



**University of
Sunderland**

Mogaji, Peter Kehinde (2017) Evaluation of Macroeconomic Indicators and Dynamics for Monetary Integration of West Africa: The Case of the WAMZ. Working Paper. UNSPECIFIED. (Unpublished)

Downloaded from: <http://sure.sunderland.ac.uk/id/eprint/14577/>

Usage guidelines

Please refer to the usage guidelines at <http://sure.sunderland.ac.uk/policies.html> or alternatively contact sure@sunderland.ac.uk.

Evaluation of Macroeconomic Indicators and Dynamics for Monetary Integration of West Africa: The Case of the WAMZ

by

Peter Kehinde Mogaji
(School of Oriental and African Studies (SOAS), University of London)

Abstracts

For a proposed monetary union, a study of the uniformity of macroeconomic policies and performances, the level of economic development of the prospective monetary union's member economies as well as the patterns of economic dynamics would give evidence to suggest potential problems and possible costs (or otherwise) of single monetary and exchange rate policy. As a theoretical property of an optimum currency area (OCA), the more the degree of uniformity or homogeneity of the economic performances of a monetary union's member countries, the easier the stability of the single currency of the union whenever the union is faced with economic shock. This paper, therefore investigated the uniformity of some relevant macroeconomic indicators as well as the homogeneity of the economic performances of the West African Monetary Zone (WAMZ) countries (consisting of The Gambia, Ghana, Guinea, Liberia, Nigeria and Sierra Leone) and assessed the macroeconomic dynamics (based on empirical analyses of growth differences) within the proposed monetary enclave in the evaluation of the feasibility of monetary integration of the West African sub-continent. Relevant data employed in this study span between 1980 and 2014. ANOVA tests was employed to determine if the economic variables being assessed are similar among the monetary union members. Twenty two variable/ratios were evaluated in the ANOVA tests. Fiscal harmony, including homogeneities in balance of payment accounts and external trade within the WAMZ were specifically investigated. Further attempt made here was the estimation of economic dynamics across the WAMZ by shrinking these dynamics into a single indicator of Theil Coefficient of Inequality which compares the differences in growth in each member country as well as growth in the entire WAMZ economies; the WAMZ economies (without the lead economy, Nigeria); and the lead economy of Nigeria. Various assessments and evaluations in this paper produced evidences that suggest that virtually all these macroeconomic and financial indicators examined do not have similar features across the WAMZ. In terms the whole WAMZ, Ghana has same feature in a WAMZ aggregate economy, when Nigeria was excluded from the analyses. Nigeria stands the only country that enormously share similarities with the entire WAMZ when the six WAMZ economies were aggregated.

1. Background

There was formal establishment of the West African Monetary Zone (WAMZ) in 2000. This monetary zone comprised of The Gambia, Ghana, Guinea, Liberia, Nigeria and Sierra Leone. It was expected that the formation of WAMZ would propelled the creation of a monetary union alongside a common central bank and a single currency (the *eco*), meant to replace the existing national currencies of the six member countries. The desire to fasten the process of the monetary integration of the African sub-region was indicated by the 15-member countries of the ECOWAS in 2000. This crystallised into a 2-phase programme for the creation of a single currency for the region. The idea was that the WAMZ (of the Anglophone West African countries and Guinea) will merge with the existing West African CFA zone franc shared by members of the West African Economic and Monetary Union (WAEMU) to form a formidable monetary union across the whole of West Africa in the future as part of the African Economic Community's six-stage process of achieving a monetary union and a single currency for Africa by 2028. The proposed monetary union failed to commence after some few attempts, the last of which was in 2015. The first phase of the plan was the launching of a single currency to be known as '*eco*' by members of the West African Monetary Zone (WAMZ) while the second phase was the merger of the WAMZ with the existing WAEMU to evolve a single currency for the whole of ECOWAS member states by January 2020.

Four quantitative primary convergence criteria for countries within the WAMZ were: (i) single digit inflation rate by 2000 and inflation rate of 5% by 2003; (ii) budget deficit (excluding grants) of not more than 5% of GDP by 2000 and 4% by 2002; (iii) central bank financing of budget deficit to be limited to 10% of previous year's tax revenue; and (iv) gross external reserves to cover at least three months of imports by the end of 2000 and six months by end-2003. Additional six secondary convergence criteria to be observed in support of the primary convergence criteria are: no accumulation of new domestic payment arrears and liquidation of all old arrears; tax revenue should not be less than 20% of the GDP; wage bill should not be less than 35% of tax revenue; domestically financed public investment should be at least 20% of tax revenue; the central parity of nominal exchange rate determined on 31 December, 2003 should be maintained with 15 per cent fluctuation band as defined by WAMZ Exchange Rate Mechanism (ERM-II); maintenance of positive real interest rates.

As highlighted above, the inauguration of the WAMZ's single currency failed was postponed on three occasions in 2003, 2005 and 2009. In July 2014, due to lack of economic convergence among the WAMZ members, as well as apparent inadequate preparations, glaringly reflecting non-feasibility of the January 2015 take-off, the WAMZ gave up the introduction of the single currency as proposed and the Heads of States and Governments of the Economic Community of West African States (ECOWAS) changed focus and strategy by relinquishing the initial plan of the WAMZ-WAEMU merger and replacing this with rescheduling the creation of a single currency for the 15-member ECOWAS countries by January 2020.

In the bid to accelerate the pace for the introduction of the West African single currency, the Presidential Task Force set up by the Heads of States and Governments of ECOWAS considered three options (as displayed in Table 1 below) and eventually recommended that Option 2 (*The Gradual Option*) be adopted. The Gradual Option highlighted that the participation of countries in the single currency will be based on compliance with the primary convergence criteria before 2020.

Table 1: Options for Single Currency in ECOWAS

	<i>Options</i>	<i>Highlights</i>
<i>Option 1</i>	<i>Big Bang</i>	By 2020, all ECOWAS member countries will participate in the single currency; and countries that cannot meet the convergence criteria <i>ex-ante</i> will achieve these <i>ex-post</i> .
<i>Option 2</i>	<i>Gradualist</i>	Member countries of ECOWAS that are able to meet the primary convergence criteria before 2020 will participate in the single currency.
<i>Option 3</i>	<i>Critical Mass</i>	The launching of the single currency will take place in 2020 on the condition that the critical mass of countries representing at least 75% of the region's GDP

Source: ECOWAS Commission

The Task Force rejected Option 1 and Option 3 because of the apparent 'too high' levels of risks relating to macroeconomic instability if these two options are adopted. Given the present situations in the West Africa region, Table 2 below reflects four possible convergence situations that can result in 2020.

Table 2: Possible Convergence Situation in ECOWAS by 2020

<i>Convergence Situation</i>	<i>Possible Qualifying Countries</i>	<i>Possible Outcomes</i>
Situation 1	WAEMU countries	Current status-quo, leading to a fresh postponement of the ECOWAS single currency.
Situation 2	WAEMU countries + Nigeria + Ghana + few other WAMZ Countries	Launching of ECOWAS single currency.
Situation 3	WAEMU countries + WAMZ countries, but without Nigeria and Ghana.	Fresh postponement of the ECOWAS single currency because of the need to grant more time for the exclusion of the two economic heavy weights (Nigeria and Ghana).
Situation 4	WAEMU countries + WAMZ countries	Launching of the ECOWAS single currency.

Source: Bakoup and Ndoye (2016)

In order to meet the January 2020 deadline and the launching of the single currency as scheduled, those critical measures that were not well addressed in the past were highlighted for full implementation before 2017. These were: (a) preparing a strategy and procedures for the future single currency of the ECOWAS monetary integration; (b) drafting a treaty that will establish the monetary union between member countries of ECOWAS and for all members to ratify this treaty; (c) designing, adopting and ratifying the Article of Association of the future common central bank for ECOWAS. In May 2015, there was the rationalisation of the total number of convergence criteria from eleven to six, consisting of four primary criteria and two secondary criteria. These modifications also involved the reviews and changes in some benchmarks. The new primary criteria are: (i) ratio of budget deficit (commitment basis, including grants) to GDP of less than or equal to 3%¹; (ii) average annual inflation rate of less than 10%²; (iii) central bank financing of budget deficit of less than or equal to 10% of the previous year's tax revenue; and (iv) gross external reserves - higher than or equal to 3 months of imports³. The new secondary criteria:⁴ (a) stable nominal exchange rate of +/- 10%; and (b) ratio of total public debt to GDP of not more than 70%.

¹ Previously, the maximum target for budget deficit/GDP ratio was 4% (excluding grants).

² This is against the former maximum of 5%.

³ The previous cover was 6 months.

⁴ Criteria removed in the rationalisation exercise were: positive real interest rate, real exchange rate stability, non-accumulation of domestic and external arrears, tax revenue/GDP, wage bill/tax revenue and public investments/tax revenue.

From a proposed monetary union, a study of the uniformity of macroeconomic policies and performances, the level of economic development of the prospective monetary union's member economies as well as the patterns of economic dynamics would give evidence to suggest potential problems and possible costs (or otherwise) of single monetary and exchange rate policy. Economic and monetary integration of countries should be easier if there are similarities in past economic performances and development. While policy preference of a country is a reflection of past economic policies, the level of economic development is depicted by developments in macroeconomic and financial structures. The case for, and the essence of monetary autonomy would be reduced if there are similarities in economic priorities of countries involved in such monetary integration. As a property of an optimum currency area (OCA), the more the degree of uniformity or homogeneity of the economic performances of a monetary union's member countries, the more it would be easy for stability of the single currency of the union whenever the union is faced with economic shock. Consequent upon these, this paper investigated the uniformity of some relevant macroeconomic indicators as well as the homogeneity of the economic performances of the WAMZ countries and assessed the macroeconomic dynamics within the monetary zone in the evaluation of the feasibility of monetary integration of the West African sub-continent. In this study, the evaluation of economic dynamics of the WAMZ here was based on empirical analyses of growth differences in the WAMZ by giving an overall measure of economic dynamics through the estimation that generates growth inequality coefficients for these countries.

