

UNIVERSITY OF EDUCATION, WINNEBA

**MACROECONOMIC CONVERGENCE COMPLIANCE AND ECONOMIC
GROWTH IN WEST AFRICA**



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UNIVERSITY OF EDUCATION, WINNEBA

**MACROECONOMIC CONVERGENCE COMPLIANCE AND ECONOMIC
GROWTH IN WEST AFRICA**

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**A Thesis in the Department of Applied Finance and Policy Management,
In School of Business, submitted to the School of
Graduate Studies in partial fulfillment
of the requirements for the award of degree of
Master of Philosophy
(Finance)**

in the University of Education, Winneba.

NOVEMBER. 2023

DECLARATION

Student's Declaration

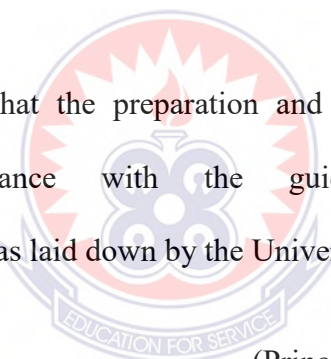
I, **VIVIAN JACKSON**, declare that this thesis, except quotations and references contained in published works which have all been identified and duly acknowledged, is entirely my original work, and it has not been submitted, either in part or whole, for another degree elsewhere.

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Supervisor's Declaration

I / We hereby declare that the preparation and presentation of this work were supervised in accordance with the guidelines for supervision of thesis/dissertation/project as laid down by the University of Education, Winneba.



..... (Principal Supervisor)

Signature :.....

Date :.....

..... (Co-Supervisor)

Signature :.....

Date :.....

DEDICATION

To my lovely husband Stephen Kobby Koomson



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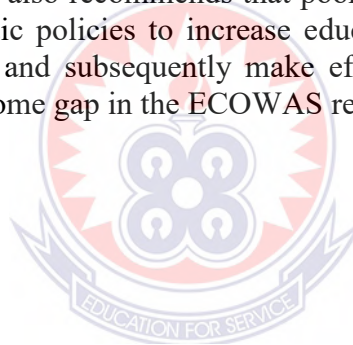
LIST OF ABBREVIATION

AfCFTA	African Continental Free Trade Agreement
BCEAO	Central Bank of West African States
COMESA	Common Market for Southern
EMCP	ECOWAS Monetary Cooperation Programme
ECA	Economic Commission of Africa
EAC	Eastern Africa East African Community
EU	European Union
FTA	Free Trade Areas
MENA	Middle East and North Africa
REC	Regional Economic Community
SADC	Southern African Development Community
WAMA	West African Monetary Agency
WAMI	West African Monetary Institute



ABSTRACT

Global interest in the creation of an economic and monetary union to support economic growth and development has recently been revived due to the successful establishment of the Euro as the European Union's single currency. The objective of this study was to analyse the effect of macroeconomic convergence compliance on growth by the development of a macroeconomic convergence compliance index for ECOWAS. The study also sought to test the per capita income convergence or divergence in ECOWAS and its sub-zones, WAEMU and WAMZ. Using a panel dataset from 2005 to 2022 on 15 ECOWAS member states, the study examined the conditional convergence hypothesis and the effect of macroeconomic convergence compliance on growth using the Generalised Method of Moments (GMM), a dynamic panel estimation technique. The study established that there was per capita income divergence among the countries in the ECOWAS region and also that compliance of member countries with macroeconomic convergence criteria has a positive and significant effect on economic growth in the ECOWAS and the WAMZ. The findings suggested that foreign direct investment, gross capital formation, and trade openness had positive and significant effects on economic growth. The study recommends that ECOWAS member countries especially the WAMZ countries establish policies that will facilitate convergence to form the monetary union and eventually the ECOWAS current union. The study also recommends that poorer countries in ECOWAS should urgently pursue pragmatic policies to increase education and gross physical capital formation accumulation and subsequently make efficient use of these resources to reduce the per capita income gap in the ECOWAS region.



CHAPTER ONE

INTRODUCTION

1.1 Overview

This study assessed macroeconomic convergence compliance and its effect on economic growth in ECOWAS with a comparative analysis of the sub-zones WAEMU and WAMZ. Chapter one is intended to provide a background to the study, research problem, the significance of the study, the purpose of the study, research questions. Also, the chapter details the scope of the study the study and finally the organisation of work.

1.2 Background to the Study

Global interest in the creation of an economic and monetary union to support economic growth and development has recently been revived due to the successful establishment of the Euro as the European Union's single currency (Saka et al., 2015; Ndiaye & Korsu, 2014). Following this, there are attempts by other regions to emulate the European Union by creating institutional frameworks and convergence processes comparable to those of the European Union as a prerequisite for a deeper monetary union (Saka et al., 2015). In international economic relations, monetary integration is significant because it helps to solve the issues of currency diversity and the unstable exchange rate system, which frequently impedes commerce between nations (Dramani, 2011; Saka et al., 2015).

The expected benefits of a monetary union include the promotion of trade, the creation of a larger market, and the widening of business- and trade-related income-earning opportunities for the citizenry to improve their standard of living (Adam et al., 2010). Also, the facilitation of unhindered movements of persons and labour in the

sub-region through the dismantling of barriers (Gnimassoun, 2019), thereby strengthening cultural, economic, social, and political cooperation (common central bank, judiciary, parliament, etc.) (Qureshi & Tsangarides, 2006; Ndiaye & Korsu, 2014). Furthermore, the creation of a more favourable environment for the collective pooling of resources for the development of essential regional infrastructure; enhancement of economic competitiveness; derivation of the economics of scale; and reduction in transaction costs (Ude, 2022; Saka et al., 2015)

Economic integration aims at the adoption of a common currency and then the opening of markets of the member countries of the group to the entire group and proceeds with the creation of a free-trade area, a customs union, a common market, and eventually an economic and monetary union (Ouedraogo & Drabo, 2019). Increasing the size of an economic market through economic integration would have positive effects on economic growth. The process of regional integration becomes an instrument of economic policy which results in improving the living conditions of the inhabitants in the region (Ouedraogo & Drabo, 2019; Lombaerde & Langenhove, 2005). The main channels through which integration motivates economic growth are the stimulation of trade through the removal of barriers and the attraction of foreign direct investment (Wiredu et al., 2020).

One of the regions where efforts have been made to launch a monetary union is West Africa (Economic and Monetary Integration in West Africa) (Ndiaye & Korsu, 2014). Before realising a monetary union, the practice has been that regions set macroeconomic convergence criteria that would guide the member states to realise the merger (Oloo et al., 2022). ECOWAS has also done the same, where thresholds have been set to guide macroeconomic policies for the member states (Ude, 2022).

The criteria adopted by the monetary committee are indeed the thresholds that member states have to attain before the formation of a monetary union and eventually a currency union (Ude, 2022). The focal point of interest was price stability, involving exchange rate stability, increasing the level of external reserves, setting fiscal constraints by limiting government debt and deficits, and encouraging coordination of economic policies amongst the member states (Abban, 2020). The only difference allowable in the criteria for different regions is the degree to which they allow member states to vary and adjust for economic shocks (WAMA, 2020; Oloo et al., 2022; Kuteesa, 2012).

The process of complying with and achieving these thresholds is expected to affect the economic performance of the member countries either positively or negatively; for example, governments are required to have low inflation, increase their savings-to-GDP ratio, reduce their budget deficit, and increase their foreign reserves (Abban, 2020; Oloo et al., 2022). These fundamental variables affect economies either upwards or downwards, depending on how they are implemented (Oloo et al., 2022).

ECOWAS member states attainment of these thresholds has been fraught with several challenges orchestrated by discrepancies in the member countries' institutional, social, and economic frameworks (Tweneboah et al., 2016). The West African Economic and Monetary Union (WAEMU) and the West African Monetary Zone (WAMZ) have different plans for the single currency in ECOWAS (Ntongho, 2022). This is partly because of the different levels of monetary sovereignty and history between French-speaking WAEMU member states, which currently use the CFA (Amato & Nubukpo, 2020), Franc (CFAF), and WAMZ states, each of which has their respective currencies (Amato & Nubukpo, 2020). In addition to the common goal of economic

development, the respective member states have individual goals for the single currency. For the eight WAEMU states, monetary independence is one of their objectives for a unified currency as they seek to break away from French domination. Conversely, Nigeria is pursuing an active role in driving forward development in the region and indeed in Africa, with the belief that through a single currency, it would have greater influence in the region (Nubukpo, 2020).

Notably, most of the ECOWAS members were operating way below the macroeconomic thresholds when they were being adopted (Tweneboah et al., 2016). Some member states have improved, but the most common tendency is unprecedented fluctuations, making it challenging to predict sustainability (Sakyi, 2013). Nonetheless, if they are achieved, the member states are likely to benefit immensely in terms of stability and, more importantly, improved economic growth (Premaratne et al., 2018).

An initial ten convergence criteria were set out to ensure all countries in the sub-region attained a level of macroeconomic outlook to reduce the risk associated with forming a currency union (Abban, 2020). However, the member states were incapacitated to attain the nominal convergence criteria and other achieved targets were inconsistent, which has led to the four-consecutive (2003, 2005, 2010, 2014) postponement of the launch of eco currency. (Ude, 2022; Sakyi, 2013).

Thus, recent research efforts have been directed at understanding the effects of regional integration agreements on regional economic growth. The underlying argument is that countries that are equal in all dimensions of government policies and technology will experience economic convergence, where differences in the real per capita incomes of the rich and poor within a Regional Economic Community (REC)

narrow significantly over the long run (Kabala and Mogotsi, 2012). Economic convergence is also expected to be observed between poor economies and developed economies globally (Tshireletso, 2017).

The existence of convergence across economies has received a lot of attention from different macroeconomists because it helps assess the validity of modern theories of economic growth. This also helps by providing information on whether the distribution of the world's income and output across countries is becoming increasingly equal over time (Barro and Sala-i-Martin, 1995). Moreover, components of the speed of convergence across countries are said to provide relevant information on key concepts of economic growth, which is the share of capital in the production function (Barro and Sala-i-Martin, 1992).

The ultimate goal of regional integration is economic growth and development. Empirical studies have shown inconclusive results concerning the impact of regional integration on the economic growth of member countries (Ijjo and Tumwebaze, 2015; Ogboabour, 2019; Premaratne et al., 2018; Park & Claveria, 2018). However, there is a consensus that regional integration is affecting economic growth through multiple channels (Premaratne et al., 2018; Rouis & Tabor, 2013; Kamau, 2011).

Despite various reforms implemented within the ECOWAS during the past decades, economic growth and the level of economic development in the sub-region are still quite lower than expected. Therefore, this study is important as it is aimed at isolating the obstacles to monetary union on the part of the WAMZ and WAEMU countries and offering suggestions for effective implementation of the convergence criteria.

1.3 Statement of the Problem

The goal of the West Africa regional integration led by ECOWAS is to enhance economic growth within the region. However, as noticed in Figure 1.1, the performance of the ECOWAS in terms of economic growth has been very disappointing during the past decades (IMF, 1989-2022). The diverse economic structures of member states and the insufficient political will to implement common policies continue to hinder progress towards macroeconomic convergence (Tweneboah et al., 2016).

Kamau (2011) also attributed this dismal performance to several factors, such as the inability of most African countries to secure access to larger markets, inherent high trade costs among neighbours, and insufficient an effective framework for regional cooperation and resource pooling.

Due to insufficient domestication of the macroeconomic convergence criteria and member states compliance with the criteria on a simultaneous or sustainable basis (Tweneboah & Eshun, 2023), the ECOWAS nations' goal of macroeconomic convergence and the prospects for establishing a single monetary zone appear to be in jeopardy. Also, several challenges, including commodity price shocks, the global financial crisis, the Ebola virus disease (EVD), the coronavirus disease pandemic, and a host of other domestic shocks, have hampered efforts by member states to attain the set thresholds (Abban, 2020).

The launch of the Eco has been postponed several times due to member states' inability to fulfill the set macroeconomic convergence criteria. The next target for the creation of a single currency is 2027 (Tweneboah & Eshun, 2023).

Despite the relative consensus on the importance of regional economic integration, there is still a gap on how to adequately measure how African countries are complying with the integration arrangement (macroeconomic convergence) criteria at a given point in time. Given the growing trend in economic integration arrangements across the world, the need to measure and assess a country's participation and efforts at complying with macroeconomic convergence in regional integration arrangements becomes crucial. The inherent problem in this case is that the member states of ECOWAS have been unable to achieve the desired threshold levels to achieve macroeconomic convergence.

Notwithstanding, considerable attempts have been made to study the convergence of macroeconomic variables in the region, but the evidence is far from conclusive. Some studies, such as Ude (2022); Tweneboah et al. (2016); Alagidede et al. (2012); Asongu (2014); Harvey & Cushing (2015); and Saka et al. (2015), have attempted to analyse convergence with different methodologies. Saka et al. (2015) examined the processes of the monetary union of ECOWAS by taking a critical look at the convergence criteria and the various conditions under which they are to be met. Ude (2022) investigated the issues of macroeconomic convergence in West Africa Monetary Zone (WAMZ) countries and the degree of compliance with both the primary and secondary convergence criteria laid down for WAMZ member countries. Ouedraogo and Drabo (2019) conducted a study to determine the effect of the dynamics of regional integration on economic growth in the West African Economic and Monetary Union (WAEMU).

The motivation for this study stems from the fact that ECOWAS could not introduce the Eco in 2020 even after the Macroeconomic Convergence and Stability Pact was

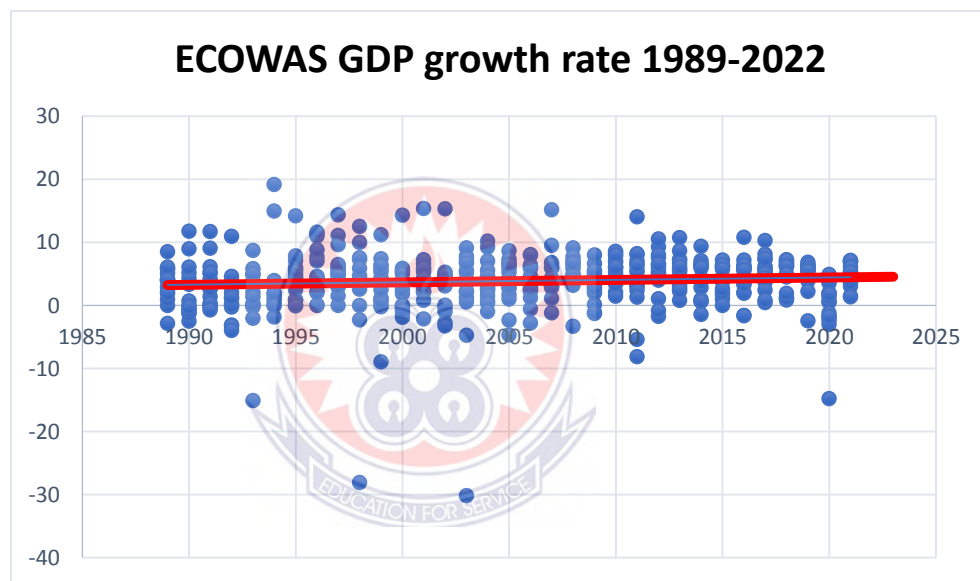
amended in December 2015 (WAMI, 2020). Even with the revision of the macroeconomic convergence criteria from ten to six, member countries failed to achieve the threshold required for the formation of the monetary union by 2020. This raises the question of the level of compliance of member states with the macroeconomic convergence criteria. Also, to the best of the researcher's knowledge, there is limited study has been conducted to measure the level of compliance by ECOWAS member countries with the macroeconomic convergence criteria. This study therefore sought to analyse the macroeconomic convergence compliance of member states through the development of an index based on the performance scores of member states on each of the criteria and how it affects economic growth.

This study follows the work of Egbuna et al. (2019), who computed an index from the performance score for each of the six indicators for the period 2015–2017 for the WAMZ economies. This study is, however, different as it expanded the period (2005–2022) and included the WAEMU zone. The study utilised a performance score index that would help in determining how member countries are progressing toward achieving economic integration. The index would facilitate assessing each member state's efforts at complying with the macroeconomic convergence criteria and measure the intensity and pace of compliance within WAMZ and WAEMU.

The study goes further to examine whether there is convergence or divergence in ECOWAS, similar to the work of Chapsa et al. (2015) concerning the Neoclassical growth models, which predict that countries in a regional trading bloc should converge. Finally, to assess the effect of the macroeconomic convergence compliance on growth, similar to the work where a dynamic panel model with Generalised Method of Moment (GMM) estimators was use. The use of a macroeconomic

convergence compliance index and analysis of its effect on economic growth in ECOWAS to the best of the researcher's knowledge is a new addition to the literature on macroeconomic convergence in ECOWAS. The outcome of this research is useful for investment and marketing policy formulation for the African Continental Free Trade Agreement (AfCFTA) for the integration of macroeconomic fundamentals and trade integration in Africa.

Figure 1.1: ECOWAS growth rate for the period 1989 to 2022



Source: IM database (1989-2022)

1.4 Purpose of the Study

The main purpose of this study was to assess the status of macroeconomic convergence in WAMZ and WAEMU member countries and specifically examine the extent to which macroeconomic convergence amongst member countries has promoted monetary union. Also, assess how economic growth in the ECOWAS reacts following the attainment of macroeconomic convergence in the WAEMU and WAMZ zones using yearly data from 2005 to 2022. Also, it contributes to the literature on

currency and money union in the ECOWAS, by assessing the preparedness or the extent of compliance to convergence of the macroeconomic variables to achieve the Eco by the new date in 2027 in the two zones after several postponements.

1.5 Objective of the Study

The specific objectives of the are:

1. Develop a macroeconomic convergence index for ECOWAS and use the index to analyse member states' compliance with macroeconomic convergence criteria.
2. Determine whether or not there is macroeconomic convergence within ECOWAS and between its subgroupings, WAEMU and WAMZ
3. Examine the effect of macroeconomic convergence compliance on economic growth in ECOWAS.

1.5 Research Questions

1. What is the level of macroeconomic convergence compliance within WAMZ and WAEMU?

1.6. Research Hypothesis

1. H0: There is no significant difference in the level of macroeconomic convergence in ECOWAS, WAEMU, and WAMZ
H1: There is a statistically significant difference in macroeconomic convergence between ECOWAS, WAEMU, and the WAMZ.
2. H0: Macroeconomic convergence has no significant positive effect on economic growth in ECOWAS member states.
H1: Macroeconomic convergence has a significant positive effect on economic growth in ECOWAS member states.

1.7 Significance of the Study

The present study holds significant public interest as it investigates the feasibility and challenges of establishing a monetary union within the West African Monetary Zone (WAMZ) and West African Economic and Monetary Union (WAEMU) zones. With the increasing focus on regional economic integration and the success of currency unions like the Euro, it is crucial to understand the impediments that hinder the formation of a common monetary union for the ECOWAS member countries.

Examining the behaviour of macroeconomic convergence criteria will provide valuable insights for policymakers, researchers, and stakeholders. Moreover, the study uncovers the leading and lagging roles played by different countries in shaping the overall macroeconomic dynamics, emphasising the need for coordinated efforts and cooperation among ECOWAS members by providing evidence on how to address the challenges and potential solutions for establishing a monetary union. This research has practical implications for policymakers seeking to enhance economic integration, stability, and financial cooperation within the two zones.

This study contributes to existing literature on regional economic integration in the ECOWAS region. The study is useful in assisting the respective countries through the relevant ministries to formulate policies geared towards the successful implementation of the EMPC protocol, thereby reaping the benefits of the monetary union.

This study is also useful in guiding ECOWAS countries in developing appropriate trade policies that will exploit the opportunities created by economic integration. By establishing the state of convergence, the study enables the respective member countries, through the ministries responsible for finance and planning as well as the

respective central banks, to develop policies towards enhanced productivity for macroeconomic stability and exchange rate stability. Lastly, the study is beneficial to academicians by providing insight into macroeconomic convergence in ECOWAS

1.8 Scope of the Study

Generally, this research seeks to find out the level of compliance of ECOWAS member countries with the macroeconomic convergence criteria, as well as if there is income convergence or divergence in the ECOWAS region and how the compliance level affects the growth in per capita income. It includes theoretical and empirical discussions of real income convergence. All fifteen (15) ECOWAS member countries were included over the period 2005–2022. However, in the analysis of the objectives, the ECOWAS region was split into the sub-zones WAMZ and WAEMU to take into account the heterogeneity in the region (Ntongho, 2022).

To estimate real convergence, there are two main measures of real convergence in the literature. The first is sigma (σ) convergence, and the second well-known measure of real convergence in the economic literature is beta (β) convergence. This study was limited to beta (β) convergence as a measure of real convergence for the fifteen (15) ECOWAS countries. This measure of convergence is based on the neoclassical growth model of Ramsey (1928), Solow (1956), and Koopmans (1966).

Beta-convergence is generally tested by regressing growth in per capita GDP on its initial level for a given cross-section of countries. Under beta convergence, there are two types of economic convergence: (i) conditional convergence, reflecting the tendency for differences in real per capita incomes across countries; and (ii) absolute convergence, where countries, independently of their initial conditions, tend to have their per capita incomes converging to one another (Barro and Sala-i-Martin, 1992).

The study employed the following variables: real GDP per capita, government expenditure as a percentage of GDP, gross fixed capital formation, trade openness, foreign direct investment, and human capital proxied by secondary school enrollment as control variables in the conditional convergence regressions.

1.9 Limitations of the Study

The analysis is based on the new set of convergence criteria adopted by the Authority of Heads of State and Government in May 2015, focusing on price stability, low budget deficits, restrictions on central bank budget deficit financing, and maintenance of adequate levels of gross external reserves (WAMA 2014) instead of the ten macroeconomic convergence criteria. In the measurement of economic growth, variables like domestic investment, the initial level of capital accumulation, FDI, and trade openness are considered. However, it can be extended with several social factors like democracy, control of corruption, and political stability.

1.10 Organisation of the Study

The study is organized in five chapters. The first chapter presents background information on the study. It also highlights the research problem, research questions, and objectives as well as the significance, scope, and organization of the study. Chapter two looks at the relevant theoretical and empirical literature while chapter three explains the research design and methodology to be used. It also presents the empirical models that were estimated and the data collection and estimation procedures that were used in the study. Chapter four provides the diagnostics and empirical findings together with the discussion. Chapter five presents the summary of the study, conclusion, policy implications, and areas of further research.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter is intended to provide an overview of the literature on the issue of macroeconomic convergence, macroeconomic convergence compliance and growth, and the pillars of macroeconomic convergence indicators as they relate objectives of the study. The chapter is divided into four sections: the first section presents the theoretical underpinnings, the second section presents the conceptual review, the third section presents the empirical framework, and finally the fourth section presents the conceptual framework.

2.2 Conceptual Review

The conceptual review discusses economic integration in ECOWAS, Regional Integration and Growth, macroeconomic convergence, currency union, and pillars of macroeconomic indicators.



2.2.1 Economic Integration in ECOWAS

The Economic Community of West African States (ECOWAS) was established as a Regional Economic Community (REC) per articles 3 and 51 to 55 on May 28, 1975, under the Treaty of Lagos as a free trade area (FTA) to achieve intra-regional commerce and economic integration. It was signed by 16 member countries, namely: Nigeria, Cote d'Ivoire, Ghana, Burkina Faso, Togo, Benin, Mali, Niger, Guinea-Bissau, Senegal, Guinea, Liberia, Sierra Leone, Gambia, and Cabo Verde, with Mauritania opting out in 2000. Article 27 of the Treaty asserts a long-term aim of establishing community citizenship for all members to remove obstacles to the free movement of people, capital, and goods. The initial plan of adopting a single currency

in the ECOWAS sub-region was, to begin with, the West Africa Monetary Zone (WAMZ) in the year 2000 and later emerging with the West Africa Economic and Monetary Union (WAEMU), which had the CFA XOF as a common currency for eight countries.

The vision of ECOWAS since it was founded in 1975 has been to create a single regional economic space with a single market and single currency that can accelerate socio-economic development and global competitiveness. Hence, in July 1987, ECOWAS adopted the ECOWAS Monetary Cooperation Programme (EMCP) with the specific objectives of improving and strengthening sub-regional payment systems under the West African Clearing House (now the West African Monetary Agency, or WAMA), introducing limited currency convertibility, establishing a single monetary zone, and eventually a common central bank and a single currency by the year 2000 (Saka et al., 2015). However, the proposed date for the realization of a single currency was later revised to 2005, 2009, and then 2020.

The ECOWAS Monetary Cooperation Programme (EMCP) contained a set of macroeconomic convergence criteria that member countries were expected to observe before the emergence of the monetary union. From an economic point of view, the convergence of macroeconomic policies is a pre-requisite for the creation of a currency union, and this would be viable only if the member countries first succeeded in achieving comparable inflation rates and a sustainable budget deficit, an approach known as “gradualism”. Thus, to achieve the goal of regional trade liberalisation and monetary union, various activities, such as preferential integration of intra-regional trade, transport and communication projects, monetary integration, and so on, were slated for implementation.

Two monetary zones were created, namely the West African Monetary Zone (WAMZ), comprising the Gambia, Ghana, Guinea, Nigeria, and Sierra Leone, and the CFA Zone, consisting of eight Francophone States and Guinea-Bissau. Both zones are part of the ECOWAS monetary integration programme (Qureshi & Tsangarides, 2006; Sanusi, 2003). The ultimate phase of ECOWAS sub-regional monetary integration efforts would be a merger of the WAMZ arrangement with the WAEMU, which already has a common central bank, the BCEAO.

By 1999, however, it was generally observed that the pace of implementation of the ECOWAS Monetary Cooperation Programme (EMCP), especially the establishment of the single monetary zone, had not matched the expectations of the founding fathers. Some perceived major obstacles to the successful implementation of the programme included insufficient political will and commitment, non-uniformity in the adoption of the required macroeconomic framework, and insufficient policy coordination and harmonisation between the Francophone West African countries, which established an economic and monetary union (WAEMU) in 1994, and the Anglophone countries (except the Republic of Guinea).

Other problems include insufficient of political will and commitment on the part of member countries, different levels of development and shocks, distrust and suspicion among member countries, problems meeting the stringent convergence criteria, inadequate financial markets and infrastructure, problems regulating and supervising financial market integration, and how to conduct effective monetary and fiscal policies. The net effects have been setbacks on the general growth structure of the ECOWAS countries through long periods of macroeconomic instability.

In 2001, a surveillance mechanism was adopted. The surveillance mechanism intended to serve as the regional instrument for monitoring the harmonisation of macro-economic and financial policies of member states, and it became a crucial move in the achievement of monetary integration objectives, particularly that of a common currency by 2020 (WAMA 2015). The revised road map for the realisation of a single currency for West Africa by 2020 was approved in 2009 after the adoption of the report of the inter-institutional working group on the ECOWAS single currency (WAMA, 2015). The currency union has yet again been postponed to 2027 (WAMA, 2020)

2.2.2 Regional Integration and Growth

Regional integration appeals as a concept that has helped promote growth, well-being, and economic development among members (Peters-Berries, 2010). It usually also fosters a variety of non-economic objectives, including promoting regional security and political coordination among members (Carbaugh, 2011). In Africa, regional integration is seen by policymakers and academics as a relevant strategy to raise the level of intra-regional trade, boost economic growth, and ensure the integration of African countries into the global economic system (Gammadigbe, 2021).

It can also be a lever for accelerating the structural transformation of African countries through economies of scale, improved competitiveness, more efficient resource mobilisation, and the promotion of regional value chains. Regional integration can also promote the dissemination of knowledge and technology and facilitate the design of new products. With this in mind, several regional economic communities (RECs) have been formed in Africa since the years of independence (Gammadigbe, 2021).

Recently, the African Union has launched the operational phase of the African Continental Free Trade Area (AfCFTA), which will be the world's largest free trade area by the number of countries once fully up and running (African Union, 2018). The goal is to establish a single market for goods and services across 54 countries, allow the free movement of business travelers and investments, and create a continental customs union to streamline trade and attract long-term investment (African Union, 2018). Whereas the AfCFTA could significantly boost intra-regional trade in Africa and promote economic growth, it can also entail costs, and its benefits may not be necessarily uniformly distributed between and within countries (Gammadigbe, 2021).

Therefore, leaders often have legitimate concerns that further trade integration of their economies with those of other countries may benefit some industries and penalise others, may have negative effects on profits and employment prospects in some sectors and skill levels, and may reduce fiscal revenues (IMF, 2019; Frazer, 2012). This highlights the potential effects of the AfCFTA on growth and income convergence or divergence and the policies that should be put in place to maximise regional integration benefits and limit its negative effects on some countries.

In addition, the relationship between regional integration and economic growth and convergence is of particular interest to economic policymakers given the specific poverty context of African economies (Gammadigbe, 2021). Indeed, the high poverty rate prevailing on this continent makes it imperative to achieve the Sustainable Development Goals (SDGs) which therefore require a sufficiently high annual growth rate for a significant reduction of poverty and inequality by 2030 (Gammadigbe, 2021).

While regional integration could promote economic growth and reduce income disparities through the channel of bilateral trade flows among member countries, African regional economic communities (RECs) are poorly integrated, with low intra-regional trade flows despite the efforts of several years of economic integration. The main constraints on regional trade development in Africa include inadequate and poor transport infrastructure, structured and regulated cross-border markets, and persistent tariff and non-tariff barriers to trade (Shepherd et al., 2017).

Better regional integration should be able to have a positive effect on countries' growth and foster economic convergence. Also, the disparate levels of economic development in African countries can suggest that some countries may benefit more than others, which would increase income disparities. Thus, the analysis of the effects of regional integration on economic growth and income convergence or divergence in African countries makes sense.

