did not finance the budget deficit in 2007, reflecting the strong fiscal performance. Gross external reserves continued to improve from 4.9 months of imports cover to 5.5 months by end of 2007. Thus, the country narrowly missed the required minimum target of 6.0 months. The performance of Gambia on this criterion has been aided by increasing foreign exchange inflows accruing from its traditional exports and transactions on the capital account.

With regard to the Secondary Criteria, the domestic arrears criterion, member States are required to prohibit and liquidate all existing arrears. Having met the tax revenue/GDP target for the first time in 2006, The Gambia sustained its performance during the year under review. Its performance on the salary mass/tax revenue benchmark is also very encouraging as the country has consistently met the required maximum target of 35.0 percent in recent years. The increasing tax revenue returns also impacted positively on the public sector wage burden relative to tax revenue, remaining favourably below the maximum limit of 35.0 percent (see, table 2.2 below). However, the level of investments

remained abysmally low regardless of the increasing revenue. Real interest rates remained positive in 2007, thus, sustaining the favourable performance realized since 2004. Gambia needs to contain inflationary pressures in order to maintain its performance on this criterion, given the low average savings rate. Using a fluctuation band of ±5.0 percent, the real exchange rate remained stable, appreciating by 1.1 percent in each of the two consecutive years of 2006 and 2007. Gambia has consistently met this target in recent years.

Table 2.2: The Gambia Convergence Position

	Target	2001	2002	2003	2004	2005	2006	2007	2008	2009
Primary criteria										
Budget Deficit/GDP	**≤ 4%**	9.8	9.1	7.2	10.2	5.1	2.7	1.0	3.9	n/a
Inflation rate	**≤ 5%**	8.1	13.0	17.6	8.0	1.8	1.4	6.0	2.6	n/a
Budget def. financing/Prev. yr. Tax Rev	**≤ 10%**	80.7	22.0	63.1	0.0	0.0	0.0	0.0	0.0	n/a
Gross External Reserves	**≥ 6**	8.2	5.2	4.6	5.0	5.2	4.9	5.5	5.4	n/a
Secondary criteria										
Domestic Arrears	**=0**	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Tax Revenue/GDP	**≥ 20%**	13.9	14.1	13.8	18.1	19.8	21.0	21.8	22.5	n/a
Wage Bill/tax Rev.	**≤ 35%**	40.1	38.0	33.3	23.1	24.3	24.2	22.4	27.5	n/a
Public Invest./Tax Rev.	**≥ 20%**	7.1	5.5	3.2	4.0	6.3	2.9	6.0	10.0	n/a
Real Interest Rates	**≥ 0**	1.9	-3.0	-0.6	6.0	3.2	3.6	3.3	2.4	n/a
Real Ex. Rate Stability	**± 5%**	3.3	3.7	-27.8	1.2	4.5	-1.1	-1.1	0.3	n/a
Total # of Criteria Met		**3**	**1**	**1**	**4**	**5**	**7**	**6**	**7**	

Source: WAMA, Central Bank of The Gambia

2.8.3 Performance under Macroeconomic Convergence: Ghana

The Macroeconomic Convergence Report (2007) shows that performances under macroeconomic convergence status have been discouraging from 2002 to 2005. It also deteriorated in 2007 as the country met none of the primary convergence criteria, having missed out on the budget deficit financing criterion. The performance on the budget deficit criterion (on commitment basis excluding grants) degenerated from 12.6 percent of GDP in 2006 to 14.7 percent, thus, missing the required target by a wide

margin. Contrary to the expectation for a single digit target, inflationary pressures increased moderately during the year under review. A combination of factors explained this phenomenon, including, the expansionary monetary policy, the relative shortfall in food production and the escalating crude oil prices that impacted negatively on the prices of all consumer commodities. Although Ghana was not able to meet the required target, performance on Gross External Reserves was very encouraging as the level increased from 3.7 months of imports cover to 4.5 months. Notwithstanding the increasing imports, the massive foreign exchange inflows from both private and official sources accounted for this rising trend.

However, Ghana achieved three of the secondary criteria (domestic arrears, tax revenue and public investment). This improvement under the secondary criteria is however encouraging. For the first time, Ghana met the criterion on domestic arrears in 2007 following indications from the fiscal authorities that it had liquidated its domestic arrears as at end of 2007.

The volume of tax revenue relative to GDP was above the minimum target at 23.7 percent, signifying the success of the recent revenue enhancement measures adopted by the government. The data indicates that Ghana has been able to sustain this performance since 2004. After achieving the required target in 2006, the country made further progress on public investments policy by surpassing the required target at 27.3 percent (see, table 2.3 below).

As in recent years, real interest rates remained negative. The declining interest rates suggest an increasing availability of loanable funds which may influence investment

positively in the short-run. However, the persistence of negative real interest rates may adversely affect financial intermediation in the long-run. However the country did not meet the required target on real exchange rate stability.

Table 2.3: Ghana Convergence Position

	Target	2001	2002	2003	2004	2005	2006	2007	2008	2009
Primary criteria										
Budget Deficit/GDP	**≤ 4%**		5.2	7.5	9.1	6.9	12.6	14.7	8.9	n/a
Inflation rate	**≤ 5%**		15.2	23.6	11.8	13.9	10.9	12.8	19.8	n/a
Budget deficit financing/Prev. yr tax Rev.	**≤ 10%**		12.1	0.0	1.6	0.0	0.0	15.6	5.0	n/a
Gross External Reserves	**≥ 6**		2.6	4.9	4.5	4.0	3.7	4.5	5.6	n/a
Secondary criteria										
Domestic Arrears	**=0**		n/a	n/a	n/a	n/a	n/a	0.0	0.0	n/a
Tax Revenue/GDP	**≥ 20%**		17.9	19.6	21.8	20.8	20.2	23.7	22.9	n/a
Wage Bill/tax Rev.	**≤ 35%**		52.0	47.6	42.8	44.1	53.1	46.8	50.1	n/a
Public Invest./Tax Rev.	**≥ 20%**		13.6	18.8	20.0	18.8	26.5	27.3	34.3	n/a
Real Interest Rates	**≥ 0**		-2.2	-13.9	-2.3	-8.5	-3.5	-8.2	-12.9	n/a
Real Ex. Rate Stability	**± 5%**		3.7	0.7	-1.1	10.2	5.8	-8.4	1.4	n/a
Total # of Criteria Met			**1**	**2**	**4**	**2**	**3**	**3**	**5**	

Source: WAMA

2.8.4 Performance under Macroeconomic Convergence: Sierra Leone

The analysis based on the Macroeconomic Convergence Report (2007) shows that Sierra Leone's convergence criteria performance improved marginally in 2007 as the country met only two targets. That is, the primary criterion on central bank budget deficit financing and the secondary criterion on real exchange rate stability.

Based on the data, achievement on some of the primary benchmarks progressed whilst others deteriorated. Consequently the budget deficit ratio relative to GDP reduced from 8.5 percent to 5.6 percent, thus missing the required target by 1.6 percentage points. Inflation accelerated moderately from 7.3 percent to 13.8 percent by end of 2007. The country met the central bank budget deficit financing target at 0.8 percent in 2007, having exceeded the required target in the preceding year. This performance is quite

encouraging, given the inadequate domestic revenue and shortfalls in external grants owing to uncertainties surrounding the 2007 parliamentary and presidential elections.

Favourable developments in the balance of payments, making the gross external reserves increased further from 4.9 months of imports cover to 5.1 months. Sierra Leone needs to strengthen the relevant policies to sustain its external sector performance in order to meet the required target of 6.0 months of imports.

Performance on the secondary criteria was not encouraging as the achievement on most of the prescribed benchmarks in this category was below expectation. It should be stated at this juncture that the criterion on domestic arrears could not be assessed due to data unavailability. Tax revenue remained relatively low, hovering below 9.0 percent of GDP reflecting a weak and inefficient capacity of the revenue mobilization agencies. However, the salary mass/tax revenue ratio remained high, at 25.9 percentage points above the maximum requirement of 35.0 percent in 2007 (see, table 2.4 below).

The level of public investments financed from domestic sources also stood at 9.1 percent compared to the minimum requirement for 20.0 percent of tax revenue. The downward movement in negative real interest rates from 1.8 percent to 8.3 percent implies a growing disincentive for long-term investment. Using a fluctuation band of ±5.0 percent, the real exchange rate was stable. The nominal exchange rate has been relatively stable in recent years. Economic activity would be expected to remain buoyant in 2008 given the continued investments the agricultural and mining sectors and efforts being made to address the energy crisis. A growth rate of 6.3 percent has been estimated for the year. Ceteris paribus, projections show that the inflationary pressures experienced in 2007 would continue to persist, to be influenced partly by the lagged effects of the money creating activities of the banking system and a rebound of

consumer demand as the new government rolls out its development agenda in all sectors of the economy. Available data obtained revealed that the average consumer price level rose by 3.2 percent during the first quarter of 2008, indicating an annualized inflation rate of 13.5 percent.

The projections further show that performance under macroeconomic convergence would remain difficult in 2008. The country may be able to meet the same two targets (central bank budget deficit financing and real exchange rate stability) realized in the preceding year. The higher demand for expenditure in education, health, services and infrastructure would place an upward pressure on the budget deficit, given the existing constraints in revenue mobilization. The authorities would continue to grapple with inflation, wage burden, public investment financed from domestic sources and negative real interest rates. The rising imports bill on both oil and non-oil commodities would also dampen level of external reserves.

Table 2.4: Sierra Leone Convergence Position

	Target	2001	2002	2003	2004	2005	2006	2007	2008	2009
Primary criteria										
Budget Deficit/GDP	**≤ 4%**	11.4	11.8	9.2	8.6	9.5	8.5	5.6	7.9	n/a
Inflation rate	**≤ 5%**	3.4	-3.1	11.3	14.6	13.1	7.3	13.8	13.5	n/a
Budget Deficit Financing/ Prev. yr tax Rev.	**≤ 10%**	31.7	0.0	25.1	0.0	0.0	13.3	0.8	1.3	n/a
Gross External Reserves	**≥ 6**	3.3	0.6	1.7	3.8	4.8	4.9	5.1	4.6	n/a
Secondary criteria										
Domestic Arrears	**=0.0**	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Tax Revenue/GDP	**≥ 20%**	8.6	8.4	8.3	8.3	8.1	8.5	8.9	8.4	n/a
Wage Bill/tax Rev.	**≤ 35%**	56.1	62.0	57.6	56.0	65.5	61.6	60.9	60.9	n/a
Public Invest./Tax Rev.	**≥ 20%**	7.3	8.9	11.1	8.2	7.9	10.6	9.1	8.9	n/a
Real Interest Rates	**≥ 0**	0.1	7.1	-7.3	-8.6	-7.2	-1.8	-8.3	-6.3	n/a
Real Ex. Rate Stability	**±%**	10.8	-12.4	-17.8	-10.7	2.0	3.7	-0.9	0.5	n/a
Total # of Criteria Met		**2**	**3**	**0**	**1**	**2**	**1**	**2**	**2**	

Source: BSL, IMF & *WAMA*

2.8.5 Performance under Macroeconomic Convergence: Nigeria

Nigeria, one of the leading countries under the convergence programme, sustained its performance by meeting the same five targets realized since 2005, comprising the three primary benchmarks of budget deficit, central bank budget deficit financing and gross external reserves) and two secondary criteria in respect of salary mass and public investments.