2. Characteristics of the Economies of WAMZ Member States

It is essential to have the understanding and knowledge of the features of the national economies of member states of the WAMZ before attempting to go into an in-depth assessment of macroeconomic indicators and dynamics of the zone. This subsection makes brief expositions of the salient features of the six national economies within the WAMZ. These descriptive analyses cover the demographics, trade, monetary, fiscal, financial, governance and other macroeconomic information.

The Gambia: The Gambia is the 177th largest export economy in the world. The 2014 Economic Complexity Index (ECI) reveals the country to be the 94th most complex economy. The Gambia got independence from the British colonial rule on 18 February,

1965 and the capital city is Banjul while the official currency is *dalasi*. The Gambia is a founding member of the Economic Community of West African States (ECOWAS) in 1975 and also of the West African Monetary Zone (WAMZ) in 2000. As at the end of 2015, The Gambia was the smallest economy and country in the WAMZ (as well as the smallest country in Africa) with 0.26% of the WAMZ's GDP as well as 0.85% of the total population of the zone. The Gambia has a land area of 11, 295 km² (4,361 square miles), with a 2015 population projection of 1.991 million. Estimated population density of The Gambia was 176 as at the end 2015. Around 50% of this population lives in urban areas while about three quarters of the population are engaged in farming (traditional subsistence agriculture) in the liberal economy characterised by historic reliance on groundnuts (peanuts) for export earnings, re-export trade built up around its ocean port, low import duties, minimal administrative procedures, a fluctuating exchange rate with no exchange controls, and a significant tourism industry". The services industry in The Gambia is the largest sector of the economy majorly made up of tourism and foreign banking and by 2016 estimates, this sector accounted for 63% of the GDP, followed by the agricultural sector which make up to 21.4% of the GDP. The agriculture sector produces peanuts, rice, millet, sorghum, corn, sesame, fish, palm kernels, vegetables, forestry, livestock and fishing and over 75% of the population depends on this sector for its livelihood. The industrial sector recorded 15% of the total output. In recent times, economic performances of The Gambia were affected by some shocks (delayed rainfall, Ebola outbreak affecting tourism, weak implementation of economic policy). These contracted the real GDP growth, falling to 0.9% in 2014, rebounding to 4.7% in 2015. Recent years also witness large fiscal imbalances as fiscal deficit moved to 11% of the GDP in 2014 (from 4.4 in 2012). Due to the difficulty in securing external finance, the deficit is hugely being financed through domestic borrowings. There was an increase of 58.29% in public debt over a five year period between 2011 and 2015, causing increase in public debt financing, which in 2015, absorbed 4% of government revenue, an increase from 2.5% recorded two years earlier. All these culminated into balance of payment crisis, putting pressure on the country's international reserves which have significantly been depleted. The government managed to maintain macroeconomic stability in the face of external shocks such as reduction in grant aid and trade revenues, as well as rising oil and food prices'.

The Gambia is a primary commodity exporting country which has sixty seven products on its exports product list. As at 2015, the country's main exports products (with the share of the country's total exports were: (i) cashew nuts (36.6%), wood – in rough (27.6%) and groundnut oil, crude (5%). There are five export products accounting for more than 75% of the country's exports.

Ghana: Ghana was formed from the merger of the British colony of the Gold Coast and the Togoland trust territory. As at 2015, Ghana has a land area of 239.46 km² (92,100 square miles) with a population estimate of 27.410 million and an estimated population density of 115. As at independence from British colonial rule on 6 March 1957, about 30% of the population lived in urban areas as against more than 50% by 2015. The capital city of Ghana is Accra while the official currency is *Ghana cedi*. Ghana is a founding member of ECOWAS in 1975 and also of the WAMZ in 2000. As at the end of 2015, Ghana was the second largest economy of the WAMZ, accounting for 9.06% of the economic size of the zone, while it is equally the second largest populated member of the WAMZ with 11.65% of the zone's entire population estimation. The country's export market is the 92nd largest in the world; and according to the ECI, the country is the 122nd most complex economy. Ghana is one of the three WAMZ countries having a stock exchange.

Soon after independence through to 1970s, the Ghanaian economy known to be strong was badly affected by failed development plans and series of military interventions. The economy was highly protected by state investments, particularly in manufacturing sector which in the 1980s, turned to be a heavy burden on state resources. Ghana carried out a currency re-denomination exercise in July 2007 when the unit of account, the cedi was redenominated to the new unit of account now called the Ghana *cedi* with the conversion rate of 10,000 *cedis* for 1 Ghana *cedi*.

As at now, Ghana is ranked by the World Bank as lower middle income economy. Ghana's natural resources base is diverse and rich. The principal mineral resources include gold, oil, timber, diamonds, bauxite, manganese, and fish while its agricultural products are cocoa, wood (timber), pineapples, cashew, spices and rubber. The dependent of the Ghanaian economy on gold, cocoa (and now oil) makes it vulnerable to movements in world commodity prices. There was a major oil discovery in Ghana in 2001, while oil production formally began in December, 2010 at 55,000 barrel production per day, witnessing a growth up to 99,000 barrels/day in 2013. In spite of the oil discovery and wealth of mineral resources, records as at 2016 show that agriculture accounted for more

than 19.6% of Ghana's GDP (and for around 55% of employment), service, 54% and manufacturing, 24%. Cocoa as a primary cash product provides about 19% of export revenue as at 2014, thus making cocoa, gold and oil as the top three revenue earning export commodities for Ghana. Ghana remains a world's top gold producer and experts' projection is that the country is likely to be the third largest oil producing country in West Africa. Currently, Ghana is aiming at being a major gas exporter.

Guinea: Guinea which got her independence from the former French colonial masters on 2 October, 1958 is the only French-speaking country in the WAMZ. Its capital city is Conakry. Guinea is a founding member of the Economic Community of West African States (ECOWAS) in 1975 and also of the West African Monetary Zone (WAMZ) in 2000. Guinea opted out of the WAEMU to take up her currency known as *Guinean franc*. As at 2015, Guinea was the 3rd largest economy of the WAMZ (claiming 1.22% of the size of the zone's economy as well as 5.36% of the total population of the zone). The Republic of Guinea, has a land area of 245, 860 km² (95,000 square miles) with a 2015 population projection of 12.609 million and an estimated population density of Guinea was 51. As at this same period, the country was the 124th world's largest economy and 133rd most complex economy as at 2015.

Guinea relies solely on the mining sector which provides 95% of export earnings of the country, while agriculture sector provides the remaining 5%. Guinea's natural resources are bauxite, iron ore, diamonds, gold, salt, uranium, fisheries and hydropower. The global demand for bauxite, diamond and gold has caused the Guinean's export share of GDP to rise in recent times. The country has the largest reserves of these mineral resources and untapped high grade iron ore reserves. Though richly endowed with mineral resources, yet, Guinea is in the category of 'poor country'. The outbreak of the Ebola epidemic devastated the economy of Guinea and grossly impacted economic growth (with near-zero growth), caused budget deficit of over 7% of GDP and constrained the capacity to accelerate development reforms programmes which are essential structural transformation of the economy. Mining, light manufacturing and agricultural processing industries made up to 45.7% of Guinea's GDP while agricultural products of rice, cassava, coffee, banana, potatoes, pineapple, sheep, goats, timber, palm products and cattle made up to 25.8% of the GDP as at the end of 2015.

As at 2014, three major export products of Guinea (and their share of the country's total exports) are: petroleum oil (40.4%), aluminum ore (35.6%) and Gold (10.8%). Two

export products (petroleum oil and aluminum) accounted for over 75% of the country's total exports.

Liberia: Liberia of today emanated from the Settlement of Freed Slaves from the United States since 1822. On 26 July 1847, when Liberia got its independence, a republic was established by the Americo-Liberians, thus making Liberia the first African country to obtain independence. Liberia has a land area of 111,369 km² and a July 2015 population projection of 4.503 million. Estimated population density of Liberia was 40 as at the end 2015. The capital city is Monrovia and Liberia's currency is *Liberian dollar*. Liberia is a founding member of the ECOWAS in 1975. Liberia and Cape Verde initially acted as observers in the WAMZ but Liberia finally joined the monetary zone on 16 February 2010.⁵ As at 2015, Liberia was the second smallest economy of the WAMZ (after The Gambia) reflecting 0.38% of the zone's GDP and having 1.91% of the zone's population. Liberia is the world's 153rd largest export economy and 129th most complex economy as revealed by the ECI.

Until the 1950s, subsistence farming and rubber production contributed very hugely to the Liberian economy. The discovery of mineral resources like iron ore, gold, diamond, tins changed the fortune of the country and made its economy to have reliance on mining activities. These mineral resources became the significant source of export earnings for the country. The country's economy was largely destroyed by mismanagement and the 14-year civil war which started in 1989 and ended in 2003. As a result of the war, many businesses had to leave Liberia with their expertise and capital. Liberia was a major exporter of iron ore before the civil war. The military intervention of 1980 reduced the world demand for Liberia's iron ore. However, with the installation of a stable democratic government many of these businesses have been returning. Around 70% of the country's population and three-quarter of rural workforce are involved in the agricultural sector providing coffee, rubber, rice, cocoa, palm oil etc.

Though, the country is richly endowed with forest, water and mineral resources including good vegetation for agricultural purposes, yet the country is hugely under-developed and it is one of the world's poorest countries. Consequently, Liberia is classified a low income country. 60% of the country's population lives below the poverty line, with poor human capital and poor infrastructures.

