University of Sunderland

Mogaji, Peter Kehinde (2017) Monetary Integration Tests for the OCA's Business Cycles Synchronicity Criteria in the WAMZ. Working Paper. UNSPECIFIED. (Unpublished)

Monetary Integration Tests for the OCA's Business Cycles Synchronicity Criteria in the WAMZ

by

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

Abstracts

A theoretical underpinning of the Optimum Currency Area (OCA) is that countries are better suited to form a currency union the more their business (output) cycles are synchronised or symmetric. If countries within a monetary union have similar business cycles or rather experience identical shocks, separate economic policies are therefore not necessary, this implying that asymmetries in output fluctuations and shocks would appropriately necessitate individual policy responses. Negative correlation of business cycles and shocks would therefore weaken the case for a common currency. This paper consequently tested business cycle synchronicity across the WAMZ by investigating the similarity and the co-movements between the two main components of business cycles: (i) the classical business cycles and (ii) the deviation business cycles, employing simple correlation analyses and the analysis of variance (ANOVA) to establish homogeneities or otherwise. The observation of the closeness of coefficient of variations of classical and deviation business cycles of individual WAMZ country were also examined. The Hodrick-Prescott (HP) filtering method (at *lambda=100*) was employed in filtering and decomposing the real output (GDP) of individual WAMZ countries into transitory and permanent components required for the assessment of classical and deviation business cycles in these countries. Correlation tests as well as tests of homogeneity of variance (Levene Statistics) in business cycles were performed. There were further investigations of the transitory and deviation (output gap) business cycles so as to determine the extent of cyclical convergence of member countries. This is relevant for the conduct of the future common monetary policy. Fifteen bilateral Euclidean distances between output gaps in the WAMZ countries were also measured in order to reveal the extent of business cycle co-movements among member countries. Time span covered by this study were split into two periods: (i) pre-convergence period (1981-2000); (ii) convergence period (2001-2015). This split is significant in bringing about comparative results in these two periods because of the possibility of these WAMZ countries behaving 'artificially' in their business attitudes during the convergence era, when efforts were being made to meet the convergence criteria. This research work yielded various results and findings which on the overall produced evidences to suggest that business cycles across the WAMZ are not synchronised. This thus weakens the case for a common currency with the WAMZ enclave.

1. Background

The West African Monetary Zone (WAMZ) was formed formally, in 2000. The monetary enclave consists of The Gambia, Ghana, Guinea, Liberia, Nigeria and Sierra Leone. The purpose of establishing the WAMZ was towards the formation of a monetary union characterised by a common central bank and a single currency (the eco), which was to replace the existing national currencies of member countries. The proposed monetary union failed to commence after some few attempts, the last of which was in 2015. The initial 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 failed January 2015 take off of the WAMZ caused the Heads of States and Governments of the Economic Community of West African States (ECOWAS) to change 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.

There were four quantitative primary convergence criteria for countries within the WAMZ: (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.

Table 1: WAMZ Members' Primary Convergence Criteria Attainments (2000-2014)

Budget Deficit/GDP (....should be ≤ 4%)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Gambia	3.6	9.8	9.1	5.2	9.9	8.4	2.7	1.1	4.2	8.6	2.7	4.2	4.6	8.8	9.1
Ghana	10.1	13.2	8.3	7.5	8.1	6.9	12.9	1.4	19.5	12.4	5.9	0.9	5.9	8.2	6.4
Guinea	5.2	3.4	6.2	8.8	5.9	1.6	2.0	0.9	1.7	7.5	14.3	2.9	3.7	3.1	3.9
Liberia	0.9	1.9	1.0	3.7	4.4	0.9	-3.0	3.4	2.0	2.0	-4.2	-0.6	-4.2	-1.0	-2.0
Nigeria	2.7	5.8	5.9	2.8	17.0	1.3	0.6	0.6	0.2	3.3	3.8	5.0	2.6	2.7	1.0
S/Leone	17.3	16.7	16.5	19.4	14.3	9.5	8.5	5.0	7.0	11.0	5.2	5.0	5.6	1.5	3.4