Performance under the primary criteria was encouraging. Government operations resulted in a significant budget surplus of 14.3 percent of GDP. Even after the application of the oil-based fiscal regime, the budget deficits of 2.3 percent and 1.8 percent recorded in 2006 and 2007 respectively were favourably below the required target of 4.0 percent.

As has been the case in recent years, the central bank did not accommodate government operations during the year under review. The Federal Government settled a significant proportion of its indebtedness to the banking system, given the high revenue returns.

The country's gross external reserves remained high at 16.1 months of imports cover, well above the minimum requirement of 6.0 months. The windfall returns on crude oil exports and other foreign exchange inflows continued to impact positively on the external reserves of Nigeria, which however contributed to a further appreciation of the domestic currency.

Performance under the secondary criteria was rather not very encouraging. The criterion on domestic arrears could not be assessed due to inadequate data. The level of tax revenue relative to GDP continued to dwindle from 14.9 percent of GDP to 10.5 percent. The wage burden relative to tax revenue was however within the required maximum limit, albeit, the level increased significantly from 19.5 percent to 31.5 percent (see, table 2.5 below). This relative increase in the wage burden may be attributed to the decrease in tax revenue and an enhancement in the size of the public sector. The level of public investment financed from domestic resources increased significantly from 23.9 percent to 35.7 percent. The prevalence of negative real interest

rates, measured as the difference between the minimum savings rate and inflation, persisted in 2007. In spite of the relative stability of the domestic currency, real exchange rate stability was not achieved, possibly, due to the appreciating nominal exchange rate.

The outlook for 2008 appears favourable considering the impact of the rising crude oil price, efforts in private sector development and massive investment in agriculture, communication, banking and other services. The macroeconomic programme of Nigeria indicates that the economy would grow by 9.0 percent in 2008. The downside risks to this expectation are the limited power supply, persistent social unrest in the Niger Delta and bottlenecks in transportation and business infrastructure.

The country may meet six targets by sustaining its performance in 2006 and meet the target on real exchange rate stability. However, the projections show that even though inflation would be contained within the single digit range, it may be difficult to realize the required target of 5.0 percent, ceteris paribus. The authorities would also grapple with tax revenue and negative real interest rates.

Table 2.5: Nigeria Convergence Position

	Target	2001	2002	2003	2004	2005	2006	2007	2008	2009
Primary criteria										
Budget Deficit/GDP	**≤ 4%**	3.2	3.9	-13.3	-21.2	-24.8	-22.1	-14.3	-13.1	n/a
Inflation Rate	**≤ 5%**	16.5	12.1	23.8	10.0	11.6	8.5	6.6	7.3	n/a
Budget Deficit financing/Prev. Yr tax Rev.	**≤ 10%**	29.3	0.0	12.0	0.0	0.0	0.0	0.0	0.0	n/a
Gross External Reserves	**≥ 6**	11.3	7.3	5.6	13.6	11.8	15.1	16.1	19.8	n/a
Secondary criteria										
Domestic Arrears	**=0.0**	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Tax Revenue/GDP	**≥ 20%**	14.7	10.0	11.1	14.6	16.8	14.9	10.5	9.9	n/a
Wage Bill/tax Rev.	**≤ 35%**	28.0	47.2	26.9	21.7	17.7	19.5	31.6	31.0	n/a
Public Invest./Tax Rev.	**≥ 20%**	71.1	83.1	21.4	23.0	23.9	23.9	35.7	31.3	n/a
Real Int. Rates	**≥ 0**	-13.1	-8.4	-20.6	-5.6	-8.3	-5.2	-3.4	-4.1	n/a
Real Ex. Rate Stability	**±10%**	11.1	-0.5	-5.4	2.7	15.0	7.4	-12.2	2.7	n/a

3.3 Method of Data Analysis

Given the nature of the specific objectives and that of the data to be obtained, both descriptive and inferential statistics will be employed for analysis. Specifically, to determine whether the proposed member countries will ever meet the convergence criteria, cointegration analysis will be used following the works of Haug et al (1999), Karfakis and Moschos (1990) and MacDonald and Taylor (1991). This is because the tendency for convergence of certain variables, as well as the rate at which they converge can be revealed by the cointegration and error correction analysis. The strategy we adopt in this study, therefore, is to test for cointegration for each of the variables that relates to the convergence criteria for all the countries in the zone. For instance, one cointegrating equation will be for a vector of inflation rates (or prices) for all the member nations. Presence of cointegration among them would imply that there is a tendency for them to converge, and the error-correction mechanism would reveal their rate and speed of convergence. The number of cointegrating vectors will suggest the number of countries that would achieve such a convergence. If the number of cointegrating equation equals the number of variables in the vector minus one, then we can conclude that all the countries in the union will meet the convergence criteria i.e. complete convergence.

3.4 Model Specification.

3.4.1 The Co-integration Model and Test Statistics

As indicated above, cointegration analysis has been used to determine whether or not some variables within a union tend to converge or not. This study adopts this approach

to test for the long run equilibrium relationship among the given macroeconomic convergence criteria. In view of the fact that the macroeconomic variables to be considered are often typically non-stationary, a minimum requirement for the formation of the WAMZ is the existence of stable long-run relationship that can tie together the variables in each of the criteria. Otherwise chances of a successful union in the WAMZ would be very slim. This issue is the focus of our empirical study. If the variables for the WAMZ countries are found to be cointegrated within each of the criteria, deviations from certain linear combinations will be stationary, implying that the variables will be tied together in the long run. Because the nominal convergence criteria imply co-movement of specific variables over time, the cointegration approach is well-suited to assess the potentials of forming the WAMZ.

The maximum likelihood theory of systems of potentially cointegrated stochastic variables presupposes that the variables are integrated of order one, or I(1), and that the data generating process is a Gaussian Vector Autoregressive model of finite order k, or VAR(k), possibly including some deterministic components. This model is adopted from the work of Johansen (1995) as modified in Haug 'et al (1999), the VAR (k) model can be written in VECM (vector error-correction model) form as;

$$\Delta X_t = \Pi X_{t-1} + \sum_{i=1}^{k-1} \Gamma_i \, \Delta X_{t-i} + \mu_0 + \mu_1 t + U_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \; Eqtn\, 3.1$$

Such that; $t = 1, \ldots, T$, and where;

X denotes the vector of endogenous variables, Π and Γ_i are the p x p matrices of coefficients that can gives us information about the long run relationship between the variables while μ_0 and μ_1 are p x 1 vectors of constant and trend coefficients,

respectively. The error vectorU_t, which is p x 1, is assumed to be multivariate normal with mean vector zero and covariance matrix $\boldsymbol{\Omega}$, and to be independent across time periods.

The VECM representation (Eqtn 3.1) is convenient because the hypothesis of cointegration can be stated in terms of the long run impact matrix Π. This matrix can always be written as;

$$\Pi = \alpha\beta' \quad \text{.....} \quad \textit{Eqtn 3.2}$$

Where α and $\boldsymbol{\beta}$ are p x r matrices of full rank. If r = 0, then $\Pi = 0$, and there exists no linear combination of the elements of X_t that is stationary. At the other extreme, if rank $(\Pi) = \mathbf{p}$, X_t is a stationary process. In the intermediate case however, when $0 < r < p$, there exist r stationary linear combinations of the elements of X_t, along with $p - r$ stochastic trends.

Thus, following from equation **3.1,** we can specify our empirical model as follows;

$$\Delta X_t = \Pi X_{t-1} + \sum_{i=1}^{k-1} \Gamma_i \, \Delta X_{t-i} + U_t \quad \text{.....} \quad Eqtn\ 3.3$$

Where $X_t = \left(Inf_t\text{Nig}, Inf_t\text{Gha}, Inf_t\text{Gui}, Inf_t\text{Gam}, Inf_t\text{ Sie},\right)$

Inf_tNig is the inflation rate of Nigeria, Inf_tGha is the inflation rate of Ghana, Inf_tGui is the inflation rate of Guinea, Inf_tGam is the inflation rate of Gambia, and Inf_t Sie, is the inflation rate of Sierra Leone.

Hence the model specification in **Eqtn 3.3** will be applied to all the convergence criteria. This follows the lead work of Johansen (1988); Ahn and Reinsel (1990) as used by Haug 'et al (1999) with little modification to capture the specific objective of the study.

Following Osterwald-Lemma (1992) and based on **Eqtn 3.1** above, we may consider five sub-models, as in Haug et'al (1999), which is ordered from most to least restrictive:

Case 0: $\mu_t = 0$

Case 1*: $\mu_t = \alpha\beta_0$

Case 1: $\mu_t = \mu_0$

Case 2*: $\mu_t = \mu_0 + \alpha\beta_1 t$

Case 2: $\mu_t = \mu_0 + \mu_1 t$

3.5 Measurements

Since the influential work of Engle and Granger (1987), several procedures have been proposed for testing the null hypothesis that two or more non-stationary time series are not cointegrated, meaning that there exist no linear combinations of the series that are stationary. One approach is to use likelihood ratio tests based on estimating a vector auto-regression. This approach was first proposed by Johansen (1988) and refined further by Johansen and Juselius (1990) and Johansen (1991, 1992, and 1994). There are two different test statistics, which are called the Trace and Max-Eigenvalue tests.

Johansen's approach, which has been used extensively in applied work, provides a unified framework for estimation and testing in the context of a multivariate vector autoregressive model in error correction form (VECM) with normal errors. The normality assumption allows a neat application of maximum likelihood theory which produces both the test statistics and the maximum likelihood estimators (MLE) of the parameters of interest. Phillips (1991) noted several desirable properties of the MLE for this model and demonstrated that asymptotically optimal inferences can be based on the MLE of the cointegrating vectors.

3.5.1 Likelihood Ratio Test

In order to decide which sub-model to use, we shall test the various sub-models against each other using Likelihood Ratio tests, which are distributed as χ^2; see Johansen and Juselius (1990). The Likelihood Ratio test will aid the choice of the appropriate model.

Because of the normality assumption, it is natural to test for the reduced rank of Π by using a likelihood ratio test. The procedure uses the technique of reduced rank regression first introduced by Anderson (1951) and applied to systems of I(1) variables independently by Johansen (1988) and Ahn and Reinsel (1990). This technique is appealing because it delivers at once the MLE of α and β and the eigenvalues needed to construct likelihood ratio tests. Consider the problem of testing the null hypothesis that there are at most r cointegrating vectors against the unrestricted model. The null hypothesis is that rank (Π) = r and the alternative is that rank (Π) = p. The likelihood ratio test statistic, called the Trace statistic by Johansen and Juselius (1990), is given by

$$\text{Trace} = -T \sum_{i=r+1}^{p} \Gamma_i \log(1-\lambda_i) \quad \text{Eqtn 3.4}$$

Where; **r** is the number of cointegration vectors,

λ_i is the eigenvalues, ordered from smallest to the largest, which arises in the solution of the reduced rank regression problem.

P is the number of variables and

T is the number of observations.

The likelihood ratio statistic, which is called the λ_{max} statistic, is

$$\lambda_{max} = -T\log(1-\lambda_{r+1}). \quad \text{.....Eqtn 3.5}$$

Of course, the λ_{max} statistic is equal to the Trace statistic when p-r = 1.