⁵ Liberia is not a founding member of the WAMZ.

With the recent drop in prices of primary commodities (and the effects of the Ebola epidemic), there had been decline in the Liberia's economic growth as evident by sharp fall from 8.7% in 2013 to as low as 0.7% in 2014 and a further drop to 0.4% in 2015. Agriculture however remained the highest contributor to the country's GDP of 42.6% in 2010 and 35.6% in 2014. Nevertheless, in spite of the fragility and poor social conditions after the civil war and prior to the outbreak of Ebola epidemic in 2014, Liberian economy witnessed steady growth up to 8.7% in 2013. The post conflict growth under a regiment of economic stability management and extractive industries' expansion is impressive and laudable.

Three principal export commodities of Liberia (with their percentage share in total exports of the country) are iron ore (40.7%), vessels/floating structures (13.9%) and natural rubber (12.9%). Four products account for more than 75% of the country's exports. The exportation of diamond and timber were banned by the United Nations in the mid-1990s. These bans on the exportation of timber and diamond were lifted in 2006 and 2007 respectively.

Nigeria: Nigeria has a land area of 923.8 km² (92,100 square miles) with a 2015 population projection of 182.202 million. This makes Nigeria to be the most populous country in Africa with more than 250 ethnic groups. Estimated population density of Nigeria was 197 as at the end 2015. Nigeria's capital city is Abuja and its currency is *naira*. Nigeria got its independence on 1 October, 1960. Nigeria is the Africa's largest economy (and so the largest and dominating economy in the WAMZ) having overtaken South Africa in 2012 when it posted a GDP of \$453 billion (in comparison with South Africa's same year result of \$384). The 2012 figure for Nigeria came as a result of the rebasing of the country's GDP (thought by many economists to be long overdue) in order to reflect structural changes in production and consumption within the country.⁶ Nonetheless, Nigeria still trails in per capita income and economic development. Nigeria is a founding member of the ECOWAS in 1975 and also of the WAMZ in 2000.

Within the WAMZ, as at 2015, Nigeria was the largest and the dominant economy controlling 88.37% of the zone's GDP as well as the most populated country having

⁶ The rebasing took Nigeria to change the base year from 1990 to 2010 as well as increase the number of industries. This resulted in increase in the size of the economy 75%. All economic variables that were expressed in terms of GDP were consequently changed due to the higher nominal GDP.

77.48% of the entire population of the WAMZ. As at 2014, Nigeria was the world's 38th largest exporting country and the 125th most complex economy in the world according to the ECI.

Nigeria is classified by the IMF as a mixed economy, a middle income country and an emerging market. The country is ranked 20th largest economy (in terms of PPP) and the 21st (in terms of nominal GDP). Nigeria had the largest manufacturing sector in Africa in 2013; and at the same time, produced large proportion of goods and services for the subcontinent of West Africa. These have implications for the WAMZ.

Historically, Nigeria's economy was agricultural based, yet over 50% of the country's workforce still largely engaged in subsistence farming. The discovery of oil and the growth in the oil industry shifted the focus of attention away from the agricultural sector. Over the past decades, the country's economy has been oil-dependent. Petroleum (the lead mineral resources in Nigeria) provides around 95% of the government revenue as well as foreign exchange earnings for the country. Nevertheless, due to outdated and inactive refineries across the country, Nigeria imports most of her fuel, in spite of around 1.8 million barrel a day oil production. The poor capacity of oil refineries and the neglect of the agricultural sector did not cause Nigerian economy to keep pace with the tremendous growth in its population and this is the reason why the country imports refined petroleum products and food. The large population, long term mismanagement of resources, endemic corruption, long era of military rule are factors of low socio-economic indicators of Nigeria. Despite the huge wealth from oil revenue (and potentials of other natural resources), the World Bank ranks Nigeria as a 'poor country', where the vast majority of the populace lives below the poverty line.

Nigeria's major natural resources are crude oil, natural gas, tin, iron ore, limestone, coal, lead and zinc. The two main export products of Nigeria (and their shares of total exports) are petroleum oil (81.4%) and liquefied natural gas (12.3%). Only one product accounts for more than 75% of the country's total exports and this makes the Nigerian economy is very vulnerable to movements in international prices and demand for oil and gas. In spite of huge dependence on oil, agricultural products still account for up to about 40% of the GDP and around 60% of the total employment. The country's major agricultural products are cocoa, palm oil, yam, cassava, sorghum millet, corn, rice, livestock, and groundnuts. On industrial scale, Nigeria produces hides and skins crude oil, coal, ceramics tin, columbite; rubber products, detergents, cement and other construction materials, wood,

textiles, beer, food products, footwear, chemicals, fertiliser and steel. Nigeria has a stock exchange which performs well, although the country's private sector underutilises equity as means of fostering corporate growth. Rural communities still have poor access to credit facilities.

In recent times, the Nigeria's economy witnessed some external shocks. The economy growth of the country fell to 3.0% in 2015, from 6.2% in 2014 while inflation rate increased from 7.8% in 2014 to 9.0 in 2015 and the country eventually entered into economic recession. A major attribute of this is the fall in global crude oil price which led to sluggish growth and slow-down in economic activities impacted by shortages in the supply of foreign exchange.

Sierra Leone: Sierra Leone has a land area of 71,740 km² (29,925 square miles), with a 2015 population projection of 6.453 million. Estimated population density of Sierra Leone was 90 as at the end 2015. Sierra Leone got independence from the British colonial rule on 27 April 1961 and the capital city is Freetown while the official currency is *leone*. After 11-year civil war (1991-2001), democracy and orderliness are slowly being re-established in Sierra Leone. This civil war caused deaths in tens of thousands and displacement of more than 33% of the population. Sierra Leone is a founding member of the Economic Community of West African States (ECOWAS) in 1975 and also of the West African Monetary Zone (WAMZ) in 2000. As at 2014, Sierra Leone was the 136th largest exporting economy and 82nd most complex economy. As at 2015, the country is the third smallest economy of the WAMZ, having 0.79 of the zone's economic size as well as the third least populated country in the zone, with 2.74% of the zone's entire population. Sierra Leone is very rich in solid minerals resources. The country has one of the largest deposits of rutile in the world. It ranks among the top ten diamond producing countries of the world. Sierra Leone's natural resources include bauxite, iron ore, platinum, gold, manganese, chromites, titanium ore and diamonds. The reliance of Sierra Leone on mining (particularly diamonds) for its economic prosperity is high. The annual diamond production in Sierra Leone is estimated between US\$250–300 million. Exportation of mineral resources remains the country's main source revenue from foreign exchange.

In Sierra Leone, agriculture employs over 80% of the population in subsistence farming. This sector generates about 25% of the export earnings for the country and contributed about 71% of the GDP as at 2015. Rice, coffee, cocoa, palm kernels, peanuts, cashew, poultry, cattle, sheep and fish are the leading agricultural products in this country. Main

mineral resource extracts involves diamond, gold, iron ore, bauxite and rutile. Diamond and gold generate 'sufficient' foreign exchange for this country. However, there had been series of off-shore oil discoveries in the country since 2009.

The Sierra Leonean economy witnessed a total collapse from 1995 due to the spill-over of the civil war in the neighbouring Liberia. The economy however began to witness expansion from mid-2000, after continuous decline in GDP from 1980. Despite of her rich resource base, Sierra Leone could be described as a depressed economy with low per capita income over the years. In recent years, the fall in international prices of iron ore (and the Ebola epidemic) caused contractions of more than 20% in the country's GDP, with a decline from 20.1% in 2013 to 4.6% in 2014 and to -21.5% in 2015. As at 2014, three principal exports of Sierra Leone (and their share of total exports) are iron ore (76.8%), diamond (8.1%). One export product (iron ore) accounts for more than 75% of the country's total exports. All the same, the Sierra Leonean economy is also vulnerable to movements in international prices of commodities. The Sierra Leonean stock exchange (one of the stock exchanges in the WAMZ) is at a development stage.

Table 3: Financial and Macroeconomic Indicators for the WAMZ Countries (as at 2015)

<i>Indicators</i>	<i>Gambia</i>	<i>Ghana</i>	<i>Guinea</i>	<i>Liberia</i>	<i>Nigeria</i>	<i>S/Leone</i>
<i>Real GDP % Growth (2007-2015 average)</i>	3.7	6.7	2.2	6.3	6.0	5.1
<i>GDP (based on PPP) in \$</i>	\$3.27b	\$113.35b	\$15.276b	\$3.781b	\$1,105.34b	\$9.832b
<i>GDP (per capita) in \$</i>	\$1,642	\$4,135	\$1,212	\$840	\$6,067	\$1,524
<i>GDP (at Official Exchange Rate) in \$ 2015</i>	\$886m	na	\$6.754b	\$2.168b	\$415.1b	\$4.289b
<i>CPI Inflation (%)</i>	6.5	17.2	8.0	7.7	9.0	9.9
<i>External Debt Stock in \$</i>	\$502.5m	\$19.15b	\$2.843b	na	\$32.27b	\$1.403b
<i>External Debt as % of GDP</i>	50.7%	64.4%	29.5%	24.0%	2.1%	33.6%
<i>Exports of Goods (fob) in \$</i>	\$113.2m	\$10.36b	\$1.611b	\$330.8m	\$45.89b	\$569.4m
<i>Imports of Goods (cif) in \$</i>	\$365.1m	\$13.47b	\$2.173b	\$2.232b	\$52.33b	\$1.575b
<i>Current Account Balance in \$</i>	-\$136m	-\$2.254b	-\$1.730b	-\$1.014b	-\$16.127b	-\$475m
<i>Current Account Balance as % of GDP</i>	-20	-8.2	-23.6	-36.9	-3.5	-11.3
<i>Annual Export % Growth (2010-2014)</i>	16.7	-43.3	2.1	0.6	3.8	127.1
<i>Trade Balance in \$</i>	-\$208m	-\$1.403b	-\$1.275b	-\$1.052b	-\$1.576b	-\$155m
<i>Budget balance as % of GDP</i>	-9.6	-5.7	-7.5	-5.6	-3.4	-3.7
<i>International Reserves (gold and Forex)</i>	\$83.8m	\$5.885b	\$233.5m	na	\$29.07b	
<i>Reserves (excluding gold)</i>	\$143.3m	N/A	\$233.5m	na	\$31.56b	\$556.5m
<i>Global Competitiveness Effect (%)</i>	9.3	41.6	-3.0	5.4	-1.69	122.7
<i>Economic Freedom Index</i>	57.5	63.0	52.1	52.7	55.6	51.7
<i>Monetary Freedom Index</i>	70.8	69.2	66.7	72.2	70.4	68.5
<i>Trade Freedom Index</i>	65.0	64.8	61.2	74.4	63.8	70.2
<i>Investment Freedom Index</i>	65.0	65.0	40.0	40.2	40.0	55.0

Sources: Various and Own Estimations

Some macroeconomic, financial and demographic information on the six WAMZ countries as at the end of 2015 are as displayed in Table 3 above.