In this context and given the expected gains of regional integration in terms of economic growth and convergence, job creation, and inequality reduction, issues related to regional integration and economic growth are now a major challenge for African countries. After several years of implementing regional economic agreements in RECs. and line with the above, several questions can be raised. Does regional integration in Africa and African RECs. promote economic growth and income convergence? Could further economic integration, such as AfCFTA, be beneficial to economic growth and income convergence in Africa? The empirical studies, that examined the impacts of regional integration on growth, remain disputed (Te Velde, 2011).

Although the role of regional integration in contributing to growth was partly acknowledged, the empirical evaluation in Africa seems to be missing. Indeed, empirical studies in developing countries have not yet properly examined this issue. Especially for African countries, most empirical studies focus exclusively on the role of regional integration in enhancing regional trade (Carrère, 2004; Avom & Gbetnkom, 2005; Anyanwu, 2003).

2.2.2.1 Static and Dynamic Effects of Regional Integration

The literature related to the effects of regional integration is an extension of the literature on international trade. Carbaugh (2011) defined it as a process of reducing restrictions on international trade, increasing mobility, and intensifying economic activities among members. It is a policy aimed at eliminating economic borders and trade barriers to the free movement of goods and services among members. The theories of regional integration follow two main lines, each reflecting a stage of development in the evolution of this literature: the traditional trade theory and the new trade theory (Gammadigbe, 2021).

Traditional theories of economic integration explain the possible benefits of integration and are often referred to as classical theory or static analysis of the effects of economic groupings (Gammadigbe, 2021; Razanaparany, 2020). Pioneering work in the static analysis of the effects of RECs has focused on the effect of different levels of regional integration on the welfare of participating countries rather than on economic growth and convergence (Gammadigbe, 2021). Indeed, Viner's (1950) analyses have shown that the necessary condition for a free trade area or customs union to create trade and increase the welfare of the participating countries is that, for a given good, the price charged by the partners in the economic bloc should be lower

than the price charged by the rest of the world. Another important condition for successful trade integration is a reasonable degree of elasticity of traded goods or the absence of supply-side constraints that may undermine the productive sector (Gammadigbe, 2021). If the partners in the economic bloc are less efficient than the rest of the world, it is the diversion effect that will be observed.

Viner (1950) states that the latter case corresponds to the situation in which trade integration leads to the substitution of imports from member countries for imports from previously more efficient third countries. Thus, under certain conditions, regional integration can be expected to enhance trade through the tariff dismantling and thus have a positive effect on growth.

The resultant economic growth is due to gains in specialisation through the exploitation of comparative advantages. In the African context, it should be outlined that the positive effects of regional integration can be reduced by the loss of fiscal revenues due to lower tariffs, which are likely to be small but could be significant in some countries that continue to apply high export duties (Razanaparany, 2020). The removal of trade barriers to promote intra-regional trade may have different short-term effects in different countries (Gammadigbe, 2021).

The static analytical framework of traditional trade or integration theory does not allow the dynamic effects of trade integration to emerge. New theories of economic integration are developed to reflect the evolution of economic conditions and business environments and fall under the scope of dynamic analyses (Pelinescu, 2015; Marinov, 2014).

Schiff and Winters (1998) defined the dynamic effects of economic integration as everything that affects the medium- and long-term economic growth rate of the member states participating in the integration agreement. These effects were initially introduced by Balassa (1961) and Cooper and Massell (1965) to provide a better rationale for the creation of RECs. Dynamic positive effects are due to the accelerated accumulation of physical and human capital, better transmission of technology through foreign direct investment (FDI), and economies of scale (Tumwebaze et al., 2015; Busto, 2011).

Trade integration provides access to a large regional market, advanced technology, and therefore a greater stock of knowledge, leading to more innovation and faster growth (Grossman & Helpman, 1991; Rivera-Batiz & Romer, 1991; Romer, 1990). This implies that a country benefits from free trade with its partners and a larger stock of knowledge, assuming that technological spillovers are absorbed to the same degree in all countries.

In addition to the theoretical effects of regional integration, the center-periphery model of Krugman (1991) and Krugman and Venables (1996) has shown that regional integration can ultimately help to reorganize the productive structure within a region according to the natural and factor endowments of the member economies, as well as the quality of regional infrastructure. Such efficient allocation could be beneficial to the economic growth of the region as a whole. There can also be long-lasting effects on productivity through learning by exporting, and such effects may be appropriate, particularly when dealing with more developed partners (Te Velde, 2011).

Although there is no reliable method for the quantitative assessment of the dynamic effects of trade integration (Marinov, 2014), dynamic effects appear to have a greater

impact on economic processes than static effects because of their deeper scope. Moreover, in the African context, where countries are at different levels of development, the appropriation of the dynamic gains resulting from regional integration is likely to be long in the relatively less advanced countries given the weakness of the institutions and the shortcomings present in the education systems (Gammadigbe, 2021).

2.2.3 Macroeconomic Convergence

The convergence of member countries forming a monetary union is inspired by the concern that, in the presence of asymmetric shocks, macroeconomic performance, and policies may cause problems for a common monetary policy. However, the concept of convergence can be separated into two, nominal convergence and real convergence. According to Onwioduokit (2002), the nominal convergence is of price and currency value whereas the real convergence is in terms of per capita incomes, production structures, and economic activities.

A school of thought argues that since monetary policy would enforce nominal convergence in any case, nominal convergence should not be a precondition for monetary union. However, another school of thought argues that using nominal convergence as a precondition for monetary union may signal that economic adaptation to the single currency will not involve important challenges nor require substantial changes in the behaviour of households or firms—which may not be true if countries have very different starting points (Masson & Rusuhuzwa, 2012).

From the arguments raised above, both schools of thought agree that nominal convergence is a necessary condition for countries adopting a common currency. However, their differences come as to whether the nominal convergence should be a

pre-condition or a post-condition. Macroeconomic convergence should be seen as both a precondition for monetary union membership and a permanent requirement for its successful operation (Masson, 1996). Therefore, both the nominal and the real convergence should be used as a precondition for monetary union.

Countries with lower per capita income, on average, have higher rates of inflation, suggesting that a common monetary policy may not be appropriate for rich and poor countries together. However, inflationary rates differential among member countries may be due to better institutions in richer countries, and improving institutions is one of the anticipated benefits of a monetary union (Masson and Rusuhuzwa, 2012).

2.2.4 Currency Union

A currency union is a union to which two or more economies belong and that has a central decision body, commonly a Currency Union Central Bank (CUCB), endowed with the legal authority to conduct a single monetary policy and issue currency of the union according to the Currency Union Technical Expert Group (CUTEG) of International Monetary Fund (2005) (Abban, 2020). A currency union is viewed as a panacea of struggling economies so ECOWAS deems it fit to strengthen ties of member countries further to improve the standard of living through trade stimulation.

Evidentially, the advantages associated with countries using a common currency includes savings due to elimination of transaction cost and usurious taxes which helps small-scale industries, accelerated investment and certainty due to reduction in cross border trade cost in line with FDI inflow within member states, exchange rate stability ensures price transparency which equalization across countries, competitive and transparent market, and minimizes business risk, prevention of devaluation and speculation which in turn attracts potential investors to gain confidence, portfolio

diversification due to reduction in exchange rate and currency risks, increase tourism due to relatively low travel cost, job creation in industries, better access to capital due to financial integration and employment, deepened money and capital market, formation of larger markets for goods and services, allows free movement of goods and services, reduces external shocks, strengthen political ties, discipline against inflation among others (Abban, 2020; Sakyi, 2013).

In a nutshell, a currency union is best for countries that lack microeconomic and macroeconomic restraint. The main disadvantages associated with currency union have to do with the loss of monetary sovereignty, the cost of adopting new currency, negative spillovers of fiscal policy if not properly coordinated, language barrier, and dealing with asymmetric shocks (Ouedraogo & Drabo, 2019).

Economic integration aims at the adoption of a common currency and the opening of the economic markets of the member countries of the group and proceeds through the creation of a free-trade area, a customs union, a common market, and an economic and monetary union. Increasing the size of an economic market through economic integration would have positive effects on economic growth. The process of regional integration becomes an instrument of economic policy and a result in improving the living conditions of the inhabitants (Ouedraogo & Drabo 2019). The theory has established the relationship between integration and economic growth (Balassa, 1961; Lombaerde & Langenhove, 2005). The main channels through which integration stimulates economic growth are the stimulation of trade through the removal of barriers and the attraction of foreign direct investment (Nuh, 2011).

2.2.5 Nominal Convergence Criteria

Undeniably, certain economic conditions must be satisfied by member states to ensure the proper functioning of a currency union. The Optimal Currency Area criteria were propounded by R.A. Mundell, P.B. Kenen, and R.I. McKinnon, as theoretical determinants of the smooth functioning of a currency union. Consequently, a set of criteria for defining, establishing, and quite smoothly functioning a currency union has been formulated. The Treaty of Maastricht defines a currency union following the concept by E. Appeal who claims that a monetary union can be formed if certain specific conditions are satisfied: 1) currencies are totally and irreversibly convertible; 2) capital movements between member states are fully liberalized; 3) financial markets between member states are completely integrated; 4) exchange rate fluctuations without any margin are irreversibly fixed; 5) a common monetary policy is conducted by a central bank.

The factors that can reduce vulnerability to shocks include a diversified production structure, similar economic structures, and rates of inflation. A set of factors that can increase the ability to absorb shocks includes the mobility of factors of production, flexible wages and prices, and fiscal and political integration. This theory enabled the formulation of a set of criteria to be met so that the Monetary Union in the European Union could be correctly created and function.

2.2.6 Pillars of Macroeconomic Convergence

The nominal convergence criteria include the inflation rate, public debt, and public deficit whereas the real convergence criteria include symmetry of shocks, business cycle synchronization, the quantity of potential intertrade flows, and the convergence of per capita income. The ex-ante convergence criteria focus on nominal convergence

whereas the theory of Optimal Currency Area criteria focuses on the convergence of real economic variables of the countries in forming a currency union.

The strength of a currency depends on the interest rate, fiscal, and monetary policies, degree of public debts as well as the stability of the government. In this background, a fall in the value of the currency increases the cost of trading amongst countries and their participation in international trade. The goal of the Central bank is to achieve price stability, economic growth, low unemployment, and a sound balance of payment. In essence, the convergence criteria are to smooth the policy channel through which policies are coordinated within the sub-region.

Price stability would be considered by adopting an inflation targeting of 5%. It will be measured per the agreed consumer price inflation (WAMA, 2015; WAMA, 2020). The price-performance should be sustainable and the inflation should average over a year not too distanced from the best performing economies in the sub-region. A sound financial system would be considered with a budget deficit of less than 3%, budget deficit financing of less than 10% by the Central Bank, and public debt per GDP of not more than 70% (WAMA, 2015). It focuses on government deficit and debt. In this context, the economies should not be under excessive deficit procedures during the period of examination (Abban, 2020).

Exchange rate stability would be considered as a key component by nominal exchange rate variation of $\pm 10\%$ (WAMA, 2015, WAMA2022). The exchange rate was measured in terms of exchange rate development in the Exchange Rate Mechanism of the countries in the zone. Countries should participate in the Exchange Rate Mechanism for the years under review without any serious stress (Abban, 2020). The durability of the convergence was also outlined with gross reserves that can

finance at least three months of imports and achieve a long-term interest rate. This would be measured in terms of achieving the long-term interest rate target that is, the rate at which some best-performing ECOWAS countries are performing in terms of price stability over a year before the examination (Abban, 2020).

The growth pact or the Stability Pact would ensure members practice fiscal discipline in meeting the convergence criteria (Abban, 2020). The growth pact would be signed by either ex-ante or ex-post members. However, the growth pact can be signed ex-ante to achieve the laid down nominal convergence for developing countries to ensure fiscal discipline (Abban, 2020). The convergence criteria annual report heightened the performance of the member states in the attainment of the macroeconomic criteria (Abban, 2020).

2.2.7 Economic Growth and Convergence

2.2.7.1 Convergence

Economic convergence in an area is understood to mean the increasing alignment of the economic variables that have been considered, due to more rapid advances in the less favoured (lagging) countries than in the average of the whole region. The convergence can be interpreted in many different ways. Barro (1997), Martin et al. (2001), and Barro and Sala-i-Martin (1995) argue, however, that there are two broad categories of convergence, i.e., real convergence and nominal convergence, over which other categorizations fall.

Nominal convergence refers to the tendency towards a greater uniformity of nominal variables (those indicative of macroeconomic stability, e.g., CPI and GDI as percentages of GDP). Real convergence, on the other hand, expresses the

approximation of the levels of economic welfare, generally proxied by per capita GDP.

Convergence in general is a broad concept that is fully explained by economic growth theories and international trade theories. This phenomenon is trying to address questions that are related to economic growth and how poorer countries catch up with richer countries. However, there are several reasons why the literature on economic growth concentrates on economic convergence. These are considered in terms of several economic factors, which include the reduction of poverty, under the hypothesis that less productive countries will be in a position to catch up with more productive ones.

Literature on economic convergence is also devoted to different state policies that encourage the economic growth of less developed countries. If these policies work, it implies that countries will tend to be similar over a certain period. It is therefore vital to note that convergence, in general, does not imply that less developed countries will eventually overtake developed countries, but this creates an opportunity for different countries to share long-term growth and, mainly, for living standards to be equal across countries. The convergence hypothesis is explained by the neoclassical theory assertion that groups of countries are becoming homogeneous in terms of levels of productivity, technology, and per capita income.

The simplest indicator for assessing real convergence between countries within an area is to test whether the per capita GDP of a country or a set of countries is approaching the mean of the area. The two most popular measures are defined as beta-convergence and sigma-convergence. Beta-convergence implies that poorer countries grow faster than richer ones in both levels and growth rates. It is generally

tested by regressing the growth in per capita GDP on its initial level for a given cross-section of countries.

This beta convergence covers two types of convergence: absolute beta convergence and conditional beta convergence. Convergence is conditional with the inclusion of control variables, while it is absolute (unconditional) without controlling for additional variables in the cross-sectional regression. In the case of conditional convergence, each country is assumed to converge to its steady state, and the speed is faster the further the country is from its steady state, whereas with unconditional convergence, countries are assumed to converge to a common steady state. Comparing the two, conditional convergence is closer to reality relative to unconditional convergence, especially when considering more homogenous groups of countries or regions (Cunado & Perez de Gracia, 2006).

On the other hand, there is Sigma-convergence, often referred to as homogenization of per capita income, which shows the reduction in the dispersion (standard deviation as a percentage of the mean) of per capita GDPs within countries. None of the existing measurement procedures mentioned above is generally accepted as inherently superior to the others in any circumstances. According to Martin et al. (2001), probably because of its intuitive appeal, beta convergence remains commonly used.

2.2.7.2 Factors Affecting Growth Convergence

The first and necessary condition for convergence in growth is the existence of diminishing returns to reproducible capital (De la Fuente, 2000). This assumption implies that output grows less than proportionately with the accumulation of capital, indicating a decrease in the marginal productivity of capital. As a result, more developed countries that are capital-abundant will experience lower returns on

investment, reducing both the incentive to save and the contribution to the growth of a given volume of investment, and thereby creating a tendency for growth to slow down over time (Mensah, 2020). In contrast, poor countries have low capital-to-labor ratios and hence have high marginal products of capital. As capital investment spreads to these countries, high growth rates are experienced. Hence, poor countries will tend to grow faster than the rich, and consequently, convergence will occur (Mensah, 2020).

A second factor to consider, according to De la Fuente (2000), in the convergence mechanism is the determinants of technological progress. Countries may differ in the intensity of their efforts to generate or adopt new technologies, which may result in differences in their long-term growth rates. These differences across countries in rates of technological investment would, however, not be sustainable, as there would be a tendency towards the gradual equalisation of technical efficiency levels due to the assumption of diminishing marginal productivity of capital (Mensah, 2020).

It is, however, argued that the accumulation of knowledge should be subject to the law of diminishing returns. If the cost of additional innovations falls with scientific or production experience, for instance, the return on technological investment may not be a decreasing function of the stock of accumulated knowledge, and cross-country differences in levels of technological effort could persist indefinitely. This suggests that technological progress could be an important divergence factor (Mensah, 2020).

Nevertheless, technical progress can also be an important convergence factor. Many authors have signaled that the public good properties of technical knowledge have an international dimension that tends to favour less advanced countries, provided they can absorb foreign technologies and adapt them to their own needs (De la ente, 2000; Mensah, 2020). This is because it is easier to adopt technology than to invent it.

Hence, less developed countries will not have to reinvent each wheel, but acting as followers, they will be in a better position to grow quicker than the technological leader, who will have to assume the costs and lags associated with the development of new leading-edge technologies (Mensah, 2020). The resulting process of technological catch-up could contribute significantly to convergence, particularly within the group of countries that can exploit the advantages derived from technological imitation (Mensah, 2020).

The literature also identifies a third convergence mechanism in addition to decreasing returns and technological diffusion. This factor is featured less prominently in theoretical models but has great practical importance. This mechanism works through structural change or the reallocation of productive factors across sectors. Poorer countries and regions tend to have relatively large agricultural sectors (Mensah, 2020; Amoateng, 2014). Given that output per worker is typically much lower in agriculture than in manufacturing or in the service sector, the flow of resources out of agriculture and into these other activities tends to increase average productivity. Since this process, moreover, has generally been more intense in poor economies than in rich ones in the last few decades, it may have contributed significantly to the observed reduction in productivity differentials across territories (Mensah, 2020).

Dervis (2012) also suggests globalisation as a key factor contributing to the convergence process. According to him, globalisation, through strengthened trade links and increased foreign direct investment, expedites catch-up growth as emerging countries import and adopt the know-how and technology of developed countries. This, he explained, was a result of the ease of adopting technology rather than inventing it.

The literature on economic convergence is very broad, as it can be explained by economic growth theories and international trade theories. According to theoretical growth models and convergence hypotheses, there are usually two types of convergence tested in empirical research, namely β convergence and σ convergence.

The growth model (Solow, 1956; Swan 1956) for the absolute convergence can be written as follows:

$$G_{it} = \alpha + \beta Y_0 + \varepsilon_{it} \dots \dots \dots (3.1)$$

Where:

G_{it} is the first difference of the logarithm of real GDP per capita.

Y_0 is the logarithm of the initial level of real GDP per capita

Where:

$i = 1 \dots N$ represent cross sections units (which are ECOWAS countries)

$t = 1 \dots T$ represents periods.

For the conditional convergence, the equation is estimated as follows:

$$G_{it} = \alpha + \beta Y_0 + \delta X_{it} + \varepsilon_{it} \dots \dots \dots (3.2)$$

Where:

X_{it} is a vector containing explanatory variables including; foreign direct investment (FDINET), trade openness over GDP (TO), gross fixed capital formation as share of GDP (INV), human capital (proxied by secondary school gross enrolment (SER),

government expenditure (GEX). Of the two types of economic convergence, the study aims to focus on beta convergence (in the context of a regional economic community). There are two expectations from using this approach: (i) that less developed countries in ECOWAS will grow faster than more developed countries until they converge to a common steady-state level in terms of per capita output, and (ii) less developed countries in ECOWAS are expected to converge to their steady-state levels based on cross-sectional differences in sources of growth (that is, capital, technology, and population growth).

Barro and Sala-i-Martin (1992) outlined that growth convergence can be explained by the use of per capita gross domestic product (GDP) or by the use of macroeconomic indicators. However, in this study, the analysis of growth convergence will be in terms of per capita GDP. According to Kumo (2011), successful economic convergence should result in similar per capita incomes and growth patterns. Empirical analysis of economic convergence should provide information on the effectiveness of a regional economic community integration promotion strategy.

2.3 Theoretical Framework

There are two principal theories or mechanisms for real economic convergence: the Heckscher-Ohlin-Samsson (HOS) model of international trade and the neo-classical growth model. Both of these models assume that all markets, including factor markets, are perfectly competitive. However, the new growth theories have a different view from the ones proposed by Heckscher-Ohlin, Samuelson, and Neo-classical models. These theories postulate that an integrated region can be a source of divergence.

2.3.1 Heckscher-Ohlin – Samuelson Model

The original development, foundation(s), and or earlier propositions of the Heckscher-Ohlin theory are noted as attributable to two Swedish economists, Eli Heckscher and his student Bertil Ohlin (Lam, 2015). There are six assumptions usually postulated with the Heckscher-Ohlin theory of trade: (1) no transportation costs or trade barriers (implying identical commodity prices in every country with free trade), (2) perfect competition in both commodity and factor markets, (3) all production functions are homogeneous to the first degree (implying constant returns to scale), (4) production functions are such that the two commodities always show different factor intensities, (5) production functions differ between commodities but are the same in both countries and (6) tastes are the same in both countries (more specifically, both countries have identical homothetic community indifference maps) (Lam, 2015).

This formulation of the Heckscher-Ohlin theory states that a country's exports depend on its resources endowment whether it is capital-abundant or labour-abundant. If capital-abundant, she will produce and export capital-intensive goods which thereof are relatively cheaper than in one or more than one country. Likewise, a labour-abundant country will produce and export labour-intensive goods which thereof are relatively cheaper than in one or more than one country (Lam, 2015).

Concerning the theoretical link between regional economic integration and real convergence, the implications of traditional theories of trade are very clear. The Heckscher-Ohlin model demonstrates that countries export goods rich in factors that are abundant in their economies and import goods rich in factors whose endowment is weak. In abstraction to transport costs, liberalisation tends to equalise the prices of goods traded. Thus, countries will export products that exploit their best factor

endowment. The demand for abundant and less expensive factors increases, while that for limited and expensive factors falls.

The convergence of the prices of goods tends to bring about a convergence of factor prices. In peripheries where labour is abundant, real salaries will fall, while at the centre, where labour is limited, they will increase, everything being equal. Capital or labour mobility is made possible between the two poles in conformity with the predictions of Mundell (1957). Labour will migrate from the periphery to the centre in search of high salaries. The consequence is an increase in wages in the periphery and a fall in wages in the centre. As for capital, it will move from the centre to the periphery in search of better returns. This movement reduces the wages of the centre and increases those of the periphery. The whole movement favours the alleviation of the difference in factor prices between regions and ends up in the convergence of the income levels of member countries.

The convergence school predicts that real income levels in an integrated economic area will come closer together. The theoretical background for this strong assertion is the Heckscher-Ohlin-Samuelson (HOS) model and its extensions. The Heckscher-Ohlin-Samuelson model (also known as the Factor Endowment or the Variable Proportion Model) not only describes the pattern of trade, but it also predicts the impact of trade on the national income and returns to the factors of production.

The HOS model provides an explanation for trade based on different factor endowments—in particular, a difference in relative factor endowments—rather than different technology, different tastes, or something else. The HOS model of trade assumes that in addition to competitive factor markets, if the economies have similar relative factor endowments, international trade between countries will then result in

goods price equalisation, due to arbitrage, without necessitating any movement of capital or labour across national boundaries.

International factor mobility speeds up productivity, wages, and price convergence in the absolute sense (Pentecost, 2002). Thus, the effect of closer economic integration should eventually lead to price and wage convergence. Therefore, according to the HOS model, the driving force behind this convergence result depends on the model considered. If factors of production are mobile across countries and regions, factor mobility guarantees convergence.

In the European context of limited labour mobility, capital mobility is when companies decide to invest outside their home market. Such FDI contributes to the transfer of knowledge and new technologies from the more advanced to the lagging regions. In situations where factors of production do not move across countries, convergence occurs as a result of international (intra-regional) trade.

Countries specialise in products that intensively use the factors of production that are abundant and cheap in that country. As a consequence of those trade relations, the theory predicts that abundant production factors in each country will become more expensive, that countries will adopt the same technology, and that income levels will fully converge. The second mechanism for real convergence across countries stems from the traditional neoclassical theory of Solow (1956) and Swan (1956).

2.3.2 Neoclassical Growth Theory

The starting point for any study of macroeconomic convergence is the neoclassical growth model, which emphasises the role of capital accumulation. This model, first constructed by Solow (1956) and Swan (1956), shows how macroeconomic policy

can raise an economy's growth rate by inducing people to save more. But the model also predicts that such an increase in growth cannot last indefinitely. In the long run, the country's growth rate will revert to the rate of technological progress, which neoclassical theory takes as being independent of economic forces, or exogenous.

Assumptions of the Neoclassical Growth Model (1) Capital subject to diminishing returns: An important assumption of the neoclassical growth model is that capital (K) is subject to diminishing returns provided the economy is a closed economy. (2) Impact on total output: Provided that labor is fixed or constant, the impact on the total output of the last unit of the capital accumulated will always be less than the one before. (3) Steady state of the economy: In the short term, the rate of growth slows down as diminishing returns take effect, and the economy converts into a "steady-state" economy, where the economy is steady, or in other words, in a relatively constant state.

Underlying this pessimistic long-run result is the principle of diminishing marginal productivity, which puts an upper limit on how much output a person can produce simply by working with more and more capital, given the state of technology.

The neoclassical model has a stronger prediction concerning convergence in growth rates than other theories' convergence prediction levels. Specifically, the model implies that there should be convergence in growth rates between all countries that share the same technology. The neoclassical growth theory, which constitutes the basis of the convergence philosophy, predicts that poorer countries in the convergence club must catch up with richer ones as they have an advantage in replicating the existing technological advancements without having to develop their own (Baumol and Sala-i-Martin, 1995).

In its simplest form, the neoclassical growth theory implies the elimination of differences between capital-labour ratios and productivity levels as countries converge to a single equilibrium. Thus, at equilibrium, productivity in each country's economy grows at the same rate, which is equal to the exogenously given rate of technical progress.

Therefore, standard neoclassical growth models predict that open economies (i.e., countries in a region) should converge. Assuming that technologies are identical and exogenous, the dynamics of convergence rest on decreasing returns to capital. Therefore, the theory assumes that countries with low capital stocks and per capita income should have a higher marginal product and return on capital. Consequently, opening up the country as it happens in the framework of an integration process like the one in ECOWAS should trigger a convergence process, as capital accumulation and faster growth in poorer countries than in richer ones sets in as a result, per capita income, labour productivity, and capital-labour ratios converge across countries.

This line of reasoning has formed the basis of conventional theories of economic integration developed since the pioneering work of Viner (1950). Thus, models that share the neoclassical growth theory generate a tendency for prices, costs, and income levels to converge, with trade and international factor mobility acting as the convergence mechanism. Because of the increased integration of economies, the process of convergence is further stimulated by the reduction of transaction costs and the elimination of foreign exchange uncertainty due to trade and factor movements.

Since poorer countries are generally considered having capital-labour ratios below their long-run optimum and thus are backward in adopting the available technology, their rate of return on fixed investment should be higher than in richer countries.

Consequently, there should be a systematic tendency for poor countries to grow faster than rich countries until they have “caught up” with the levels of income per head of the rich countries. This is the convergence hypothesis.

In the neo-classical framework, persistent inter-country differences in incomes per head reflect either difference in the quality of factors of production available or in the efficiency with which they are combined. Therefore, the policy recommendation of the mainstream neo-classical school is that the best way to ensure both convergence of incomes per head and steady economic growth over the long run is to allow market forces to operate freely. This is the basis for policy recommendations to lagging countries to enable them to “catch up” with prevailing income levels in rich countries (Vernables, 2000). The presumption that poorer countries, on average, will grow faster than richer ones (over the long run) has been termed beta convergence. Such differential growth is necessary to reduce the inter-country variation of per capita income levels (Vernables, 2000).

A tendency for the dispersion of per capita incomes (as measured by their standard deviation as a percentage of the mean) across a group of countries to fall over time has been called sigma convergence. Therefore, sigma convergence is not only a function of the differential rates of growth between poorer and richer countries but also of the size of the initial income gap. These standard conclusions have been challenged. Critics of the neoclassical theory challenge the assumption that all countries have the same access to exogenous technology. Some dispute the claim that market forces are capable of triggering sustained growth and convergence in under-performing countries.

2.3.5 The New Growth Theories

New models have emerged in the last fifteen years, notably under the aegis of the new growth theory or endogenous growth theory, which, contrary to the neoclassical paradigm, does not predict that income convergence between rich and poor countries is the only possible outcome of economic integration (Martin et al., 2001). In these new approaches, emphasis is put on endogenous sources of growth and technical progress, and more especially on the importance of investment in human capital and the spillover effects of fixed capital. This model agrees with the post-Keynesian view that increased investment may raise the long-run rate of growth because investment may be subject to increasing returns. Therefore, in general, the key to “catching up” lies in closing the technology gap between the poor and richer countries (Vernables, 2000).

According to Romer (1986), one of the first proponents of this theory returns to capital do not have to be diminishing. If this assumption is relaxed, the impact of economic integration on convergence is not as clear as in the Solow setting (neoclassical reasoning). Lucas (1988), as cited by Martin et al. (2001), proposed an approach where increasing returns on human capital are the main driving force of economic growth. There is therefore a distinct possibility that a “brain drain” from poorer to richer countries could act as a vehicle for cross-country divergence. Some endogenous growth models that emphasise the importance of commercially oriented research and development efforts as the main engine of growth may also explain the existence of permanent and even widening technological and income gaps between countries. The Schumpeterian approach incorporates a different viewpoint on competitive markets and identifies innovative entrepreneurship as the key to sustained growth (Schumpeter, 1934). The post-Keynesian analysis also comes with another

viewpoint. They stress higher profits and the strengthening of the propensity to invest, which leads to a sustained growth path.

2.3.6 New Economic Geography Theory

In a separate argument put forward by Krugman (1991) in what he calls new economic geography literature, he puts forward several reasons to explain why economic integration may lead to a pattern of increased spatial income inequality, assuming increasing returns. The assumption of increasing returns introduces the presence of imperfect competition. A characteristic feature of these models is that they assume the existence of knowledge spillover effects at the regional level. They do this by considering that imitation is cheaper than innovation, thus implying that convergence through technological diffusion is a likely outcome, assuming diminishing returns.