3.5.2 Unit Root Test

However, before estimating any VECM systems, we shall test each time series for a unit root using both Augmented Dickey-Fuller and Phillip-Peron tests at 5% level. The test will ascertain the number of times a non-stationary data will need to be differenced to arrive at stationarity.

CHAPTER FOUR
PRESENTATION, ANALYSIS AND INTERPRETATION OF RESULTS

4.1 Unit Root Test Results

Since the convergence criteria are divided into primary and secondary, the test also goes in this order. We began this section by investigating the time series properties of each primary converging criterion employed in the study using both the Augmented Dickey Fuller (ADF) and Phillip Peron (PP) tests to determine the order of integration of the series. Appendices I to V present the unit root test results generated from E-views 4.0, while,table 4.1 gives the summary.

Based on the Budget Deficit to Gross Domestic Product ratio (BD/GDP) convergence criterion, ADF indicates that BD/GDP is integrated of order one i.e. ***I(1)*** for all the countries i.e. Gambia, Ghana, Guinea, Nigeria and Sierra Leone. But for PP, Gambia shows a contradictory result, as shown in **table 4.1** below.

For the Inflation Rate criterion (INF), ADF suggests that the series are ***I(1)*** for Ghana, Guinea, Nigeria and Sierra Leone. This indicates that there is the possibility for the above countries to converge in the long run based on the inflation criterion. The Gambia is stationary at level i.e. ***I(0),*** we can conclude that it has met the criterion. For PP, while the series is ***I(0)*** for Ghana and Sierra Leone, it is ***I(1)*** for Gambia, Guinea and Nigeria, see table 4.1 below.

For the Budget Deficit Financing to Tax Revenue ratio (BDF/TR); while ADF suggests ***I(0)*** for the Ghana, it suggests ***I(1)*** for the other countries. PP suggests ***I(1)*** for the Gambia, while the other countries are ***I(0).***

Looking at the Gross External Reserves (GER), ADF indicates Ghana is ***I(0)*** while the other countries are ***I(1).*** However PP suggests Gambia and Ghana are ***I(0),*** while the other countries are ***I(1)***

Table 4.1: Summary of Unit Root Test Results for Primary convergence criteria

UNIT ROOT TEST RESULTS FOR PRIMARY CONVERGENCE CRITERIA								
	BD/GDP				INFR			
	LEVEL		1st DIFF		LEVEL		1st DIFF	
	ADF	PP	ADF	PP	ADF	PP	ADF	PP
GAMBIA	-3.2287	-5.4270	-5.5441		-6.4992	-2.9098		-8.4897
Order Of Integration		*I(0)*	*I(1)*		*I(0)*			*I(1)*
GHANA	-1.1734	-1.7308	-2.1924	-5.7008	-3.4206	-3.5248	-4.3915	
Order Of Integration			*I(1)*	*I(1)*		*I(0)*	*I(1)*	
GUINEA	-2.2228	-2.9385	-4.1802	-6.6004	-1.7488	-1.9883	-3.0567	-4.7089
Order Of Integration			*I(1)*	*I(1)*			*I(1)*	*I(1)*
NIGERIA	-1.8944	-2.3317	-3.6482	-5.2627	-2.9761	-2.7245	-3.9680	-4.3055
Order Of Integration			*I(1)*	*I(1)*			*I(1)*	*I(1)*
SIERRA LEONE	-3.1623	-2.9839	-5.7275	-5.3450	-2.7973	-4.0445	-3.5174	
Order Of Integration			*I(1)*	*I(1)*		*I(0)*	*I(1)*	

UNIT ROOT TEST RESULTS FOR PRIMARY CONVERGENCE CRITERIA								
	BDF/TR				GER			
	LEVEL		1st DIFF		LEVEL		1st DIFF	
	ADF	PP	ADF	PP	ADF	PP	ADF	PP
GAMBIA	-1.4492	-2.9982	-5.0340	-9.3643	-3.5963	-5.7536	-7.1501	
Order Of Integration			*I(1)*	*I(1)*		*I(0)*	*I(1)*	
GHANA	-7.4219	-4.1394			-5.4232	-4.7092		
Order Of Integration	*I(0)*	*I(0)*			*I(0)*	*I(0)*		
GUINEA	-3.4990	-7.4219	-7.2992		-2.1414	-2.2514	-3.7454	-5.4469
Order Of Integration		*I(0)*	*I(1)*				*I(1)*	*I(1)*
NIGERIA	-2.4226	-6.0211	-4.8006		-2.1596	-2.8694	-4.3602	-6.4904
Order Of Integration		*I(0)*	*I(1)*				*I(1)*	*I(1)*
SIERRA LEONE	-4.2112	-5.7585			-2.0818	-2.1312	-3.8492	-6.1447
Order Of Integration	*I(0)*	*I(0)*					*I(1)*	*I(1)*

Source: E-views 4.0. Notes: For all the series at levels, we included trend and intercept, as their line plots indicate. The critical values are based on Mckinnon criterion. The null hypothesis of the test is: a series has a unit root. I() shows the level of integration.

The properties of the secondary convergence criteria i.e. Internal Arrears (IAA), Tax Revenue to GDP ratio (TR/GDP), Wage Bill to Tax Revenue ratio (WB/TR), Public Investment to Tax Revenue ratio (PI/TR), Real Interest Rate (RIR) and Real Exchange Rate (RER) were also investigated. However, only Ghana and Guinea have available data for IAA. Appendices I to V present the unit root test results generated from E-views 4.0, while table 4.2 gives the summary.

For IAA, while ADF suggests ***I(0)*** for Ghana, it suggests ***I(1)*** for Guinea. For PP, it suggests ***I(2)*** for Ghana and ***I(0)*** for Guinea.

For the TR/GDP, ADF suggests Gambia is ***I(0)***, while the other countries are ***I(1)***. However, PP suggests ***I(0)*** for Gambia and Guinea, while the other countries are ***I(1)***.

For WB/TR, both tests suggest ***I(1)*** for all the countries with the exception of Guinea which suggests ***I(0)***.

For PI/TR, Nigeria and Sierra Leone are ***I(0)*** based on ADF, while Gambia, Ghana and Guinea are ***I(1)***. For same criterion, PP suggests Guinea and Sierra Leone to be ***I(0)***, while others are ***I(1)***. For RIR, ADF suggests Gambia and Sierra Leone to be ***I(1)***, while others are ***I(0)***. Here PP suggests all the countries to be ***I(0)***. For RER, both tests indicate that Gambia is ***I(1)***, while the remaining countries are ***I(0)***.

Table 4.2: Summary of Stationarity Test Results

UNIT ROOT TEST RESULTS FOR SECONDARY CONVERGENCE CRITERIA								
	IAA				TR/GDP			
	LEVEL		1st DIFF		LEVEL		1st DIFF	
	ADF	PP	ADF	PP	ADF	PP	ADF	PP
GAMBIA					-4.6367	-3.9659		
Order Of Integration	---	---	---	---	I(0)	I(0)		
GHANA	-5.6726	-3.0354			-2.3948	-3.1703	-3.9067	-6.7516
Order Of Integration	I(0)	I(0)					I(1)	I(1)
GUINEA	-3.0032	-4.4044	-4.1854		-2.4613	-3.9658	-3.9418	
Order Of Integration		I(0)	I(1)			I(0)	I(1)	
NIGERIA					-3.4003	-2.9989	-4.4649	-5.1359
Order Of Integration	------	----	---	---			I(1)	I(1)
SIERRA LEONE					-4.8978	-3.2830		-3.9592
Order Of Integration	------	----	---	---	I(1)			I(1)

UNIT ROOT TEST RESULTS FOR SECONDARY CONVERGENCE CRITERIA								
	WB/TR				PI/TR			
	LEVEL		1st DIFF		LEVEL		1st DIFF	
	ADF	PP	ADF	PP	ADF	PP	ADF	PP
GAMBIA	-2.6164	-3.2075	-3.7696	-5.8258	-2.4718	-1.9747	-4.6251	-4.2006
Order Of Integration			I(1)	I(1)			I(1)	I(1)
GHANA	-0.3939	-2.0458	-4.0905	-4.7016	-2.027390	-2.9770	-3.0870	-4.7405
Order Of Integration			I(1)	I(1)			I(1)	I(1)
GUINEA	-3.7092	-4.2026			-3.2764	-4.2983	-3.7133	
Order Of Integration	I(0)	I(0)				I(0)	I(1)	
NIGERIA	-2.9295	-2.7410	-3.5357	-4.7797	-3.826682	-2.6739	-3.6672	
Order Of Integration			I(1)	I(1)	I(0)		I(1)	
SIERRA LEONE	-2.9512	-3.5445	-3.9501	-6.8043	-3.9802	-5.1057		
Order Of Integration			I(1)	I(1)	I(0)	I(0)		

UNIT ROOT TEST RESULTS FOR SECONDARY CONVERGENCE CRITERIA								
	RIR				RER			
	LEVEL		1st DIFF.		LEVEL		1st DIFF.	
	ADF	PP	ADF	PP	ADF	PP	ADF	PP
GAMBIA	-3.1908	-4.0185	-5.7354		-2.2808	-3.1524	-4.5929	-6.7524
Order Of Integration		*I(0)*	*I(1)*				*I(1)*	*I(1)*
GHANA	-4.6906	-4.6767			-4.3387	-5.6130		
Order Of Integration	*I(0)*	*I(0)*			*I(0)*	*I(0)*		
GUINEA	-2.3772	-3.7522			-6.2288	-6.3054		
Order Of Integration	*I(0)*	*I(0)*			*I(0)*	*I(0)*		
NIGERIA	-3.8548	-4.4881			-3.7764	-3.9949		
Order Of Integration	*I(0)*	*I(0)*			*I(0)*	*I(0)*		
SIERRA LEONE	-2.5285	-3.6273	-3.4020		-5.3891	-3.8839		
Order Of Integration		*I(0)*	*I(1)*		*I(0)*	*I(0)*		

Source: E-views 4.0. Notes: For all the series at levels, we included trend and intercept, as their line plots indicate. The critical values are based on Mckinnon criterion. The null hypothesis of the test is: a series has a unit root. I() shows the level of integration.

4.2 Analyses of Cointegration Results

Having determined the order of integration for the primary and secondary convergence criteria for the five countries, cointegration tests were then conducted to determine the long-run convergence among the countries based on the convergence criteria. In carrying out the cointegration tests, the appropriate lag lengths were chosen based on the Akaike and Swarchz Info-criteria. Also, it is worthy of noting that the cointegration tests were conducted on each of the criterion using different lag lengths as suggested by the lag selection criteria. Countries whose convergence criteria were integrated of the same order were cointegrated. Appendix XIV to XXI present the cointegration test results generated from E-views 4.0.

Table 4.3 below shows the cointegration result for the first primary convergence criterion; Budget Deficit to Gross Domestic Product ratio (i.e. BD/GDP) for Gambia, Ghana, Guinea, Nigeria and Sierra Leone. The trace statistic (λ_{trace}) suggested 1 cointegrating equation at both 5% and 1%; and Max-eigenvalue (λ_{max}) suggested 1 cointegrating equation at both 5% and no

cointegrating equation at 1%. This implies that at most four countries shared stochastic trend and the countries are most likely going to meet the this criterion in the long-run. Hence, we can say that base on the prevailing situation four countries out of these five are likely to satisfy criterion in the long-run.