Table 4: Sizes of the Economy, Base Money and Population of WAMZ Countries

WAMZ Country	% Size of Economy in WAMZ (as measured by Nominal GDP (US\$) at end of 2015)	% Base Money in WAMZ (in US\$) at end of 2014)	% Population Estimations in WAMZ (as at end of 2015)
The Gambia	0.18	0.50	0.84
Ghana	7.05	11.5	11.76
Guinea	1.26	3.7	5.15
Liberia	0.38	1.91	1.92
Nigeria	90.33	82.5	77.24
Sierra Leone	0.80	0.90	3.09
Total	100	100	100

Source: Compiled by the Author from various sources

To reflect the sizes of the economies of the WAMZ countries in the context of nominal GDP and base money as measures, as well as the population of these countries, Table 4 above exhibits the proportion (in percentages of the WAMZ total) of these indicators for each country.

3. Optimum Currency Area and Macroeconomic Dynamics

There are so many definition of an optimum currency area given in literature. One can describe an optimum currency area as a domain within which exchange rates are fixed and monetary policy best maintain full employment, balanced international payments and a stable internal average price. It is an area that for optimal balance adjustments and effectiveness of domestic macroeconomic policy, has fixed exchange rates within the area but maintain flexible exchange rates with trading partners. It is a geographical region in which economic efficiencies are shared and huge economic benefits are created by a single currency; a region in which the benefits of forming a monetary union outweigh the cost. It is also a geographical and economic domain that operates one currency and one monetary policy operates and have a general means of payments either a single currency or several currencies whose exchange value are immutably pegged to one another with unlimited convertibility for both current and capital market transactions, but whose exchange rate fluctuate in unison against the rest of the world.

In the OCA theory, a popular criterion is the symmetry of economic dynamics as established by classical and contemporary theorists. It is vital to incorporate the homogeneity of economic dynamics into the OCA related assessment of monetary integration of a proposed monetary union. If there are structural differences in growth,

these potentially point to stabilisation costs of monetary integration. When a group of countries adopt a single currency and/or a common monetary policy, these countries relinquish the opportunity to adjust their monetary conditions according to the desires of economic monetary policy. In a monetary union, this 'lost opportunities' are of greater value, the higher the degree of difference in output. For instance, the more economic growth and marginal return on capital are heterogeneous across a monetary union, the more a common central bank would have problems in setting the real interest rate in order to deal with various degrees of growth in money and credit. In many respects, it is usual that there will always be differences in economic dynamics of prospective members of a (proposed) monetary union. Such differences may be in average growth rate, amplitudes and timing of fluctuations.

The history of the theory of optimum currency area (OCA) dates back to early 1960s when the criteria that should gauge the optimality of a region to have a single currency, thus forming a common currency area (OCA) was first formulated by Robert Mundell in 1961 and further developed significantly by Ronald McKinnon in 1963 and Peter Kenen in 1969.

Right from the early 1960s when the theory of optimum currency area came to limelight, several authors, through their various seminal contributions have been able to come up with various properties of an optimum currency area. Most of these properties, which many regarded as prerequisites, features attributes or criteria of an optimum currency area are summarised in the Box 1 below:

Box 1: Properties/Criteria of an Optimum Currency Area and Implications	
Properties/Criteria	Implications
Flexibility of Nominal Wages and Price (<i>Friedman, 1963</i>)	Flexibility of wages and prices within/between members of a common currency area will make asymmetric shocks to be overcome easily because the movement adjusting for the shocks will not be linked with inflation in one country and/or sustained unemployment in another and thus bringing in higher degree of stability in the common currency area
Mobility of Factors of Production - Including labour (<i>Mundell, 1961</i>)	There will be reduction in the need to alter real factor prices and nominal exchange rate between member countries when responding to disturbances, if factors of production are mobile within the common currency area, even if factor costs are rigid. It will be more difficult to maintain a fixed exchange rate regime when the capital mobility is higher. Simply put, adjustments to asymmetric shock are facilitated and the pressures for adjustments in exchange rates are reduced when the degree of labour mobility is high.
Degree Openness of the Economy (<i>McKinnon, 1963</i>)	The higher the degree of economic openness of a member country of a common currency area, the more the likelihood of the transmission of the changes in international prices of tradables to domestic prices. If the higher share of domestic outputs of a country are generated from trades within the common currency area, such country will benefit from membership of the currency union.
Size of the Economy (<i>McKinnon, 1963</i>)	Large economies have the tendencies to be attracted by the flexible exchange rate regime implying that medium or small-sized countries find fixed exchange rate regime (as desired by monetary union) attractive.
Diversification of Production, Exports and Consumption (<i>Kenen, 1969</i>)	The higher the diversification of production and consumption by member countries of a currency union, the more likely the reduction in costs due from discarding nominal exchange rate changes between these countries, thus finding a common currency as valuable. The impact of shocks that are specific to a particular sector of the economy would be diluted by high level of diversification in production and consumption. Consequently, diversification shields economy against series of disturbances and causes reduction in the needs for changes in terms of trade through nominal exchange rate.
Similarities in Inflation or Differences in Inflation (<i>Fleming, 1971</i>)	It is more difficult to maintain a fixed exchange rate regime in situations of inflation rate differentials between member countries of a common currency area. External imbalances can crop up due to continuous differences in inflation rates of nations within the common currency area. Terms of trade will remain fairly stable when Inflation rates between countries are similar over time and at the same time low.
Fiscal Integration (<i>Kenen, 1969, De Bandt & Mongelli, 2000</i>)	When countries share supranational fiscal transfer system in redistributing funds to those member countries that are affected by adverse asymmetric shocks, such countries would also have smooth adjustments to such negative shocks and would require reduced adjustments in nominal exchange rate. This fiscal integration requires the needs to share the risks involved and necessitates a high level of political integration. Asymmetric shocks are counteracted through fiscal transfers - (When there are shocks, affecting particular member countries within a common currency area in different ways, fiscal transfers from prosperous member countries to non-prosperous member countries would counteract the effects of the shocks). High degree of policy integration leads to low inflation.
Political Integration (<i>Mintz 1970; Harberler, 1970; and Cohen, 1993</i>)	Several authors see economic integration to be so far in front of political integration. The political determination of countries to integrate is a significant condition for sharing a common currency. Cooperation on common economic matters, adherence to joint commitments, and more international linkage will all be strengthened and enhanced by political will of member nations within the common currency area. In transforming a group of nations to a successful common currency area, it essential that there is similarity of attitudes to politics and policies among member countries of the common currency area.
Financial Market Integration (<i>Ingram, 1962</i>)	The higher the level of financial integration, the greater the extent of the need to establish an optimum currency area across geographical blocs.

	<p>The need for exchange rate adjustments can be reduced by financial market integration.</p> <p>Through capital market inflows, temporary adverse disturbances can be cushioned.</p> <p>With financial market integration, there will be reduction in the need to change inter-regional or intra currency area terms of trade through fluctuations in exchange rate.</p> <p>For the sustainability of a successful common currency area, tight financial market integration is essential.</p>
<p>Similarities of Shocks and Similarities in Policy Responses to the Shocks (<i>Bayoumi & Eichengreen, 1997; Masson & Taylor, 1993; Demertizis, Hughes & Rummel, 2000; Alesina, Barro & Tenreyro, 2002.</i>)</p>	<p>If member countries of an optimum currency area record similarities in demand and supply shocks and the speed of at which their respective economy adjust as well as the speed of policy responses, there will be loss of monetary policy autonomy and fall in the cost of loss of direct control over the nominal exchange rate.</p> <p>Member countries of an optimum currency area showing large co-movements of output and prices would incur the lowest cost of dumping monetary independence vis-a-vis other member countries.</p> <p>This implying that the higher the similarities in shocks between members of a common currency area, the lower the costs of losing independence monetary policy.</p>
<p>Similarities in Monetary Policy Transmission (<i>Angeloni, Kashyap, Mojon and Terlizzese, 2001</i>)</p>	<p>Similarities in monetary transmission mechanism among member countries of an optimum currency area speak volume about the similarities in financial structures of these countries.</p>
<p>External Nominal Shocks</p>	<p>Fixed exchange rate regime will not be attractive to a potential member of an optimum currency area, if such country faces external nominal shocks. A flexible exchange rate system would be more appropriate.</p>
<p>Monetary Shocks</p>	<p>Fixed exchange rate regime will be more attractive to a potential member of an optimum currency area, if such country faces monetary shocks. A flexible exchange rate system would not be attractive.</p>
<p>Real Shocks</p>	<p>Fixed exchange rate regime will not be attractive to a potential member of an optimum currency area if such country faces real shocks. A flexible exchange rate system would be more appropriate.</p>
<p>Business Cycle Synchronisation</p>	<p>Flexible exchange rate regime will not be appropriate if the group of countries forming an optimum currency area has synchronised business cycle.</p>
<p>Central Bank's Credibility</p>	<p>If the central banks of the prospective member of a common currency area lack the credibility to moderate inflation, fixed exchange rate regime would be more advantageous, rather than flexible exchange rate.</p>
<p>Monetary Policy Effectiveness</p>	<p>For a prospective member of a common currency area, the cost of monetary independence is low (and not a high cost) such country's monetary policy is ineffective.</p>

Sources: Author's compilations

Box 1 above reveals that there are many criteria for deciding how suitable countries are for an optimum currency area. However, the general agreement among the proponents⁷ of 'optimum currency area' is that in such region, labour is very mobile while economies are faced with same forms of economic shocks. The assertion of the OCA literature is that if two or more countries are to share the same currency without experiencing negative effects, it is necessary and sufficient to meet the OCA criteria.