This model also emphasises the role of trade and foreign direct investment as channels for technology spillovers. This model considers human capital to be an essential condition for convergence (Krugman, 1991). New growth theories allow a greater role for government policy in creating conditions for sustained growth and catch-up. The view held here is that economic behaviour is embedded in a framework of economic, social, and political institutions that go beyond economic activity.

2.4 Empirical Literature Review

This section of chapter two reviewed empirical literature on macroeconomic convergence, regional integration and economic growth.

2.4.1 Empirical Literature on Macroeconomic Convergence

Barro and Sala-i-Martin (1992) conducted a study in the United States using the neoclassical growth model framework to converge across 48 states. The study used data on personal income from 1840 and on gross state product from 1963. There was clear evidence of convergence in the sense that economies tend to grow faster in per capita terms when they are below the steady state position. As for the speed of the convergence, it appeared to be roughly 2%.

Barro and Sala-i-Martin (1995) conducted a study on health expenditure in the European Union for the period of 1960 to 1995 using sigma convergence and rigorous parametric testing for beta convergence. Additionally, the study also discovered that dispersion in health expenditure was decreasing over time. The study confirmed the hypothesis that convergence in income improves economic integration.

Randa and Smith (2001) conducted a study on human capital convergence: international evidence from 100 different countries for the period of 1970 to 1996. The authors used the three-stage least squares (3SLS) model to investigate the existence of human capital convergence. The study used education and life expectancy as explanatory variables and the initial values of education and life expectancy as dependent variables. The results found that there is convergence in these variables. There is evidence that investment in health and the openness of trade are important factors.

According to a study by Badinger et al. (2002) in Germany during the period 1985–1999, regional convergence in the European Union was determined using a spatial dynamic panel analysis (GMM). The results from the study obtained using the system

GMM estimator on the filtered variable showed a speed of convergence of 6.9 percent and a capital elasticity of 0.43.

Hammouda et al. (2009) undertook a study on why regional integration does not improve income convergence in Africa. The study employed panel data from 1981 to 2000 for 20 countries in Africa. The study used various techniques, including absolute, conditional, and sigma convergence, as well as cointegration analysis. The study found low-income convergence that was associated with slow output growth in many African countries, the slow accumulation of factors of production, and low factor productivity due to inefficient production technology. Failure to improve intra-regional trade, intra-regional investments, and low labour mobility was also linked to the slow income convergence of the African Regional Economic Community. The study also established that the constrained capital accumulation as a result of the limited inflow of FDI was also a factor that contributed to the low-income convergence in these countries.

Dramani (2010) analysed economic convergence in the Francophone countries in Africa. Specifically, the study tested the convergence of the economies of the West African Economic and Monetary Union (WAEMU) and the Economic and Monetary Community of Central Africa (CEMAC) zones. The study utilised both cross-sectional and panel data spanning the period 1970–2000, using variables that included per-capita income, inflation rate, the ratio of outstanding debt to GDP, and the ratio of current external balance to GDP. The study found that the convergence process, and hence that of integration, had not been carried out uniformly in the Franc Zone countries. Rather, the process had been given greater emphasis in WAEMU than in the CEMAC Zone.

Further, the study found a period-related convergence in the cotton-producing countries, coffee-producing countries, and coastal countries. This showed that the hypothesis of a common convergence path in the Franc Zone had not been borne out by the study. The study concluded that the analysis of spatial effects had brought to the fore the existence of inhibitory effects on convergence speed. Taking border effects into account contributed to reducing the convergence speed by half on average over the post-devaluation period and by one-fifth over the structural adjustment period.

Szeles and Marinescu (2010) undertook a study on real convergence in Central and Eastern European (CEE) countries. The study utilised panel data for the period 1998–2009 for ten CEE countries and employed the GMM technique of analysis. The study established that there was empirical evidence of both absolute and conditional convergence. The study used trade openness, inflation rate, government debt, gross capital formation, household final consumption, labour productivity, exchange rate, and population growth as control variables for conditional convergence. The study concluded that trade openness, labour productivity, and exchange rate were the main drivers of regional growth in the CEE region.

Kumo (2011) investigated convergence in macroeconomic policy and stability indicators in Southern Africa over the period 1992–2009, applying the panel unit root test. The results of this study do not confirm the existence of convergence. Furthermore, the study discovered that per capita GDP and income were negatively affecting growth. In conclusion, the study outlined that most of the economies of SADC have shown a tendency of macroeconomic divergence in 2009 in monetary policy, fiscal policy, and foreign exchange reserve ratios.

Kabala and Mogotsi (2012) conducted a study of economic convergence in COMESA using fixed effects panel data analysis. The outcome of the results confirms the existence of convergence among member states. The paper examined whether there was a tendency for real per capita income differences between richer and poorer countries in the region to narrow significantly and establish determinants of economic convergence from 1996 to 2007. In the application of the economic criterion, the paper outlined that the absolute convergence clubs into the COMESA, and it also outlined that most of the economies there are trapped in poverty.

Péridy et al. (2013) undertook an analysis of real convergence in MENA countries' regional areas for more than eight disaggregated areas. The study used panel data from 10 MENA countries and employed a spatial panel data econometric model of conditional beta-convergence. The variables investigated included per-capita income, trade openness, transport and infrastructure, distance and temperature, and precipitation, which were used as control variables for convergence. The finding was that, except Egypt and Morocco, the Middle East and North Africa (MENA) countries were converging. However, the convergence was slow, and regional inequalities remained considerable in these countries. The speed of convergence was estimated to be three percent, and the half-time period necessary to reach the steady state was equal to 25.5 years. The study further established that climate change is likely to have detrimental effects on real income and may delay the convergence process.

Solarin and Sahu (2013) in Malaysia carried out a study to check the validity of convergence or divergence in CFA-FRANC countries using time series analysis. The study used the total average, regional average (West African and Central African countries), and per capita income of France as benchmarks. There was no conditional

convergence towards any of the three benchmarks, even though Benin satisfies the catch-up hypothesis towards the total average, while Burkina Faso satisfies the catch-up hypothesis towards the West African.

A study by Ndiaye and Korsu (2014) investigated within an econometric framework the existence of nominal and real convergence among the ECOWAS countries, the WAMZ countries, the WAMZ countries plus Cape Verde, as well as between each non-UEMOA country and the UEMOA zone. Quarterly data from 2000 to 2010 on the nominal exchange rate, interest rate, reserve money, inflation rate, and budget deficit were used for nominal convergence testing. The results show that there is partial real convergence among the WAMZ countries (with and without Cape Verde) and the ECOWAS countries as a whole. On a bilateral basis, none of the non-UEMOA countries is in nominal or real convergence with the UEMOA, except the exchange rate convergence found with Cape Verde. The results suggest that the WAMZ countries or the ECOWAS countries may go into a monetary union based on the convergence observed in reserve money (nominal convergence).

Asongu (2014) evaluated whether the proposed African monetary unions were optimal currency areas by analysing real growth and monetary and fiscal policy convergence. The study used panel data for the period 1980–2008 in overlapping two-year intervals. Further, the study employed a two-step GMM estimation technique to establish whether there was real GDP, monetary, and fiscal policy convergence in the African Regional Economic Community. The variables that were investigated included trade openness, public investments, GDP growth, inflation rate, and financial size. The study findings showed there is no convergence that was attributed to institutional cross-country differences, an absence of fiscal policy convergence, and

insufficient potential for eliminating idiosyncratic fiscal shocks due to business cycle incoherence. The study concluded that the member states needed to ensure that the cross-country differences in structural and institutional characteristics that hampered the effectiveness of convergence in monetary, real GDP, and fiscal policies were harmonised.

Schaffer and Péridy (2015) studied the spatial convergence of Maghreb regional areas. The variable of concern in this study was the GDP per capita. The study used panel data from 1990 to 2005 and employed a non-parametric approach based on classical and spatial Markov chains. This approach investigates the long-term spatial associations between regional units. It established that Maghreb areas showed a significant trend of regional convergence in GDP per capita. The study also showed that there was an important spatial clustering process in these areas. According to the study, although almost 75 percent of the areas seemed to converge towards a rather high GDP per capita level in the stationary state, 25 percent found themselves trapped in a lower development trend that seemed to be spatially auto-correlated. This meant that in the Maghreb region, regions were interdependent in terms of GDP per capita growth.

Chapsa et al. (2015) examined income convergence within the EU-15 over the period 1995–2013. The study used the dynamic panel approach with a system GMM estimator. Furthermore, the study used economic factors such as physical and human capital, inflation, government consumption, and openness. There was the existence of conditional beta convergence. In addition, the study used institutional variables such as corruption and bureaucracy. The study found that corruption affects growth negatively; contrarily, bureaucracy has no significant effect on growth performance.

Tshekiso (2015) conducted a study on the convergence of health expenditure and health outcomes in the Southern Africa Development Community (SADC). The study used spatial dependence models and club convergence over a period of 1995–2012. The results show that SADC countries form two clubs, in which 11 countries are converging towards 2 countries with the lowest health expenditure per capita, which are converging separately. Overall, there was a convergence rate of 0.1% without the use of spatial models. Furthermore, the HIV prevalence was converging at 1.2% in the spatial error model and by 1.1% in the spatial lag model.

Wahiba (2015) focused on the study of the conditional convergence hypothesis among African countries that belonged to the West African Economic and Monetary Union (WAEMU). His paper investigated the effect of convergence, stability, and growth pact on convergence dynamics by considering control variables comprising the share of investment in gross domestic product, enrolment, and the opening ratio. The study revealed that these variables contributed to the revival of economic growth in the region.

A study by Aye-Agele and Ojeke (2016) investigated per capita income convergence in member countries of ECOWAS and the prospect of petroleum trade providing the catalyst to cause their per capita incomes to converge to the ECOWAS average. The neoclassical growth model framework was used to examine absolute and conditional convergence among the member countries.

The models specified include absolute and conditional convergence. The results indicate some evidence for a stationary behaviour of the residuals and conclude that there exists a panel-cointegrating relationship between per capita income, non-oil trade, and population. Although there is evidence of absolute convergence, it did so at

a slow annual speed of 1.6 percent. However, the conditional β -convergence based on non-oil trade and other variables consistently sustained the convergence, with higher annual speeds ranging from 2.1 to 2.5 percent.

Karanasos et al. (2016) carried out a study on inflation convergence in the EMU. The study used panel data for the period 1980–2013 and utilised the inflation rate to test for convergence. The panel unit root test method was employed to analyse the convergence, and the study found that some countries were in the process of converging absolutely or relatively. Further, by using a clustering algorithm, the study established three absolute convergence clubs in the pre-euro period, comprising early accession countries, which included Luxembourg clusters with Austria and Belgium, a second sub-group comprised of Germany and France, and the third sub-group formed by the Netherlands and Finland.

Furuoka et al. (2018) tested the income convergence hypothesis for five ASEAN countries using the Fourier-augmented Dickey-Fuller (FADF) method. However, the results showed a positive causal relationship with 10% of the two-country pairings. These findings suggested that other fundamental variables, such as technology and innovation, may be more important than trade liberalisation efforts to reduce inter-country income gaps.

Zulfiqar (2018) conducted an assessment of the income convergence process for a set of 40 Asian countries over the 1980–2016 periods. To do so, a pooled least squares methodology is applied with time dummies and cross-section weights for standard errors. Findings concluded the presence of conditional convergence in the Asian region, which is further established by including population growth, inflation rate, unemployment rate, export growth, and openness as control variables.

Githuku et al. (2018) undertook a study on income convergence in the East African Community. The study used panel data for the period 1990–2012 and employed the autoregressive distributed lag model technique of analysis. The study's findings established the existence of conditional convergence and that the per capita GDP growth rate was positively affected by physical capital and the exchange rate, while it was inversely influenced by human capital and inflation. However, the study did not support unconditional convergence, implying that the catching-up process in the Eastern African Community (EAC) exists after controlling for differences in steady states. Thus, the income differences between EAC member countries were found to decline with time after controlling for differences in steady states.

Tapsoba et al. (2019) studied fiscal convergence in Africa by establishing the role of the Regional Economic Community in fiscal convergence in Africa. The variables of concern in this study were categorised into economic and institutional variables. The economic variables used in the study included public debt, GDP growth, inflation rate, and current account balances, while the institutional variables included political stability, level of democracy, and rule of law. The study used panel data from 1990 to 2015 and employed a GMM estimation technique. According to the study, the African Regional Economic Community significantly reduces fiscal divergence between countries. The study concluded that common monetary areas are more efficient at fostering fiscal convergence.

The study by Anoruo (2019) tests the convergence of per capita income among the members of the Economic Community of West African States (ECOWAS). For a deeper understanding of convergence, this study examines convergence in ECOWAS for three different time frames, namely, whole, pre-, and post-ECOWAS formation

periods, with the help of panel convergence. The results indicate divergence among the member states for all sample periods, but there is convergence within the member states for all sample periods, similar to the work of Amoateng. (2014), using a panel dataset from 1975 to 2012 on 15 ECOWAS member states, the study examined the convergence hypothesis by employing the panel Generalised Method of Moments (GMM). The study established per capita income divergence among the countries in the ECOWAS region; however, the study established per capita income convergence among the West African Economic and Monetary Union (WAEMU) sub-group. These findings are in complete disagreement with the prediction of the HC-ASM and further suggest that regardless of the presence of savings, physical capital stock, and government expenditure, the per capita income disparity gap among countries in the ECOWAS region tends to widen.

Kaboro et al. (2018) studied the effect of real GDP growth convergence on exchange rate volatility in the EAC. Panel data for the period 2000–2016 was used in this study. The study employed a fixed effects model to analyse the relationship between GDP growth convergence and exchange rate volatility. The empirical findings established a negative effect of GDP convergence on exchange rate volatility, implying that convergence in GDP growth reduces exchange rate volatility in the EAC. The study concluded that the EAC countries should harmonise their economies for an effective monetary union to be formed.

Magazzino and Mele (2022) empirically tested the economic convergence that operates between five selected Asian countries (namely Thailand, Singapore, Malaysia, the Philippines, and Indonesia). In particular, we sought to investigate how increased economic integration has impacted the inter-country income levels among

the five founding members of ASEAN using a new machine learning (ML) approach applied along with panel data analysis (GMM) and the application of the KOF Globalisation Index. The Generalised Method of Moments (GMM) results highlight that the endogenous growth theory seems to be supported for the selected Asian countries, indicating evidence of diverging forces resulting from unequal growth and polarisation dynamics.

Buigut (2011) undertook a study to determine whether EAC member countries would form a successful monetary union. The study employed a multivariate cointegration framework to analyse the co-movement behaviour of nominal exchange rates, real exchange rates, inflation rates, monetary base, and real GDP for the five countries using quarterly panel data from 1997–2008. The study established only partial convergence for the variables considered. This suggested there could be substantial costs for the member countries from a fast-tracked process of EAMU formation. The implication was that EAC countries needed significant adjustments to align their monetary policies and to allow a period of monetary policy coordination to foster convergence. This would improve the chances of a sustainable currency union.

2.4.2 Empirical Literature on Regional Integration and Economic Growth

Badinger (2001) examined the effect of regional integration for EU countries over 1950–2000 by using instrumental variable estimation, least squares dummy variables, and one-step first diff-GMM. His finding suggested that EU regional integration spurred economic growth after the Second World War.

A study conducted by Kamau (2011) examines how economic growth was impacted by regional integration among the Common Market for Southern and Eastern Africa (COMESA), East African Community (EAC), and Southern African Development

Community (SADC) over 1970–2008 and finds a positive correlation between economic growth and regional integration. Similarly, Ijjo and Tumwebaze (2015) studied the growth effect of COMESA regional integration from 1980–2010 using GMM procedures. Their findings suggested that COMESA influences the economic growth of its members positively through the growth of physical capital stock, world GDP, and trade openness.

Park and Claveria (2018) used a multidimensional approach to study the impact of regional integration on growth, inequality, and poverty across the various regions in Asia, Africa, Latin America, and the European Union from 2006–2016. They have estimated their model through a sys-GMM technique. Their findings suggested that regional integration has a positive and significant effect on economic growth through three dimensions, namely, regional value chain, infrastructure and connectivity, and institutional and social integration.

Ouedraogo and Drabo (2019) investigated the effect of dynamic regional integration on economic growth in the WAEMU. For that, they employed autoregressive vector analysis and panel data from 2000–2013. They have found that WAEMU countries have contributed 0.5 percent of the variation in long-run GDP growth in the region.

Mann (2015) studied the impact of regional integration on economic growth in Central and Eastern Europe. For that, he estimated a convergence equation based on the augmented Solow model for a panel of 10 countries from 1995–2010. His findings suggested that, in the medium term, regional integration has a positive growth effect, but the magnitude is low.

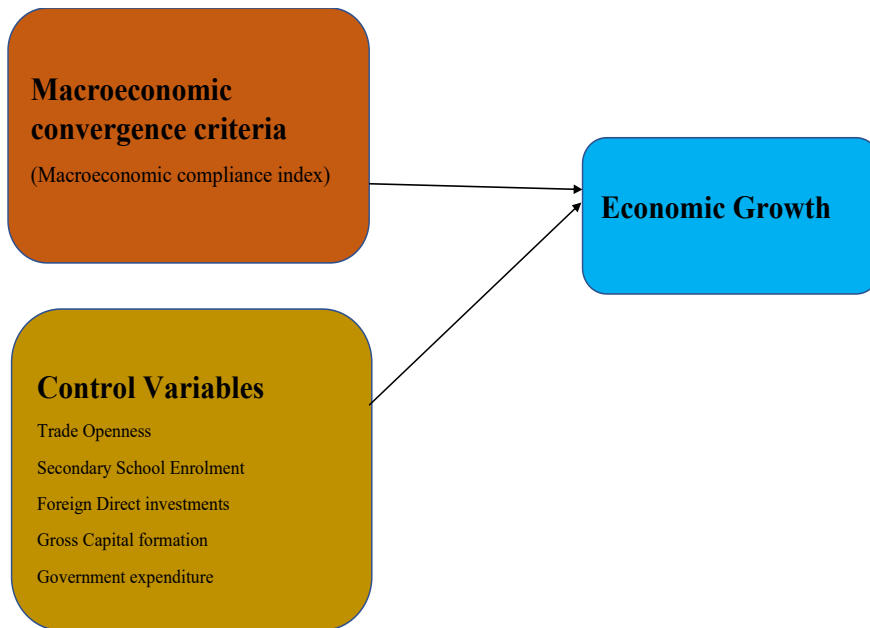
Zahonogo (2017) assessed the linkage existing between trade and economic growth for 42 sub-Saharan countries from 1980–2012. He estimated a dynamic growth model using a pooled mean group estimation technique. His empirical results revealed the existence of a threshold trade. This author suggests that, below the trade threshold, higher openness to international trade will generate more economic growth, while higher trade openness will decrease economic growth above the trade threshold.

Seck et al. (2020) used spatial dynamic panel data to estimate the spillover effects of economic growth in Africa over six years (2000–2016). Their key finding argued that the growth effects of neighbouring countries are higher through trade than geographical proximity. However, the scale of the benefits from the spillover effects is smaller in African developing countries than those from developed ones (for instance, the US or EU).

2.5 Conceptual Framework

The assumption underlying this study is that for a successful monetary and currency union in ECOWAS, member countries have to take steps to comply with all the convergence criteria. The level of compliance by member states should lead to the ECOWAS goal of economic growth and macroeconomic stability. Through trade, human capital development, physical capital development, and the proper use of government resources, there would be an increase in the per capita income of the ECOWAS region (Amoateng 2014; Chapsa 2015).

The monitoring and evaluation team of ECOWAS should be adequately resourced to ensure strict compliance by member states or propose changes to the macroeconomic convergence criteria according to the capacity of each member state to enhance compliance.

Figure 1.2: Macroeconomic convergence and economic growth

Source: Conceptual Framework by Author (2023)

2.7 Summary of Literature Review

This section gives a synthesis of both the theoretical and empirical literature reviews. In achieving that, the section sets out to give a summary of both the theoretical and empirical literature on regional integration and growth and convergence and growth.

The Neoclassical growth models predict that countries in a regional trading bloc should converge assuming identical and exogenous technologies, the convergence dynamics rest on the decreasing returns to capital. Countries with low capital stocks and per capita income should have a higher marginal product and return on capital. As a result, opening up the country in an integration process should therefore trigger a convergence process since capital should flow to capital-scarce countries to take advantage of higher returns. This should lead to more rapid capital accumulation and faster growth in poor countries than in richer ones.

This line of reasoning is held by Sala-Martin (1991, 1995), Barro (1997), and Baumol et al. (1994) and has formed the basis for conventional theories of economic integration. Models with neoclassical assumptions tend to predict income, price, and cost convergence in countries in a regional grouping. These conditions of the Neoclassical theory were then challenged by new growth theorists like Schumpeter (1934), Romer (1986), and Krugman (1991). These theorists do not conclude or predict economic convergence between rich and poor countries. These new growth models conclude that they do not believe returns to capital are decreasing, as proposed by the neo-classical economists; rather, they believe returns to capital are increasing.

Based on the foregoing, this study is anchored on the neoclassical growth theory. This chapter also looked at some empirical studies on macroeconomic convergence, the effect of regional integration on economic growth, and the conceptual framework.



CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This section outlines the design employed to conduct the research, the method of collecting data, and the method of analysing it, which comprises the estimation specification and techniques of the models for the various objectives.

3.2 Research Paradigm

Deshpande (1983) and Mertens (2012) mentioned that a paradigm is a set of assumptions that provides a conceptual framework or a philosophical approach for a worldview that enables researchers to construct organised studies around the world. Fitzgerald and Howcroft (1998) noted several dichotomies and paradigms had been used in the study of social sciences, such as positivism versus interpretivism, quantitative versus qualitative, induction versus deduction, and explanatory versus confirmatory. There are four different research paradigms: positivism, realism, critical theory, and interpretivism (Healy & Perry, 2000). Positivism is used for quantitative research, while the other three are used in qualitative research (Healy & Perry, 2000).

This study therefore followed the positivist paradigm within the framework of classical and neoclassical economics. The positivist philosophy favours the use of a quantitative approach to research. Also, this philosophy is suitable for the development of mathematical models to measure the relationship between quantitative variables.

3.3 Research Design

A research design is the ‘procedures for collecting, analyzing, interpreting and reporting data in research studies’ (Creswell & Plano Clark 2007, p.58). It is the overall plan for connecting the conceptual research problems with the pertinent (and achievable) empirical research. In other words, the research design sets the procedure on the required data, the methods to be applied to collect and analyze this data, and how all of this is going to answer the research question (Grey, 2014). As explained by Robson (2002), there are three possible forms of research design: exploratory, descriptive and explanatory.

This study adopted the explanatory research design. An explanatory study sets out to explain and account for descriptive information. (Grey, 2014). It builds on exploratory and descriptive research and goes on to identify actual reasons a phenomenon occurs. Explanatory research looks for causes and reasons and provides evidence to support or refute an explanation or prediction. It is conducted to discover and report some relationships among different aspects of the phenomenon under study.

3.4 Research Approach

There are three approaches or methods to conducting research: qualitative methods, quantitative methods and mixed methods (Creswell, 2003; Creswell & Plano-Clark, 2007; Teddlie & Tashakkori, 2009).

A quantitative method was used in this study. Aliaga and Gunderson (2000), describes quantitative study as a research approach explaining a phenomenon by collecting numerical data that are analyzed using statistical approaches. It is an approach in which the investigator employs strategies of inquiry such as experiments and surveys and collects data on predetermined instruments that yield statistical data (Creswell,

2003). The greatest strength associated with quantitative research is that its methods produce reliable and quantifiable data that can potentially be generalized to a large population (Marshall, 1996). In addition, it is suitable to test and validate already constructed theories about how and why phenomena occur through testing hypotheses that are constructed before the data are collected. This approach was suitable model to be employed to examine the effects of macroeconomic convergence compliance on growth in ECOWAS.

3.5 Study Population

The population consists of fifteen (15) countries forming the Economic Community of West African States (ECOWAS). The fifteen member countries in ECOWAS are divided into WAMZ and the WAEMU zones. The WAMZ zone is made up of member countries namely: Nigeria, Ghana, Gambia, Liberia, Sierra Leone, Cabo Verde and Guinea. WAEMU zone is made up of Cote D'Ivoire, Burkina Faso, Togo, Benin, Mali, Niger, Guinea Bissau, and Senegal (ECOWAS, 1975; Convergence Report (2010, 2014, 2016, 2017, and 2021). The ECOWAS region is chosen due to its composition and different economic and monetary structures (Adeleye et al., 2020).

3.6 Sample Size

The study employed the census approach to determination sample size. This approach uses the entire population as the sample. This approach is appropriate because the study sought to use all the 15 ECOWAS member states as the sample size. A census is more attractive for small populations. Also, a census eliminates sampling error and provides data on all the individuals in the population.

3.7 Data Collection

This study adopted the macroeconomic convergence criteria adopted by the Authority of ECOWAS Heads of State and Governments in 2015. Data was collected on the primary criteria: data on the Budget Deficit/GDP(BDG), Average annual Inflation Rate (AIR), Gross External Reserves (GEXR), and also Central Bank Financing of the Budget Deficit < 10% of the previous year's tax revenue (CBFB), and data on secondary criteria: Public Debt as a percentage of GDP (PDG) and Nominal Exchange Rate Variation (ECHV) (Convergence Report 2010, 2014, 2016, 2017, and 2021) from WAMI and BCEAO in the computation of the macroeconomic compliance index.

Based on theory and empirical studies, a number of variables that are thought to influence per capita income convergence have been included in the model of the current study. Foreign Direct investment (FDI). Investment (represented by gross fixed capital formation) as a percentage of GDP (INV), Trade openness (TO), Secondary School Enrollment (SER), and GDP per capita (PGDP) were sourced to measure economic growth.

The data used in the study for analysis were annual data obtained from the World Bank Development Indicators (WDI) and the Convergence Report (2010, 2014, 2016, 2017, and 2021) from WAMI and BCEAO. The study covers the period from 2005 to 2022, and the growth estimation variables are expressed in United States dollars. Data analysis was done with STATA 14 and EVIEWS 10. The results of descriptive statistics and regression were presented in tables and graphs.

3.8 The Theoretical and Empirical Framework

The theoretical framework and empirical methodology used for the study are mainly based on those used in Chapsa et al. (2015). This is because Chapsa et al. (2015) estimate the dynamic model using the GMM estimator. A dynamic model used has overcome challenges faced by a static panel approach and was developed from the classical approach to convergence. Barro (1996) used the model to compare GDP per capita across countries.

The model uses two concepts of convergence, namely β -convergence and σ -convergence. β -convergence is whereby poor economies tend to grow faster than rich ones, while σ -convergence is when a group of countries are converging in the sense of σ if the dispersion of their GDP per capita levels tends to decrease over time (Barro, 1996). Additionally, the theory postulates that it is possible for poor economies to grow faster than rich ones without observing the cross-sectional dispersion falling over time. The key implication is to find β -convergence without finding σ -convergence.

These definitions of convergence were developed from the theory of the Solow growth model (1956). The Solow growth model uses a Cobb-Douglas production function that assumes labour-augmented technological progress and constant returns to scale. Consequently, the growth equation is stated as:

$$Y = K^\alpha (AL)^{1-\alpha} \dots\dots\dots (3.1)$$

Where:

Y = output

K = capital,

L = labour, and

A = the total factor of productivity

α and $1 - \alpha$ denote output elasticities.

The assumption by Solow (1957) growth model postulates that technology is exogenous with diminishing marginal returns to capital. However, Romer (1986) argued that the diminishing marginal productivity of capital might not cause long-run growth. Furthermore, Romer (1990) stated that both physical and human capital are a function of new knowledge. Therefore, he argues that the marginal productivity of knowledge can effectively override the marginal productivity of physical capital only if there is an increasing marginal product of both physical and human capital.

However, one can conclude that there is a possibility of economic growth in the long run as a result of an increase in the marginal product of knowledge. Barro (1991) also suggested that the development of social infrastructure enhances literacy, which can lead to an increase in economic growth. On the basis of the production function in equation (3.1), empirical studies testing absolute economic convergence estimate the following equation:

$$g_{i,t} = \alpha + \beta \log y_{i,0} + \epsilon_{i,t} \dots \dots \dots (3.2)$$

Where; α is the constant, β represent the estimated rate of convergence and $\epsilon_{i,t}$ is the error term. The dependent variable $g_{i,t}$ is the growth rate of the per capita GDP of a country i and the independent variable $y_{i,0}$ represents the initial GDP per capita of the specific country. The above equation (4.2) implies that countries will converge towards a common steady state in terms of income. On the other hand, empirical studies testing for the existence of conditional economic convergence estimate the following equation:

$$g_{i,t} = \alpha + \beta \log y_{i,0} + \gamma X_{i,t} + \epsilon_{i,t} \dots \dots \dots (3.3)$$

As discussed above; α is the constant, β stands for the estimated rate of convergence, $\epsilon_{i,t}$ is the error term. The dependent variable $g_{i,t}$ is the growth rate of the per capita GDP of the country i and independent variable $y_{i,0}$ represents the initial GDP per capita of the specific country. The term $X_{i,t}$ is the vector of independent variables which by economic theory includes; Foreign Direct Investment (FDI), Trade openness over GDP (TO), Gross fixed capital formation as share of GDP (INV), Human Capital (proxied by Secondary School Enrolment (SER), and Government Expenditure (GEX). The above equation (3.3) implies that a country will converge to its own steady state based on cross-section differences in different economic sources which include the population growth, technology, and physical and human capital.

The general specification of the estimated model in reference to the objectives of the current study is given in two scenarios;

(i) For the absolute beta convergence, the equation is as follows

$$g_{i,t} = f(\ln pgdp_{i,t-1}) \dots \dots \dots (3.4)$$

Where: the dependent variable is the average growth rate and the explanatory variables is the logarithm of lagged PGDP.