Inflation Rates (....should be ≤5% or 0.05)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Gambia	0.2	8.1	13.0	17.6	8.0	1.8	1.4	6.0	6.8	2.7	5.0	4.8	4.3	5.7	5.6
Ghana	40.5	21.3	15.2	23.6	11.8	13.9	10.9	12.8	18.1	16.0	14.7	8.7	9.2	11.6	15.5
Guinea	7.2	5.2	6.1	12.9	27.6	29.7	39.1	12.8	13.5	7.9	15.5	21.4	15.2	11.9	9.7
Liberia	3.2	19.4	11.1	5.0	16.1	7.0	8.9	11.7	9.4	7.8	7.3	8.5	7.7	7.6	9.9
Nigeria	14.5	16.4	12.1	23.8	10.0	11.6	8.5	6.6	15.1	12.0	12.4	10.8	12.2	8.5	8.0
S/Leone	-28.0	3.4	-1.3	11.3	14.4	13.1	7.3	13.8	12.3	12.0	17.1	16.0	12.9	10.4	7.1

Central Bank Financing (....should be ≤10% RF)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Gambia	0.0	80.7	22.0	63.1	0.0	0.0	0.0	0.0	35.9	13.7	14.9	12.6	0.4	na	41.0
Ghana	57.9	0.0	12.1	0.0	1.6	0.0	0.0	0.0	17.3	0.0	0.0	10.5	0.0	9.2	11.0
Guinea	24.0	-0.7	24.5	14.6	26.2	-8.8	54.0	0.0	5.8	38.7	91.0	0.0	0.0	0.0	0.0
Liberia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nigeria	0.0	29.3	0.0	19.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
S/Leone	0.0	8.9	0.0	26.4	0.0	0.0	13.3	0.8	0.3	18.6	37.6	1.1	0.0	0.0	7.6

Gross External Reserves (....should be ≥6 months)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Gambia	7.5	7.2	2.9	3.1	4.7	5.2	4.9	4.4	4.3	6.5	6.8	6.1	4.8	na	3.7
Ghana	0.8	1.2	2.3	4.1	3.7	4.0	3.7	3.9	2.2	4.4	3.7	3.15	0.03	3.5	4.2
Guinea	2.2	2.8	2.3	1.6	1.2	1.1	0.8	0.4	1.1	1.0	4.2	3.7	3.1	3.4	3.1
Liberia	3.6	2.6	0.0	-0.2	0.2	0.1	0.1	0.7	0.7	0.7	4.3	3.3	2.2	2.4	3.0
Nigeria	13.6	11.3	9.9	8.5	16.1	11.8	15.1	17.4	15.3	13.0	7.9	6.3	9.5	8.9	7.4
S/Leone	2.8	2.3	3.1	1.7	3.3	4.8	4.9	5.1	4.2	6.2	1.9	2.56	2.5	2.1	2.8

Source: West African Monetary Agency and Author's Calculations

A mid-term convergence assessment in 2002 revealed that despite some achievements by WAMZ member countries, these were not adequate enough support the take-off of the monetary union in January 2003. A major problem was the inadequate commitment of member countries of WAMZ to support their commitment expressed with actions. This consequently led to the extension of the WAMZ programme to 30 June, 2005 so that the common central bank and the common currency would take off on 1 July 2005. Another deadline of 31 December, 2009 was set so that the single currency and the common central bank would be effective from 1 January 2010. Due to same reasons this could not be met. The official reason for this action was stated as "the global economic and financial crisis which has put constraints on member state's ability to meet the convergence criteria individually and collectively". The last agreed take off date of 1 January 2015

actually became unrealistic thus bringing about heavy cloud over the take-off of the monetary union.[1] It is necessary to state that as at date, the WAMZ has no take-off date. Tables 1 above exhibits the year-by-year attainments of the primary convergence criteria by the six WAMZ countries over the thirteen-year convergence period spanning from 2000 to 2014. The summary of the three-year (2012-2014) averages of the achievements of these primary criteria are presented in the first segment of Table 2. Further in Tables 2, the country-by-country achievements of five secondary convergence criteria by the WAMZ countries over a 13-year period (2010-2013) are displayed. On comparative basis, Tables 3 below shows the rankings of the WAMZ countries regarding the meeting of the primary and secondary convergence criteria over the 3-year periods of assessments while the ranking of the 3-year averages over the period of 13 years are as displayed in Table 4. Nigeria and Guinea respectively achieved the number one spots in the achievements of the primary and secondary convergence criteria while Ghana and Sierra Leone took the last position in each category, respectively. In general, for both the primary and secondary convergence criteria over the 3-year period, Nigeria gets the number one ranking as Ghana and Sierra Leone share the position at the bottom of the table.