Whenever there are strong signals of wide and persistence differences in economic structures and in the conducts of individual country's economy, this has an implication of 'one size does not fit all'. Additional point in favour of the essence of similarities in macroeconomic indicators and dynamics for a currency union is the presumable low cost

⁷ Mundell (1961), McKinnon (1963), Kenen (1969), Gosh and Wolf (1994), Frankel and Rose (1998) and Alesina, Barro and Tenreyro (2002)

of being a member of the union because fiscal and monetary stance similarities are the root causes of similarities in macroeconomic indicators and dynamics. For instance, macroeconomic divergences will make currency union members to face 'real interest rate differentials'. The high inflation member countries with sound economic growth may take advantage of the implied 'low interest rate' which further stimulates those economies concerned, but to the disadvantage of the low inflation-low growth member countries.

Members of the WAMZ that decided to participate in the monetary zone will eventually abandon their national currencies; lose the control of their respective national monetary policies and fix their nominal exchange rates in relation to each other. From that date, the WAMZ member countries will neither be able to change short term interest rates nor change exchange rates (price of their currencies). They will no more be able to determine the quantity of money within their respective economies.

As alternative to exchange rate, for countries in this category, only factor mobility (capital mobility and labour mobility) and wage flexibility will remain the main adjustment mechanisms.

The loss of the ability of a member of a monetary union (like WAMZ countries) to operate national monetary and exchange rate policies independently in the presence of asymmetric shocks will be a cost of monetary union to these countries. However, the WAMZ will be an optimum currency area if the benefits that the member countries will receive for joining the monetary union will outstrip or outweigh the costs of being in the union. The key concern for the proposed monetary cooperation within the West Africa is the uniformity in macroeconomic dynamics and the responses of these macroeconomic indicators to shocks and whether this will affect member countries in the same manner. Therefore if a WAMZ member country has large asymmetric (country-specific) shock and there is no appropriate adjustment mechanism, such country should not join the common currency area; and if this apply to a group of countries planning to go onto monetary union, it is not advisable for such group of countries to create a common currency union. This is because of the cost of maintaining a fixed exchange rate which would outweigh the benefits of such fixed exchange regime.

4. Data and Methods

In the first aspect, the assessment of the degree of similarities in the behaviours of macroeconomic indicators of the WAMZ countries was carried out through the analysis of variance (ANOVA) tests. The result of this test was employed to determine if the economic variables being assessed are similar among the monetary union members. Macroeconomic variables of output growth, output gaps, inflation (GDP deflator and consumer price index), nominal exchange rate and fiscal policy ratios of budget balance/GDP, government expenditure/GDP and government revenue/GDP) were analysed. Relevant data employed here span between 1980 and 2014.

Tests of output growth and output gaps were performed to determine if there is a wide growth rate variation or similarities in the deviation of real output from its potential levels within the WAMZ, given the theoretical short run difficulty in stabilising economic growth. Regarding inflation, if there is any significance difference within the WAMZ countries, it would be difficult for the single currency to function effectively due to the contradictory effect of applying the necessary macroeconomic policies across the six economies by the single monetary authority. On the various exchange rate ANOVA tests, it is the wish of the WAMZ to have a single currency that would be able to trade at par with other world's strong convertible currencies, particularly, the US dollar. This may be difficult to achieve if there is a wide variance in the WAMZ's member s' US dollar exchange rate as this may portend high possibility of significant future fluctuation between the proposed single currency and the US dollar taking cognisance of inflation trends. Further to the consideration of the monetary elements, the synchronisation of money supply/GDP ratios, money supply growth rates, real interest rates and real effective exchange rates were also evaluated. Fiscal harmony is indispensable towards establishing a fiscal union which is very crucial for a successful monetary union. Therefore, to test for the presence of fiscal harmony within the WAMZ, the variability in the six fiscal ratios were investigated. In addition to these, homogeneities in balance of payment accounts and external trade ratios were assessed by applying current account/GDP, total balance/GDP, income balance/GDP, imports-exports/GDP, inflow of foreign direct investment/GDP and international reserves/GDP ratios.

The ANOVA tests carried out here show the statistical significance of the differences (or otherwise) in a variable of member countries being analysed. The statistical assumptions in an ANOVA test are independence of errors, normality and equality of variance. The

one-way ANOVA is appropriate in a statistical model in which no restriction are imposed on means of the population group and the outcomes for each group in the analysis are normally distributed displaying common variances while it is assumed that the deviations of these individual outcomes from the means of the population group are independent. Generally, the null hypothesis for an ANOVA test is a 'point hypothesis' which states that 'there is nothing interesting happening'. In a one-way ANOVA test, the null hypothesis with j group is:

$$H_0 = \mu_1 = \mu_2 = \dots \mu_j$$

The alternative hypothesis is:

$$H_A = \mu_1 \neq \mu_2 \neq \dots \mu_j$$

Where: μ = the population mean.

Specifically for this analysis, the null hypothesis is:

$$H_0 = \text{Gambia} = \text{Ghana} = \text{Guinea} = \text{Liberia} = \text{Nigeria} = \text{Sierra Leone}$$

and the alternative hypothesis is:

$$H_A = \text{Gambia} \neq \text{Ghana} \neq \text{Guinea} \neq \text{Liberia} \neq \text{Nigeria} \neq \text{Sierra Leone}$$

The null hypothesis was that the mean of the macroeconomic variables and fiscal ratios in the six WAMZ countries are equal. For the analysed variables/ratios, at 95% level of confidence, the rule here is that if the p-value obtained from the test should be less than the 5% level of significance, the difference in the variable/ratio among the WAMZ countries is statistically significance and so, we reject the null hypothesis.

Further attempt made here is the estimation of economic dynamics across the WAMZ by shrinking these dynamics into a single indicator of Theil Coefficient of Inequality which compares the differences in growth in each member country as well as growth in: (a) the entire WAMZ economies; (ii) the WAMZ economies (without the lead economy, Nigeria); and (iii) the lead economy of Nigeria. Generally, Theil coefficient of inequality relates to economic growth convergence and it measures inequality within regions rather than equality among individuals within a region. Specifically, the application of Theil coefficient allowed for the comparison of the WAMZ economic dynamics. Data on economic growth of the six WAMZ countries, spanning between 1987 and 2015 were applied in these estimates.

Theil (1967) developed two popularly employed measures of inequality which satisfy all the ideal and standard properties of an inequality measure. Theil 1 statistics ($U1$) adapted from Theil (1958) is expressed as:

$$U1 = \left(\frac{\sqrt{\frac{1}{N} \sum_{t=1}^N (y_{it} - x_t)^2}}{\sqrt{\frac{1}{N} \sum_{t=1}^N y_{it}^2} + \sqrt{\frac{1}{N} \sum_{t=1}^N x_t^2}} \right) \quad 1$$

Theil 2 statistics ($U2$) adapted from Theil (1966) is given as:

$$U2 = \left(\frac{[\sum_{t=1}^N (x_t - y_{it})^2]^{\frac{1}{2}}}{\sum_{t=1}^N (y_{it}^2)} \right) \quad 2$$

where y_{it} is the economic growth of WAMZ country i and x_t is the economic growth of the WAMZ (as well as economic growth of WAMZ without Nigeria and economic growth of Nigeria). N is the number of observations. The values of Theil 1 ($U1$) of lie between zero (0) and unity (1). It is assumed that at the minimum value of zero, there is perfectly fit complete equality. If at the extreme of the value of 1, there is no fit, thus depicting complete inequality. For Theil 2 ($U2$), though there is also lower boundary of zero as in Theil 1 ($U1$), but there is no definite upper boundary. The minimum value of zero is also a perfect fit. Values yielded by $U1$ and $U2$ are not expected to be same. By implications, maxima inequality is achieved at the upper boundaries.