(ii) For the conditional beta convergence:

$$g_{i,t} = f(\ln pdgp_{t-1}, L.FDI_{i,t}, TO_{i,t}, GEX_{i,t}, INV_{i,t}, SER_{i,t}) \dots (3.5)$$

Where; FDI is foreign direct investment, TO is trade openness, GEX is government expenditure, INV is gross fixed capital formation, SER is the secondary school gross

enrolment. The choice of sources of economic growth was mainly selected in line with economic theory and also due to the availability of data from potential sources.

Equation 3.5 was extended to include the macroeconomic convergence compliance index to measure its effect on the growth.

$$g_{i,t} = f(\ln pdgp_{t-1}, FDI_{i,t}, TO_{i,t}, GEX_{i,t}, INV_{i,t}, SER_{i,t}, COIN_{i,t}) \dots\dots (3.6)$$

The expectation of beta convergence is that the sign for the logarithm of the lagged per capita GDP variable should be negative, implying that the lower the initial value of real per capita GDP, the faster the growth and the greatest possibility of less developed countries catching up with developed ones in the region. The expectation for the catch-up effect is that poorer countries are expected to have higher economic growth if the convergence coefficient is negative and significant. However, the convergence coefficient (β) depends mainly on the productivity of capital and the willingness to save (Barro and Sala-i-Martin, 1992).

3.9 Definitions of Variables, Measurement, and Expected sign

3.9.1 The Dependent Variable

Real GDP per capita (PGDP) growth rate: real GDP is a measure of the total output of a country that takes gross domestic product (GDP) and divides it by the population in the country. The coefficient of the lagged PGDP is expected to be negative, implying that poorer countries are eventually catching up with rich countries. This reflects that there is an inverse relationship between the annual average growth in real GDP per capita and the initial real GDP per capita, thus implying that lagging countries are catching up with the leading countries. The leading country's output performance must grow slower than the stragglers in order for convergence to occur.

The study follows the literature by using the growth rate of per capita GDP as a proxy for economic growth. The variable is measured in millions of US dollars. The variable was obtained from the World Bank Development Indicators (WDI) statistical database. Real GDP is used in the analysis as a measure of real sector activities. The choice of this variable is guided by theory. Researchers such as Saka et al. (2015), Amoateng (2014), Levine et al. (2000), Beck and Levine (2000), and Tshireletso (2017) also used this variable as a proxy for economic growth.

3.9.2 The Independent Variables

Compliance index (COIN): ECOWAS member states are required to satisfy all the macroeconomic convergence criteria prior to the launch of the monetary union. The macroeconomic convergence compliance of member countries was created using the member's performance score in meeting the macroeconomic convergence criteria. The macroeconomic convergence compliance variable enters the model as a policy variable. The study computed an additive index based on the performance scores for each of the six indicators and calculated the mean score to arrive at an index for macroeconomic convergence compliance. The study adopted the work of Egbuna et al. (2018), who computed the index with other integration indexes to form a composite index.

Foreign Direct Investment (FDI) is mainly the capital investment that is owned and operated by a foreign entity (Black et al. 2012). The increase in investor base can bring in more capital flows; therefore, the expectation is that countries with higher FDI should have higher growth and converge. On the other hand, some empirical studies have found that FDI crowded out domestic investment. Hence, the coefficient of FDI is expected to be positive or negative. In this study, the net inflow of FDI as a

percentage of GDP was used (Razanaparany, 2020). The data is in current millions of US dollars at constant prices for a given year. The World Bank Development Indicators (WDI) statistical database was used to extract the data.

Trade openness over GDP (TO): This is mainly the total exports and imports of goods and services as a percentage of GDP. Literature has shown that trade openness has the potential to cause economic growth (Park and Claveria, 2018). Therefore, the coefficient of the variable is expected to be significant and positive since economic theory suggests that the more the country has liberalised trade, the higher the economic growth. The variable is expressed as a share of GDP in the current US dollar for a given year. Data for this variable was obtained from the statistical database of the World Bank indicators.

Gross fixed capital formation as a share of GDP (INV) Formerly, gross domestic fixed investment included plants, machinery, and equipment. It also includes the construction of roads, railways, and others such as schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings. The variable is used as a proxy for investment. Gross fixed capital formation as a proxy for capital has been used in several other studies, such as Park and Claveria (2018), Amoateng (2014), Aryeetey and Fosu (2005), and Mansouri (2005).

The role of capital accumulation as a central element of sustained growth in Africa has been extensively documented in the literature, so the coefficient of the investment rate must be positive (Barthelemy & Soderling, 2001). The higher the rate of investment, the higher the growth rate of the economy, all other things being equal. This is in line with both neoclassical and endogenous growth predictions.

Secondary School Enrollment (SER): This is the ratio of total enrolment, regardless of age, to the population of the age group that officially corresponds to the level of secondary education (Black et al. 2012). This is a proxy for human capital; therefore, skilled labour may contribute to growth and convergence. Schultz (1999) reported that the impact can be negative when countries have low endowments in human capital. Human capital can also positively affect the level of GDP through its effects on productivity and economic policies. All in all, the signs of the human capital variable can be either positive or negative.

Government Expenditure (GEX): In a standard open economy, public spending has a positive demand impact, especially in the short run (a demand boom is associated with higher growth). Meanwhile, this effect can be overwhelmed by negative supply-side influences if the increased spending implies distortionary taxes. In the latter case, one may expect a negative coefficient. The ratio of government expenditure to GDP (GEX) variable enters the model as a policy variable and also to complete the components of the GDP.

Keran (1971) stated that changes in government spending affect total spending and corporate earnings, thereby affecting share prices. Government expenditure, according to the Keynesian proposition, is expected to raise economic growth. It could, however, reduce economic growth because of the crowding-out effect on private investment and the inflationary pressures it can lead to (Allen & Ndikumana, 2000). However, given that all things remain constant and follow the Keynesian proposition, the study expects GOV to have a positive sign.

According to the Keynesian proposition, an increase in government expenditure, if bonds are financed, raises aggregate demand, which leads to an increasing demand for

cash balances. Government expenditure is expected to propel economic growth without a crowding-out effect on the private sector. This study follows the works of Easterly & Rebelo (1993) and Alexander (1997).

3.10 Dynamic Panel Model

A dynamic panel model is preferred to the static panel model because it includes the lagged dependent variable as an explanatory variable. Therefore, this feature makes the assumption that strict exogeneity does not hold under the dynamic model.

The study employed a generalised method of moments (GMM) for dynamic panels since the method addresses the presence of unobserved country-specific effects and common time effects, as suggested by Allerano and Bond (1991). However, another way of dealing with challenges encountered by previous studies Kumo (2011), Charles and Hoarau (2011), and Kabala and Mogotsi (2012) use instrumental variables with lags in order to take care of the endogeneity problem and check cross-sectional dependency. Most economic issues are dynamic by nature; therefore, the use of the dynamic panel model helps to understand adjustments to economic growth theories. The dynamic model is advantageous because it captures individual effects specifications that may be used to summarise cross-sectional heterogeneity, which is not observable.

3.11 Measurement Error and Endogeneity

The issue of measurement error occurs when the theory outlines that the inclusion of the variable in a model cannot be correctly measured (Gujarati & Porter, 2009). In econometric terms, it is very important to deal with measurement error. As a result, the difficulty in measuring some important variables may force a researcher to use an incorrect variable. This might end up bringing some contradictory empirical results.

Endogeneity occurs when the variable is correlated with the error term (that is when an explanatory variable is defies zero conditional mean assumption) (Arellano & Bond,1991). Literature has shown that measurement error and endogeneity have similar effects on the panel regression model in general. The use of instrumental variables (IVs) is used as a remedy for endogeneity. However, the use of the GMM by the current study, while relaxing the assumption of exogeneity, just like the IVs method, it is expected to result in efficiency in the estimation.

3.12 Diagnostic Tests for Panel Models

3.12.1 Specification Test

As far as empirical work is concerned, GMM estimators are said to be more efficient if the moment conditions are valid (Arellano and Bond, 1991). Under the specification tests, the Sargan overidentifying test and the AR (2) test of Arellano and Bond (1991), which is the second-order test for serial correlation, are carried out. The Sargan overidentifying test is done under the null hypothesis of overidentifying restrictions being satisfied or valid, against the alternative hypothesis that overidentifying restrictions are unsatisfied or invalid. The test is about the validity of instrumental variables. Therefore, due to belief in the consistency of the GMM, it is vital to carry out this test. The rejection of the null hypothesis does not support the model, but failing to reject the null hypothesis supports the model. The model is supported when the probability value (p-value) of the J-statistic is insignificant.

Additionally, the consistency of the GMM also depends on second-order serial correlation. Therefore, it requires that there be no second-order serial correlation in the first difference of the error term. The AR (2) test of Arellano and Bond (1991) is used because any first-differenced equation with original uncontrolled disturbance

terms is assumed not to be serially correlated. Therefore, the first-order serial correlation rejects the null hypothesis of no serial correlation. With this problem, AR (2) is more useful than AR (1). The null hypothesis under this test is that there is no autocorrelation, against the alternative of autocorrelation. Therefore, rejecting the null means that there is a second-order serial correlation, and failing to reject the null means that there is no second-order serial correlation.

3.12.2 Testing for Cross-Sectional Dependence

One of the most important steps before the estimation of the model is also to test for cross-sectional dependence because ignoring cross-sectional correlation can lead to severely biased results. The study uses the Pesaran (2004) CD test to check if complex forms of spatial and temporal dependence may arise when the cross-sectional units have been randomly and independently sampled. The test employs the correlation coefficients between the time series for each panel member.

In the context of ECOWAS as a region of interest, the dataset is N=15 countries, this would be 15 x 14 the correlations between country *i* and all other countries, for *i*=1 to N-1. So, it follows that the estimated correlation coefficient between country *i* and *j* is as ρ^{ij} , therefore the Pesaran CD statistic is computed as:

$$CD = \sqrt{\left[\frac{2}{N(N-1)}\right]} * \left[\sum_{i=1}^{N-1} \sum_{j=1+1}^N \sqrt{T_{ij} \rho^{ij}}\right] CD \sim N(0,1) \dots \dots \dots (3.7)$$

Where:

T_{ij} is the number of observations for the correlation coefficient.

Equation 3.7 is mostly suitable for unbalanced panel data with the null hypothesis of cross-section independence, the above statistic is the distributed standard normal for $T_{ij} > 3$ and where N is sufficiently large. The CD test is important because it is robust

to non-stationarity, heterogeneity, or structural breaks and was shown to be significant even in small samples.

Alternatively, Pesaran (2004) outlined that cross-section dependence is a panel test of error cross-section dependence used in different types of panel models. The proposed test is mainly concerned with the average of pairwise correlation coefficients of OLS residuals from each regression in the panel rather than just a Breush-Pagan LM test.

3.12.3 The Unit Root Test

Testing for a unit root in the panel has been made known by Levin, Lin, and Chu (2002): Maddala and Wu (1999): ImPesaran and Shin (IPS) (2003): Choi (2001): Fisher (2002) and Hardi (2000). The study will use the Augmented Dickey Fuller-Fisher (ADF-Fisher) and Philip Perron (PP) tests to determine the presence of unit root and order of integration for data series mainly because these two are allowed for unbalanced panel data. The other valid reason for using the two tests is that they allow for heterogeneous dynamics which are useful for panel applications.

3.13 Estimation Techniques

The main reason why the study adopted the dynamic model over the static model is because of the assumption of uncorrelated errors being invalid and the chances of a substantial amount of spatial dependence. Therefore, in this context, the static panel estimation will yield inefficient parameters, and biased estimates and this makes the use of the dynamic model more appealing. However, the GMM estimation approach is used to deal with these issues. The dynamic panel model allows testing on sample moments implied by the presence of individual effects by which the GMM is a robust estimator, unlike maximum likelihood estimation which does not require information on the exact distribution of the disturbances (Arellano & Bover, 1995).

Therefore, most estimators in the panel are special cases of GMM (Wooldridge, 2009). The GMM also takes care of the problem of serial correlation and heteroscedasticity (Bond et al., 2001). The estimator can be implemented when the number of time periods (T) the greater than the cross sections (N) which is applicable to our sample of ECOWAS. The GMM in general is capable of correcting unobserved country heterogeneity, omitted variable bias, measurement error, and potential endogeneity problems that arise in growth estimation (Arellano and Bond, 1991). The most two common estimators for the GMM are difference GMM due to Arellano and Bond (1991) who built upon the works of Anderson and Hsiao (1982) and Holtz-Eakin et al. (1988), and system GMM due to Blundell and Bond (1998), extending the knowledge from Arellano and Bover (1995).

The difference GMM estimator goes by, firstly, taking the difference of the dynamic panel model in order to remove the individual specification unobserved effect. This is further discussed by Arellano and Bover (1995), who suggested that the average future value for each variable is subtracted from the current one rather than the lagged one. This in short describes the forward orthogonal deviations that are relevant and appropriate for an unbalanced panel.

The system GMM estimator procedure, it manipulates the difference GMM, through the inclusion of an extra assumption which produces an additional set of moment conditions to leverage. Furthermore, this requires that lagged changes in the dependent variable are valid instruments for the level of the lagged dependent variable in the level equation (Arellano and Bover, 1995). In more specific terms this will be only true if and only if the deviations from the long-run mean are correlated to the individual-specific unobserved effect.

3.14 Generalised Method of Moments (GMM) Instruments

Instrument specification is very important in GMM estimation because it improves the efficiency of the estimator when correctly specified. The GMM estimator allows the correction of endogeneity bias (time-varying component) through instrumenting the explanatory variables (foreign direct investment, trade openness, gross fixed capital formation, and secondary school enrolment).

The use of the Stata 14 software permits the correction of any instrumental specification error by the `_collapse'` command. This command is used to limit the instruments in case the researcher has overstated instrumental variables. Since the study uses a small sample (the ECOWAS region), a large number of instruments may cause the Sargan test to be weak. So, the rule of thumb is to keep the number of instruments less than or equal to the number of groups. However, the number of lags is also very vital under instrumental specification because, with lags, one can find a good instrument, but using deeper lags reduces the sample size.

3.15 Test of significance difference between the two Regression Coefficients of the Subsample.

To determine the significance of the difference between the two regression coefficients of the subsample, this study follows the work of Clogg et al. (1995) and Clark et al. (2006). The numerator of this test is the estimated difference between the two coefficients in the population, and the denominator is the estimated standard error of the difference.

$$H_0: b_1 = b_2$$

$$H_1: b_1 \neq b_2$$

Z-scores were calculated as

$$z = \frac{(b_1 - b_2)}{\sqrt{(seb_1)^2 + (seb_2)^2}}$$

where b_1 is coefficient (r or slope) from sub sample 1 (WAEMU) and b_2 is coefficient (r or slope) from sub sample 2 (WAMZ).

3.16 Summary of Methodology

This chapter looked at the research design, data source and collection, and the model and estimation techniques employed for the objectives of the study. An additive index of macroeconomic convergence compliance was generated to help analyse compliance, or the number of convergence criteria met by each member country for each year over the period of the study (Appendix 1). The GMM estimation technique was used to assess the effect of macroeconomic convergence on economic growth. Correlation and unit root tests were conducted to ensure the model was fit for purpose.

The chapter also explored the main theoretical underpinnings of the study. Based on theory and empirical studies, a number of variables that are thought to influence per capita income convergence have been included in the model of the current study. The chapter also dealt with the issue of variable description, measurement, justification for the choice, as well as their priori economic expectations, particularly in terms of signs.

Also, the panel dataset on foreign direct investment (represented by gross fixed capital formation) as a percentage of GDP, trade openness, secondary school enrollment, and government expenditures from 2005 to 2022 was employed for the study based on the relaxation of the assumption of a closed economy without government activity. The macroeconomic convergence compliance index (refer to

Appendix 3) was used as a policy variable in the model to measure the effect of compliance on growth. In both estimations, per capita income growth is the dependent variable. Also, in both estimations, a negative coefficient on initial per capita income implies convergence; otherwise, there is divergence.

Further, empirical models and some econometric estimation techniques relevant to the study have been specified and discussed. Discussion on the various sensitivity analyses aimed at ensuring the fitness of variables and models has also been made. By doing so, the chapter has set out a good platform for the estimation and discussion of results.



CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter presents the empirical results from all data techniques previously discussed in chapter three (3). The descriptive, sensitivity analysis and a graphical presentation of the macroeconomic convergence compliance for each member state have been presented. Finally, the results of the panel generalized method of moments GMM.

4.2.1 Descriptive Statistics of the Variables

In this section, the basic characteristics of the variables in question are presented. This includes graphs of trends of the macroeconomic convergence criteria and summary statistics of the variables used in the regression analysis are presented.

4.2.2 Overview of the Macroeconomic Convergence Criteria

Table 4.1 Convergence Criteria Outlined for West African Countries

ECOWAS	
Primary Criteria	Secondary Criteria
1. An average annual inflation rate of less or equal to 5%.	1. Public debt per GDP of not more than 70%
2. A budget deficit of not more than three percent	2. Nominal exchange rate variation of plus and minus 10%.
3. Gross reserves can finance at least three months of imports	
4. Central bank financing of budget deficit not more than 10% of the previous year's tax revenue;	

Source: ECOWAS Commission (2015)

To get a clearer picture of the trends of the macroeconomic convergence criteria over the period of the study and also in the WAEMU and WAMZ zones, this study employed graphs to depict the trends for the zones separately.

4.2.3 Primary Convergence criteria

As part of the processes towards the formation a monetary union, ECOWAS member states are required to satisfy four primary convergence criteria as follow: Inflation Rate ≤ 5 percent; budget Deficit/GDP Ratio ≤ 3 percent Central Bank Financing of Budget Deficit/Previous Year's Tax Revenue ≤ 10 percent and Gross External Reserves ≥ 3 months of imports cover.

Average annual inflation of not more than 5%.

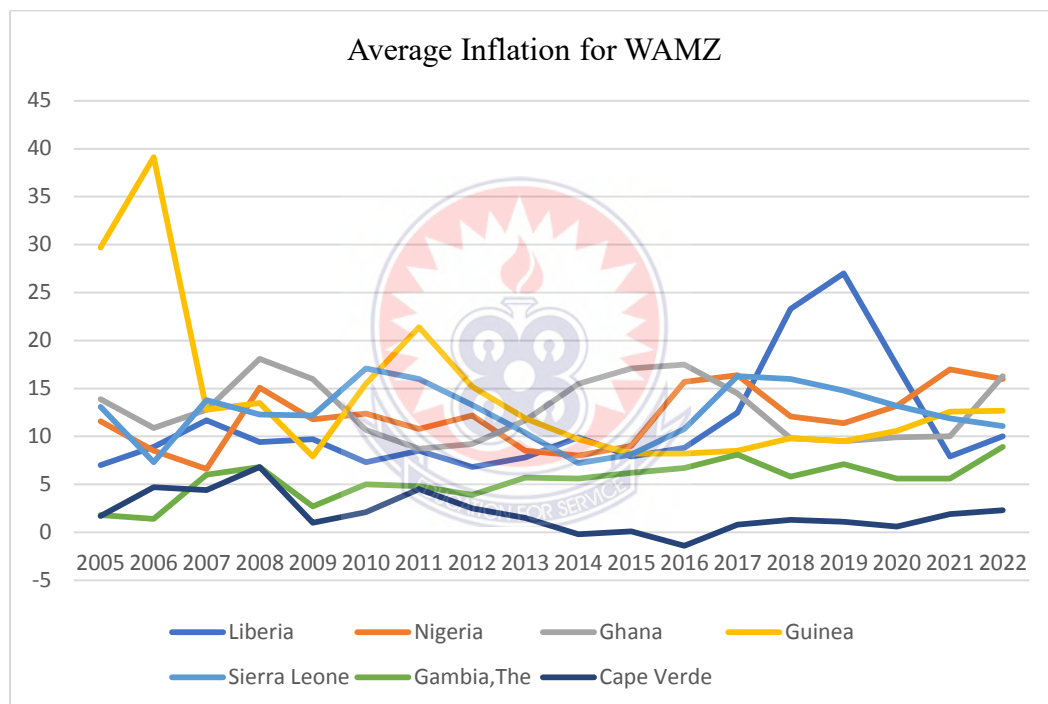
The target for inflation criterion is single digit and this measurement is in the nominal term. This target means that the inflation rate of member countries should not exceed 5%. The inflation here is defined as the increase in the general price based on the Consumer Price Index, between successive years. Price stability is an important economic factor for the attainment of real economic growth. The achievement of this criterion is perhaps meant to determine if macroeconomic stability can be sustained in the long run in the currency union (Adusei, 2012).

Figures 4.1 and 4.2 present the inflation rates over 2005–2022 for fifteen countries in the ECOWAS, as measured by the percentage change in the consumer price index. The figure shows the differentials of inflation patterns for countries in the WAMZ and the WAEMU, which form the ECOWAS. Figure 3.1 shows that countries that use sovereign currencies are more characterized by an insufficient macroeconomic restraint. figure 4.2 shows that there is a relative uniformity or stability band in the movement of the inflation rate in the WAEMU compared to the WAMZ (Fig.4.1).

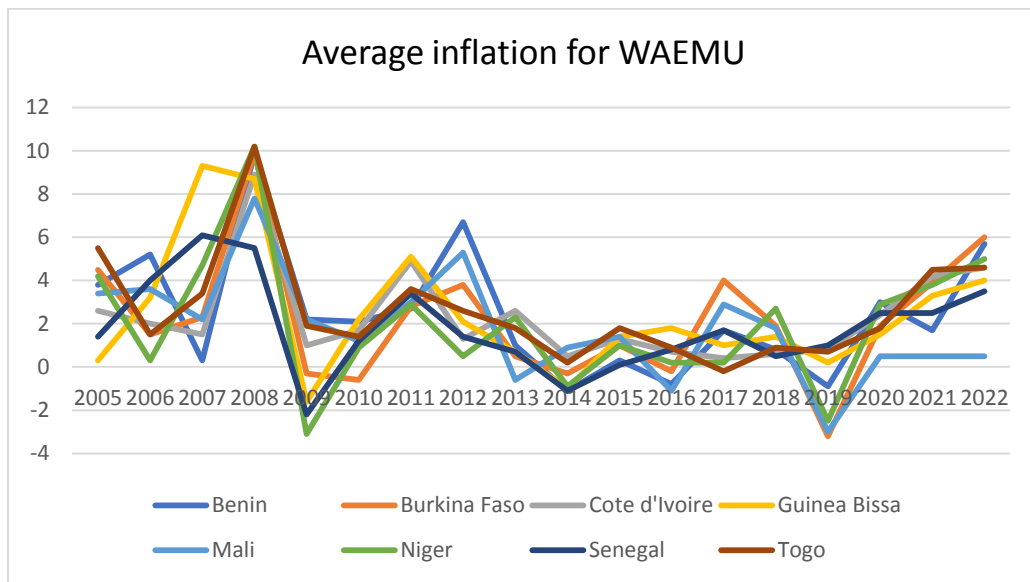
These figures show the difference in inflation patterns for countries with a common currency and countries that use sovereign currencies.

Average rate of inflation (AIR) for WAEMU WAMZ was 2.2% and 10.0%. The mean value for WAEMU is below the threshold of $\leq 5\%$. The WAMZ zone however failed to meet the target with approximately 5% more than the target. The WAMZ and ECOWAS as a whole failed to meet for the period.

Figure 4.1: Average inflation for WAMZ



Source: WAMI database (2005-2022)

Figure 4.2: Average inflation for WAEMU

Source: WAMI database (2005-2022)

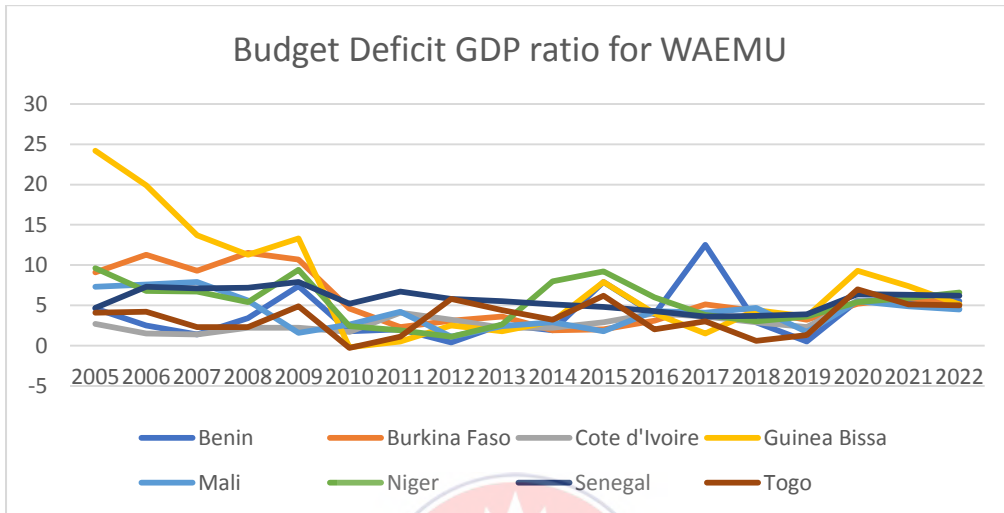
A budget deficit of not more than 3%

An unfavourable fiscal balance has a negative influence on monetary policy as well as the economic stability of a country as a whole. This criterion is therefore intended to evaluate the government's commitment to fiscal prudence. Under this criterion, member countries' fiscal operations should not result in a deficit that is more than 3% of the GDP. This means that member countries' expenditures on fiscal operations are required not to exceed 3% of the GDP.

The target for the budget deficit has become difficult for most of the member states to meet, especially with the onset of COVID-19 (WAMA, 2020). The BDG mean for both WAEMU and WAMZ was above the threshold. The mean value of the budget deficit was 4.84% for the WAEMU and 4.25% for the WAMZ. The minimum value of -0.3% was recorded by Togo in 2010, and the maximum value of 24.2 percent was recorded by Guinea-Bissau in 2005 in the WAEMU. In the WAMZ zone, the minimum value of -7.5 was recorded by Liberia in 2012, and the maximum value was

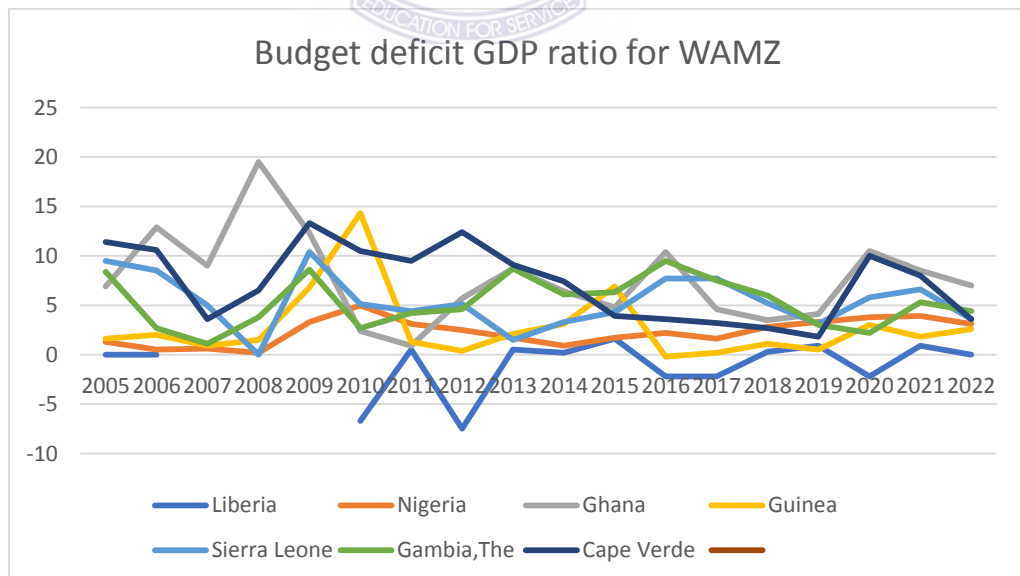
recorded by Ghana in 2008. In effect, none of the zones, and by extension, ECOWAS as a whole, met this criterion.