Table 2: 3-year Averages of Convergence Indicators Attainments by WAMZ Members

3-year Average of Primary Convergence Indicators (2012-2014)						
	Gambia	**Ghana**	**Guinea**	**Liberia**	**Nigeria**	**S/Leone**
Budget Deficit/GDP (≤4%)						
	5.7	6.8	3.5	-2.4	2.1	3.5
Inflation Rates (≤5%)	5.2	12.1	12.2	8.4	9.5	10.1
Central Bank Financing(≤10%)	20.7	6.7	0.0	0.0	0.0	2.5
Gross External Reserves (≥6 months)	4.2	2.6	3.2	2.5	8.6	2.4
3-year Average of Secondary Convergence Indicators (2010-2013)						
	Gambia	**Ghana**	**Guinea**	**Liberia**	**Nigeria**	**S/Leone**
Tax Revenue/GDP (≥20%)	13.6	16.9	17.1	24.2	12.8	9.8
Wage Bill/Tax Revenue (≤35%)	44.4	46.6	28.7	47.4	38.0	58.2
Public Investment/Tax Revenue (≥20%)	7.7	14.7	27.8	13.6	17.7	26.6
Real Interest Rates (> 0)						
	4.5	8.5	2.2	-6.8	-6.5	-7.7
Stability of Real Exchange Rate (± 5%)	-4.5	-10.2	-5.6	-4.7	-1.1	5.4

Source: West African Monetary Agency and Author's Calculations

---

[1] From all indications, the WAMZ member countries found it difficult to meet the convergence criteria.

Table 3: Rankings of the Attainments of the Convergence Indicators by WAMZ Members

Rankings of the 3-year Average of <u>Primary</u> Convergence Indicators (2012-2014)						
	Gambia	**Ghana**	**Guinea**	**Liberia**	**Nigeria**	**S/Leone**
Budget Deficit/GDP	5	6	3	1	2	3
Inflation Rates	1	5	6	2	3	4
Central Bank Financing	6	5	1	1	1	4
Gross External Reserves	2	4	3	5	1	6
Member Country's Total	**14**	**20**	**13**	**9**	**7**	**17**
Overall Ranking	*4th*	*6th*	*3rd*	*2nd*	*1st*	*5th*

Rankings of the 3-year Average of <u>Secondary</u> Nominal Convergence Indicators (2011-2013)						
	Gambia	**Ghana**	**Guinea**	**Liberia**	**Nigeria**	**S/Leone**
Tax Revenue/ GDP	4	3	2	1	5	6
Wage Bill/Tax Revenue	3	4	1	5	2	6
Public Investment/Tax Revenue	6	4	1	5	3	2
Real Interest Rates	2	1	3	5	4	6
Stability of Real Exchange Rate	3	6	5	4	2	1
Member Country's Total	**18**	**18**	**12**	**20**	**16**	**21**
Overall Ranking	*3rd*	*3rd*	*1st*	*5th*	*2nd*	*6th*

Source: West African Monetary Agency and Author's Calculations

Table 4: Rankings of the 3-year Average of General (<u>Primary and Secondary</u>) Convergence Indicators (2010-2012)

	Gambia	**Ghana**	**Guinea**	**Liberia**	**Nigeria**	**S/Leone**
Budget Deficit/GDP	5	6	3	1	2	3
Inflation Rates	1	5	6	2	3	4
Central Bank Financing	6	5	1	1	1	4
Gross External Reserves	2	4	3	5	1	6
Tax Revenue/ GDP	4	3	2	1	5	6
Wage Bill/Tax Revenue	3	4	1	5	2	6
Public Investment/Tax Revenue	6	4	1	5	3	2
Real Interest Rates	2	1	3	5	4	6
Stability of Real Exchange Rate	3	6	5	4	2	1
Member Country's Total	**32**	**38**	**25**	**29**	**23**	**38**
Overall Ranking	*4th*	*5th*	*2nd*	*3rd*	*1st*	*5th*

Source: West African Monetary Agency and Author's Calculations

Within the convergence indictors' context, these ranking demonstrates the readiness of the six WAMZ countries for the currency union, from the most-ready (the top ranked) and the least-ready (the low-ranked).