Theil measures have several properties that make them to be superior measures of inequality.⁸ Two conveniences derivable from Theil coefficient of inequality are that: (a) within the broad inequality concept, they give rooms for the comparison of pairs of economic variables at different scales. Particularly in this study, this enables the measurement of how individual WAMZ countries glaringly behaved differently from the monetary zone's average; (b) it allow time series inequality to be decomposed into main statistical factors (mean difference, variation differences and covariance (correlation) differences). Consequently, in describing the difference between two variables by statistical properties, inequality can be decomposed into three factors: (i) mean proportion (MP); (ii) variance proportion (VP); and (iii) covariance proportion (CP). These three properties must add up to be unity (1). MP shows the sample mean difference

⁸ Theil statistics are symmetric, replication invariant, mean independent and satisfies the Pigou-Dalton property and they are Lorenz-consistent.

between the two variables involved. A large element is an evidence to suggest that the inequality stems from different scales of the two series. VP reveals the sample deviation from actual and forecast. A large VP implies that higher variability of one variable (than the other) explains much proportion of the inequality. When the CP is large, it indicates that the correlation coefficient between the two variables is small; and this measures trend differences and the degree of absence of fluctuation synchrony around trend because it reveals the effect biases in mean biases and variance biases. These three components of inequality can be derived mathematically as:

$$MP = \left(\frac{(\bar{y} - \bar{x})^2}{\frac{1}{N} \cdot \sum_{t=1}^N (y_{it} - x_t)^2} \right) \quad 3$$

where \bar{y} is $\frac{1}{N} \cdot \sum_{t=1}^N y_{it}$ and \bar{x} is $\frac{1}{N} \cdot \sum_{t=1}^N x_t$

$$VP = \left(\frac{(\sigma_{y,N} - \sigma_{x,N})^2}{\frac{1}{N} \cdot \sum_{t=1}^N (y_{it} - x_t)^2} \right) \quad 4$$

where $\sigma_{y,N}$ is $\sqrt{\frac{1}{N} \cdot \sum_{t=1}^N (y - \bar{y})^2}$

and $\sigma_{x,N}$ is $\sqrt{\frac{1}{N} \cdot \sum_{t=1}^N (x - \bar{x})^2}$

$$CP = \left(\frac{2 \cdot (1 - \rho_N) \cdot \sigma_{y,N} \cdot \sigma_{x,N}}{\frac{1}{N} \cdot \sum_{t=1}^N (y_{it} - x_t)^2} \right) \quad 5$$

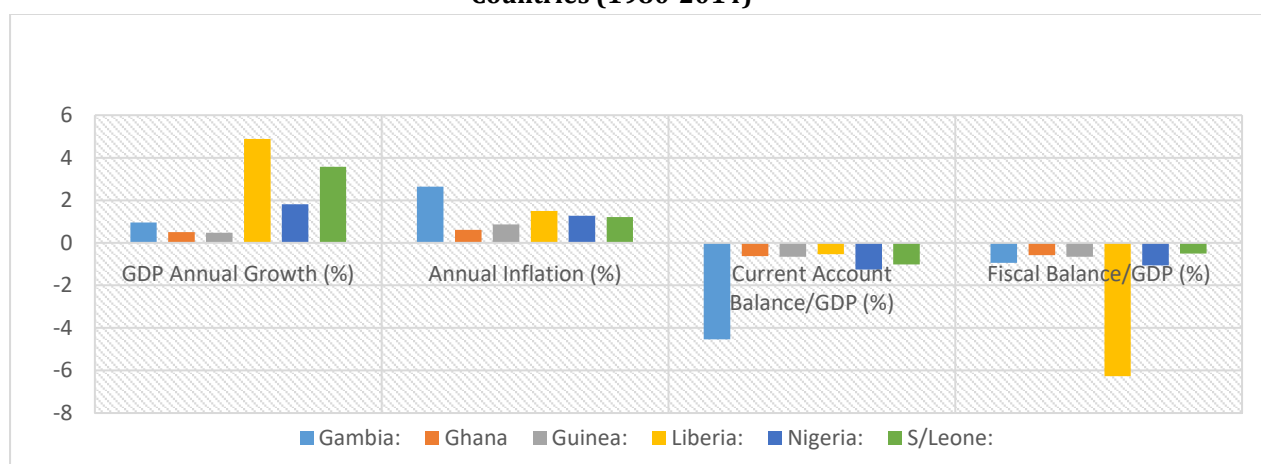
where ρ_N is $\left[\left(\frac{1}{(\sigma_{y,N}) \cdot (\sigma_{x,N})} \right) \cdot \sum_{t=1}^N (y_t - \bar{y}) \cdot (x_t - \bar{x}) \right]$

and $MP + VP + CP = 1$.

5. Results and Findings

Information on the dispersion of four macroeconomic indicators of the WAMZ countries are exhibited in Figure 1 below. This reveals the pattern of coefficients of variation of output growth, inflation, current account balance/GDP and fiscal balance/GDP ratios over a 35-year period between 1980 and 2014.

Figure 1: Plot of Coefficients of Variation of Historical Macroeconomic Performances of WAMZ Countries (1980-2014)



Source: EIU Database and Author's Estimations

Note: Liberia's estimations for GDP annual growth and fiscal balance start from 1994 and 2007 respectively.

Generally, GDP growth and inflation revealed dissimilar patterns as Liberia, Sierra Leone and Ghana standing out clearly. Current account and fiscal balance (both as ratios of GDP) show some close similarities across the WAMZ apart from the case of The Gambia (in current account ratio) and Liberia in fiscal balance ratio. The results of the one-way ANOVA test are presented in the Table 5 below which shows clearly that output gaps and growth rates of real GDP and money supply (M1 and M2) displayed uniformity among the WAMZ countries implying that it may not be difficult for the zone's money supply growth and economic growth to be stabilised the short run. The uniformity in money supply (M1) growth rate is an indication that common monetary policy with money supply as instrument will not be inappropriate for the WAMZ. The results for inflation rates indicated that if the single monetary authority would want to moderate inflation within the single currency area, the policy objective may not be achieved due to the contradictory effects that may result. The suggestion from the analysis of the nominal dollar exchange rates was that it would be difficult to avoid the possibility of future fluctuations between the US dollar and the WAMZ's proposed single currency which may be unable to compete at par with the US dollar.

Table 5: Results of ANOVA Tests of Uniformity of Economic Variables/Ratios of WAMZ Countries

<i>Variables/Ratios</i>	<i>p-value</i>	<i>F-ratio</i>	<i>Critical value</i>	<i>Decision</i>	<i>Uniformity of Variable/Ratio</i>
<i>Real GDP Growth Rate</i>	0.12	1.82	2.34	H ₀ accepted	<i>YES</i>
<i>Output gap</i>	0.99	0.002	2.32	H ₀ accepted	<i>YES</i>
<i>Inflation (GDP Deflator)</i>	0.00	3.64	2.34	H ₀ rejected	<i>NO</i>
<i>Inflation (CPI)</i>	0.00	5.63	2.34	H ₀ rejected	<i>NO</i>
<i>Nominal Dollar Exchange Rate</i>	1.74E-24	60.87	2.34	H ₀ rejected	<i>NO</i>
<i>Real Effective Exchange Rates*</i>	5.37E-16	38.73	2.52	H ₀ rejected	<i>NO</i>
<i>Real Interest Rates</i>	0.003	3.97	2.34	H ₀ rejected	<i>NO</i>
<i>Money Supply (M2)/GDP Ratio</i>	2.48E-08	11.82	2.34	H ₀ accepted	<i>YES</i>
<i>Money Supply (M1) Growth</i>	0.39	1.05	2.34	H ₀ accepted	<i>YES</i>
<i>Money Supply (M2) Growth</i>	0.39	1.05	2.34	H ₀ rejected	<i>NO</i>
<i>Budget Balance/GDP</i>	2.68E-06	8.40	2.34	H ₀ rejected	<i>NO</i>
<i>Primary Balance/GDP</i>	1.46E-06	8.81	2.34	H ₀ rejected	<i>NO</i>
<i>Public Debt/GDP</i>	6.63E-13	21.04	2.34	H ₀ rejected	<i>NO</i>
<i>Debt/Export Ratio</i>	2.37E-05	7.12	2.35	H ₀ rejected	<i>NO</i>
<i>International Reserves/Debt</i>	1.62E-09	13.93	2.34	H ₀ rejected	<i>NO</i>
<i>Govt. Expenditure/GDP</i>	6.88E-07	9.34	2.34	H ₀ rejected	<i>NO</i>
<i>Government Revenue/GDP</i>	0.00	4.12	2.34	H ₀ rejected	<i>NO</i>
<i>Current Account Balance/GDP</i>	4.56E-16	29.2	2.34	H ₀ rejected	<i>NO</i>
<i>Income Balance/GDP</i>	0.00	5.11	2.34	H ₀ rejected	<i>NO</i>
<i>Total Balance/GDP</i>	7.27E-15	25.91	2.34	H ₀ rejected	<i>NO</i>
<i>Imports/Exports</i>	3.71E-25	69.46	2.35	H ₀ rejected	<i>NO</i>
<i>Inflow FDI/GDP *</i>	0.14	1.82	2.52	H ₀ rejected	<i>NO</i>

Source: Author's calculation and the EIU database

* Due to lack of data, estimations were made leaving out Liberia.

The fiscal ratios undoubtedly exhibited lack of fiscal harmony within the WAMZ and this is a cause for concerns so as to avoid possible sovereign debt problems just as none of the external trade/balance of payments ratios show uniformity.

Out of the twenty two variable/ratios assessed in the ANOVA tests, only four exhibited homogeneous characteristics. There were significant differences in the other eighteen variables/ratios examined. This indicates that WAMZ countries have individual economic characteristics that are different from each other. These heterogeneities signify that a policy meant to solve the problem of WAMZ country many have a transmittal effect that may cause other member countries within the zone to experience a consequential secondary effect that may be hugely negative. On the overall, although, variables relating to money supply and output are positive, other indicators have negative implications for the monetary integration of the WAMZ.