Figure 4.3: Budget Deficit of the WAEMU countries



Source: WAMI database (2005-2022)

Figure 4.4: Budget Deficit of the WAMZ countries



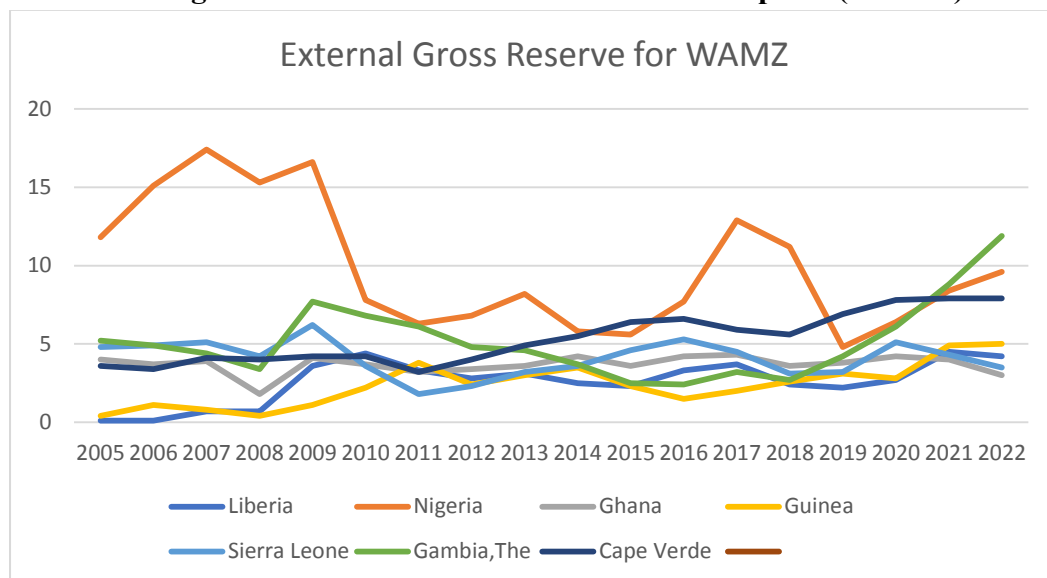
Source: WAMI database (2005-2022)

Gross reserves that can finance at least three months of imports

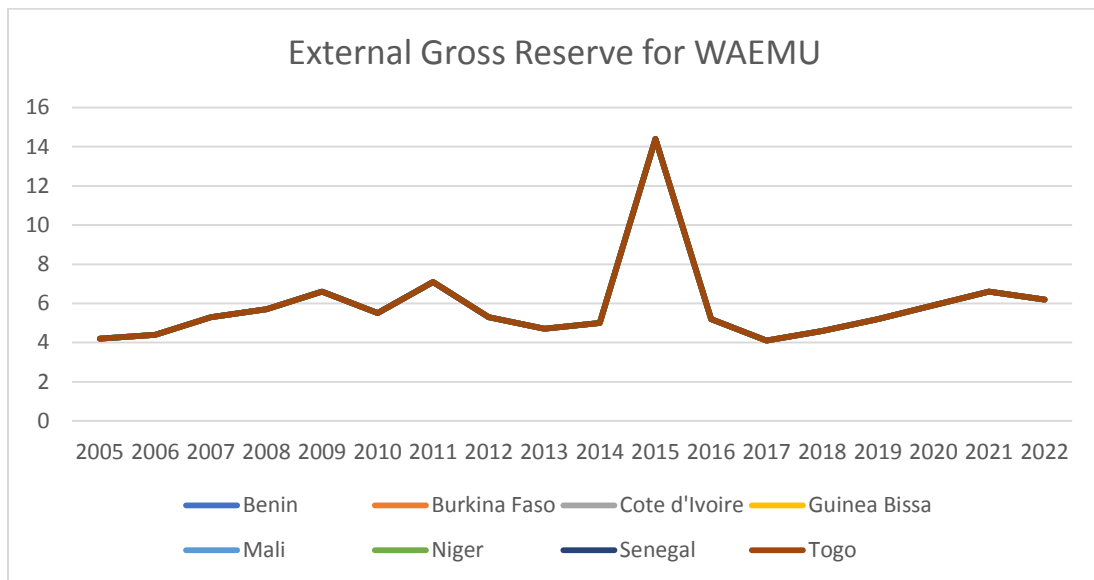
The reserve is an indicator that shows the economic health of countries in the ECOWAS sub-region. It is a source of security for governments in an unpredictable economic situation. It helps control and manipulate exchange rates for currencies from speculation attacks. Countries with a significant export volume in global trade would have a huge stock of reserves (Ajibola et al., 2015). These reserves are mostly held in the US dollar, attributable to the US dollar being a primary reserve currency and, therefore, most suitable for trading. However, countries in the WAEMU hold their reserves in the Euro due to the monetary union treaty with France. Gross External Reserves (GEXR) have a mean of 5.9 and 4.7 months of import cover for WAEMU and WAMZ, respectively.

The mean values in both zones exceeded the threshold of >3 months of import cover. However, the WAEMU performed better than the WAMZ countries with 1.2 months of import cover. This criterion was met by ECOWAS as a whole and also by the WAEMU and WAMZ.

Figure 4.5: Gross Reserves in Months of Imports (WAMZ)



Source: WAMI database (2005-2022)

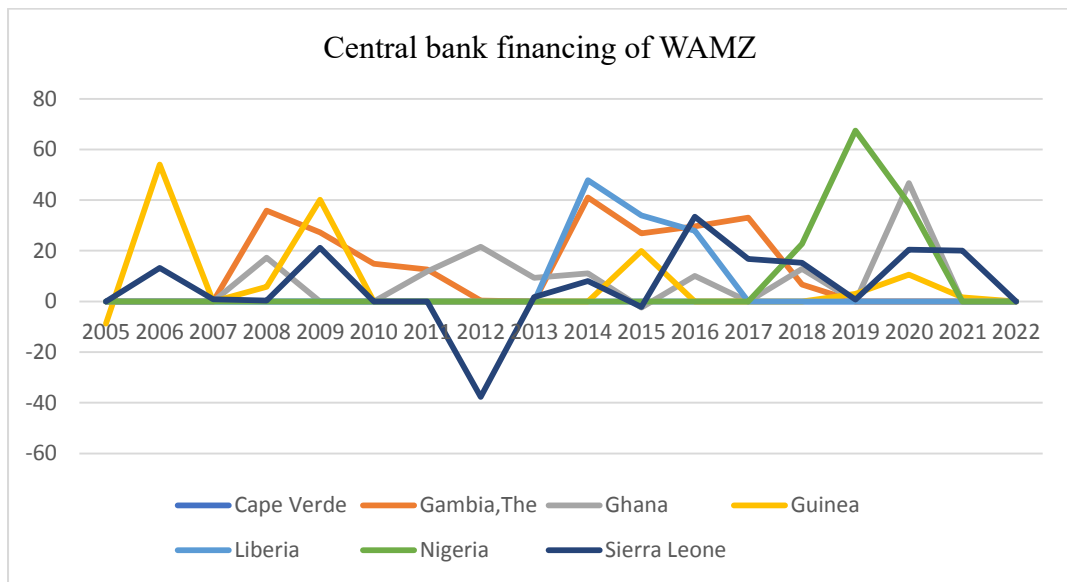
Figure 4.6: Gross Reserves in Months of Imports (WAEMU)

Source: WAMI database (2005-2022)

Central Bank financing of budget deficit not more than 10% of the previous year's tax revenue.

One of the sources of financing a government deficit is the central bank, which prints money to fund the debt. In order to sustain fiscal prudence, there should be a ceiling on the national central bank's financing of the budget deficit. This criterion seeks to limit the financing of government fiscal operations by central banks to 10.0% of the previous year's tax revenue. Most of the countries in this zone have performed credibly well so far as this criterion is concerned.

The average Central Bank Financing of Budget Deficit (CBFB) for WAEMU is zero percent, as most WAEMU member countries do not rely on government financing of the budget deficit. The situation is, however, different in the WAMZ zone, with a mean of 6.7%. Although the mean value is below the target of $\leq 10\%$ in both zones.

Figure 4.7: Central Bank financing of WAMZ countries

Source: WAMI database (2005-2022)

4.2.4 Secondary Convergence

The secondary convergence criteria secondary criteria: Public debt per GDP of not more than 70% and Nominal Exchange Rate Variation ± 10 percent

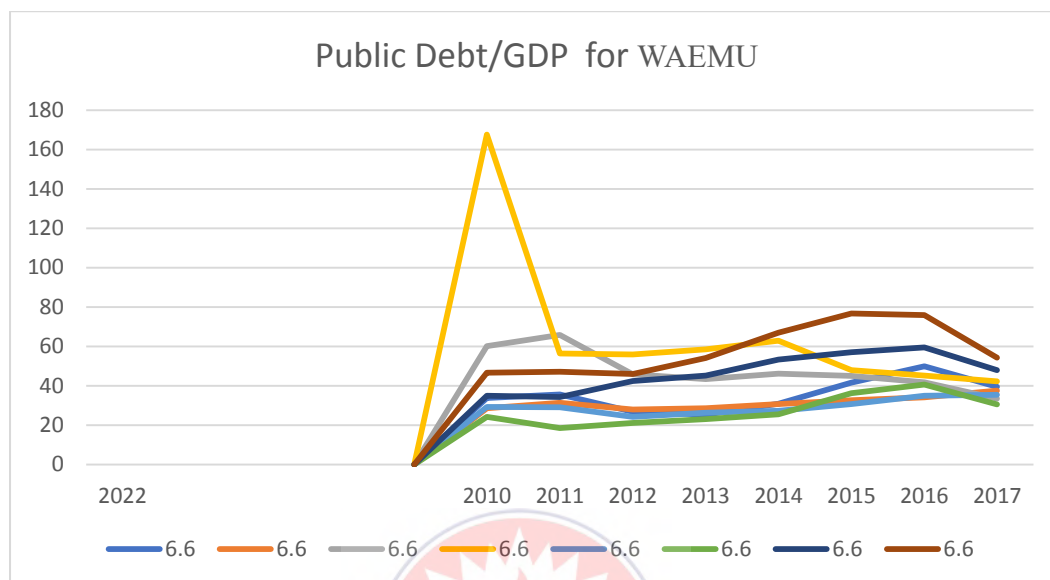
Public debt per GDP of not more than 70%

Public debt per GDP measures the ability of countries to pay their debts by comparing the debts of the country with its annual economic output. It shows the number of years to service debts when GDP is dedicated to debt-servicing. Higher debt to GDP affects the level of inflation and foreign direct investment since investors will be burdened with outrageous taxes (Abban 2020; Ajayi & Choi, 1993). Raissi (2018) argue that a higher public debt per GDP slows down growth in the long run. Therefore, the essence of the criteria was to ensure a sustainable debt level over the years.

A remedy for reducing public debt is to increase the sale of securities to foreigners. The average mean of public debt to GDP (PDG) for WAEMU is 33.5% with a spread of 25.8 percent. The mean for WAMZ is 43.1%, with a spread of 40.3%. The mean

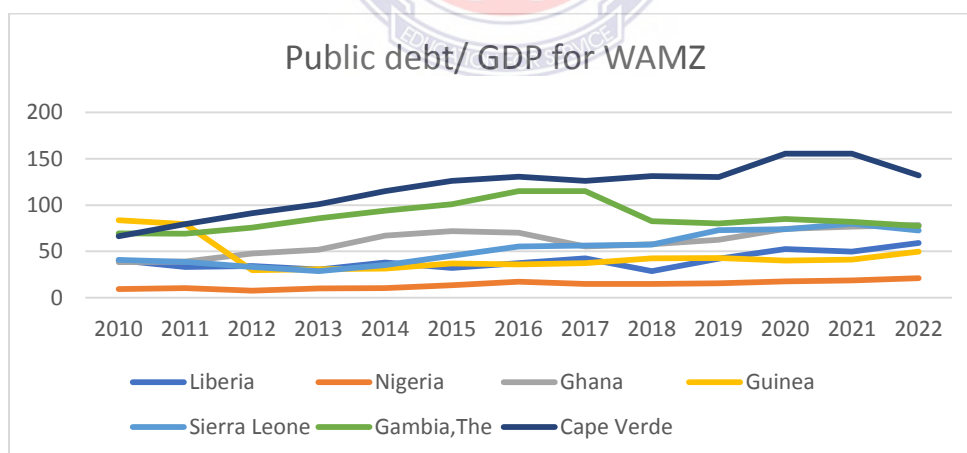
values for both zones were below the threshold of < 70%. However, the WAEMU performed better than the WAMZ, with a 9.6% difference.

Figure 4.8: Public debt per GDP of WAEMU Countries



Source: WAMI database (2005-2022)

Figure 4.9: Public debt per GDP of WAMZ countries



Source: WAMI database (2005-2022)

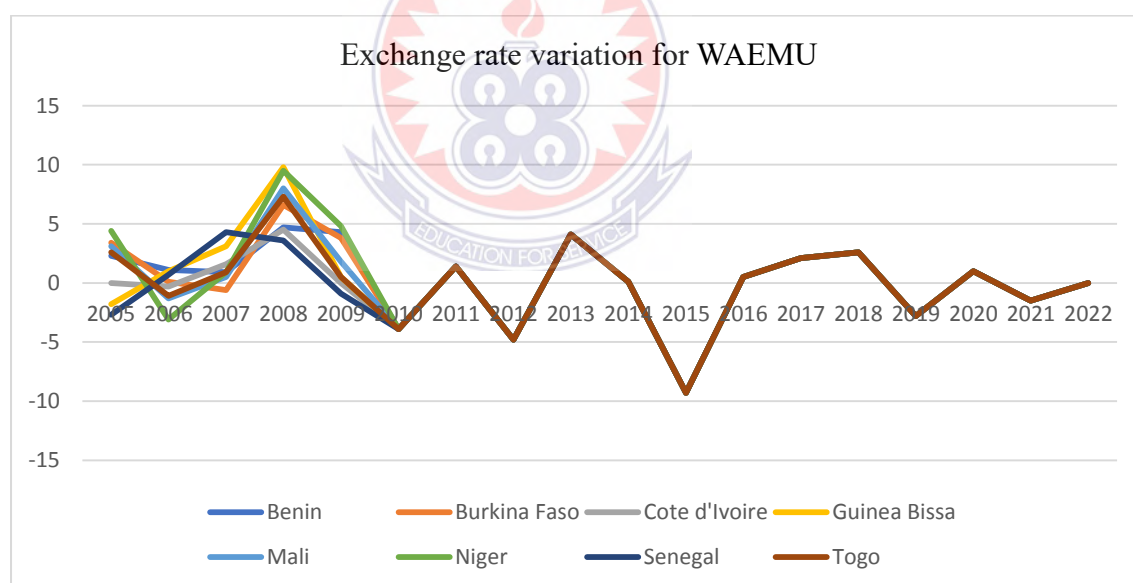
Nominal exchange rate variation of plus and minus 10%

The nominal exchange rate shows how a currency is exchanged for another. Countries do not have a bilateral nominal exchange rate due to the non-convertibility of

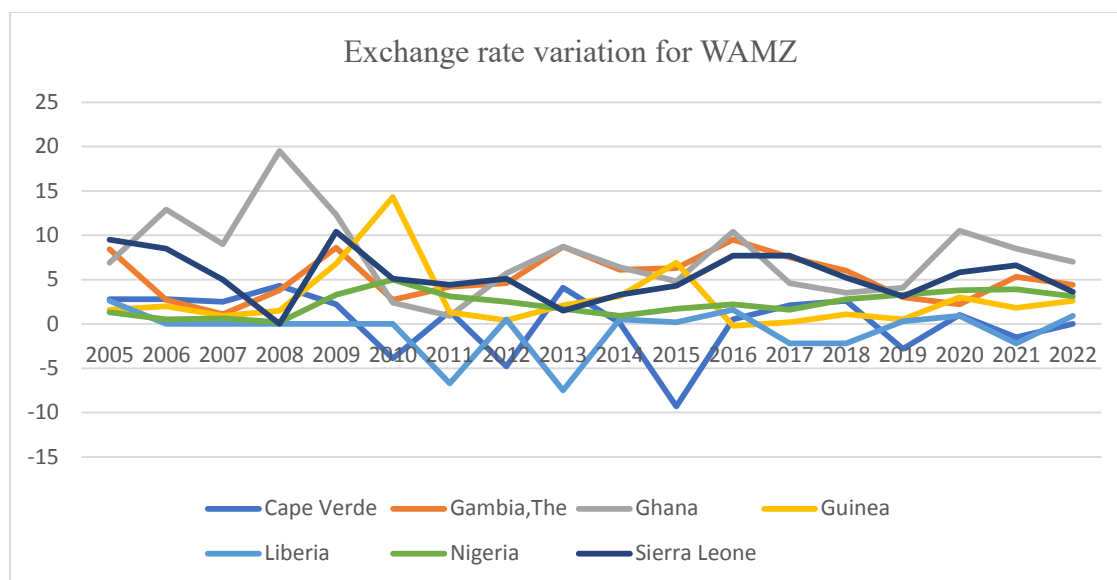
currencies in the sub-region. This criterion requires that the nominal exchange rate variation (depreciation or appreciation) of various member countries with respect to that of the US dollar should be within the range of $\pm 10\%$.

This means that the fluctuation of member countries' exchange rates should be within the margins of $\pm 10\%$. The average of the Exchange Rate Variation (ECHV) was 0.03% for WAEMU and -2.22% for the WAMZ zone. The mean values are below the threshold of $\leq 10\%$ for both zones. However, the currencies in the WAEMU zone appreciated as against the depreciation experience in the WAMZ zone. This criterion was met by ECOWAS as a whole and also by the two zones.

Figure 4.10: Nominal exchange rate variation of WAEMU countries



Source: WAMI database (2005-2022)

Figure 4.11: Nominal exchange rate variation of WAMZ countries

Source: WAMI database (2005-2022)

In conclusion, the WAEMU zone converges on all the macroeconomic convergence criteria except the budget deficit to GDP as compared to the WAMZ who converged on four of the convergence criteria (ECHV, CBFB, GEXR, and PDG) and failed on two (AIR, BDG).

4.3 Summary Statistics

The summary statistics presented consist of mean, median, maximum value, and minimum values. The following table contains some elements of descriptive statistics like mean, standard deviation, and minimum and maximum values of each respective variable.

The summary statistics of the variables used in the regression were examined. The results are presented in Table 2. The statistics show that the mean per capita GDP for the ECOWAS sub-region was 808.56 for the period under consideration. The maximum level of growth for the region was 2936.64. The mean of the total of investment in the percentage of GDP (INV) was 19.68, gross enrollment in secondary

school was 26.06%, net inflows FDI(FDINET) was 4.87% of GDP, the openness to international trade (TO) was 53.91% of GDP. The most fluctuating variable given by its spread was GEX with a spread of 28.33.% of GDP. TO has the highest maximum of 117.82 and the lowest minimum value of 0.00. FDINET (-2.57) has negative minimum values with the other variables having positive 0.00 values.

Table 4.2: Descriptive Statistics Summary

Variable	PGDP	TO	FDINET	INV	GEX	SER
Mean	808.575	53.9071	4.86515	19.6774	80.4735	26.0616
Std. Dev.	681.293	24.5917	10.6063	9.96952	28.3274	27.4467
Median	576.426	56.635	2.65	20.3385	87.4317	23.4805
Min	0	0	-2.57	0	0	0
Max	2936.64	117.82	103.34	52.6698	116.438	114.715

Source: Calculation by the author from World Development Indicators: Per Capital Gross Domestic Product (PGDP), Secondary School Enrolment (SER), Trade Openness (TO), Gross Domestic Product (% growth) (GDPR), Gross Fixed Capital formation (INV), Government Expenditure (GEX), Foreign Direct Investment (net inflow) (FDINET). World Bank's WDI

4.4.1 Sensitivity Analysis

In this section, a sensitivity analysis was done by testing for multicollinearity with a Pearson's correlation and testing for unit root test within the regression.

4.4.2 Unit Root Tests

In order to estimate conditional convergence, the study introduces other explanatory variables (trade openness, foreign direct investment, gross capital formation, government expenditure, and secondary school enrolment), and the stationarity status of all the variables in the convergence model specified for the study was determined. This was done so as to avoid spurious results. The results of the stationarity test of the variables employed in the study are presented in Table 4.3. As a measure of

robustness, the Augmented Dickey fuller (ADF) and Phillip Perron unit root test statistics were computed. All the two tests reject the null hypothesis that all the panels contain unit roots.

Table 4.3: Fisher Type Unit root test of Variables

Variable	ADF		PP	
	Intercept	P value	Intercept	P value
lnPGDP	-5.298	0.0000	-4.9433	0.0000
TO	-7.436	0.0000	-6.497	0.0000
FDINET	-6.294	0.0000	-6.09	0.0000
SER	-6.011	0.0000	-8.377	0.0000
GEX	-3.868	0.0026	-4.764	0.0001
INV	-6.055	0.0000	-6.025	0.0000

Source: Calculation by the author from World Development Indicators. Source Authors' computation: Gross Domestic Product per capita (PGDP), Secondary School Enrolment (SER), Trade Openness (TO), Gross Fixed Capital Formation (INV), Government Expenditure (GEX), Foreign Direct Investment (net inflow) (FDINET), Nominal Convergence Index (COIN). World Bank's WDI, ECOWAS.

4.4.3 Pesaran (2004) CD Test for Cross-Section Dependence.

H_0 = cross-section independence

H_1 = no cross-section independence

Table 4.5 presents the results of the cross-sectional dependence among variables used in the regression estimate. As stated in Chapter 3, the study used the Pesaran (2004) CD test, and the results are discussed.

Table 4.4 Results of Pesaran (2004) CD Test.

CD-test	p-value	corr	abs(corr)
27.11	0.0000	0.661	0.706

Note: Under the null hypothesis of cross-section independence $CD \sim N(0,1)$

The CD-test shows the significant probability value of 0.000, this means that the study rejects the null hypothesis of cross-section independence and conclude that there is cross-section dependence among variables. However, it follows that the problem of cross-section dependence on variables was corrected using the Prais-Winsten regression; correlated panels corrected standard errors (PCSEs).

4.4.4 Correlation Analysis

In order to estimate conditional convergence, the study introduces other explanatory variables (trade openness, foreign direct investment, gross capital formation, government expenditure, and secondary school enrolment). A correlation analysis of all the variables in the convergence model specified for the study was computed to determine the strength of the linear relationship between the variables.

Table 4.2 indicates the correlation results. According to the table, the correlations between Gross Domestic Product per capita (PGDP), Secondary School Enrolment (SER), Capital formation (INV), Macroeconomic Convergence compliance Index (COIN), Government Expenditure (GEX), and Trade Openness were positive. Gross Fixed Foreign Direct Investment (net inflow) (FDINET) was negatively correlated to GDP. The correlations are also less than 0.7, which implies that there is no multicollinearity among the variables since the variables are not closely related (see Schober et al.,2018, Muchiri,2017).

Table 4.5 Correlation Analysis

Variable	lnPGDP	TO	FDINET	INV	GEX	SER	COIN
lnPGDP	1						
TO	0.3555	1					
FDINET	-0.1347	0.2256	1				
INV	0.4382	0.5757	-0.1894	1			
GEX	0.1324	0.5594	-0.4285	0.4694	1		
SER	0.4821	0.4352	-0.0132	0.3542	0.0036	1	
COIN	0.1900	0.0352	-0.0791	0.0069	0.0249	0.0322	1

Source: Calculation by the author from World Development Indicators. Gross Domestic Product per capita (PGDP), Secondary School Enrolment (SER), Trade Openness (TO), Gross Fixed Capital Formation (INV), Government Expenditure (GEX), Foreign Direct Investment (net inflow) (FDINET), Nominal Convergence Index (COIN). World Bank's WDI, ECOWAS.

4.5 To develop an index for macroeconomic convergence compliance index for ECOWAS and analyse the compliance with macroeconomic convergence criteria in WAMZ and WAEMU countries.

To achieve objective one, there was an assessment of member states' compliance with the macroeconomic convergence criteria for the year under review. The analysis revealed that (See Appendix 3) for the macroeconomic convergence compliance index created no member state satisfied all the six (6) convergence criteria over the period 2005-2022 consistently. However, a number of countries that met at least six (6) convergence criteria in a particular year are mostly from the WAEMU Zone as compared to the WAMZ zone.

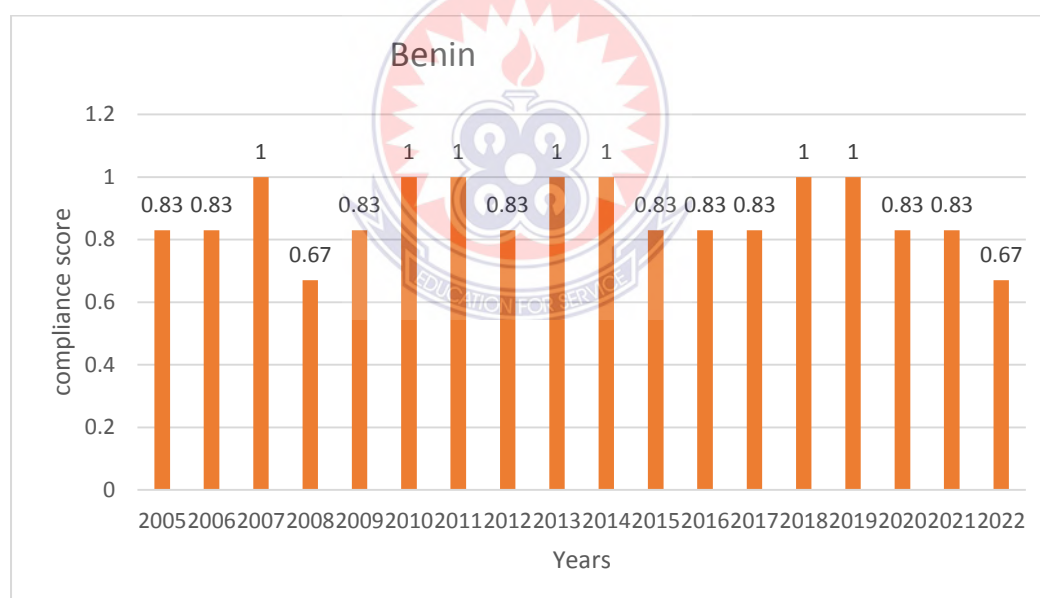
The table (Appendix 3) clearly shows the achievement of the convergence criteria has not been consistent and simultaneous within the two zones. A country that meets all six criteria for a particular year has a compliance score of 1.00, meeting five out of the six criteria gives a score of 0.83, meeting four of the criteria gives a score of 0.67,

meeting three of the criteria gives a score of 0.5. A score of 0.33 for meeting two of the criteria and a score of 0.17 for meeting a criterion. 0.00 for meeting none of the criteria.

Benin

Benin for the year 2005 and 2006 recorded an index score of 0.83 (met 5 out of the 6 convergence criteria), there was an improvement in 2007 when the score increased to 1.0 (all six criteria was met). There was a however a decline from 1 to 0.67 (met 4 out of the six criteria) in 2008. Between 2009 and 2021 Benin average was between 1 and 0.83 until 2022 where the score was 0.67 as shown in figure 4.12.

Figure 4.12 Compliance with Macroeconomic Convergence Criteria- Benin



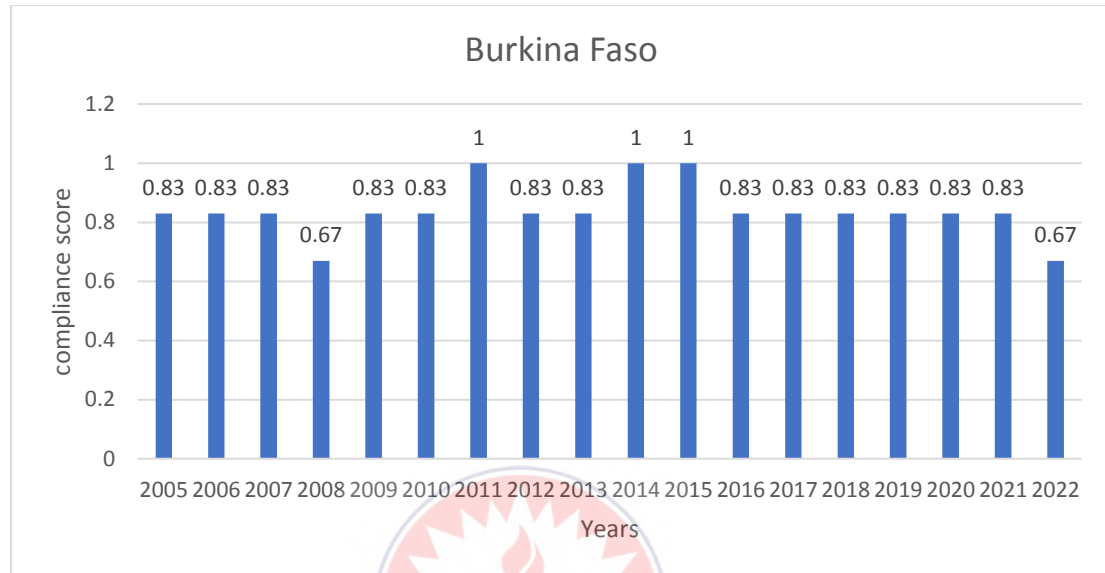
Source: WAMI database (2005-2022)

Burkina Faso

Burkina Faso for the years 2005-2007 achieved a score of 0.83 (met five out of six criteria). There was however a decline to 0.67 in 2008. In the period 2009 and 2010, there was a rise to 0.83 followed by a score of 1.00 in 2015 and 2011. The period 2012 and 2013 saw a decline to 0.83 followed by a rise to 1.00 in 2014 and 2015. The

score was consistent at 0.83 for 2016 to 2021 followed by a fall to a score of 0.67 in 2022 as shown in figure 4.13.

Figure 4.13 Compliance with Macroeconomic Convergence Criteria -Burkina Faso

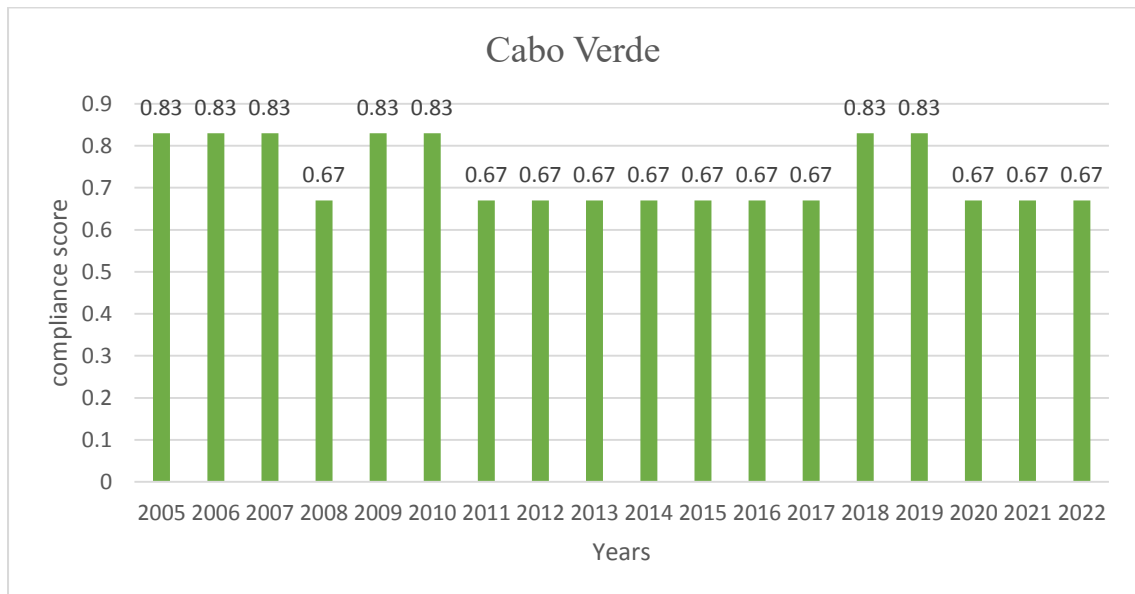


Source: WAMI database (2005-2022)

Cabo Verde

Cabo Verde for the years 2005-2007 achieved a score of 0.83 (met five out of six criteria). There was however a decline to 0.67 in 2008. In the period 2009 and 2010, there was a rise to 0.83 followed by a score of 0.67 for the period in 2011 and 2017. The period 2018 and 2019 saw a rise to 0.83 followed by a decline to 0.67 for the period 2020 and 2022 as shown in figure 4.15.