Table 4.3: Budget Deficit/GDP for Gambia, Ghana, Guinea, Nigeria and Sierra Leone

Trace (λ_{trace})					
No. of CE(s)	None	At most 1	At most 2	At most 3	At most 4
Eigenvalue	0.81378	0.63895	0.36060	0.31927	0.07995
λ_{trace} *Statistic*	83.13835	44.47964	21.04842	10.76223	1.916663
5% Critical Value	68.52	47.21	29.68	15.41	3.76
1% Critical Value	76.07	54.46	35.65	20.04	6.65
Maximum Eigenvalue (λ_{max})					
No. of CE(s)	None	At most 1	At most 2	At most 3	At most 4
Eigenvalue	0.813778	0.638953	0.360600	0.319270	0.079955
λ_{max} *Statistic*	38.65871	23.43121	10.28619	8.845566	1.916663
5% Critical Value	33.46	27.07	20.97	14.07	3.76
1% Critical Value	38.77	32.24	25.52	18.63	6.65

The cointegration result for Inflation rate criterion for the four cointegrating countries; Ghana, Guinea, Nigeria and Sierra Leone is shown on table 4.4 below. The trace statistic (λ_{trace}) and Max-eigenvalue (λ_{max}) suggested 3 cointegrating equations at both 5% and 1% respectively. The result suggested that at most three share stochastic trend and are most likely going to converge in the long-run on the basis of this criterion. Therefore, such countries have high tendencies of meeting this criterion in the long-run to facilitate the formation of this monetary zone.

Table 4.4: Inflation Rate for Ghana, Guinea, Nigeria and Sierra Leone

Trace (λ_{trace})				
No. of CE(s)	None	At most 1	At most 2	At most 3
Eigenvalue	0.999855	0.934351	0.620010	0.013891
λ_{trace} *Statistic*	263.3732	77.80564	20.61357	0.293755
5% Critical Value	47.21	29.68	15.41	3.76
1% Critical Value	54.46	35.65	20.04	6.65
Maximum Eigenvalue (λ_{max})				
No. of CE(s)	None	At most 1	At most 2	At most 3
Eigenvalue	0.999855	0.934351	0.620010	0.013891
λ_{max} *Statistic*	185.5676	57.19207	20.31981	0.293755
5% Critical Value	27.07	20.97	14.07	3.76
1% Critical Value	32.24	25.52	18.63	6.65

Table 4.5 shows the cointegration result for Budget Deficit Financing to Tax Revenue ratio criterion (i.e. BDF/TR) for the 3 cointegrating countries i.e. Gambia, Guinea and Nigeria. The trace statistic (λ_{trace}) and Max-eigenvalue (λ_{max}) identified 2 cointegrating equations at 5% and 1 cointegrating equation at 1% critical levels respectively. The result shows that at most two countries shared stochastic trend and are most likely to converge in the long-run on the basis of the criterion and as the situation prevails.

Table 4.5: Budget Deficit Financing/Tax Revenue for Gambia, Guinea and Nigeria

Trace (λ_{trace})			
No. of CE(s)	None	At most 1	At most 2
Eigenvalue	0.807302	0.511931	0.061978
λ_{trace} Statistic	48.55824	15.62562	1.279647
5% Critical Value	29.68	15.41	3.76
1% Critical Value	35.65	20.04	6.65
Maximum Eigenvalue (λ_{max})			
No. of CE(s)	None	At most 1	At most 2
Eigenvalue	0.807302	0.511931	0.061978
λ_{max} Statistic	32.93263	14.34597	1.279647
5% Critical Value	20.97	14.07	3.76
1% Critical Value	25.52	18.63	6.65

The result of the cointegration test conducted on Gross External Reserves (GER) for the four cointegrating countries (Gambia, Guinea, Nigeria and Sierra Leone) is presented on table 4.6. The trace statistic (λ_{trace}) and Max-eigenvalue (λ_{max}) identified 1 cointegrating equation at 5% and 1% critical levels respectively. The result shows that at most three countries shared stochastic trend and are likely to converge on the basis of GER.

Table 4.6: Gross External Reserve for Gambia, Guinea, Nigeria and Sierra Leone

Trace (λ_{trace})				
No. of CE(s)	None	At most 1	At most 2	At most 3
Eigenvalue	0.802783	0.437482	0.350160	2.49E-05
λ_{trace} Statistic	57.85637	22.14049	9.483198	0.000548
5% Critical Value	47.21	29.68	15.41	3.76
1% Critical Value	54.46	35.65	20.04	6.65
Maximum Eigenvalue (λ_{max})				
No. of CE(s)	None	At most 1	At most 2	At most 3
Eigenvalue	0.802783	0.437482	0.350160	2.49E-05
λ_{max} Statistic	35.71588	12.65729	9.482651	0.000548
5% Critical Value	27.07	20.97	14.07	3.76
1% Critical Value	32.24	25.52	18.63	6.65

Table 4.7 shows the cointegration result for the four cointegrating countries (Ghana, Guinea, Nigeria and Sierra Leone) on the basis of Tax Revenue to Gross Domestic Product ratio. The trace statistic (λ_{trace}) and Max-eigenvalue (λ_{max}) identified 3 cointegrating equations at 5% and 2 cointegrating equations at 1% significance level respectively. Both the λ_{trace} and λ_{max} suggested that at most three cointegrating countries shared stochastic trend and are likely to converge in the long-run on the basis of the Tax Revenue/GDP criterion. Hence, this number is most likely to meet this criterion.

Table 4.7: Tax Revenue/GDP for Ghana, Guinea, Nigeria and Sierra Leone

Trace (λ_{trace})				
No. of CE(s)	None	At most 1	At most 2	At most 3
Eigenvalue	0.905054	0.705601	0.521742	0.020825
λ_{trace} *Statistic*	95.39031	43.59236	16.69030	0.462997
5% Critical Value	47.21	29.68	15.41	3.76
1% Critical Value	54.46	35.65	20.04	6.65
Maximum Eigenvalue (λ_{max})				
No. of CE(s)	None	At most 1	At most 2	At most 3
Eigenvalue	0.905054	0.705601	0.521742	0.020825
λ_{max} *Statistic*	51.79795	26.90206	16.22731	0.462997
5% Critical Value	27.07	20.97	14.07	3.76
1% Critical Value	32.24	25.52	18.63	6.65

The cointegration test conducted on the ratio of Wage Bills to Tax Revenue for the four cointegrating countries (Gambia, Ghana, Nigeria and Sierra Leone) showed that there is 1 cointegrating equation for the trace statistic (λ_{trace}) at 5% and no cointegrating equation at 1% critical levels, while the Max-eigenvalue (λ_{max}) shows no cointegrating equation at both 5% and 1% critical levels respectively. At most three cointerating countries shared stochastic trend which implies that they are likely to converge in the long-run on the basis of their Wage Bills/Tax Revenue, as shown on table 4.8 below.

Table 4.8: Wage Bill/Tax Revenue for Gambia, Ghana, Nigeria and Sierra Leone

Trace (λ_{trace})

No. of CE(s)	None	At most 1	At most 2	At most 3
Eigenvalue	0.613228	0.530232	0.392608	0.003883
λ_{trace} *Statistic*	48.57400	27.67577	11.05439	0.085594
5% Critical Value	47.21	29.68	15.41	3.76
1% Critical Value	54.46	35.65	20.04	6.65

Maximum Eigenvalue (λ_{max})

No. of CE(s)	None	At most 1	At most 2	At most 3
Eigenvalue	0.613228	0.530232	0.392608	0.003883
λ_{max} *Statistic*	20.89823	16.62138	10.96879	0.085594
5% Critical Value	27.07	20.97	14.07	3.76
1% Critical Value	32.24	25.52	18.63	6.65

The cointegration result for the four cointegrating countries (Gambia, Ghana, and Guinea) was presented on table 4.9 for the ratio of Public Investment to Tax Revenue. The λ_{trace} and λ_{max} identified no cointegrating equations each at 5% and 1% respectively. On the basis of hypotheses, at most two countries shared stochastic trend and are most likely to converge in the long-run.

Table 4.9: Public Investment/Tax Revenue for Gambia, Ghana and Guinea

Trace (λ_{trace})

No. of CE(s)	None	At most 1	At most 2
Eigenvalue	0.524431	0.249029	0.116051
λ_{trace} *Statistic*	26.51870	9.424116	2.837178
5% Critical Value	29.68	15.41	3.76
1% Critical Value	35.65	20.04	6.65

Maximum Eigenvalue (λ_{max})

No. of CE(s)	None	At most 1	At most 2
Eigenvalue	0.524431	0.249029	0.116051
λ_{max} *Statistic*	17.09458	6.586938	2.837178
5% Critical Value	20.97	14.07	3.76
1% Critical Value	25.52	18.63	6.65

Finally, the cointegration test conducted for the two cointegrating countries (Gambia and Sierra Leone) for the Real Interest Rate convergence criterion is presented on table 4.10. The λ_{trace} statistic identified two cointegrating equations at 5% critical levels and no cointegrating equation at 1% critical levels. The λ_{max} value identified no cointegrating equation each at both 5% and 1%

critical levels. The hypothesis suggests the presence of at least one country having the stochastic trend and is likely to converge on the basis of this criterion in the long-run.

Table 4.10: Real Interest Rate for Gambia and Sierra Leone

	Trace (λ_{trace})	
No. of CE(s)	None	At most 1
Eigenvalue	0.402172	20.04
λ_{trace} *Statistic*	16.20258	4.884629
5% Critical Value	15.41	3.76
1% Critical Value	20.04	6.65
	Maximum Eigenvalue (λ_{max})	
No. of CE(s)	None	At most 1
Eigenvalue	0.402172	0.199108
λ_{max} *Statistic*	11.31795	4.884629
5% Critical Value	14.07	3.76
1% Critical Value	18.63	6.65

For all the variables analyzed (Budget Deficit/GDP, Inflation Rate, Budget Deficit Financing/Tax Revenue, Gross External Reserve, Tax Revenue/GDP, Wage Bill/Tax Revenue, Public Investment/Tax Revenue and Real Interest Rate), the empirical results from all the convergence criteria considered suggest that the convergence motive of the West African Monetary Zone (WAMZ) countries has been encouraging. The results imply that there are very good possibilities of the WAMZ member countries satisfying the requirements necessary for the launching of the project by 2015 especially going by the situation is it were. However, for a more reliable long-run convergence, the WAMZ member countries will need to make some committed adjustments to align their policies for the single currency to be more viable. As part of the precondition for the take off of the WAMZ project, at least three countries must satisfy at least three primary and three secondary criteria for at least three consecutive years; the direct implication of these results is that if the WAMZ member countries can put in more efforts towards the actualization of the project, the targets can be achieved even earlier. The results however put some optimistic and positive tendencies of these countries meeting this requirement from now to 2015 as it is likely to provide adequate time for effective policy coordination for the

member countries. A clearly defined convergence period, with clear targets to be achieved by all member states would nevertheless be put up as part of any negotiated framework to this programme.

4.3 Analyses of the Speed of Adjustment

Having conducted the cointegration tests for all the convergence criteria of the five countries in order to determine their long-run relationship, we also went ahead to determine the speed of adjustment of the countries. This would give us an idea the speed with which these countries are likely to converge. With regards to Budget Deficit/GDP, it is likely that within the next four years these four countries are likely to converge. This is based on the adjustment coefficient from cointegrating equation which tells the speed of adjustment of the criteria.