The results of economic dynamics estimations of Theil 1 and Theil 2 coefficients of inequality as well as the variance and covariance proportions for the three benchmarks

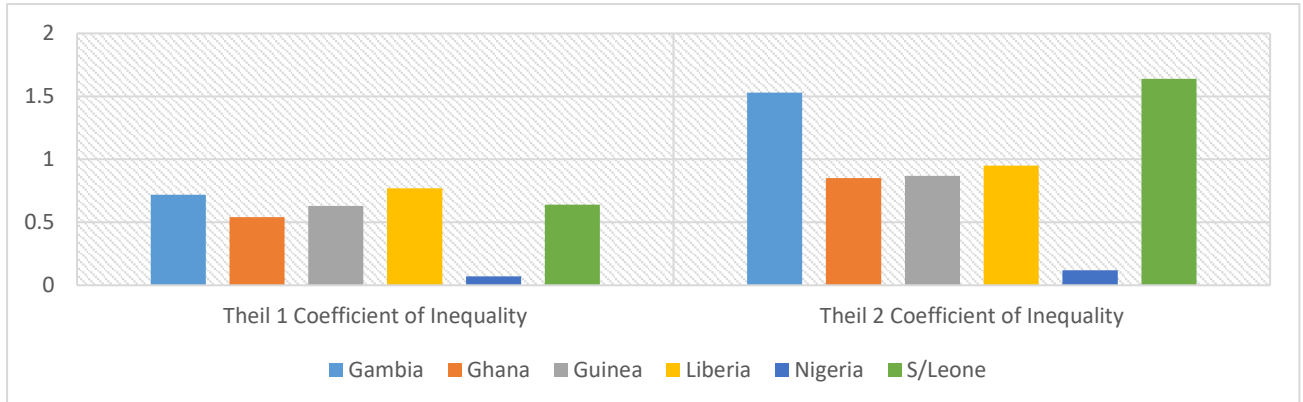
indicated in this study are displayed in Table 6 while the related plots are in Figures 2 to 7 below. The comparison of economic growth in the six WAMZ countries with the aggregate WAMZ's economic growth over the 28-year period covered by the estimations are highlighted in Table 6. Nigeria, the lead economy shows the lowest coefficients of inequality in both Theil 1 and estimations. Sierra Leone and The Gambia displayed the highest inequality with the WAMZ's aggregate in Theil 2 results as revealed in pictorial representation in Figure 2 below. The rates of inequality of the other five WAMZ countries in Theil 1 estimation results reveal close similarities with Ghana yielding the lowest of all.

Table 6: Theil Coefficient of Inequality on Nominal GDP Growth for WAMZ Countries (1987-2015)

<i>Nominal GDP Growth Relative to WAMZ Average</i>				
	<i>Theil 1 Coefficient</i>	<i>Variance Proportion</i>	<i>Covariance Proportion</i>	<i>Theil 2 Coefficient</i>
<i>Gambia</i>	0.72	0.85	0.15	1.53
<i>Ghana</i>	0.54	0.39	0.61	0.85
<i>Guinea</i>	0.63	0.92	0.08	0.87
<i>Liberia</i>	0.77	0.86	0.14	0.95
<i>Nigeria</i>	0.07	0.01	0.99	0.12
<i>S/Leone</i>	0.64	0.93	0.07	1.64
<i>Nominal GDP Growth Relative to WAMZ Average (Excluding Nigeria)</i>				
	<i>Theil 1 Coefficient</i>	<i>Variance Proportion</i>	<i>Covariance Proportion</i>	<i>Theil 2 Coefficient</i>
<i>Gambia</i>	0.69	0.70	0.30	1.33
<i>Ghana</i>	0.11	0.02	0.98	0.63
<i>Guinea</i>	0.57	0.52	0.48	0.79
<i>Liberia</i>	0.78	0.93	0.07	0.96
<i>S/Leone</i>	0.60	0.61	0.39	1.03
<i>Nominal GDP Growth Relative to Nigerian Average</i>				
	<i>Theil 1 Coefficient</i>	<i>Variance Proportion</i>	<i>Covariance Proportion</i>	<i>Theil 2 Coefficient</i>
<i>Gambia</i>	0.71	0.78	0.22	1.54
<i>Ghana</i>	0.59	0.51	0.49	0.82
<i>Guinea</i>	0.64	1.00	0.00	0.87
<i>Liberia</i>	0.77	0.89	0.13	0.95
<i>S/Leone</i>	0.63	0.84	0.16	1.58

Source: Author's calculation and the EIU database

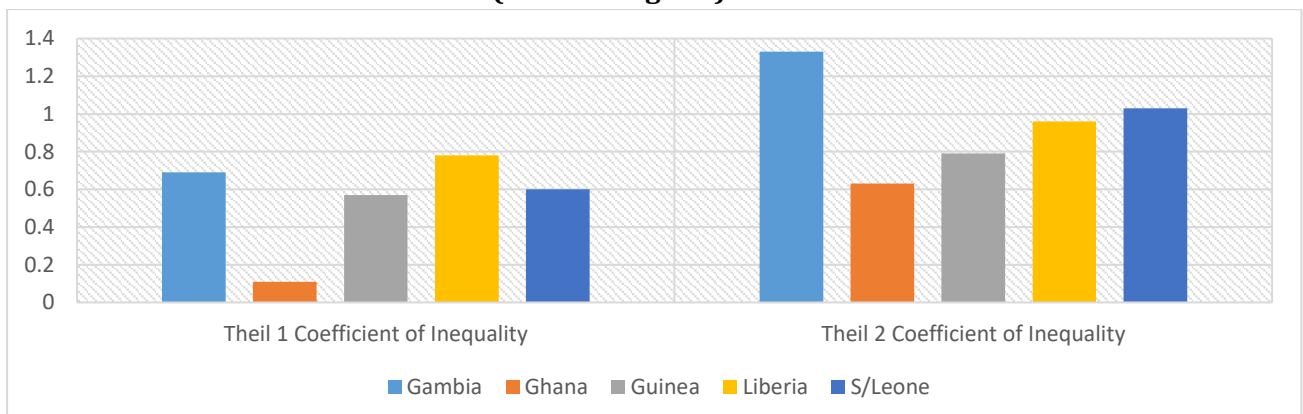
Figure 2: Theil 1 Coefficients of Inequality for Output Growth Relative to WAMZ Average



Source: Author's calculation and the EIU database

When the equality of economic dynamics in the WAMZ without Nigeria was estimated, Ghana returned the lowest degree of inequality in both Theil coefficient estimations as highlighted in Figure 3 below. However, these degrees of inequality were more pronounced in Theil 2 coefficient results. When the WAMZ's lead economy, Nigeria was served as the benchmark for the other five countries within the zone, the levels of inequality were high as reflected in the output of both Theil measures of inequality, but more similar in Theil 1 estimation results where Ghana recorded the lowest of the degrees of inequality as Figure 4 below shows. These denote that patterns of economic dynamics in the five other WAMZ countries are not same as in the case of the lead economy, Nigeria, thus justifying the results generated in the estimations in which the aggregate WAMZ economy was the reference.

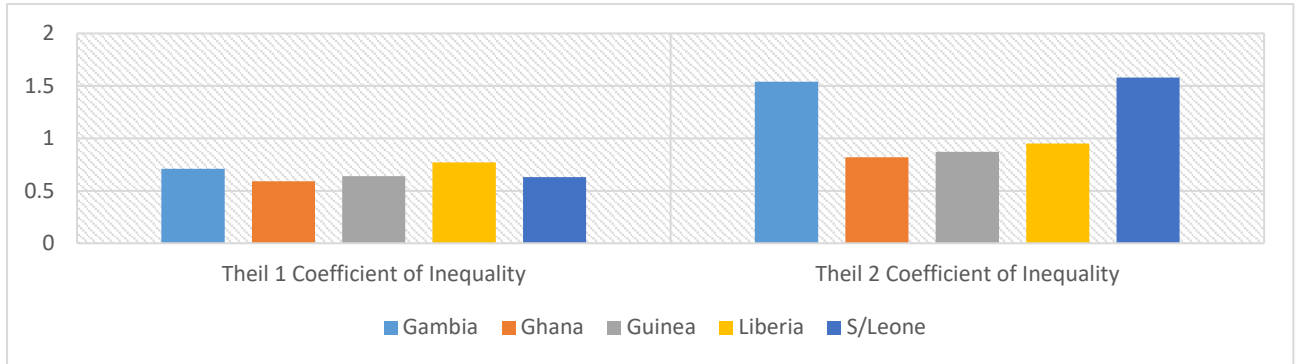
Figure 3: Theil Coefficients of Inequality for Output Growth Relative to WAMZ Average (without Nigeria)



Source: Author's calculation and the EIU database

The overall implication of these results is that the economy of WAMZ revolves around a single country, Nigeria.