Figure 4.14 Compliance with Macroeconomic Convergence Criteria- Cabo Verde

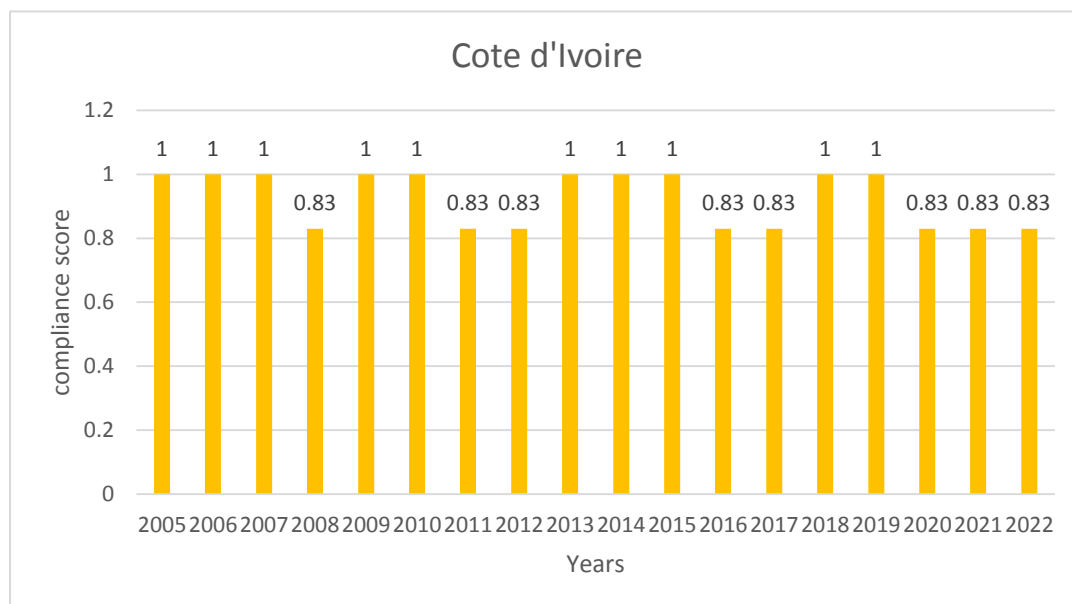


Source: WAMI database (2005-2022)

Cote d'Ivoire

Cote d'Ivoire for the years 2005-2007 achieved a score of 1.00 (met all six criteria). There was however a decline to 0.83 in 2008. In the period 2009 and 2010, there was a rise to 1.00 followed by a decline in the score to 0.83 in 2011 and 2012. The period 2013 to 2015 saw a rise to 1.00 followed by a decline to 0.83 for the period 2016 and 2017. There was however an increase in score for 2018 and 2019 to 1.00 followed by a decline to 0.83 for 2020 to 2022 as shown in figure 4.15

Figure 4.15 Compliance with Macroeconomic Convergence Criteria- Cote d'Ivoire

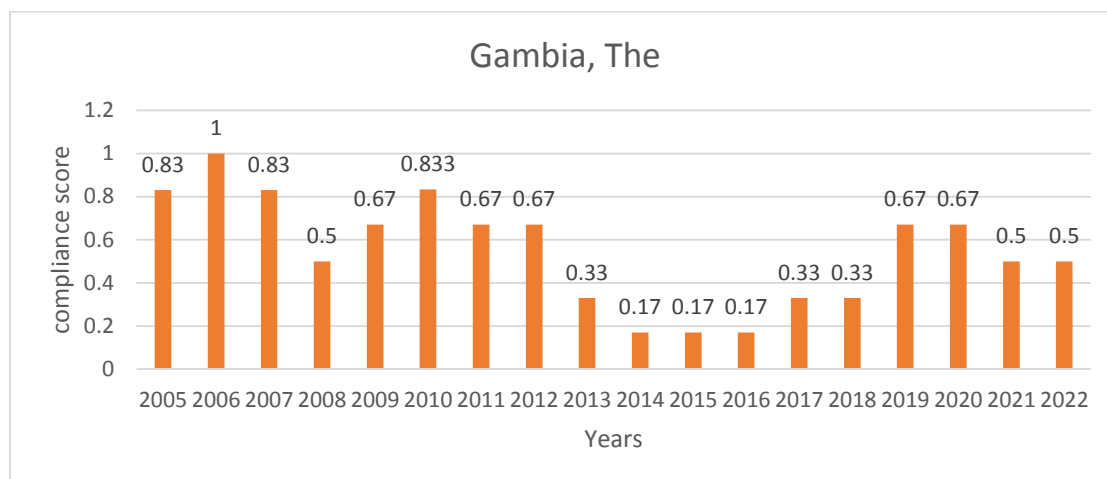


Source: WAMI database (2005-2022)

Gambia

The Gambia for the year 2005 recorded a score of 0.83 (met four of the criteria). There was however an increase to 1.00 in 2006 followed by a fall to 0.83 in 2007. The period 2008 was a further fall in the score to 0.5 (met three of the criteria). There was a consistent score of 0.67 from 2009 to 2012. The period 2015 and 2016 recorded the lowest score of 1.7 (achieving one criterion). The period after 2016 to 2022 was a mixed of score of 0.33, and 0.5 as shown in figure 4.16.

Figure 4.16 Compliance with Macroeconomic Convergence Criteria- Gambia, The

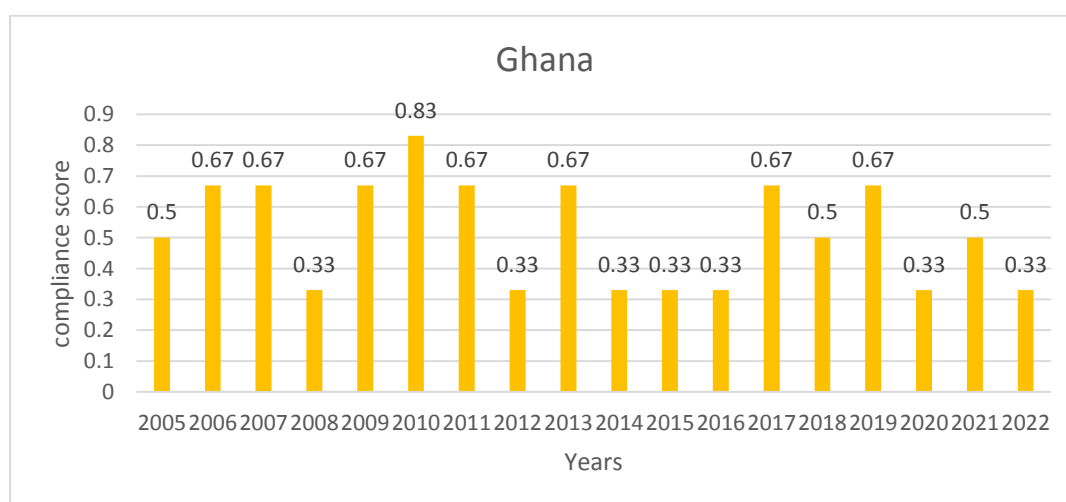


Source: WAMI database (2005-2022)

Ghana

Ghana for the year 2005 achieved a score of 0.5 (met three criteria). There was however an increase in score to 0.67 for 2006 and 2007 followed by a fall to 0.33 in 2008. The period in 2010 recorded the highest score of 0.83 and had the lowest score on compliance in 2022 of 0.17. The period from 2010 to 2021 had mixed scores of 0.33, 0.5, and 0.67 as shown in figure 4.17.

Figure 4.17 Compliance with Macroeconomic Convergence Criteria- Ghana

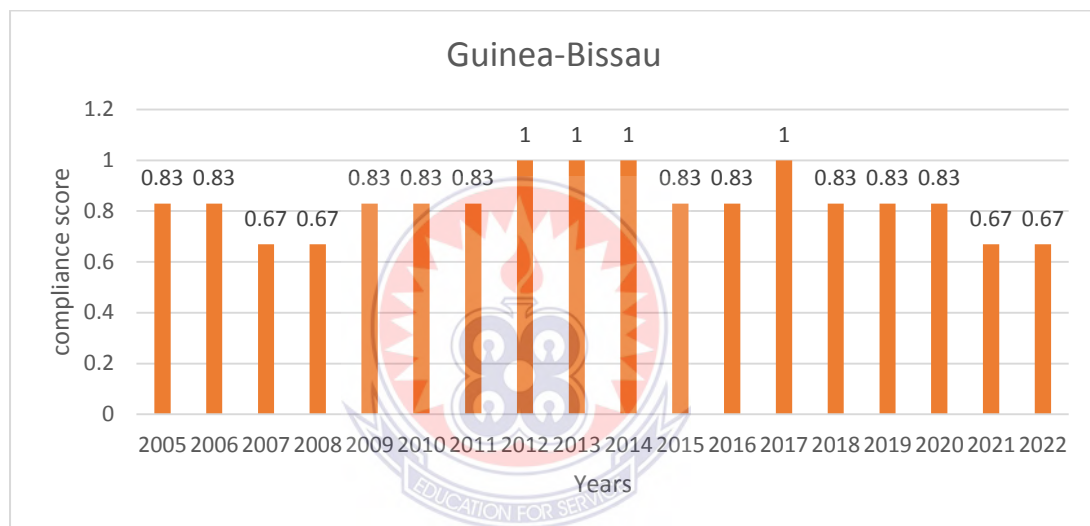


Source: WAMI database (2005-2022)

Guinea-Bissau

Guinea-Bissau for the years 2005 and 2006 achieved a score of 0.83 (met five criteria). There was however a decrease in score to 0.67 for 2007 and 2008 followed by an increase to 0.83 for 2009 to 2011. The period 2012, 2013, 2017 recorded the highest score of 1.00. In the period 2014 -2020 there was a fall to 0.83 and a further fall to 0.67 for 2021-2022 as shown in figure 4.18.

Figure 4.18 Compliance with Macroeconomic Convergence Criteria- Guinea-Bissau

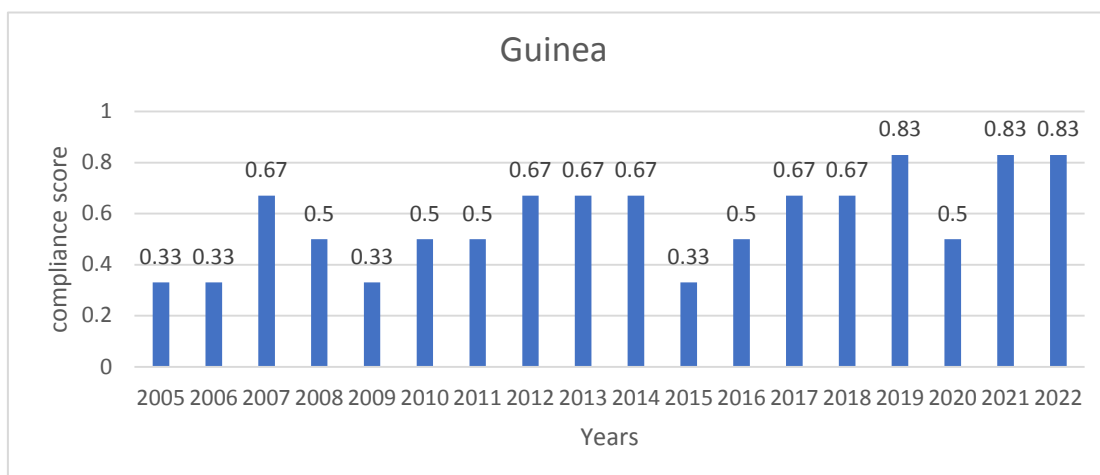


Source: WAMI database (2005-2022)

Guinea

Guinea for the years 2005 and 2006 achieved a score of 0.33 (met two criteria). There was an increase in score to 0.67 for 2007. The score for 2008 was 0.5 followed by a decrease to 0.33 for 2009. The period 2011 to 2013 and 2017-2019 recorded a score of 0.67 followed by 0.5 in 2020. For the period 2019,2021 and 2022 the score was 0.83 as shown in figure 4.19.

Figure 4.19 Compliance with Macroeconomic Convergence Criteria- Guinea

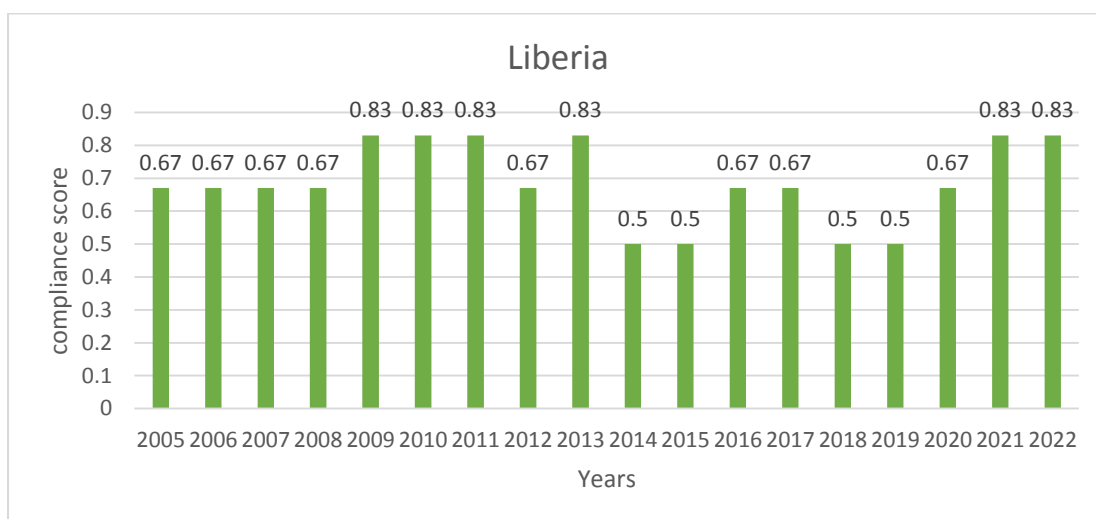


Source: WAMI database (2005-2022)

Liberia

Liberia for the years 2005-2008 achieved a score of 0.67 (met four criteria). There was an increase in score to 0.83 for 2009-2011. The score for 2012 was 0.67 which was a fall from 2011, followed by an increase to 0.83 for 2013. The period 2014 to 2020 recorded a mixed score of 0.5 and 0.67 followed by an increase to 0.83 for 2021 and 2022 as shown in figure 4.20.

Figure 4.20 Compliance with Macroeconomic Convergence Criteria- Liberia

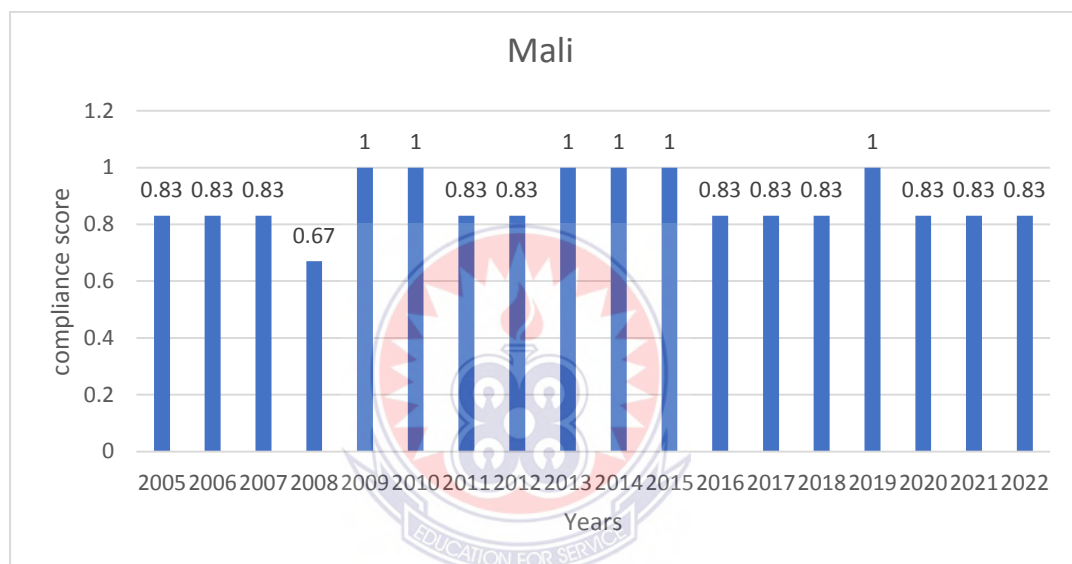


Source: WAMI database (2005-2022)

Mali

From figure 4.21, Mali for the years 2005-2007 achieved a score of 0.83 (met five of criteria). There was however a decrease in score to 0.67 for 2008. The score for 2009 and 2010 was 1.00 indicating an increase in score followed by a fall to 0.83 in 2011 and 2012. The period from 2013 to 2015 recorded an increase of 1.00. The period 2016-2022 recorded a score of 0.83 except for 2019 which recorded 1.00.

Figure 4.21 Compliance with Macroeconomic Convergence Criteria- Mali

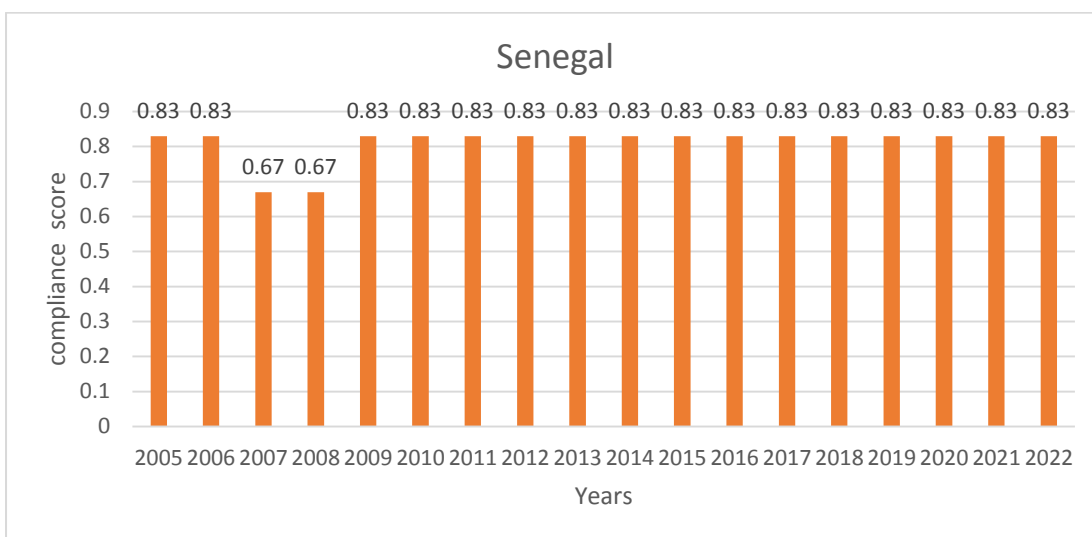


Source: WAMI database (2005-2022)

Senegal

From figure 4.22, Senegal for the years 2005-2006 achieved a score of 0.83 (met five of the criteria). There was however a decrease in score to 0.67 for 2007 and 2008. The score for the period 2009 to 2022 was consistent at a score of 0.83.

Figure 4.22 Compliance with Macroeconomic Convergence Criteria- Senegal

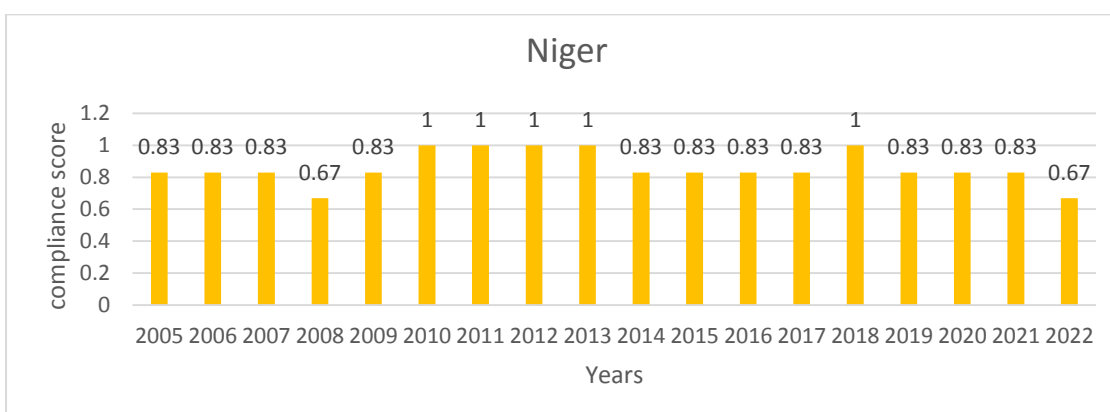


Source: WAMI database (2005-2022)

Niger

From figure. 4.23 Niger, for the period 2005 to 2007 recorded a compliance score of 0.83 (achieved five of the six criteria). There was a decrease from 0.83 to 0.67 in 2008 followed by a rise in 2009 to 0.83. The period 2011 to 2013 and 2018 showed a perfect score of 1.00, however, there was a decrease from 1.00 to 0.83 over the period 2014 to 2021 followed by a further decline in 2022 to 0.6.

Figure 4.23 Compliance with Macroeconomic Convergence Criteria- Niger

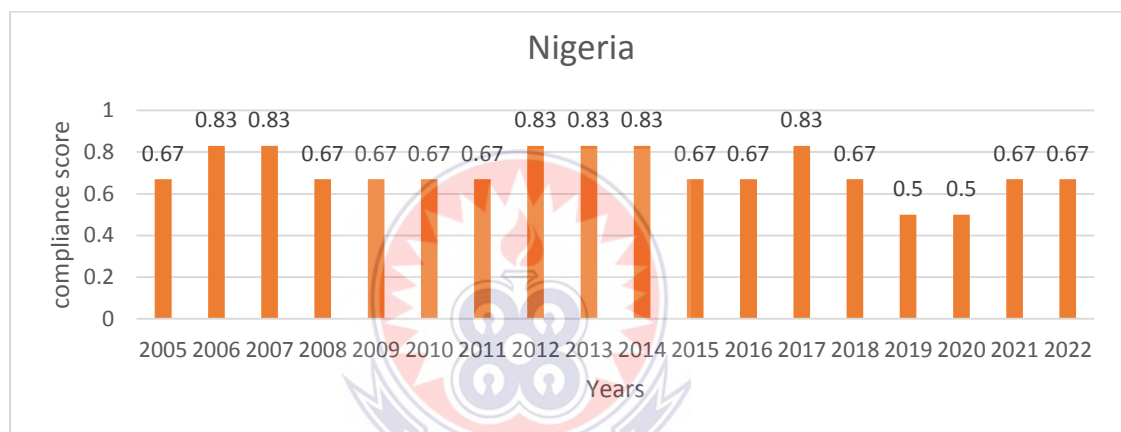


Source: WAMI database (2005-2022)

Nigeria

From figure.4.24 Nigeria, for the period 2005 recorded a compliance score of 0.67 (achieved four of the six criteria). There was an increase from 0.67 to 0.83 in 2006 and 2007 followed by a fall for the period 2008 to 2011 of 0.67. In the period 2012 to 2014 there was a consistent score of 0.8 followed by a fall to a score for 0.67 in 2015 to 2016,2018 and a further fall to 0.5 in 2019 and 2020. There was an increase from 0.5 to 0.67 for 2021 and 2022.

Figure 4.24 Compliance with Macroeconomic Convergence Criteria- Nigeria

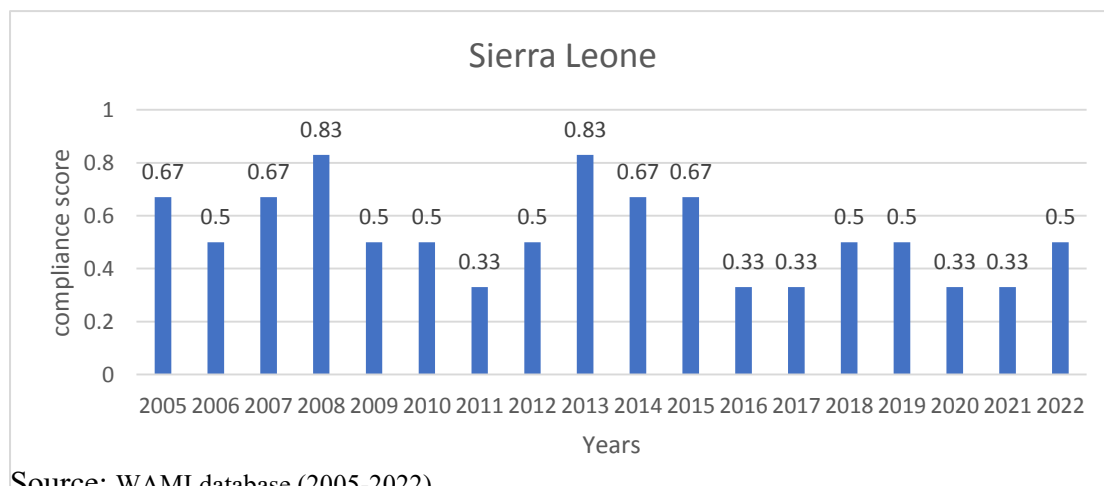


Source: WAMI database (2005-2022)

Sierra Leone

Sierra Leone for the year 2005 recorded a score of 0.67 followed by a fall to 0.5 in 2006. For the period 2014-2015, the performance score was 0.67. In the period 2009, 2011-2012 and 2016-2019, and 2022, Sierra Leone achieved a compliance score of 0.33. The highest scores of 0.83 happened in 2008 and 2013 and the lowest score of 0.33 was recorded in 2020 to 2021 from figure 4.25.

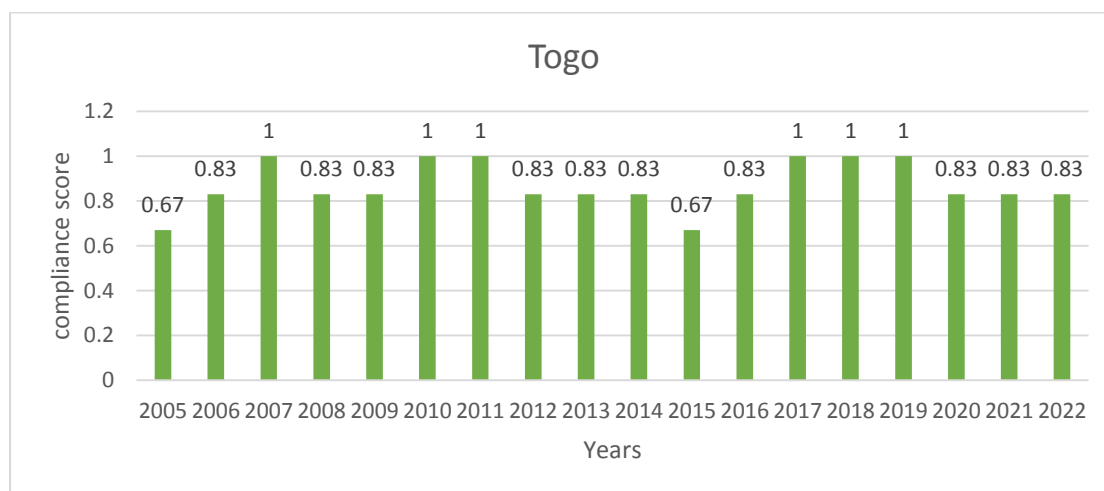
Figure 4.25 Compliance with Macroeconomic Convergence Criteria- Sierra Leone



Togo

Togo for the year 2005 recorded a score of 0.67 followed by a rise to 0.83 in 2006 and a further rise to 1.00. In the period 2008-2009, the performance score was 0.83 a fall from 2007 of 1.00, followed by a rise to 1.00 for 2010-2011. In the period 2012 to 2014, the score was 0.83 followed by a fall to 0.67 in 2015. For the period 2016 and 2020-2022, the compliance score was 0.83 and for 2017-2019 was 1.00 as shown in figure 4.26.