However, for the Inflation Rate criterion, the countries are likely to meet it within a year. This is based on the adjustment coefficient and going by the present trend, these countries are likely to meet this criterion within the next two years.

For the Budget Deficit/Tax Revenue criterion, the countries have high probabilities of meeting this criterion to achieve the convergence in the next one year.

The speed of adjustment for this criterion shows that going by the present situation, within a year these cointegrating countries are likely to converge.

For Tax Revenue/GDP criterion, it may however take these countries about eight years base on the prevailing situations to all converge.

Based on the current situations, it will take the converging countries about three years to meet the Wage Bills/Tax Revenue criterion. However, it is inclusive to state how long it may likely take them to converge based on the prevailing situation. The likely period for the convergence of the Real Interest Rate criterion is likely to be a year.

CHAPTER FIVE
SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Summary

The study investigated the possibility of the West African Monetary Zone (WAMZ) countries forming a monetary union based on the behavior of the convergence criteria. Specifically, the study focused on all the convergence criteria i.e. Budget Deficit/GDP (BD/GDP), Inflation Rate (Inf.), Budget Deficit Financing by the Central Bank/Tax Revenue (BDF/TR), Gross External Reserves (GER), non-accumulation of Internal Arrears (IAA), Tax Revenue/GDP (TR/GDP), Wage Bill/Tax Revenue Ratio (WB/TR), Public Investment/Tax Revenue Ratio (PI/TR), Real Interest Rate (RIR), and Real Exchange Rate Stability (RER). Stationarity tests using both Augmented Dickey-Fuller (ADF) and Phillip-Peron (PP) tests at 5% level were conducted on all the series before cointegration to identify the cointegrating countries based on the criteria.

Also, the study went further to conduct lag-length structure test for all the series that integrated of the same order so as to determine the lag-length structure. Finally, the cointegration tests were conducted to determine the long-run relationship among the variables to achieve the study objective.

5.2 Outline of Key Findings

a) The study found out that base on the first criterion of BD/GDP, at most four countries would meet this criterion and within a year.

b) It also found out that while at most three countries would meet the inflation rate and gross external reserves criteria only two would meet the BDF/TR criterion and the period is likely to be within two years.

c) For TR/GDP and WB/TR, at most three countries are likely to meet these criteria for the period of eight and three years respectively.

d) The cointegration results also showed that based on the prevailing situation, the WAMZ countries' performance towards the achievement of a second monetary zone in the region is plausible.

e) It also showed that while some countries been meeting some of the criteria, some have not.

f) The countries are likely to meet up the set targets for the commencement of this project by 2015 based on this prevailing situation.

g) The countries have also been adhering to the set policies by the monitoring institutions rather than following independent policies.

5.3 Conclusion

In this study, we made an attempt to empirically investigate the possibility of the West African Monetary Zone (WAMZ) countries forming a monetary union by 2015 based on the behavior of the convergence criteria using cointegration technique. The outcome of this study suggested that the problem of continuous "take-off" date postponement was attributable to the non-strict adherence to the policies set by the monitoring institutions. However, the required number of countries of at least three out of five; that are conditionally expected to meet at least three primary and secondary criteria each before the taking off of the project may likely be achieved based on the prevailing situation.

5.4 Recommendations

Based on the findings of this study, the following recommendations were made;

- The monitoring institution (WAMI) should place high priority on both monetary and fiscal discipline by member countries. In this regard, the WAMZ countries must

coordinate fiscal policy with other policy areas, so as to maintain an environment of price and exchange rate stability, external account equilibrium and fiscal sustainability.

- Efforts should also be geared towards the attraction of investors in to these countries and allocation of substantial parts the countries' resources to investment so as to guarantee production capacity in subsequent years.
- On the fiscal policy side, direct measures should aim at streamlining the tax system and administration in order to make it more efficient.
- Measures should also be put in place to ensure the reduction of unnecessary expenditures especially on personnel costs.
- Additional measures should include broadening tax bases to make more improvements in the revenue administration and mobilisation.
- Most importantly, periodic checks and assessments of macroeconomic performances of these countries must be seriously ensured to avoid any hazardous experience.
- On the expenditure side, governments should prioritize and rationalize their expenditure towards growth enhancing and poverty reduction activities.
- Popular support should also be mobilized from all the segments of the member countries. Thus, the organized business community, academia, trade unions, NGOs and the mass media should be involved in the process to engender a sense of ownership.
- Lastly but not the least, provision can be made for those countries that meet-up the set criteria to go ahead and form the union, while others join subsequently as they meet-up.

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APPENDICES

APPENDIX I: UNIT-ROOT TEST RESULTS FOR GAMBIA

NON-STATIONARY BUDGET DEFICIT/GDP

ADF Test Statistic	-3.228686	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY BUDGET DEFICIT/GDP

ADF Test Statistic	-5.544118	1% Critical Value*	-4.4415
		5% Critical Value	-3.6330
		10% Critical Value	-3.2535

*MacKinnon critical values for rejection of hypothesis of a unit root.

PP Test Statistic	-5.426967	1% Critical Value*	-4.3942
		5% Critical Value	-3.6118
		10% Critical Value	-3.2418

*MacKinnon critical values for rejection of hypothesis of a unit root.

NON-STATIONARY INFLATION RATE

PP Test Statistic	-2.909820	1% Critical Value*	-4.3942
		5% Critical Value	-3.6118
		10% Critical Value	-3.2418

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY INFLATION RATE

I(0)

ADF Test Statistic	-6.499199	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

I(1)

PP Test Statistic	-8.489654	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

NON-STATIONARY BUDGET DEFICIT FINANCING/TAX REVENUE

ADF Test Statistic	-1.449234	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

PP Test Statistic	-2.998151	1% Critical Value*	-4.3942
		5% Critical Value	-3.6118
		10% Critical Value	-3.2418

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY BUDGET DEFICIT FINANCING/TAX REVENUE I(1)

ADF Test Statistic	-5.034034	1% Critical Value*	-4.4415
		5% Critical Value	-3.6330
		10% Critical Value	-3.2535

*MacKinnon critical values for rejection of hypothesis of a unit root.

PP Test Statistic	-9.364319	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

NON-STATIONARY GROSS EXTERNAL RESERVE

ADF Test Statistic	-3.596260	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY GROSS EXTERNAL RESERVE I(1)

ADF Test Statistic	-7.150146	1% Critical Value*	-4.4415
		5% Critical Value	-3.6330
		10% Critical Value	-3.2535

*MacKinnon critical values for rejection of hypothesis of a unit root.

I(0)

PP Test Statistic	-5.753628	1% Critical Value*	-4.3942
		5% Critical Value	-3.6118
		10% Critical Value	-3.2418

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY TAX REVENUE/GDP I(0)

ADF Test Statistic	-4.636567	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

PP Test Statistic	-3.965839	1% Critical Value*	-4.3942
		5% Critical Value	-3.6118
		10% Critical Value	-3.2418

*MacKinnon critical values for rejection of hypothesis of a unit root.

NON-STATIONARY WAGE BILL/TR

ADF Test Statistic	-2.616404	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

PP Test Statistic	-3.207481	1% Critical Value*	-4.3942
		5% Critical Value	-3.6118
		10% Critical Value	-3.2418

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY WAGE BILL/TR I(1)

ADF Test Statistic	-3.768597	1% Critical Value*	-4.4415
		5% Critical Value	-3.6330
		10% Critical Value	-3.2535

*MacKinnon critical values for rejection of hypothesis of a unit root.

PP Test Statistic	-5.825805	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

NON-STATIONARY PUBLIC INVESTMENT/TAX REVENUE

ADF Test Statistic	-2.471848	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

PP Test Statistic	-1.974653	1% Critical Value*	-4.3942
		5% Critical Value	-3.6118
		10% Critical Value	-3.2418

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY PUBLIC INVESTMENT/TAX REVENUE

ADF Test Statistic	-4.625066	1% Critical Value*	-4.4415
		5% Critical Value	-3.6330
		10% Critical Value	-3.2535

*MacKinnon critical values for rejection of hypothesis of a unit root.

PP Test Statistic	-4.200634	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

NON-STATIONARY REAL INTEREST RATE

ADF Test Statistic	-3.190821	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY REAL INTEREST RATE
I(1)

ADF Test Statistic	-5.735446	1% Critical Value*	-4.4415
		5% Critical Value	-3.6330
		10% Critical Value	-3.2535

*MacKinnon critical values for rejection of hypothesis of a unit root.

I(0)

PP Test Statistic	-4.018515	1% Critical Value*	-4.3942
		5% Critical Value	-3.6118
		10% Critical Value	-3.2418

*MacKinnon critical values for rejection of hypothesis of a unit root.

NON-STATIONARY REAL EXCHANGE RATE

ADF Test Statistic	-2.280829	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

PP Test Statistic	-3.152447	1% Critical Value*	-4.3942
		5% Critical Value	-3.6118
		10% Critical Value	-3.2418

STATIONARY REAL EXCHANGE RATE

ADF Test Statistic	-4.592940	1% Critical Value*	-4.4415
		5% Critical Value	-3.6330
		10% Critical Value	-3.2535

*MacKinnon critical values for rejection of hypothesis of a unit root.

PP Test Statistic	-6.752398	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

APPENDIX II: UNIT-ROOT TEST RESULTS FOR GHANA

NON-STATIONARY BUDGET DEFICIT/GDP

ADF Test Statistic	-1.173357	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

PP Test Statistic	-1.730802	1% Critical Value*	-4.3942
		5% Critical Value	-3.6118
		10% Critical Value	-3.2418

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY BUDGET DEFICIT/GDP

ADF Test Statistic	-2.192435	1% Critical Value*	-2.6756
		5% Critical Value	-1.9574
		10% Critical Value	-1.6238

*MacKinnon critical values for rejection of hypothesis of a unit root.

PP Test Statistic	-5.700759	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

NON-STATIONARY INFLATION RATE

ADF Test Statistic	-3.420568	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY INFLATION RATE

ADF Test Statistic	-4.391457	1% Critical Value*	-4.4415
		5% Critical Value	-3.6330
		10% Critical Value	-3.2535

*MacKinnon critical values for rejection of hypothesis of a unit root.

PP Test Statistic	-3.524789	1% Critical Value*	-3.7343
		5% Critical Value	-2.9907
		10% Critical Value	-2.6348

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY BUDGET DEFICIT FINANCING/TAX REVENUE I(0)

ADF Test Statistic	-4.139415	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

PP Test Statistic	-7.421864	1% Critical Value*	-4.3942
		5% Critical Value	-3.6118
		10% Critical Value	-3.2418

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY GROWTH RATE OF EXTERNAL RESERVE I(0)

ADF Test Statistic	-5.423239	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

PP Test Statistic	-4.709154	1% Critical Value*	-4.3942
		5% Critical Value	-3.6118
		10% Critical Value	-3.2418

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY INTERNAL ARREARS I(0)

ADF Test Statistic	-5.672596	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

PP Test Statistic	-5.672592	1% Critical Value*	-4.3942
		5% Critical Value	-3.6118
		10% Critical Value	-3.2418

*MacKinnon critical values for rejection of hypothesis of a unit root.