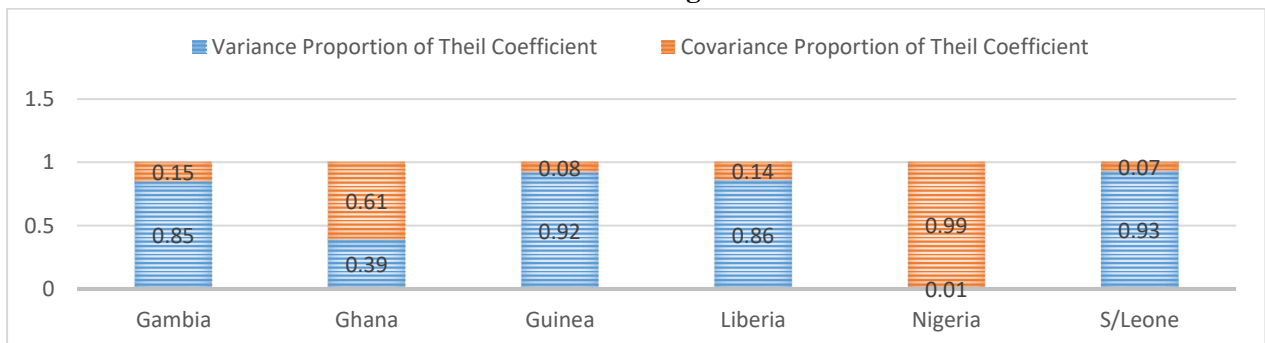
Figure 4: Theil Coefficients of Inequality for Output Growth Relative to the Lead Economy - Nigeria



Source: Author's calculation and the EIU database

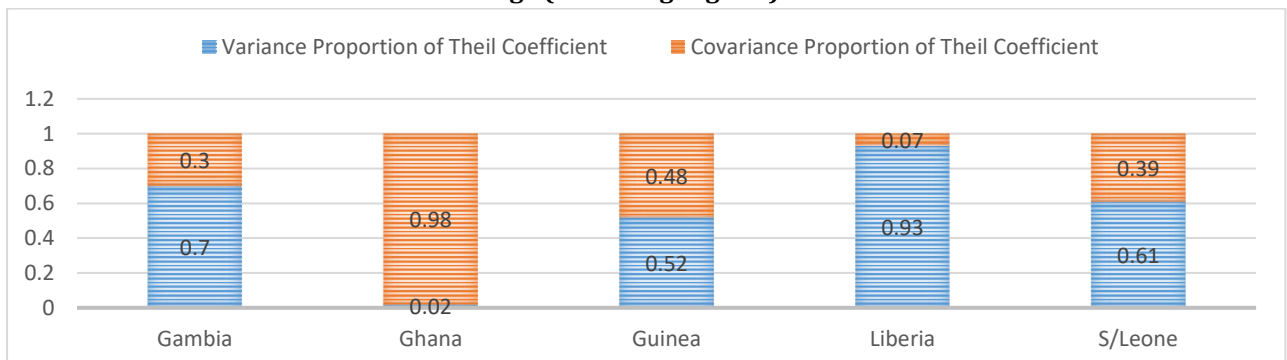
The statistical components of the dynamics of economic growth estimated under the three benchmarks are exhibited in Figures 5, 6 and 7 below. Because the WAMZ countries were fully evaluated against these over the estimation period, the mean proportion (MP) in all estimation is zero, while the variance proportion (VP) and the covariance proportion (VP) yielded values that added up to unity. These results reflect the relationship of the inequality to different variance and lack of covariance.

Figure 5: Components of Theil 1 Coefficients of Inequality for Output Growth Relative to WAMZ Average



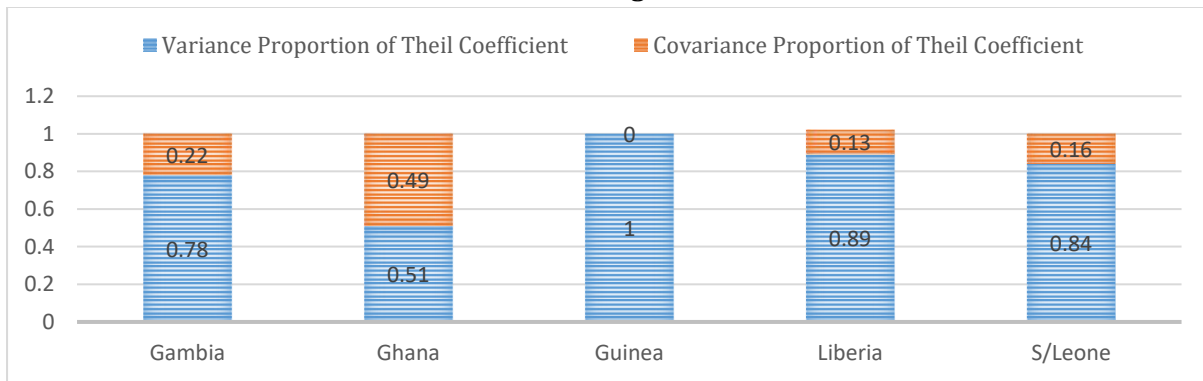
Source: Author's calculation and the EIU database

Figure 6: Components of Theil 1 Coefficients of Inequality for Output Growth Relative to WAMZ Average (excluding Nigeria)



Source: Author's calculation and the EIU database

Figure 7: Components of Theil 1 Coefficients of Inequality for Output Growth Relative to Nigerian Average



Source: Author's calculation and the EIU database

Figure 5 above reveals that Nigeria has a very high variability of economic growth at 0.99 with the WAMZ aggregate economy. Apart from Ghana, other WAMZ countries reported low variability. Nigeria has the lowest level of lack of synchrony (0.01) of fluctuations around trend when the WAMZ was the benchmark; and this implies strong correlation between Nigeria and the WAMZ aggregate economy. The analysis of the WAMZ economy without Nigeria revealed Ghana as having the highest level of variability at 0.98 if Nigeria would not be part of the WAMZ economy as well as having the highest degree of correlation with such economy as shown in Figure 6 above. The results of the inequality of growth estimations in relation to the Nigeria's economy are displayed in Figure 7. This reveals that Guinea has the lowest variability of economic growth with Nigeria (the lead economy) and the highest lack of synchrony around trend with the Nigeria's economy. Ghana recorded the highest variability of economic growth with Nigeria at 0.49. The patterns of the dynamics of these five WAMZ economies are not close to that of the lead economy, Nigeria. This has serious implications for a future common monetary policy formulation and implementation in the WAMZ. However, despite the fact that the ANOVA test of GDP growth in the WAMZ yielded an encouraging result in the evaluation carried out in this paper.

6. Conclusions

The evaluation of the feasibility of the monetary integration of the WAMZ was performed in this paper from a properties of the OCA theory. Estimation methods applied in these assessments were ANOVA, Theil coefficient of inequality and Euclidean distance. Evidence gathered in this paper suggested that: (i) that virtually all these macroeconomic and financial indicators do not have similar features across the WAMZ; (ii) in terms of economic dynamics of the whole WAMZ, Nigeria stands the only country that enormously

share similarities with the WAMZ aggregate economy, while Ghana has same feature in a WAMZ aggregate economy without Nigeria.

References

Alesina A, Barro, R and Tenreyro, S (2002) "Optimum Currency Areas" *NBER Working Paper* No 9072, June.

Angeloni, I. A, Kashyap, A., Mojon, B and Terlizzesse, D. (2011) Monetary Transmission in the Euro Area: Where Do We Stand?" *ECB Working Paper* No114.

Bakoup, F. and Ndoye, D. (2016). 'Why and When to Introduce a Single Currency in ECOWAS' *Africa Economic Brief*, Vol. 7 (1).

Bayoumi, T. and Eichengreen, B. (1997), "Ever Close to Heaven? An Optimum Currency Area Index for European Countries", *European Economic Review* 41, 761-770.

Brooks, C. (2014). *Introductory Econometrics for Finance*. Cambridge: Cambridge University Press.

Cohen, B. J. (1993). "Beyond Emu: The Problem of Sustainability," *Economics and Politics*, Wiley Blackwell, vol. 5(2), pages 187-203, July.

De Bandt, O., Mongelli, F.P., 2000. "Convergence of Fiscal Policies in the Euro Area", *Working Paper 20*, European Central Bank.

Demertizis, M., Hughes A, and Rummel, O. (2000) "Is European Union a Natural Currency Area or is it Held Together by Policy Maker?" *Weltwirtschaftliches Archive* Vol 136 (4) PP 657 -79.

ECOWAS Commission (2011) Presentation retrieved downloaded on 12 December 2011 at ECOWAS Online: www.ecowas.int.

Fleming, J. M. (1971). 'On Exchange Rate Unification.' *Economic Journal*, Vol. 81 (323):467-88.

Frankel, J. and Rose, A. (1998), "The Endogeneity of the Optimum Area Criteria", *The Economic Journal*, 108 (499) 1009-1025.

Friedman, M. (1963). *Inflation Causes and Consequences* Bombay: Asian Publishing House.

Ghosh, A. and Wolf, H. (1994), 'How Many Monies? A Generic Approach to Finding Optimum Currency Area' *NBER Working Paper* 4805.

Habeler, G. (1970), 'The International Monetary System: Some Recent Development and Discussions' in *Approaches to Greater Flexibility in Exchange Rates*, edited by George Halm, Princeton University Press PP 115-23.

Ingram, J.C (1969), 'Comment: The Currency Area Problem' in *Monetary Problems of the International Economy*, Robert A. Mundell and Alexander R. Swoboda (eds), The University of Chicago press, Chicago and London.

Kenen, P (1969) The Theory of Optimum Currency Areas An Ectetic View in R.A Mundell and A.K Soboda (eds), *Monetary Problems of the International Economy* Chicago, Ill: University of Chicago Press

Masson, P.R. and Taylor M.P. (1993) *'Policy Issues in the Operations of Currency Unions'* Cambridge University Press.

McKinnon, R. (1963), 'Optimum Currency Areas', *American Economic Review* Vol: 53 pp 717-24

Mintz, N.N. (1970), 'Monetary Union and Economic Integration' *The Bulletin*, New York University Graduate School of Business Administration, Institute of Finance.

Mundell, R.A. (1961), 'A Theory of Optimum Currency Areas', *American Economic Review* Vol 53, pp. 657-64

Stock, J. H. and M.W Watson (2012). *'Introduction to Econometrics'*. Harlow: Pearson Education Limited.

Theil, H. (1958). *'Economic Forecasts and Policy'*. Amsterdam: North Holland.

Theil, H. (1966). *'Applied Economic Forecasting'*. Chicago: Rand McNally.

Theil, H. (1967). *'Economics and Information Theory'*, Amsterdam: North Holland.