Figure 4.26 Compliance with Macroeconomic Convergence Criteria- Togo

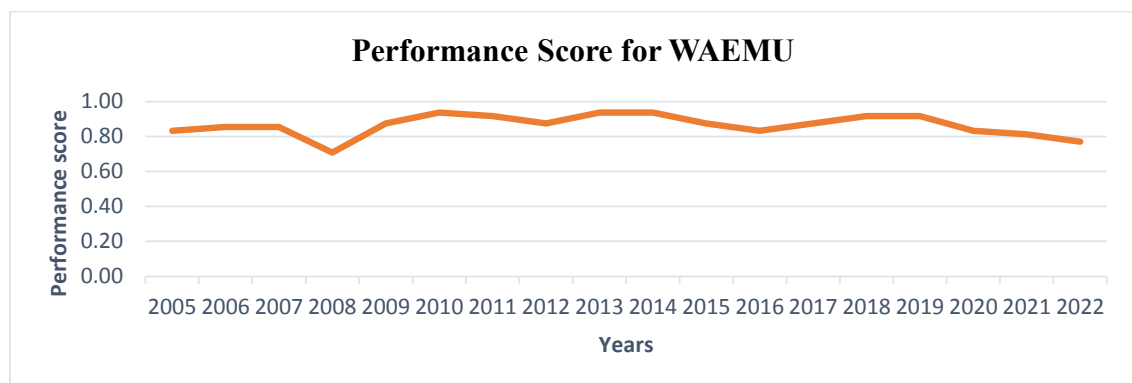


Average Compliance score of the WAEMU and WAMZ zones

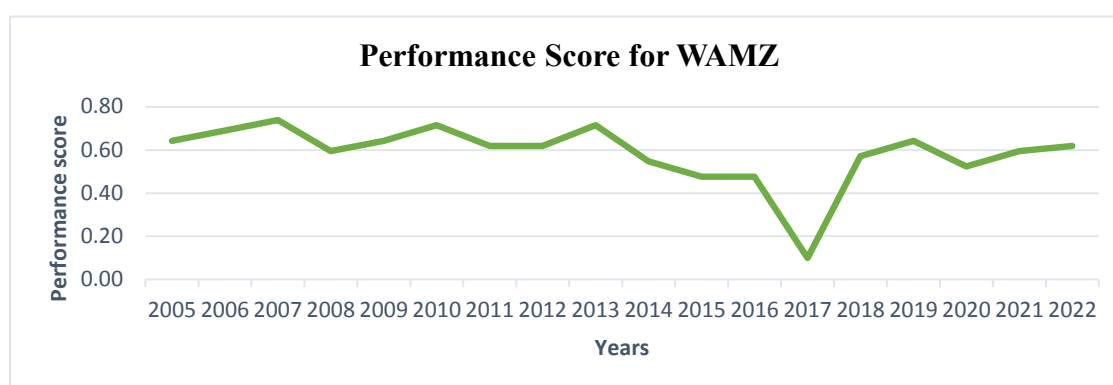
From figure 4.27 and figure 4.28, the average performance score for WAEMU generally showed increased compliance to the convergence criteria by member countries. The average moved from 0.83 in 2005 to 0.85 in 2006 and 2007. there was however a decline in 2008 to 0.71. The year 2009 saw an increase to 0.88. In the years 2010 through to 2021, the index hovered around 0.81 to 0.94 until 2022 when it dropped to 0.73.

The average performance for the WAMZ zone has shown that the level of compliance has mostly been below that of the WAEMU zone as shown by their performance score per the nominal convergence index. The average for the year 2005 was 0.60 there was an improvement in 2006 (0.64) and 2007(0.71) however, the year 2008 recorded a decrease from 0.71 to 0.55. The period from 2014 to 2018 saw the lowest performance of 0.48, with the worst performance in 2017. and 0.6 until 2015 and 2016 when it decreases to 0.55. There was, however, an increase in 2019 to 0.64 and in 2022 to 0.62.

Figure 4.27 Average Compliance Score for WAEMU



Source: WAMI database (2005-2022)

Figure 4.28 Average Compliance Score for WAMZ

Source: WAMI database (2005-2022)

4.6 To test the Macroeconomic Convergence or Divergence in WAEMU and WAMZ.

To achieve objective two the beta convergence proposed by Neoclassical growth model (Solow Under this section, the result of the convergence which is the second objective of the study was presented. To examine the convergence, the study uses the beta convergence.

To test for the hypothesis that is no difference in the coefficient in the sub samples, the study used the z score test. This section presents the results from the examination of the absolute and conditional convergence in the ECOWAS region and test of difference score (z score).

H0: There's no significant difference in the level of macroeconomic convergence in ECOWAS, WAEMU and WAMZ

In this objective, the study seeks to examine, on the basis of the beta convergence. The theory of convergence is in line with the neoclassical growth model (Solow, 1956; Swan 1956). This explains the fact that there is a tendency over the long term to level the rate of income growth or that of per capita production in different zones. Hence convergence exists when a "poor" economy tends to increase more rapidly

than a “rich” economy such that the poor economy will catch up with the level of income per capita production of the “rich economy”. This is referred to in the literature as the β convergence (Barro and Sala-i-Martin, 1995). In the present case, the study concentrates on the conditional convergence in which case, ECOWAS countries are assumed to be identical in terms of references, technologies and economic policies; one of which is the formation of a single currency by 2027. There is β convergence if the estimated β is significantly negative holding other effects constant.

The study performed a z score test to determine if there is significance difference in coefficients of income convergence of divergence in the subsamples (Clogg et al,1995; Clark et al.,2006).

The results of the GMM estimation for absolute convergence and conditional convergence for ECOWAS (model 1), WAEMU (model 2), and WAMZ (model 3) are reported in Tables 4.6 and 4.7, respectively.

Tables 4.6 and 4.7 show that the p-values for the Sargan test show an insignificant value at all significance levels (1%, 5%, and 10%). This implies that the study fails to reject the null hypothesis of overidentifying assumptions and concludes that instruments are valid. On the other hand, the models have no second-order serial correlation due to the insignificant p-values for the AR (2). Therefore, all the models are correctly specified.

The output of the various Tables 4.6-4.8 shows the number of countries and the number of observations is not the same. This is because the observation is a single data point within the sample size or the row or entries in the data set. According to Walker (2008) a high number of observations is needed to increase the reliability of a

study. The number of observations in each output is large enough and that the researcher concludes that the result of the study is reliable.

4.6.3 Absolute Convergence

The result of the absolute convergence as presented in Table 4.6 indicated that the coefficient of the log of initial per capita for all three models from the GMM estimation was positive instead of the expected negative sign. This implies that, for the period of estimation, there was no clear evidence of convergence among the ECOWAS member countries.

The coefficients of log initial GDP per capita in models 1 (0.998), 2 (0.891), and 3 (0.964) were positive, contrary to the hypothesised sign, an indication of income divergence. The implication here is that changes in current growth are affected by their past value in determining absolute divergence. In addition, the coefficients are significant at 1%. This study therefore failed to reject the null hypothesis of per capita income convergence in the ECOWAS region. The extent of divergence was wider in ECOWAS as a whole and the WAMZ zone. The WAEMU was lower compared to the WAMZ zone.

A test of the significant difference in the coefficient of the subsample WAEMU and WAMZ (Appendix 2) showed a z score of 0.89 indicating an insignificant (PATERNOSTER et al., 1998) difference in the coefficient of the income divergence in the two zones. For the test of difference in the coefficient in the sub sample for absolute convergence the study failed to reject the null hypothesis that there is a no significant difference in the divergence in WAMZ and WAMU zone.

Table 4. 6 Estimated results for absolute convergence among ECOWAS member countries

VARIABLES	(1) Full Sample ECOWAS	(2) Sub WAEMU	(3) Sub WAMZ
L.lnPGDP	0.998*** (0.0171)	0.891*** (0.0378)	0.964*** (0.0114)
Constant	0.0282 (0.138)	0.749*** (0.234)	0.207 (0.147)
AR (2)	0.252	0.054	0.558
Sargan test	0.534	0.626	0.212
Observations	213	115	98
Number of Countries	15	8	7

Source: Calculation by the author from World Development Indicators.

1. Windmeijer robust standard errors are in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively

2. For the model diagnostics, the p-values of the Arellano–Bond test for second-order serial correlation and the Sargan test for overidentifying restrictions indicates the validity of the instruments used in all system GMM estimations

4.6.5 Conditional Convergence

To examine the factors that affect the rate of convergence among the member states in the ECOWAS region, the study went on to examine the conditional convergence of the ECOWAS member states in the region. In examining the conditional convergence, the study considered other variables like gross capital formation, trade openness, government, expenditure, secondary school enrollment, and foreign direct investment to measure the effect of the external economy on the countries as presented in Table 4.6.

The result still indicated that there is no convergence since beta has a positive sign. This is inconsistent with the convergence hypothesis that the lag coefficient of per capita income should be negative. This implies that, in the conditional sense,

ECOWAS member states diverge. This study therefore rejects the null hypothesis of per capita income convergence in the ECOWAS region.

The conditional convergence was estimated for the same period, 2005–2022. The estimations for ECOWAS (model 1), WAEMU (model 2), and WAMZ (model 3) suggested that there is no convergence in the ECOWAS region for the period under estimations; this is evident by the positive value of the betas.

A test of the significant difference in the coefficient of the subsample WAEMU and WAMZ (Appendix 2) after the introduction of the control variables in the conditional convergence estimation showed a z score of 3.06, indicating a significant (PATERNOSTER et al., 1998) difference in the coefficient of the per capita in the two zones and the extend of the divergence.

For the test of difference in the coefficient in the sub sample for conditional convergence the study rejects the null hypothesis that there is a no significant difference in the divergence in WAMZ and WAMU zone.

In comparing the absolute and conditional convergence estimations, the coefficient of the lag of per capita GDP indicated an increase in divergence in WAEMU (0.891 to 1.193) and a reduction in WAMZ divergence (0.964 to 0.665). This implied that the control variables used have the effect of driving convergence in the WAMZ zone in the long run.

The observation from the results is that the coefficient of $\ln PGDP$ in the ECOWAS was 0.971. The WAEMU was 1.193 and the WAMZ was 0.665. The coefficient of the lagged of the per capita income was positive and statistically significant, implying

that a one percent increase in the initial income results in about 97%, 119%, and 67% increases in current income in ECOWAS, WAEMU, and WAMZ, respectively.

The coefficients for SER (secondary school enrollment) are -0.134, -0.158, and 0.237 in models 1, 2, and 3, respectively. SER had a significant and negative effect in ECOWAS and WAEMU and a positive but insignificant effect in WAMZ. Indicating that a unit increase in SER induces an income growth rate in ECOWAS and WAEMU by 13% and 16%, respectively, but a unit increase in SER causes about a 24% increase in income growth rate in WAMZ.

The INV (gross capital formation) coefficients are -0.179 (ECOWAS), 0.139 (WAEMU), and 0.094 (WAMZ). INV was significant and positive as expected in the WAMZ, but positive and insignificant in the WAEMU. Also, significant and negative effects in the ECOWAS. By implication, a unit increase in INV will lead to a decrease of about 18% in the income growth rate in ECOWAS and a 14% and 9% increase in the income growth rate of WAEMU and WAMZ, respectively.

The government expenditure variable was significant in all three models and positive in WAEMU, as was expected, but negative in ECOWAS and WAMZ. The GEX coefficients of -0.803, -1.044, and 1.248 showed that government expenditure impacted income growth negatively in ECOWAS and WAMZ but positively in WAEMU. By implication, a one-unit increase in the proportion of GEX would cause a decrease in income growth rate of about 80% and 104% in ECOWAS and WAMZ, respectively, and an increase of about 103% in income growth in the WAEMU zone.

Net foreign direct investment was significant and had the *a priori* signs in all three models. The FDINET (net foreign direct investment) in models 1 and 2 showed a

negative relationship with per capita income but a positive relationship in model 3. The coefficients are -0.028, -0.084, and 0.013, respectively, indicating that a unit increase in net foreign direct investment decreases income growth in ECOWAS by 2.8% but causes an increase of 8.4% and 13% in WAEMU and WAMZ, respectively.

Trade openness was significant and positive in ECOWAS, as expected, but positive and insignificant in WAEMU. Also, it is negative and insignificant in WAMZ. The coefficients are 0.372, 0.163, and -0.084, respectively, indicating that as trade openness increases, the income growth rate also increases by about 37% and 16% in the ECOWAS and WAEMU zones and a decrease of 8% in the WAMZ.

Table 4. 7 Estimated results for conditional convergence among ECOWAS member countries

VARIABLES	(1)	(2)	(3)
	Full Sample ECOWAS	Sub WAEMU	Sub WAMZ
L.lnPGDP	0.971*** (0.0780)	1.193*** (0.0772)	0.665*** (0.159)
lnSER	-0.134** (0.0534)	-0.158** (0.0760)	0.237 (0.206)
lnINV	-0.179*** (0.0481)	0.139 (0.146)	0.0939*** (0.0360)
lnGEX	-0.803** (0.380)	1.248*** (0.355)	-1.044*** (0.295)
lnFDINET	-0.0283 (0.0264)	-0.0841*** (0.0176)	0.0127 (0.0528)
lnTO	0.372*** (0.141)	0.163 (0.178)	-0.0848 (0.126)
Constant	3.406* (1.907)	-7.278*** (1.433)	6.197*** (1.871)
AR (2) test	0.818	0.996	0.973
Sargan test	0.916	0.466	0.331
Observations	107	72	47
Number of Country	14	8	6

Source: Calculation by the author from World Development Indicators (2005-2022)

Note: 1. Windmeijer robust standard errors in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively

2. For the model diagnostics, the p-values of the Arellano–Bond test for second-order serial correlation and the Sargan test for overidentifying restrictions indicate the validity of the instruments used in all system GMM estimations.

4.6.6 To examine the effect of macroeconomic convergence compliance on economic growth in ECOWAS.

H0: Macroeconomic convergence compliance has a significant positive effect on economic growth in ECOWAS member states

This hypothesis (objective 3) assumes that by aligning economic policies and indicators among ECOWAS member states (here proxied by the macroeconomic convergence compliance index (COIN), the aim of regional integration on economic growth would be achieved.

The macroeconomic convergence compliance index (COIN) was therefore introduced as a policy variable in the result of Table 4.7 to measure the effect of member states compliance with the macroeconomic convergence criteria on economic growth. The per capita gross domestic product (PGDP) was used as a proxy for economic growth. The study rejects the null hypothesis that macroeconomic convergence compliance has no significant positive effect on economic growth in the cases of WAMZ but failed to reject the null hypothesis in the case of the WAEMU zone.

The effect of the macroeconomic convergence compliance index on the growth in ECOWAS is noteworthy. The effect of the COIN in both subsamples showed positive growth but in ECOWAS as a whole there was negative growth, indicating possibly that a mixed of the two zone with their different economic structure may lead to negative in per capita income to indicate convergence among member states.

The coefficients of the \ln PGDP of 0.985 (ECOWAS), 1.216 (WAEMU), and 0.652 (WAMZ) were positive and significant in all three models, indicating that an increase in the initial per capita income growth rate leads to an increase in the current per capita income (Table 4.8).

The result still indicated that there is no convergence since beta has a positive sign. This is inconsistent with the convergence hypothesis under that the lag coefficient of per capita income should be negative. This implies that, in the conditional sense, ECOWAS member states diverge. This study therefore rejects the null hypothesis of per capita income convergence in the ECOWAS region.

A test of the significant difference in the coefficient of the subsample WAEMU and WAMZ (Appendix 2) after the introduction of the macroeconomic compliance index in the conditional convergence estimation showed a z score of 3.76, indicating a significant (PATERNOSTER et al., 1998) difference in the coefficient of the per capita in the two zones and the extend of the divergence.

For the test of difference in the coefficient in the sub sample for conditional convergence the study rejects the null hypothesis that there is a no significant difference in the divergence in WAMZ and WAMU zone.

The effect of the macroeconomic convergence compliance index on the divergence in ECOWAS and WAMZ is noteworthy. The coefficient of COIN being negative and significant in ECOWAS as a whole implies that a one-unit increase in compliance with the macroeconomic convergence criteria will lead to a decrease in the per capita GDP. In other words, with the negative growth in per capita GDP, eventually there will be convergence in ECOWAS in the long run. The situation in WAMZ with a significant and positive COIN coefficient implied that an increase in the per capita GDP would lead to a widening of the divergence among WAMZ member countries.

There is, however, no effect of the macroeconomic convergence compliance index in the WAEMU zone. The interference of France in the internal affairs of the WAEMU could be a challenge for the success of regional integration (Zoma & Congo, 2022).

The result of Table 4.7 was compared to the result of Table 4.8 to measure the effect of the COIN on the variable use in both regressions. Firstly, there was an increase in growth in model 1 (ECOWAS) from 0.971 to 0.985 and in model 2 (WAEMU) from 1.193 to 1.216. However, model 3 (WAMZ) experienced a decrease in the growth rate from 0.665 to 0.652.

Secondly, there was no change in the sign (- or +) of the coefficients, but there was a difference in the values of the coefficients of Government expenditure, Trade Openness, Secondary School Enrollment, Foreign Direct investment and Gross capital formation with the introduction of the compliance index.

The coefficients of COIN were significant at the 1% level and positive in WAMZ, as expected, suggesting that as compliance with macroeconomic convergence criteria increases, growth also increases, holding all other variables constant. It was, however, significant at the 5% level and negative in ECOWAS. Also, it was positive and insignificant in WAEMU. The coefficients of COIN were -0.173 (ECOWAS), 0.230 (WAEMU), and 0.378 (WAMZ).

This could imply that higher compliance with the macroeconomic convergence criteria is associated with an increase in income growth. In other words, based on this model, the COIN index is statistically significant in explaining the variation in the per capita income growth rate in both ECOWAS and the WAMZ sub-zone but not the same in the WAEMU zone. Thus, the evidence demonstrates that ECOWAS member

countries strict compliance with the macroeconomic convergence criteria could lead to decreased economic growth.

The observation from the results is that the coefficient of $\ln PGDP$ in the first model was 0.985. The second model was 1.216, and the third model was 0.652. The coefficient of the lagged of the per capita income was positive and statistically significant, implying that a one percent increase in the initial income results in about 98%, 122%, and 65% increases in current income in ECOWAS, WAEMU, and WAMZ, respectively. The coefficients for SER (secondary school enrollment) are -0.169, -0.156, and 0.253 in models 1, 2, and 3, respectively. Indicating that a unit increase in SER induces an income growth rate in ECOWAS and WAEMU by 17% and 16%, respectively, but a unit increase in SER causes about a 25% increase in income growth rate in WAMZ.

The INV (gross capital formation) coefficients are -0.163 (model 1), 0.173 (model 2), and 0.061 (model 3). By implication, a unit increase in INV will lead to a decrease of about 16% in the income growth rate in ECOWAS and a 17% and 9% increase in the income growth rate of WAEMU and WAMZ, respectively. By implication, a one-unit increase in the proportion of GEX would cause a decrease in income growth rate of about 81% and 134% in ECOWAS and WAMZ, respectively, and an increase of about 99% in income growth in the WAEMU zone.

Net foreign direct investment coefficients are -0.043, -0.094, and 0.047, respectively, indicating that a unit increase in net foreign direct investment decreases income growth in ECOWAS by 2.8% but leads to an increase of 4.3% and 9% in WAEMU and WAMZ, respectively. Trade openness coefficients are 0.394, 0.139, and -0.098, respectively, indicating that as trade openness increases, the income growth rate also

increases by about 39% and 14% in the ECOWAS and WEAMU zones and a decrease of 10% in the WAMZ.

For the model diagnostics, the p-values for the Sargan test show insignificant values at all significance levels (1%, 5%, and 10%). This implies that the study failed to reject the null hypothesis that overidentifying assumptions are valid and concluded that instruments are valid. On the other hand, the models have no second-order serial correlation due to the insignificant p-values for the AR (2). Therefore, all the models are correctly specified.

Table 4.8 Result of Macroeconomic Convergence Compliance on Economic Growth

VARIABLES	(1)	(2)	(3)
	Full Sample ECOWAS	Sub WAEMU	Sub WAMZ
L.lnPGDP	0.985*** (0.0871)	1.216*** (0.0917)	0.652*** (0.118)
lnSER	-0.169** (0.0802)	-0.156** (0.0673)	0.253* (0.151)
lnINV	-0.163*** (0.0482)	0.173 (0.163)	0.0607 (0.0869)
lnGEX	-0.806** (0.327)	1.359*** (0.505)	-0.987** (0.402)
lnFDINET	-0.0426 (0.0323)	-0.0940*** (0.0197)	0.0469** (0.0202)
lnTO	0.394*** (0.149)	0.139 (0.200)	-0.0984 (0.0871)
COIN	-0.173** (0.0808)	0.230 (0.194)	0.378*** (0.131)
Constant	3.462** (1.685)	-8.132*** (2.318)	5.849*** (2.012)
AR (2) test	0.622	0.431	0.823
Sargan test	0.812	0.998	0.313
Observations	107	72	46
Number of Countries	14	8	6

Source: Calculation by the author from World Development Indicators

1. Windmeijer robust standard errors in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively

2. For the model diagnostics, the p-values of the Arellano–Bond test for second-order serial correlation and the Hansen test for overidentifying restrictions indicate the validity of the instruments used in all system GMM estimations.

4.7 Discussion of Results

To develop a macroeconomic convergence index for ECOWAS and to use the index to analyse member states' compliance with macroeconomic convergence criteria.

For objective one, the study computed the performance scores for each of the six indicators and calculated the mean score to arrive at the macroeconomic convergence compliance index (COIN) (see Appendix 3), similar to the work of Egbuna et al. (2018), who developed an economic integration index to measure the intensity and pace of regional economic integration in the WAMZ Zone for 2015–2017. This study, however, was over the period 2005–2022, using data from the ECOWAS Macroeconomic Convergence Report in 2011, 2016, 2017, and 2021 (source: WAMA) and covering the WAEMU and WAMZ zones. The number of countries satisfying each convergence criterion from 2005 to 2022 is presented in Appendix 4, and the number of convergence criteria met by each member country is presented in Appendix 5.

The adoption of the new convergence criteria resulted in a significant improvement in performance compared to previous assessments conducted based on the former criteria (WAMA, 2011, 2014). The following criteria were delisted after the rationalization exercise: non-accumulation of domestic and external arrears, tax revenue/GDP, wage bill/tax revenue, public investments/tax revenue, positive real interest rate, and real exchange rate stability (WAMA, 2015).

The improvement in member countries' performance was facilitated by the revision of the targets on inflation (AIR), gross external reserves (GEXR), and central bank financing of budget deficits (CBFB) (WAMA, 2014, 2017). The new target for the

criterion on inflation is now a threshold of a maximum of 5%. Similarly, the minimum threshold for the criterion of gross external reserves had been reduced from six months of imports of goods and services to three months. Moreover, only two secondary criteria have been maintained in the new ECOWAS convergence criteria, namely the criteria related to public debt (PDG) and nominal exchange rate stability (ECHV) (WAMA, 2014). As a result, the overall performance of the region improved due to the fact that member countries' performance vis-à-vis these two criteria is generally satisfactory. Regarding the primary criteria, the performance of member countries was encouraging with respect to the criteria on inflation, gross external reserves, and Central Bank financing of budget deficits. However, member countries continue to face difficulties in controlling the budget deficit (BDG) (WAMA, 2021).

Regarding the primary criteria, the performance of member countries was encouraging with respect to the criteria on gross external reserves (GEXR) and Central Bank financing of budget deficits (CBFB). Thus, an average of thirteen (13) countries (all member countries except Liberia and Guinea) have been consistent in achieving the required targets on gross external reserves, while ten (10) countries (all WAEMU, Cabo Verde, and Nigeria) have complied with the criterion on Central Bank financing of the budget deficit.

The performance on average inflation in the WAEMU zone (Benin, Burkina Faso, Cote d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal, and Togo) was mostly consistent, as some countries even recorded negative figures (-0.2, -3.2%) (WAMA, 2011, 2014, 2017, 2016, 2021; ECOWAS Commission, 2014). The only country in the WAMZ that consistently satisfied this criterion was Cabo Verde. However, member countries continue to face difficulties in controlling budget deficits. As a result, only two (2)

countries (Liberia and Nigeria) have been consistent in achieving the target during the period of this study.

The year 2014 also experienced a poor performance, mainly related to Guinea and Sierra Leone, two countries adversely affected by the Ebola outbreak, which had disastrous economic and fiscal consequences for the other countries. The sharp slowdown in economic activity resulted mainly in a significant decline in tax revenue mobilisation, while these countries had to cope with exceptional and high expenses (ECOWAS Commission, 2016).

The lowest number of countries that met the target for BDG was recorded in 2020, 2021, and 2022. The three (3) countries (Gambia, Guinea, and Liberia) in 2020, two (2) countries (Guinea and Liberia) in 2021, and the same countries in 2022. Despite the improvement in the aggregate fiscal balance, member states' individual performance deteriorated in 2021 as the number of countries that met this criterion declined from seven (7) in 2019 to two (2) in 2020. Ball and Mankiw (1995) argued that budget deficits adversely affect savings, interest rates, investment, exchange rates, and long-term growth. Countries should therefore devise policies to stimulate savings in line with exposing the large informal sector to accumulate additional revenues to finance the budget (Amoateng, 2014).

The performance of ECOWAS countries under the secondary criteria was generally encouraging. During the period for this study, all WAEMU member countries complied with the standard on exchange rate stability (ECHV); this can be attributed to the fixed exchange rate regime in this zone (WAMA, 2020; Sy & Sow, 2016). The WAMZ member countries mostly failed on this criterion. Exchange rate stability remains a challenge for Gambia and Ghana (WAMA, 2020). Also, as a general rule, a

country with a consistently lower inflation rate exhibits a higher currency value as its purchasing power increases relative to other currencies.

Those countries with higher inflation typically see depreciation in their currency concerning the currencies of their trading partners (Asigbetse et al., 2022). Diversification of the economy from an import-to-export based economy is fundamental for economic growth and, hence, development. This can be achieved through efficient and effective regulation of foreign exchange and political stability, which are very volatile macroeconomic variables (Sissoko & Dibooglu, 2006).

The public debt to GDP (PDG) variable was not part of the convergence criteria during the 2005–2009 period due to the high debt rate facing most African countries; this variable was however captured in the 2014 ECOWAS report with the reason that most of the debt was cancelled under various debt-related initiatives (Status of Macroeconomic Convergence Report 2014). Data from the WBI and IMF were not available for most countries during 2005–2009.

The stock of public debt in the region was equivalent to 33.3% of GDP at the end of December 2021, compared to 27.7% of GDP at the end of December 2020 (WAMA, 2021). This was influenced mainly by the increased borrowing during COVID-19 and concessional advances to some Member States by development partners for strategic interventions and balance of payments support, as well as strategic bailouts by the government to key domestic institutional sectors (WAMA, 2021). Most of the member countries in WAEMU and WAMZ satisfied the target for the PDG. However, in recent years, only Cape Verde and Gambia have experienced difficulties in meeting the prescribed benchmark for the criterion on public debt.

Regarding the individual performance of member countries (Appendix 4), the analysis shows that eight (8) countries (all of the WAEMU zone) met most of the primary criteria and secondary criteria over the period. The average performance of the WAEMU zone as a whole was over 0.83 (achieving five of the six convergence criteria) (WAMA 2011, 2014, 2017, 2021).

However, the individual countries' performance in the WAMZ zone had mixed outcomes. The analysis of the WAMZ index during the period 2005–2022 depicted an increased level of integration among the WAMZ Member States. However, it was observed that the sub-region was not ready for a monetary union, and Member States may need to expand their intra-regional trade volumes over time and intensify efforts aimed at meeting the macroeconomic convergence criteria on a sustained basis (WAMA 2011, 2014, 2017, 2021; Egbuna et al., 2018).

As compared to the WAEMU zone, the WAMZ zone as a whole has an average performance score of 0.5 (refer to Fig. 4.27) on the macroeconomic convergence compliance index (achieved mostly three out of the six convergence criteria), which is consistent with the study by Egbuna et al. (2018). The study reported that the WAMZ economic integration index showed an increased level of integration among member states, as the index scores rose to 0.536 and 0.571 in 2016 and 2017, respectively, from 0.529 in 2015, indicating increased commitment to the WAMZ integration agenda. The underperformance by some of the member states in the WAMZ index is attributable to the twin shocks of the Ebola Virus Disease (EVD) and the fall in world commodity prices, in addition to the massive landslide in Sierra Leone in 2017.

Even though Egbuna et al. (2019) found evidence of real convergence in some countries in the WAMZ (Nigeria, Ghana, and Sierra Leone), convergence among all the WAMZ countries was much slower relative to the West African Economic and Monetary Union (WAEMU) countries. It therefore suggested a gradualist approach to the regional integration process in ECOWAS, such that countries that could not achieve convergence should strive to comply with the nominal convergence criteria on a sustained basis.

In summary, the emergence of the COVID-19 pandemic in early 2020 drifted the policy direction of ECOWAS during the period largely towards maintaining human safety and mitigating the impact of the pandemic on the economies of Member States. Consequently, the region entered into a recession in 2020, occasioned by sharp declines in oil prices and the near collapse of the services sector. The economies of ECOWAS member states recovered to pre-COVID-19 growth paths in 2021, underpinned by policy support, the recovery of commodity prices, the easing of COVID-19 restrictions, and the reopening of economies following the steady rise in the vaccine rollout, which helped restore confidence. Real GDP in the region rebounded to 4.2% in 2021 from the contraction of 0.8% recorded in 2020 (WAMA 2020; ECOWAS Commission, 2022).

Inflationary pressures, however, remained elevated in the region due to global supply chain disruptions and rising oil and food prices. The unprecedented fiscal stimulus to mitigate the impact of the pandemic on businesses and households also led to a steady rise in budget deficits and public debt levels, raising concerns for debt sustainability in the region. Most countries in the region have already embarked on fiscal consolidation to bring down the budget deficit and public debts to sustainable levels,

while central banks have also been proactive in adjusting policy rates to rein in inflation (ECOWAS Commission, 2022).

To test the macroeconomic convergence or divergence in WAEMU and WAMZ.

In this objective, the study sought to examine, on the basis of the neoclassical model, if less advanced economies grow faster than wealthy ones. The convergence possibility among ECOWAS countries to a similar level of income per capita is examined at two levels: absolute convergence and conditional convergence. The results of the GMM estimation for absolute convergence and conditional convergence are reported in Tables 4.6 and 4.7, respectively.

The estimations for absolute and conditional convergence for each of the zones, ECOWAS (model 1), WAEMU (model 2), and WAMZ (model 3), suggested that there is no convergence in the ECOWAS region for the period under estimations; this is evident by the positive value of the betas. Such a huge conditional divergence rate suggests a much wider disparity in income among the ECOWAS member countries during the period of investigation. The result obtained is inconsistent with the convergence hypothesis that the lag coefficient of per capita income should be negative (Barro and Sala-i-Martin, 1995). This implied that, in the conditional sense, ECOWAS member states diverge.