NON-STATIONARY TAX REVENUE/GDP

ADF Test Statistic	-2.394666	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

PP Test Statistic	-3.170333	1% Critical Value*	-4.3942
		5% Critical Value	-3.6118
		10% Critical Value	-3.2418

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY TAX REVENUE/GDP I(1)

ADF Test Statistic	-3.906716	1% Critical Value*	-4.4415
		5% Critical Value	-3.6330
		10% Critical Value	-3.2535

*MacKinnon critical values for rejection of hypothesis of a unit root.

PP Test Statistic	-6.751617	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

NON-STATIONARY WAGE BILL/TAX REVENUE

ADF Test Statistic	-0.393932	1% Critical Value*	-3.7497
		5% Critical Value	-2.9969
		10% Critical Value	-2.6381

*MacKinnon critical values for rejection of hypothesis of a unit root.

PP Test Statistic	-2.045812	1% Critical Value*	-4.3942
		5% Critical Value	-3.6118
		10% Critical Value	-3.2418

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY WAGE BILL/TAX REVENUE I(1)

ADF Test Statistic	-4.090496	1% Critical Value*	-4.4415
		5% Critical Value	-3.6330
		10% Critical Value	-3.2535

*MacKinnon critical values for rejection of hypothesis of a unit root.

PP Test Statistic	-4.701628	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

NON-STATIONARY PUBLIC INVESTMENT/TAX REVENUE

ADF Test Statistic	-2.027390	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

PP Test Statistic	-2.977044	1% Critical Value*	-4.3942
		5% Critical Value	-3.6118
		10% Critical Value	-3.2418

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY PUBLIC INVESTMENT/TAX REVENUE I(1)

ADF Test Statistic	-3.270508	1% Critical Value*	-2.6756
		5% Critical Value	-1.9574
		10% Critical Value	-1.6238

*MacKinnon critical values for rejection of hypothesis of a unit root.

PP Test Statistic	-4.740520	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY REAL INTEREST RATE I(0)

ADF Test Statistic	-4.690606	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

	-4.676719	1% Critical Value*	-4.3942
PP Test Statistic			
		5% Critical Value	-3.6118
		10% Critical Value	-3.2418

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY REAL EXCHANGE RATE I(0)

ADF Test Statistic	-4.338731	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

PP Test Statistic	-5.613032	1% Critical Value*	-4.3942
		5% Critical Value	-3.6118
		10% Critical Value	-3.2418

*MacKinnon critical values for rejection of hypothesis of a unit root.

APPENDIX III: UNIT-ROOT TEST RESULTS FOR GUINEA

NON-STATIONARY BUDGET DEFICIT/GDP

ADF Test Statistic	-2.222814	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

PP Test Statistic	-2.938533	1% Critical Value*	-4.3942
		5% Critical Value	-3.6118
		10% Critical Value	-3.2418

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY BUDGET DEFICIT/GDP I(1)

ADF Test Statistic	-4.180183	1% Critical Value*	-4.4415
		5% Critical Value	-3.6330
		10% Critical Value	-3.2535

*MacKinnon critical values for rejection of hypothesis of a unit root.

PP Test Statistic	-6.600406	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

NON-STATIONARY INFLATION RATE

ADF Test Statistic	-1.748817	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

PP Test Statistic	-1.988320	1% Critical Value*	-4.3942
		5% Critical Value	-3.6118
		10% Critical Value	-3.2418

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY INFLATION RATE I(1)

ADF Test Statistic	-3.061793	1% Critical Value*	-2.6756
		5% Critical Value	-1.9574
		10% Critical Value	-1.6238

*MacKinnon critical values for rejection of hypothesis of a unit root.

PP Test Statistic	-4.708905	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

NON-STATIONARY BUDGET DEFICIT /TAX REVENUE

ADF Test Statistic	-3.498979	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY BUDGET DEFICIT /TAX REVENUE I(1)

ADF Test Statistic	-7.299235	1% Critical Value*	-4.4415
		5% Critical Value	-3.6330
		10% Critical Value	-3.2535

*MacKinnon critical values for rejection of hypothesis of a unit root.

NON-STATIONARY GROSS EXTERNAL RESERVE

ADF Test Statistic	-2.141402	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY GROSS EXTERNAL RESERVE I(1)

ADF Test Statistic	-3.745419	1% Critical Value*	-4.4415
		5% Critical Value	-3.6330
		10% Critical Value	-3.2535

*MacKinnon critical values for rejection of hypothesis of a unit root.

NON-STATIONARY INTERNAL ARREARS

ADF Test Statistic	-3.003166	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY INTERNAL ARREARS

ADF Test Statistic	-4.185432	1% Critical Value*	-4.4415
		5% Critical Value	-3.6330
		10% Critical Value	-3.2535

*MacKinnon critical values for rejection of hypothesis of a unit root.

NON-STATIONARY TAX REVENUE/GDP

ADF Test Statistic	-2.461294	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY TAX REVENUE/GDP I(1)

ADF Test Statistic	-3.941812	1% Critical Value*	-4.4415
		5% Critical Value	-3.6330
		10% Critical Value	-3.2535

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY WAGE BILL/TR I(0)

ADF Test Statistic	-3.709154	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

NON-STATIONARY PUBLIC INVESTMENT/TAX REVENUE

ADF Test Statistic	-3.276376	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY PUBLIC INVESTMENT/TAX REVENUE I(1)

ADF Test Statistic	-3.713275	1% Critical Value*	-4.4415
		5% Critical Value	-3.6330
		10% Critical Value	-3.2535

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY REAL INTEREST RATE I(0)

ADF Test Statistic	-2.377189	1% Critical Value*	-2.6700
		5% Critical Value	-1.9566
		10% Critical Value	-1.6235

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY REAL EXCHANGE RATE I(0)

ADF Test Statistic	-6.228754	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

APPENDIX IV: UNIT-ROOT TEST RESULTS FOR NIGERIA

NON-STATIONARY BUDGET DEFICIT/GDP

ADF Test Statistic	-1.894418	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY BUDGET DEFICIT/GDP I(1)

ADF Test Statistic	-3.648188	1% Critical Value*	-4.4415
		5% Critical Value	-3.6330
		10% Critical Value	-3.2535

*MacKinnon critical values for rejection of hypothesis of a unit root.

NON-STATIONARY INFLATION RATE

ADF Test Statistic	-2.976091	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY INFLATION RATE I(1)

ADF Test Statistic	-3.967996	1% Critical Value*	-4.4415
		5% Critical Value	-3.6330
		10% Critical Value	-3.2535

*MacKinnon critical values for rejection of hypothesis of a unit root.

NON-STATIONARY BUDGET DEFICIT/GDP

ADF Test Statistic	-2.422580	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY BUDGET DEFICIT/GDP I(1)

ADF Test Statistic	-4.800603	1% Critical Value*	-4.4415
		5% Critical Value	-3.6330
		10% Critical Value	-3.2535

*MacKinnon critical values for rejection of hypothesis of a unit root.

NON-STATIONARY GROSS EXTERNAL RESERVE

ADF Test Statistic	-2.159588	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY GROSS EXTERNAL RESERVE I(1)

ADF Test Statistic	-3.849190	1% Critical Value*	-4.4415
		5% Critical Value	-3.6330
		10% Critical Value	-3.2535

*MacKinnon critical values for rejection of hypothesis of a unit root.

NON-STATIONARY TAX REVENUE/GDP

ADF Test Statistic	-3.400255	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY TAX REVENUE/GDP

ADF Test Statistic	-4.464912	1% Critical Value*	-4.4415
		5% Critical Value	-3.6330
		10% Critical Value	-3.2535

*MacKinnon critical values for rejection of hypothesis of a unit root.

NON-STATIONARY WAGE BILL/TAX REVENUE

ADF Test Statistic	-2.929549	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY WAGE BILL/TAX REVENUE I(1)

ADF Test Statistic	-3.5357	1% Critical Value*	-3.4691
		5% Critical Value	-2.6454
		10% Critical Value	-2.2602

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY PUBLIC INVESTMENT/TAX REVENUE

ADF Test Statistic	-3.826682	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY REAL INTEREST RATE I(0)

ADF Test Statistic	-3.854819	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY REAL EXCHANGE RATE I(0)

ADF Test Statistic	-3.776352	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

APPENDIX V: UNIT-ROOT TEST RESULTS FOR SIERRA LEONE

NON-STATIONARY BUDGET DEFIT/GDP

ADF Test Statistic	-3.162299	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY BUDGET DEFIT/GDP I(1)

ADF Test Statistic	-5.727539	1% Critical Value*	-4.4415
		5% Critical Value	-3.6330
		10% Critical Value	-3.2535

*MacKinnon critical values for rejection of hypothesis of a unit root.

NON-STATIONARY INFLATION RATE

ADF Test Statistic	-2.797265	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY INFLATION RATE

ADF Test Statistic	-3.517382	1% Critical Value*	-3.7667
		5% Critical Value	-3.0038
		10% Critical Value	-2.6417

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY BUDGET DEFICIT FINANCING/TR I(0)

ADF Test Statistic	-4.211178	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

NON-STATIONARY GROSS EXTERNAL RESERVE

ADF Test Statistic	-2.081708	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY GROSS EXTERNAL RESERVE I(1)

ADF Test Statistic	-4.360230	1% Critical Value*	-4.4415
		5% Critical Value	-3.6330
		10% Critical Value	-3.2535

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY TAX REVENUE/GDP I(0)

ADF Test Statistic	-4.897814	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

NON-STATIONARY WAGE BILL/TR

ADF Test Statistic	-2.951208	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY WAGE BILL/TR I(1)

ADF Test Statistic	-3.950069	1% Critical Value*	-4.4415
		5% Critical Value	-3.6330
		10% Critical Value	-3.2535

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY PUBLIC INVESTMENT/TR I(0)

ADF Test Statistic	-3.980169	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

NON-STATIONARY REAL INTEREST RATE

ADF Test Statistic	-2.528478	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY REAL INTEREST RATE I(1)

ADF Test Statistic	-3.527984	1% Critical Value*	-2.6756
		5% Critical Value	-1.9574
		10% Critical Value	-1.6238

*MacKinnon critical values for rejection of hypothesis of a unit root.

STATIONARY REAL EXCHANGE RATES I(0)

ADF Test Statistic	-5.389077	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*MacKinnon critical values for rejection of hypothesis of a unit root.

LAG LENGTH CRITERIA

APPENDIX VI: BUDGET DEFICIT/GDP FOR GAMBIA, GUINEA, NIGERIA AND SIERRA LEONE

VAR Lag Order Selection Criteria
Endogenous variables: BD_GDP_GH BD_GDP_GM BD_GDP_GU BD_GDP_NG BD_GDP_SL
Exogenous variables:
Date: 07/18/11 Time: 09:02
Sample: 1985 2009
Included observations: 22

Lag	LogL	LR	FPE	AIC	SC	HQ
1	-286.7084	NA	1451538.	28.33713	29.57695	28.62919
2	-252.3544	37.47707	852623.9	27.48677	29.96641	28.07090
3	-207.0729	28.81553	425262.4*	25.64299*	29.36245*	26.51918*

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

APPENDIX VII: INFLATION RATE FOR GHANA, GUINEA, NIGERIA AND SIERRA LEONE

VAR Lag Order Selection Criteria
Endogenous variables: INF_GH INF_GU INF_NG INF_SL
Exogenous variables:
Date: 07/18/11 Time: 08:12
Sample: 1985 2009
Included observations: 21

Lag	LogL	LR	FPE	AIC	SC	HQ
1	-330.4999	NA	2.57E+09	32.99999	33.79582	33.17270
2	-316.2207	17.67903	3.49E+09	33.16387	34.75553	33.50930
3	-303.9097	10.55229	7.89E+09	33.51521	35.90269	34.03335
4	-246.5810	27.29937*	5.57E+08*	29.57914*	32.76245*	30.27000*

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

APPENDIX VIII : BUGDET DEFICT FINANCING/TAX REVENUE FOR GAMBIA, GUINEA AND NIGERIA

VAR Lag Order Selection Criteria
Endogenous variables: BDF_TR_GM BDF_TR_GU BDF_TR_NG
Exogenous variables:
Date: 07/18/11 Time: 08:05
Sample: 1985 2009
Included observations: 20

Lag	LogL	LR	FPE	AIC	SC	HQ
1	-254.1855	NA	54393747	26.31855	26.76663	26.40602
2	-248.1277	8.480851	76765024	26.61277	27.50893	26.78771
3	-232.8044	16.85566	47441653	25.98044	27.32468	26.24285
4	-214.4113	14.71448	26334295*	25.04113	26.83345	25.39101
5	-199.4933	7.459023	31750705	24.44933*	26.68972*	24.88668*

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

APPENDIX IX: GROSS EXTERNAL RESERVE FOR GAMBIA, GUINEA, NIGERIA AND SIERRA LEONE

VAR Lag Order Selection Criteria
Endogenous variables: GER_GM GER_GU GER_NG GER_SL
Exogenous variables:
Date: 07/17/11 Time: 16:30
Sample: 1985 2009
Included observations: 23

Lag	LogL	LR	FPE	AIC	SC	HQ

1	-159.7113	NA	51.52286*	15.27925*	16.06916*	15.47791*
2	-145.9275	17.97894	69.51802	15.47195	17.05177	15.86927

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

APPENDIX X: TAX REVENUE/GDP FOR GHANA, GUINEA, NIGERIA AND SIERRA LEONE

VAR Lag Order Selection Criteria
Endogenous variables: TR_GDP_GH TR_GDP_GU TR_GDP_NG TR_GDP_SL
Exogenous variables:
Date: 07/17/11 Time: 16:53
Sample: 1985 2009
Included observations: 23

Lag	LogL	LR	FPE	AIC	SC	HQ
1	-200.0471	NA	1718.970*	18.78670	19.57661*	18.98536*
2	-183.2502	21.90898	1784.759	18.71741*	20.29723	19.11473

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

APPENDIX XI: WAGE BILL/TAX REVENUE FOR GAMBIA, GHANA, NIGERIA AND SIERRA LEONE

VAR Lag Order Selection Criteria
Endogenous variables: WB_TR_GH WB_TR_GM WB_TR_NG WB_TR_SL
Exogenous variables:
Date: 07/17/11 Time: 17:02
Sample: 1985 2009
Included observations: 23

Lag	LogL	LR	FPE	AIC	SC	HQ
1	-287.6693	NA	3501846.*	26.40602*	27.19593*	26.60468*
2	-275.4801	15.89894	5427712.	26.73740	28.31722	27.13472

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

APPENDIX XII: PUBLIC INVESTMENT/TAX REVENUE FOR GAMBIA, GHANA AND GUINEA

Date: 07/17/11 Time: 16:44
Sample(adjusted): 1987 2009
Included observations: 23 after adjusting endpoints
Trend assumption: Linear deterministic trend
Series: PI_TR_GH PI_TR_GM PI_TR_GU
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None	0.524431	26.51870	29.68	35.65
At most 1	0.249029	9.424116	15.41	20.04
At most 2	0.116051	2.837178	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Trace test indicates no cointegration at both 5% and 1% levels

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	5 Percent Critical Value	1 Percent Critical Value
None	0.524431	17.09458	20.97	25.52
At most 1	0.249029	6.586938	14.07	18.63
At most 2	0.116051	2.837178	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Max-eigenvalue test indicates no cointegration at both 5% and 1% levels

APPENDIX XIII: REAL INTEREST RATE FOR GAMBIA AND SIERRA LEONE

VAR Lag Order Selection Criteria
Endogenous variables: RIR_GM RIR_SL
Exogenous variables:
Date: 07/17/11 Time: 16:46
Sample: 1985 2009
Included observations: 22

Lag	LogL	LR	FPE	AIC	SC	HQ
1	-133.1570	NA	892.5423*	12.46882*	12.66719*	12.51555*
2	-131.2988	3.040827	1092.196	12.66352	13.06027	12.75698
3	-128.5897	3.940488	1253.189	12.78088	13.37599	12.92107

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

JOHANSEN COINTEGRATION TEST RESULTS

APPENDIX XIV: BUDGET DEFICIT/GDP FOR GAMBIA, GUINEA, NIGERIA AND SIERRA LEONE

Date: 07/18/11 Time: 09:05
Sample(adjusted): 1987 2009
Included observations: 23 after adjusting endpoints
Trend assumption: Linear deterministic trend
Series: BD_GDP_GH BD_GDP_GM BD_GDP_GU BD_GDP_NG BD_GDP_SL
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.813778	83.13835	68.52	76.07
At most 1	0.638953	44.47964	47.21	54.46
At most 2	0.360600	21.04842	29.68	35.65
At most 3	0.319270	10.76223	15.41	20.04
At most 4	0.079955	1.916663	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Trace test indicates 1 cointegrating equation(s) at both 5% and 1% levels

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	5 Percent Critical Value	1 Percent Critical Value
None *	0.813778	38.65871	33.46	38.77
At most 1	0.638953	23.43121	27.07	32.24
At most 2	0.360600	10.28619	20.97	25.52
At most 3	0.319270	8.845566	14.07	18.63
At most 4	0.079955	1.916663	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Max-eigenvalue test indicates 1 cointegrating equation(s) at the 5% level
Max-eigenvalue test indicates no cointegration at the 1% level

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

BD_GDP_GH	BD_GDP_GM	BD_GDP_GU	BD_GDP_NG	BD_GDP_SL
0.054247	0.433583	-0.547588	0.241073	0.089036
0.172187	0.203737	0.120257	0.155909	-0.500844
0.315898	-0.075665	0.254217	0.131555	-0.075436
-0.316497	-0.035088	0.091441	-0.170269	0.165955
-0.052483	0.126237	0.063854	-0.245699	0.099664

Unrestricted Adjustment Coefficients (alpha):

D(BD_GDP_GH)	-0.515200	-0.201392	-2.738520	1.952032	-0.629906

D(BD_GDP_GM)	-2.946275	-2.120652	-0.326408	-0.307400	-0.478065
D(BD_GDP_GU)	0.659532	-0.900648	-1.433771	-1.018675	-0.160594
D(BD_GDP_NG)	-0.968633	0.162172	-1.137324	-1.019058	0.265118
D(BD_GDP_SL)	-1.105356	1.736479	-1.247419	-1.105114	-0.492016

1 Cointegrating Equation(s): Log likelihood -291.5874

Normalized cointegrating coefficients (std.err. in parentheses)

BD_GDP_GH	BD_GDP_GM	BD_GDP_GU	BD_GDP_NG	BD_GDP_SL
1.000000	7.992763	-10.09435	4.443982	1.641314
	(1.09316)	(1.36775)	(0.68189)	(0.95851)

Adjustment coefficients (std.err. in parentheses)

D(BD_GDP_GH)	-0.027948
	(0.08340)
D(BD_GDP_GM)	-0.159827
	(0.04790)
D(BD_GDP_GU)	0.035778
	(0.04424)
D(BD_GDP_NG)	-0.052545
	(0.03830)
D(BD_GDP_SL)	-0.059962
	(0.05453)

APPENDIX XV: INFLATION RATE FOR GHANA, GUINEA, NIGERIA AND SIERRA LEONE

Date: 07/18/11 Time: 08:15
Sample(adjusted): 1989 2009
Included observations: 21 after adjusting endpoints
Trend assumption: Linear deterministic trend
Series: INF_GH INF_GU INF_NG INF_SL
Lags interval (in first differences): 1 to 3

Unrestricted Cointegration Rank Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.999855	263.3732	47.21	54.46
At most 1 **	0.934351	77.80564	29.68	35.65
At most 2 **	0.620010	20.61357	15.41	20.04
At most 3	0.013891	0.293755	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Trace test indicates 3 cointegrating equation(s) at both 5% and 1% levels

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	5 Percent Critical Value	1 Percent Critical Value

None **	0.999855	185.5676	27.07	32.24
At most 1 **	0.934351	57.19207	20.97	25.52
At most 2 **	0.620010	20.31981	14.07	18.63
At most 3	0.013891	0.293755	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Max-eigenvalue test indicates 3 cointegrating equation(s) at both 5% and 1% levels

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

INF_GH	INF_GU	INF_NG	INF_SL
0.268786	0.222801	-0.075306	-0.050355
-0.186001	-0.102030	-0.049797	0.059592
-0.115753	0.009164	0.028672	0.075011
0.185636	-0.066873	-0.078741	0.038016

Unrestricted Adjustment Coefficients (alpha):

D(INF_GH)	-4.955384	-0.753536	0.161762	0.517082
D(INF_GU)	-2.526444	-0.577462	-4.116076	-0.023743
D(INF_NG)	4.325234	8.963153	4.388147	0.199325
D(INF_SL)	4.676439	-10.00450	-7.011739	0.704491

1 Cointegrating Equation(s): Log likelihood -200.2802

Normalized cointegrating coefficients (std.err. in parentheses)

INF_GH	INF_GU	INF_NG	INF_SL
1.000000	0.828918	-0.280170	-0.187343
	(0.00326)	(0.00168)	(0.00158)

Adjustment coefficients (std.err. in parentheses)

D(INF_GH)	-1.331935
	(0.45321)
D(INF_GU)	-0.679071
	(0.53491)
D(INF_NG)	1.162560
	(1.11243)
D(INF_SL)	1.256959
	(1.51419)

APPENDIX XVI: BUGDET DEFICT FINANCING/TAX REVENUE FOR GAMBIA, GUINEA AND NIGERIA

Date: 07/18/11 Time: 08:08
Sample(adjusted): 1990 2009
Included observations: 20 after adjusting endpoints
Trend assumption: Linear deterministic trend
Series: BDF_TR_GM BDF_TR_GU BDF_TR_NG
Lags interval (in first differences): 1 to 4

Unrestricted Cointegration Rank Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.807302	48.55824	29.68	35.65
At most 1 *	0.511931	15.62562	15.41	20.04
At most 2	0.061978	1.279647	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Trace test indicates 2 cointegrating equation(s) at the 5% level
Trace test indicates 1 cointegrating equation(s) at the 1% level

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.807302	32.93263	20.97	25.52
At most 1 *	0.511931	14.34597	14.07	18.63
At most 2	0.061978	1.279647	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Max-eigenvalue test indicates 2 cointegrating equation(s) at the 5% level
Max-eigenvalue test indicates 1 cointegrating equation(s) at the 1% level