Significant differences in the divergence between WAEMU and WAMZ sub zones were identified (Appendix 2). The tests of the significant difference in the coefficient of the absolute convergence regression output of the subsamples per capita GDP were below the mean in the samples. However, with the introduction of the control variables, the test was significant and positive, an indication that the per capita GDP was above the means. The introduction of the macroeconomic convergence index

resulted in an increase in the z score and a further increase in the per capita GDP above the mean per capital GDP.

Divergence in the standard of living is observed, meaning that some countries are escaping poverty while others are trapped (Adeleye et al., 2020). The fact that there no convergence across the ECOWAS countries can be explained by the strong heterogeneity of the economic structures, which implies that the countries evolve along different long-run paths (Adeleye et al., 2020). The heterogeneities are symptomatic of differences in the efficiency of capital utilisation, in the capacity to absorb aid, in competitiveness, and in the conduciveness of economic policies (Adeleye et al., 2020; Dufrenot & Sanon, 2005).

In general, the estimation results do not render support to the hypothesis of per capita income convergence among countries in the ECOWAS region during the period under consideration. Countries in the region differ strongly in terms of natural endowment, educational system, macroeconomic targets, population structure, political administration, and structure, *inter alia*, all of which tend to affect their per capita income growth. Jones (2002) investigated the convergence effect of regional integration in West Africa on the assumption of cross-country homogeneity, but he failed to find strong evidence for per capita income convergence among the so-called homogeneous ECOWAS countries.

The findings of this study are similar to those of Asongu (2014); his findings showed no convergence, and that was attributed to institutional cross-country differences, an absence of fiscal policy convergence, and insufficient potential for eliminating idiosyncratic fiscal shocks due to business cycle incoherence. The study concluded that the member states needed to ensure that the cross-country differences in structural

and institutional characteristics that hampered the effectiveness of convergence in monetary, real GDP, and fiscal policies were harmonised.

The findings for ECOWAS are consistent with the conclusions of earlier works by Jones (2002), Uдах & Nyong (2011), Amoateng (2014), Ndiaye and Korsu (2014), and have been confirmed by recent work by Ogbuaju et al. (2021), Anoruo (2019), Aye-Ayele (2016), and Aye-Ayele & Ojeka (2016), whose work concluded on a divergence in ECOWAS after they examined the beta (β) convergence (absolute and conditional convergence) in ECOWAS.

The findings are contrary to the work of Hammond (2009), who found low-income convergence that was associated with slow output growth in many African countries and concluded that the slow accumulation of factors of production and low factor productivity are due to inefficient production technology. Also, the failure to improve intra-regional trade, intra-regional investments, and low labour mobility was linked to the slow income convergence of the African RECS.

The study also established that the constrained capital accumulation as a result of the limited inflow of FDI was also a factor that contributed to the low-income convergence in these countries. The findings are contrary to the work by Saka et al. (2015), who examined the convergence criteria of the ECOWAS countries using panel least squares and beta convergence. The data used covered 2000–2008. The study showed that income was converging even though the pace of growth was different among the economies, but there was a need for more integration to achieve a steady state; therefore, with more integration, monetary union would be feasible. and (Razanaparany, 2020), who found a negative coefficient for the delayed per capita income.

The findings for the WAEMU zone are consistent with the work of Dufrenot and Sanon (2005), Dramani (2010), Ndiaye and Korsu (2014), and Ndiaye (2021), who tested the convergence in the WAEMU zone. The result for the WAMZ is consistent with Amoateng (2014), who found the WAMZ to diverge, contrary to the results of the study by Ude 2022 and Ndiaye (2021), who found a slow convergence in the WAM

Which Factors Inhibit Growth and Which Spur Growth?

The effect of human capital on economic growth has been extensively examined. Human capital, which could be defined as acquired skills, knowledge, and health, among others, is able to improve the productivity and efficiency of labour just like physical capital and, therefore, should be regarded as a vital input to production. A positive effect of human capital (proxied by secondary school enrollment) in the growth model is expected (Amoateng 2014).

It is argued that a higher level of human capital stock leads to an increase in productivity and technological growth (Kyiaco, 1991). This is then expected to improve the growth of the low-income countries and help them catch up. This is in line with endogenous growth theory by Romer (1990), who suggests that long-run economic growth is attainable if the increasing marginal product of knowledge overrides the diminishing marginal product of physical capital.

The effect of human capital on growth, according to a number of empirical studies, is found to be strong and positive. However, it is of major importance to study the channels through which human capital affects growth process. According to Barro (1997), for instance, the increase of human capital has a positive effect on labor productivity and, hence on growth. The results by Kartal et al. (2017), Alataş and

Çakir (2016), Izushi and Huggins (2004), and Akpolat (2014), established a positive effect of human capital on economic growth. According to Alatas and Cakir (2016), the positive effect of human capital on economic growth is two-fold. First, human capital participates directly in the production process as a productive factor. In this sense, the accumulation of human capital would directly generate the growth of output. Second, human capital can contribute to raising technical progress, and in this way, the level of human capital affects productivity growth.

Izushi and Huggins (2004) observe that knowledge has non-excludability attributes in that its use by one firm does not limit its use by another. Thus, the non-excludability nature of knowledge allows researchers to share knowledge and act on it to create new ideas. These new ideas are then embodied in the production processes, bringing about economic growth.

The empirical results of this study showed that the effect of human capital on the growth of the member states was significant in ECOWAS (model 1) and WAEMU (model 2) and was not statistically significant in WAMZ from the regression output (Tables 4.7 and 4.8.). For the overall model, human capital seems to have a negative effect on the growth of income in the region. Although surprising, these results are in line with the conclusions found in other studies. For instance, to explain the negative sign of enrolment rates in growth equations, Knight et al. (1993) observe that in poor countries, enrolment rates continue to rise, even when growth rates fall. Easterly (2000) has also pointed out that education seems to have no role in the growth of economies.

Also, this study confirms studies such as Pelinescu (2015) and Pritchett (2001) that established a negative effect of human capital on growth. These studies attributed the

negative effect to the heterogeneous nature of the countries that were analysed and their level of economic development, differences in skills needed in the labour market, as well as measurement errors.

Starting from Solow (1956) and moving forward to new growth theory, investment has an important role in growth process. Arrow (1962) and Romer (1986) introduce externalities to capital whereby private returns to scale may be diminishing, but social returns - reflecting spillovers of knowledge or other externalities - can be constant or increasing. A positive relationship between growth and investment in physical capital has been found by Githuku et al. (2018), Ongo and Vukenken (2014), and Roe and Diao (2004).

The effect of gross capital formation on economic growth has been emphasised in the growth literature. Physical capital stock has been identified by Amoateng (2014), Aryeetey and Fosu (2005), Mansouri (2005), and Kedir (2017), who studied the drivers of economic growth in Africa and found that gross fixed capital formation had a positive and statistically significant effect on economic growth.

Relationship between government expenditure and growth seems to be ambiguous. Government activities' impact on growth depends mainly on their net productivity effect, while there may be also a "size" effect. More specifically, when government consumption is low, the productive effects of public spending may exceed the social costs of raising funds (Karras, 2001; Bassanin & Scarpetta, 2001). In the context of endogenous growth theory, there is scope for well-designed government expenditure and tax systems to play an important role in reinforcing long-term growth, through its effects on the rates of investment in human and physical capital.

The government expenditure ratio in this study was however negative and was significant at the 1% and 5% significance levels in ECOWAS and WAMZ, similar to empirical literature, where fiscal deficits (implied by a reduction in government consumption) negatively affect growth in countries with unfavourable macroeconomic conditions. Government spending seems to dent economic growth. As suggested by the literature, the impact of government expenditure is not obvious *a priori*.

Allen & Ndikumana (2000) and Dreher (2006) note that a large government sector may induce inefficiencies and crowd out private sector investment, while government provision of efficient infrastructure and a proper legal framework may enhance growth. The result of this study indicates that the crowding-out effect of government consumption may dominate its growth-enhancing impact. This is also in line with the negative impact of government consumption, which eliminated spending on productivity-enhancing sectors such as defence and education in Barro (2003).

For countries with a modicum of macroeconomic stability (for instance, those with a low inflation rate), increased public deficits do not dampen growth, as the result in WAEMU indicated. For instance, Amoateng (2014) and Baldacci et al. (2003) found a positive sign in the WAEMU and concluded that macroeconomic stability is reflected by low levels of inflation rates.

As far as it concerns openness, the dominant growth theories support a positive relation to growth mentioning as possible channels the exposure to competition and exploitation of comparative advantage as in Heckshel-Ohlin model, or the technology diffusion and knowledge spillovers as shown by the Ricardian model. Also, in the endogenous growth literature trade openness positively affects per capita income and

growth through economies of scale and diffusion of knowledge between countries (Mirestean & Tsangarides, 2009).

Trade openness (TO) has a significant coefficient and a positive sign, as expected in ECOWAS. This means that the more an individual country is open to trade, the higher the gain in productivity growth due to an increase in flows of goods and services. This is in line with the neoclassical growth models that assert the gain of trade liberalised on economic growth through comparative advantage. Also, Zahonogo (2017), whose empirical results revealed that higher openness in international trade will generate more economic growth while higher trade openness will decline economic growth above the trade threshold, Also, Szeles and Marinescu (2010) concluded that trade openness, labour productivity, and exchange rate were the main drivers of regional growth.

The study results confirm the finding by Anyanwu (2014), who established a positive and significant association between trade openness and economic growth in China. According to Anyanwu (2014), trade openness would affect the growth of an economy through various channels. These include exploitation of comparative advantage, technological transfer and diffusion of knowledge, increased economies of scale, and increased competitiveness. These factors can be attributed to the positive relationship between trade openness and GDP growth in ECOWAS as a whole.

Relationship between FDI and growth also seems to be ambiguous. The economic rationale for offering special incentives to attract FDI frequently derives from the belief that foreign investment produces externalities in the form of technology transfers and spillovers. FDI itself is the most important type of capital movement, stimulates additional investment in both human and physical capital, and increases

competition in local markets. However, certain characteristics in the host countries, such as, the capacity to absorb new technologies (Melnyk et al. (2014), or the existence of developed financial markets (Chapsa et al.,2015) seem to play an important role. In contrast, some theories predict that FDI in the presence of pre-existing trade, price, financial, and other distortions will hurt resource allocation and slow down growth (Romer, 1993).

In this study, Foreign direct investment (FDINET) had a negative and significant coefficient in WAEMU and a positive and significant coefficient in WAMZ. Recent studies have supported the positive effect of FDI on economic growth. The studies include Melnyk et al. (2014), Ek (2007), and Siddique et al. (2017). These studies have argued that FDI influences the host economy's growth through the transfer of new technologies and know-how, the formation of human resources, integration in global markets, an increase in competition, and firms' development and reorganization. This implies that an appropriate business environment to facilitate the transfer of technology and managerial skills by foreign firms and encourage re-investment of profits would be necessary for FDI to positively impact growth in ECOWAS and aid these countries to converge towards a monetary union.

Also, Baiashvili and Gattini (2020) studied the effect of FDI. The study found that FDI had a positive effect on economic growth across these countries. The positive effect was attributed to institutional factors such as the rule of law, government effectiveness, control of corruption, and regulatory quality, particularly in developing economies. The ECOWAS countries can, therefore, improve their economic performance by attracting more FDI through enhancing institutional factors as well as creating an enabling environment that would be attractive to FDI.

Other studies such as Rahman (2015), Dinh and Nguyen (2019), Toulaboé et al. (2009), and Umeora (2013) have found a negative relationship between FDI and

economic growth. These studies have attributed the negative effect of FDI on GDP growth to factors such as an unskilled labour force, inadequate infrastructure, and a slow privatization process. Others are inefficient bureaucracy, political instability, recurring natural disasters, corruption, insufficiency in transparency, and the absorptive capacity of the recipient country.

To examine the effect of macroeconomic convergence compliance on economic growth in ECOWAS

The empirical findings presented in Table 4.8 indicate that the coefficient of the policy variable, namely the macroeconomic convergence compliance index (COIN), that was used to augment the baseline specification for Table 4.7 was significant and positive in the WAMZ zone. The results showed some differences in the values of the coefficients of the variables and their significant level, but the variables retained their sign. This implied that higher compliance with macroeconomic convergence criteria is associated with an increase in income growth and that the variation in the income growth rate can be explained by member state compliance levels.

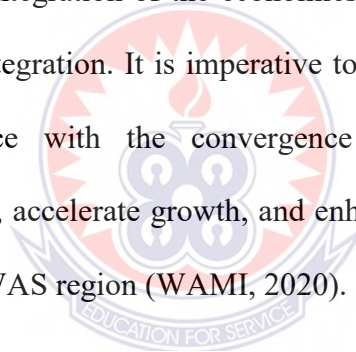
The findings of this study are similar to those of Park and Claveria (2018), Ijjo, and Tumwebaze. (2015) and Mann (2015), whose findings suggested that regional integration has a positive and significant effect on economic growth. Also, Ewijk and Arnorld (2015) concluded that the benefits of economic cooperation and integration include macroeconomic stability.

The effect of the convergence compliance index on ECOWAS as a whole was significant and negative. Thus, the evidence demonstrates that member countries strict compliance with the macroeconomic convergence criteria could lead to decreased economic growth. This raises the question of whether African countries would not gain by following a process that is more in line with the specific nature of their

economies instead of trying to copy the exact model of the Maastricht Treaty (Dramani, 2010).

The European model of economic integration seems to focus on price stability rather than economic growth and employment (Amoateng, 2014; Maleleka, 2007; Pesaran, 2007). It is based on policy convergence. Therefore, its success required the close homogeneity of the economies involved. Because of the structurally diverse economies, the level of policy convergence at the ECOWAS level does not appear to be as convincing as the European Monetary Union (EMU) (Oloo et al., 2022).

The viability and sustainability of a monetary union depend on macroeconomic convergence and close integration of the economies of Member States on the pillars of trade and financial integration. It is imperative to concretize these building blocks by ensuring compliance with the convergence criteria in order to achieve macroeconomic stability, accelerate growth, and enhance the economic well-being of the citizens of the ECOWAS region (WAMI, 2020).



CHAPTER FIVE

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

5.1 Introduction

This chapter is divided into three main sections. The first section presents the summary of the study and gives the main findings of the study. The second section presents the conclusions that are drawn from the main findings of the study. The last section then draws policy recommendations from the study as well as making recommendations for future research.

5.2 Summary

The study aimed to examine the effect of macroeconomic convergence compliance on growth through the creation of a macroeconomic convergence compliance index for ECOWAS and the two sub-zones, WAEMU and WAMZ. The study included all 15 member countries of the ECOWAS region, with panel data spanning from 2005 to 2022. The data for the analysis were obtained mainly from the ECOWAS Macroeconomic Convergence Report in 2011, 2016, 2017, and 2021 (source: WAMA).

The analysis of the data was done at two levels. The first was to examine the sensitivity of the variables by performing the unit root and the correlation test between the main explanatory variables used in the study. Secondly, the study employed an Additive index computation for the compliance index (COIN) and System GMM analysis to examine the hypothesis set for the study.

The variables that were used to develop the macroeconomic convergence compliance index were the performance score of member states on Budget deficit/GDP (BDG), Average annual inflation rate (AIR), gross external reserves (GEXR), and Central Bank financing of the budget deficit of the previous year's tax revenue (CBFB), as well as data on secondary criteria: public debt as a percentage of GDP (PDG) and nominal exchange rate variation (ECHV).

The control variable for objectives two and three included foreign direct investment (FDI). Investment (represented by gross fixed capital formation) as a percentage of GDP (INV), Trade openness (TO), Secondary School Enrollment (SER) Government Expenditure (GEX), and COIN (index).

The study modelled a convergence growth model using the system GMM estimator since there was a potential for endogeneity in the growth models. Under this, conditional convergence was examined. However, before any conclusions or explanations of the results would be made, the study subjected the regression analysis to a diagnostic test to determine the reliability and efficacy of the results presented in the model for analysis.

The empirical evidence for the income convergence estimations for both absolute and conditional convergence showed that there is income divergence among the ECOWAS member states. The macroeconomic convergence compliance index had a positive relationship with the income growth rate in WAEMU and WAMZ and significantly explained the variation in the income growth rate in only the WAEMU zone. The effect of the compliance index in ECOWAS, though significant, had a negative effect on growth. Because of the structurally diverse economies, the level of

policy convergence at the ECOWAS level does not appear to be as convincing as that of the European Monetary Union.

5.3 Major Findings

The following findings could be drawn from the study:

1. WAMZ member states failed to comply with all the macroeconomic criteria, especially the primary criteria, on a sustained basis during the period of this study. Also, the target for the budget deficit has become difficult for most of the member states to meet, especially with the onset of COVID 19.
2. There was evidence of income divergence in ECOWAS. And the sub -zones WAEMU and WAMZ
3. The level of human capital development, capital formation, and trade openness are important determinants of economic growth in the ECOWAS region.
4. The level of compliance with the macroeconomic convergence criteria is an important factor that affects growth in ECOWAS.

5.4 Conclusions

The following conclusions are made based on the result obtain for the specific objectives of study

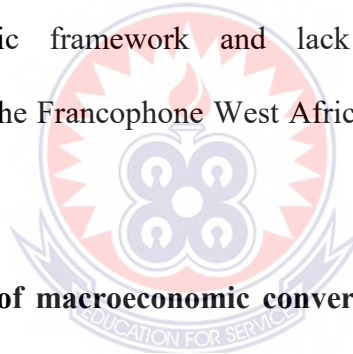
To develop a macroeconomic convergence index for ECOWAS and to use the index to analyse member states' compliance with macroeconomic convergence criteria.

Base on the findings of objective one, compliance level of member states is quite poor especially among the WAMZ member states. The reason for the noncompliance may be due to the fact that macroeconomic surveillance in ECOWAS to ensure compliance

with the convergence criteria has failed to sanction member states who are unable to attain the microeconomic convergence criteria and also as a result of insufficient political commitment of national government in ECOWAS. The convergence criteria should be seen as binding on member states for compliance to be effective.

To test the macroeconomic convergence or divergence in WAEMU and WAMZ.

The gradual transition to regional economic integration by member countries requires that they undergo a process of convergence of their economies. The divergence in ECOWAS may cause tensions that hold up the integration, create expectations of unsustainable intra-regional fiscal transfers, and complicate policies at the union level. The cause of the divergence may be due to the non-uniformity in the adoption of required macroeconomic framework and lack of policy coordination and harmonization between the Francophone West African countries and the Anglophone countries;



To examine the effect of macroeconomic convergence compliance on economic growth in ECOWAS

The mixed effect of the macroeconomic convergence compliance index in the ECOWAS, WAMZ and WAEMU may be due to the non-uniformity in the adoption of required macroeconomic framework and insufficiency of policy coordination and harmonization between the Francophone West African countries and the Anglophone countries. Also, the different economic and monetary structure may account for why strict compliance to the convergence criteria may lead to negative growth in ECOWAS as a whole.

5.5 Policy Recommendation

Macroeconomic convergence compliance index for ECOWAS

The first policy recommendation is that in order for ECOWAS countries to achieve deeper regional integration in the future, policymakers need to pay attention to ensuring compliance with the macroeconomic convergence criteria by improving the resources available to the WAMI, an institute entrusted with the responsibility to carry out multilateral surveillance of macroeconomic performance (Issiaka & Blaise, 2013) and harmonising policies, especially those that are affecting growth.

Also, the study recommends that member state who fail to comply to the convergence criteria over a period of time should be made to face the necessary sanction.

Macroeconomic divergence in WAEMU and WAMZ

The ability of the member states to achieve and sustain macroeconomic convergence differs, and they may be unable to reach the convergence criteria within the same time period dictated by the agreed target date for the establishment of the monetary union. Countries should therefore be allowed to determine their own convergence time path to comply with the criteria for accession to a monetary union.

Furthermore, though the presence of human capital and physical accumulation might cause per capita income divergence in the region, it had a significant and positive impact on per capita income growth. This suggests that some policies should be formulated to ensure more physical capital accumulation in the ECOWAS region. Additionally, ECOWAS country members must create a business environment to attract more FDI into the region. Lastly, policies in favour of increasing the level of openness in international trade should be implemented. This can be made possible by

reducing tariff and non-tariff barriers to promote intra-ECOWAS trade and also trade with the rest of the world.

Macroeconomic convergence and compliance with economic growth in ECOWAS

As a new addition to the literature and with evidence of the positive effect of macroeconomic convergence compliance on growth and the current divergence in member states, the researcher recommends that the ECOWAS Commission intensify efforts at ensuring member states comply with the integration agreement in order to achieve the ECOWAS goal of convergence and the eventual formation of the monetary and currency union to achieve the ultimate goal of economic growth in member states.

Also, efforts and strategies used by member states to attain the threshold should be recognised, and such efforts should be proposed for implementation by others who find it difficult to meet the targets.

5.6 Suggestions for Future Research

Further research is needed on factors that make it easier for some ECOWAS member states to comply with the macroeconomic convergence criteria. Secondly, future research could also be on factors contributing to divergence in ECOWAS and the sub-zone.

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APPENDIX

Appendix 1

Addictive Index Computation

With several variables that measure the same thing, it might be appropriate to make an index variable. It is a more comprehensive variable that measures, for instance, an added score or an average of the different variables. One advantage of index variables is that measurement errors in the constituent variables cancel out, and you get a better measure of the underlying concept that you are really interested in.

Firstly, the variables were recorded so that they had a common scale. Generating a common scale for the variable is necessary because, if, for instance, a variable that ranges from 1-4 is added to a variable that has a scale of 1-10, there would be a problem. The 1-10 variable would carry a lot more "weight" in the index.

$$gen\ varnamedummy = (varname\ logical\ operator\ threshold)$$

The six convergence criteria form the basics of six questions.

- 1) Is the fiscal deficit $\leq 3\%$?

FDGdummy1 = +1" if a country meets the 3% less or equal to the target and
-0" otherwise

- 2) Is the average inflation $\leq 5\%$?

AIRdummy2 = +1" if a country meets the 5% less or equal to the target and
-0" otherwise

- 3) Is the central bank financing of budget deficit $\leq 10\%$?

CBFBdummy3 = +1" if a country meets the 10% less or equal to the target and
-0" otherwise

4) Is the nominal exchange variation ± 10 ?

$ECHVDummy4 = +1$ if a country meets the 3% less or equal to the target and -0 otherwise

5) is the ratio of public debt to GDP $\leq 70\%$?

$PDGDummy5 = +1$ if a country meets the 70% less or equal to target and -0 otherwise

6) Is the external gross reserve ≥ 3 months of import?

$GEXRDummy6 = +1$ if a country meets the 3% greater or equal to the target and -0 otherwise.

Dummy variables were generated which assign the numbers '0' and '1' to indicate countries that did not meet or met any of the convergence criteria in each year. The variables are generally coded so that 1 means "met" and 0 "did not meet". The interest is in whether a country met or did not meet the criteria and therefore constructed a new set of variables (dummies) that have the value 1 if the country meets a criterion, and 0 if a country did not meet the criteria.

To create the index the command *egen* - an extended version of *gen* combined with the row means() was employed. Here, the researcher lists the variables to take the average.

$$\begin{aligned} &egen\ compositeindex(COIN_{it}) \\ &= (FDGDUMMY1_{it}\ AIRDUMMY2_{it}\ CFBFDUMMY3_{it}\ PDGDUMMY4_{it} \\ &\quad ECHVDUMMY5_{it}\ GEXRDUMMY5_{it}) \end{aligned}$$

Appendix 2

Test of the significant difference in the coefficients of the absolute convergence region- Table 4.6

Z-scores were calculated as

$$z = \frac{(0.891 - 0.964)}{\sqrt{(0.0378)^2 + (0.0114)^2}}$$

$$z = -1.89$$

Test of the significant difference in the coefficients of the conditional convergence region- Table 4.7

Z-scores were calculated as

$$z = \frac{(1.193 - 0.665)}{\sqrt{(0.077)^2 + (0.159)^2}}$$

$$z = 3.06$$

Test of the significant difference in the coefficients of the conditional convergence and the macroeconomic compliance index convergence region- Table 4.8.

$$z = \frac{(1.216 - 0.652)}{\sqrt{(0.092)^2 + (0.118)^2}}$$

$$z = 3.76$$

Appendix 3

Macroeconomic Convergence Compliance Index Scores

Year	Benin	Burkina	Cape	Cote	Gambia	Ghana	Guinea	Guinea	Liberia	Mali	Niger	Nigeria	Senegal	Sierra	Togo
2005	0.83	0.83	0.83	1.00	0.83	0.50	0.33	0.83	0.67	0.83	0.83	0.67	0.83	0.67	0.67
2006	0.83	0.83	0.83	1.00	1.00	0.67	0.33	0.83	0.67	0.83	0.83	0.83	0.83	0.50	0.83
2007	1.00	0.83	0.83	1.00	0.83	0.67	0.67	0.67	0.67	0.83	0.83	0.83	0.67	0.67	1.00
2008	0.67	0.67	0.67	0.83	0.50	0.33	0.50	0.67	0.67	0.67	0.67	0.67	0.67	0.83	0.83
2009	0.83	0.83	0.83	1.00	0.67	0.67	0.33	0.83	0.83	1.00	0.83	0.67	0.83	0.50	0.83
2010	1.00	0.83	0.83	1.00	0.83	0.83	0.50	0.83	0.83	1.00	1.00	0.67	0.83	0.50	1.00
2011	1.00	1.00	0.67	0.83	0.67	0.67	0.50	0.83	0.83	0.83	1.00	0.67	0.83	0.33	1.00
2012	0.83	0.83	0.67	0.83	0.67	0.33	0.67	1.00	0.67	0.83	1.00	0.83	0.83	0.50	0.83
2013	1.00	0.83	0.67	1.00	0.33	0.67	0.83	1.00	0.83	1.00	1.00	0.83	0.83	0.83	0.83
2014	1.00	1.00	0.67	1.00	0.17	0.33	0.67	1.00	0.50	1.00	0.83	0.83	0.83	0.67	0.83
2015	0.83	1.00	0.67	1.00	0.17	0.33	0.33	0.83	0.50	1.00	0.83	0.67	0.83	0.67	0.67
2016	0.83	0.83	0.67	0.83	0.17	0.33	0.50	0.83	0.67	0.83	0.83	0.67	0.83	0.33	0.83
2017	0.83	0.83	0.67	0.83	0.33	0.67	0.67	1.00	0.67	0.83	0.83	0.83	0.83	0.33	1.00
2018	1.00	0.83	0.83	1.00	0.33	0.50	0.67	0.83	0.50	0.83	1.00	0.67	0.83	0.50	1.00
2019	1.00	0.83	0.83	1.00	0.67	0.67	0.83	0.83	0.50	1.00	0.83	0.50	0.83	0.50	1.00
2020	0.83	0.83	0.67	0.83	0.67	0.33	0.50	0.83	0.67	0.83	0.83	0.50	0.83	0.33	0.83
2021	0.83	0.83	0.67	0.83	0.50	0.50	0.83	0.67	0.67	0.83	0.83	0.67	0.83	0.33	0.83
2022	0.67	0.67	0.67	0.83	0.50	0.33	0.83	0.67	0.83	0.83	0.83	0.67	0.83	0.50	0.83

Appendix 4

Number of convergence criteria attained per country (WAEMU)

Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Benin	5	5	6	4	5	6	6	5	6	6	5	5	5	6	6	5	5	4
Burkina Faso	5	5	5	4	5	5	6	5	5	6	6	5	5	5	5	5	5	4
Cote d'Ivoire	6	6	6	5	6	6	5	5	6	6	6	5	5	6	6	5	5	5
Guinea-Bissau	5	5	4	4	5	5	5	6	6	6	5	5	6	5	5	5	4	4
Mali	5	5	5	4	6	6	5	5	6	6	6	5	5	5	6	5	5	5
Niger	5	5	5	4	5	6	6	6	6	5	5	5	5	6	5	5	5	5
Senegal	5	5	4	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Togo	4	5	6	5	5	6	6	5	5	5	4	5	6	6	6	5	5	5
WAEMU Performance	5.00	5.13	5.13	4.25	5.25	5.63	5.50	5.25	5.63	5.63	5.25	5	5.25	5.5	5.5	5.00	4.88	4.63

Number of convergence criteria attained per country (WAMZ)

Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Cabo Verde	5	5	5	4	5	5	4	4	4	4	4	4	4	5	5	4	4	4
Gambia, The	5	6	5	3	4	5	4	4	2	1	1	1	2	2	4	4	3	3
Ghana	3	4	4	2	4	5	4	2	4	2	2	2	4	3	4	2	3	2
Guinea	2	2	4	3	2	3	3	4	5	4	2	3	4	4	5	3	5	5
Liberia	4	4	4	4	5	5	5	4	5	3	3	4	4	3	3	4	4	5
Nigeria	4	5	5	4	4	4	4	5	5	5	4	4	5	4	3	3	4	4
Sierra Leone	4	3	4	5	3	3	2	3	5	4	4	2	2	3	3	2	2	3
WAMZ Performance	3.86	4.14	4.43	3.57	3.86	4.29	3.71	3.71	4.29	3.29	2.86	2.86	3.57	3.43	3.86	3.14	3.57	3.71

Appendix 5

Number of countries that met each criterion over the study period

	Target	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
FDG	$\leq 3\%$ GDP	4	6	7	6	3	9	8	7	9	7	5	4	5	8	8	3	2	2
GEXR	≥ 3 months	13	13	13	12	14	14	14	12	15	14	12	13	14	12	14	13	15	15
PDG	$\leq 70\%$ GDP	14	15	15	15	15	14	13	13	13	13	11	11	13	13	12	11	10	10
AIR	$\leq 5\%$	9	9	7	0	10	10	9	8	9	9	9	9	9	9	9	9	9	7
CBFB	$\leq 10\%$	15	13	15	13	12	14	13	14	15	12	12	11	13	12	14	11	14	15
ECHV	± 10	12	14	15	13	15	14	13	14	14	13	13	12	13	14	14	15	14	14