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

BDF_TR_GM	BDF_TR_GU	BDF_TR_NG
-0.105010	-0.077127	0.368958
-0.097954	-0.015487	-0.289639
0.044677	-0.155139	0.113461

Unrestricted Adjustment Coefficients (alpha):

D(BDF_TR_GM)	6.655994	6.011865	1.178395
D(BDF_TR_GU)	-5.394008	6.242444	1.056849
D(BDF_TR_NG)	-1.087904	1.070241	-1.348902

1 Cointegrating Equation(s): Log likelihood -199.8689

Normalized cointegrating coefficients (std.err. in parentheses)

BDF_TR_GM	BDF_TR_GU	BDF_TR_NG
1.000000	0.734471	-3.513566
	(0.32864)	(0.91418)

Adjustment coefficients (std.err. in parentheses)

D(BDF_TR_GM)	-0.698943
	(0.43631)
D(BDF_TR_GU)	0.566423
	(0.43102)
D(BDF_TR_NG)	0.114240
	(0.24204)

APPENDIX XVII: GROSS EXTERNAL RESERVE FOR GAMBIA, GUINEA, NIGERIA AND SIERRA LEONE

Date: 07/17/11 Time: 16:32
Sample(adjusted): 1988 2009
Included observations: 22 after adjusting endpoints
Trend assumption: Linear deterministic trend
Series: GER_GM GER_GU GER_NG GER_SL
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.802783	57.85637	47.21	54.46
At most 1	0.437482	22.14049	29.68	35.65
At most 2	0.350160	9.483198	15.41	20.04
At most 3	2.49E-05	0.000548	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Trace test indicates 1 cointegrating equation(s) at both 5% and 1% levels

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.802783	35.71588	27.07	32.24
At most 1	0.437482	12.65729	20.97	25.52
At most 2	0.350160	9.482651	14.07	18.63
At most 3	2.49E-05	0.000548	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Max-eigenvalue test indicates 1 cointegrating equation(s) at both 5% and 1% levels

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

GER_GM	GER_GU	GER_NG	GER_SL

-1.150202	-0.832525	-0.103546	0.466395
-0.560066	0.474842	0.291390	-0.870884
1.177310	-0.348262	-0.030584	-0.174445
0.164556	-0.006374	-0.248630	-0.291361

Unrestricted Adjustment Coefficients (alpha):

D(GER_GM)	0.960780	0.331907	-0.044202	-8.15E-05
D(GER_GU)	0.679495	0.113305	0.317805	0.002356
D(GER_NG)	-0.076097	-1.220633	0.581522	-0.006770
D(GER_SL)	0.343494	0.379069	0.485936	-0.000791

1 Cointegrating Equation(s): Log likelihood -118.7340

Normalized cointegrating coefficients (std.err. in parentheses)

GER_GM	GER_GU	GER_NG	GER_SL
1.000000	0.723808	0.090024	-0.405490
	(0.12527)	(0.04875)	(0.12816)

Adjustment coefficients (std.err. in parentheses)

D(GER_GM)	-1.105091
	(0.23110)
D(GER_GU)	-0.781556
	(0.26857)
D(GER_NG)	0.087527
	(0.82769)
D(GER_SL)	-0.395088
	(0.34136)

APPENDIX XVIII: TAX REVENUE/GDP FOR GHANA, GUINEA, NIGERIA AND SIERRA LEONE

Date: 07/17/11 Time: 16:54
Sample(adjusted): 1988 2009
Included observations: 22 after adjusting endpoints
Trend assumption: Linear deterministic trend
Series: TR_GDP_GH TR_GDP_GU TR_GDP_NG TR_GDP_SL
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.905054	95.39031	47.21	54.46
At most 1 **	0.705601	43.59236	29.68	35.65
At most 2 *	0.521742	16.69030	15.41	20.04
At most 3	0.020825	0.462997	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level

Trace test indicates 3 cointegrating equation(s) at the 5% level
Trace test indicates 2 cointegrating equation(s) at the 1% level

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.905054	51.79795	27.07	32.24
At most 1 **	0.705601	26.90206	20.97	25.52
At most 2 *	0.521742	16.22731	14.07	18.63
At most 3	0.020825	0.462997	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Max-eigenvalue test indicates 3 cointegrating equation(s) at the 5% level
Max-eigenvalue test indicates 2 cointegrating equation(s) at the 1% level

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

TR_GDP_GH	TR_GDP_GU	TR_GDP_NG	TR_GDP_SL
-0.046199	-0.541587	0.144106	-0.230244
-0.041660	-0.110320	-0.052857	0.782825
0.479603	-0.651443	-0.954370	0.902198
0.235110	0.060541	0.039741	0.741618

Unrestricted Adjustment Coefficients (alpha):

D(TR_GDP_GH)	1.610122	0.161655	0.240730	-0.034527
D(TR_GDP_GU)	1.634043	-0.757099	-0.232128	0.189980
D(TR_GDP_NG)	-0.068746	0.186869	1.711247	0.058810
D(TR_GDP_SL)	-0.008082	-0.757912	0.074795	-0.029598

1 Cointegrating Equation(s): Log likelihood -141.9960

Normalized cointegrating coefficients (std.err. in parentheses)

TR_GDP_GH	TR_GDP_GU	TR_GDP_NG	TR_GDP_SL
1.000000	11.72292	-3.119258	4.983741
	(1.40808)	(0.96390)	(1.86145)

Adjustment coefficients (std.err. in parentheses)

D(TR_GDP_GH)	-0.074386
	(0.00921)
D(TR_GDP_GU)	-0.075491
	(0.02282)
D(TR_GDP_NG)	0.003176
	(0.03220)
D(TR_GDP_SL)	0.000373
	(0.01242)

APPENDIX XIX: WAGE BILL/TAX REVENUE FOR GAMBIA, GHANA, NIGERIA AND SIERRA LEONE

Date: 07/17/11 Time: 17:04
Sample(adjusted): 1988 2009
Included observations: 22 after adjusting endpoints
Trend assumption: Linear deterministic trend
Series: WB_TR_GH WB_TR_GM WB_TR_NG WB_TR_SL
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None *	0.613228	48.57400	47.21	54.46
At most 1	0.530232	27.67577	29.68	35.65
At most 2	0.392608	11.05439	15.41	20.04
At most 3	0.003883	0.085594	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Trace test indicates 1 cointegrating equation(s) at the 5% level
Trace test indicates no cointegration at the 1% level

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	5 Percent Critical Value	1 Percent Critical Value
None	0.613228	20.89823	27.07	32.24
At most 1	0.530232	16.62138	20.97	25.52
At most 2	0.392608	10.96879	14.07	18.63
At most 3	0.003883	0.085594	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Max-eigenvalue test indicates no cointegration at both 5% and 1% levels

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

WB_TR_GH	WB_TR_GM	WB_TR_NG	WB_TR_SL
-0.144337	-0.419863	0.563842	0.128646
-0.038770	0.295499	0.017379	-0.110499
-0.046524	0.191425	-0.123098	0.053491
-0.201116	-0.096544	0.210092	0.087022

Unrestricted Adjustment Coefficients (alpha):

D(WB_TR_GH)	0.903545	0.221726	0.980017	-0.234138
D(WB_TR_GM)	1.371507	-3.107966	-1.327772	-0.213048
D(WB_TR_NG)	-1.291442	-2.203808	0.758091	-0.230210
D(WB_TR_SL)	-1.425700	2.777906	-4.020440	-0.215902

1 Cointegrating Equation(s): Log likelihood -258.1613

Normalized cointegrating coefficients (std.err. in parentheses)

WB_TR_GH	WB_TR_GM	WB_TR_NG	WB_TR_SL
1.000000	2.908919	-3.906440	-0.891295
	(0.80173)	(0.63733)	(0.23076)

Adjustment coefficients (std.err. in parentheses)

D(WB_TR_GH)	-0.130414
	(0.17266)
D(WB_TR_GM)	-0.197959
	(0.24855)
D(WB_TR_NG)	0.186402
	(0.20968)
D(WB_TR_SL)	0.205781
	(0.34613)

APPENDIX XX: PUBLIC INVESTMENT/TAX REVENUE FOR GAMBIA, GHANA AND GUINEA

Date: 07/17/11 Time: 16:44
Sample(adjusted): 1987 2009
Included observations: 23 after adjusting endpoints
Trend assumption: Linear deterministic trend
Series: PI_TR_GH PI_TR_GM PI_TR_GU
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None	0.524431	26.51870	29.68	35.65
At most 1	0.249029	9.424116	15.41	20.04
At most 2	0.116051	2.837178	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Trace test indicates no cointegration at both 5% and 1% levels

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	5 Percent Critical Value	1 Percent Critical Value
None	0.524431	17.09458	20.97	25.52
At most 1	0.249029	6.586938	14.07	18.63
At most 2	0.116051	2.837178	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Max-eigenvalue test indicates no cointegration at both 5% and 1% levels

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

PI_TR_GH	PI_TR_GM	PI_TR_GU
-0.015594	0.132591	0.235308
0.010037	0.168111	-0.136883
-0.217972	0.002544	-0.086791

Unrestricted Adjustment Coefficients (alpha):

D(PI_TR_GH)	-0.180810	-1.809403	1.229617
D(PI_TR_GM)	-1.571765	-1.803547	-0.585609
D(PI_TR_GU)	-4.608676	1.817699	-0.520372

1 Cointegrating Equation(s): Log likelihood -203.3666

Normalized cointegrating coefficients (std.err. in parentheses)

PI_TR_GH	PI_TR_GM	PI_TR_GU
1.000000	-8.502931	-15.09013
	(3.08145)	(4.01015)

Adjustment coefficients (std.err. in parentheses)

D(PI_TR_GH)	0.002819
	(0.01881)
D(PI_TR_GM)	0.024509
	(0.01570)
D(PI_TR_GU)	0.071865
	(0.02170)

APPENDIX XXI: REAL INTEREST RATE FOR GAMBIA AND SIERRA LEONE

Date: 07/17/11 Time: 16:49
Sample(adjusted): 1988 2009
Included observations: 22 after adjusting endpoints
Trend assumption: Linear deterministic trend
Series: RIR_GM RIR_SL
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None *	0.402172	16.20258	15.41	20.04
At most 1 *	0.199108	4.884629	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Trace test indicates 2 cointegrating equation(s) at the 5% level
Trace test indicates no cointegration at the 1% level

Hypothesized	Max-Eigen	5 Percent	1 Percent

No. of CE(s)	Eigenvalue	Statistic	Critical Value	Critical Value
None	0.402172	11.31795	14.07	18.63
At most 1 *	0.199108	4.884629	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Max-eigenvalue test indicates no cointegration at both 5% and 1% levels

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

RIR_GM	RIR_SL
0.238841	0.254113
0.308050	-0.109556

Unrestricted Adjustment Coefficients (alpha):

D(RIR_GM)	-1.435782	-1.514762
D(RIR_SL)	-3.958547	0.431658

1 Cointegrating Equation(s): Log likelihood -126.1158

Normalized cointegrating coefficients (std.err. in parentheses)

RIR_GM	RIR_SL
1.000000	1.063945
	(0.34196)

Adjustment coefficients (std.err. in parentheses)

D(RIR_GM)	-0.342923
	(0.22806)
D(RIR_SL)	-0.945462
	(0.29391)