The WAMZ's single currency failed to take-off and 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 5 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 5: Options for Single Currency in ECOWAS

	Options	*Highlights*
Option 1	*Big Bang*	By 2020, all ECOWAS member countries will participate in the single currency; and countries that cannot meet the convergence criteria *ex-ante* will achieve these *ex-post*.
Option 2	*Gradualist*	Member countries of ECOWAS that are able to meet the primary convergence criteria before 2020 will participate in the single currency.
Option 3	*Critical Mass*	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 6 below reflects four possible convergence situations that can result in 2020.

Table 6: Possible Convergence Situation in ECOWAS by 2020

Convergence Situation	Possible Qualifying Countries	Possible Outcomes
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%[2]; (ii) average annual inflation rate of less than 10%[3]; (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 imports[4]. The new secondary criteria:[5] (a) stable nominal exchange rate of +/- 10%; and (b) ratio of total public debt to GDP of not more than 70%.

Consequent upon these background information, this paper, in consideration of the significance of the feasibility of monetary integration of West Africa, considered the

---

[2] Previously, the maximum target for budget deficit/GDP ratio was 4% (excluding grants).
[3] This is against the former maximum of 5%.
[4] The previous cover was 6 months.
[5] 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.

relevance of the business cycle synchronicity property and theory of the OCA and tested if business cycles across the WAMZ are sychronised.

2. Optimum Currency Area (OCA) Properties and Theoretical Underpinnings

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.

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. According to Krahi (2010), these three men contributed the main pieces for an academic debate where common notion has not been found yet, thus making the theory of optimal currency area an unfinished puzzle. In spite of the fact Robert Mundell is known as the father of the theory of optimum currency area, having formulated and named the theory, he was not the first to delve on the issue within the idea of the theory.

The development of the optimum currency area concept came in the context of the discussions of the relative advantages of the fixed exchange rate regime over the flexible exchange rate regime. During the early part of the Bretton Wood System, economists from many angles had various discussions which centre on the result and effect of the fixed exchange regime; and some of their conclusion influenced the theory of optimum currency area (OCA). According to Mongelli (2005: 608), the OCA theory was developed when the Bretton Wood System of fixed exchange was still in operation. What Mundell

tried to do was to determine if it would be optimal for currency of countries to float freely (Mundell, 1961). The predominant focus of Mundell is on areas with a single currency in which the control of money supply would be in the hands of one central bank.

In agreement with Cesarano (2006), discussions on the OCA theory and field associated with it can be categorised into two namely: the Friedman's View on one hand and the positions of Mundell, Mckinnon and Kenen on the other hand. Though, regarded as two groups of opinions, Kawai (1987) however sees Friedman to have opted for flexible exchange rate while Dellas and Tavlas (2009) see Friedman as having a critical view on policies that brings stabilization at the domestic level in accordance with the traditions of Keynesian economists. In the 1950s, it was generally assumed that Friedman called for flexible exchange rate regime. Boyer (2009) however regarded Friedman as the man who laid foundation for the subsequent theory of optimum currency area.

There are two major phases of contributions to the theory of optimum currency area: Pioneering Phase (first wave) and Cost-benefit Phase (second wave). In the Pioneering Phase Robert Mundell (1961), Ronald McKinnon (1963) and Peter Kenen (1969) are the important authors regarded as the traditional contributors of the OCA theory. Notable authors and contributors in the Cost-benefit Phase (second wave) are Corden (1972), Ishiyama (1975), Tower and Willet (1976) and Mundell (1973). Three major properties of the OCA theory are:

Property 1 - Labour Mobility and Wage Flexibility: These are contributions by Robert Mundell (1961) Robert Mundell is the initial contributor to the theory of optimum currency area in 1961 when he identified factor mobility as the strategic attribute of an optimum currency area.

Property 2 - Size and Openness of the Economy: These are the contributions made by Ronald McKinnon (1963): Ronald McKinnon is a second major contributor to the theory of optimum currency area as he emphasises on the size and the degree of openness of an economy as a factor that is crucial in a currency area that is optimal.[6]

Property 3 - Diversification of Production: These are contributions by Peter Kenen (1969). In 1969, Peter Kenen introduced 'Product Diversification' as a more relevant criterion of

---

[6]This is the second major OCA criterion added by McKinnon The first criterion by Robert Mundell in 1961 is mobility of labour and flexibility of wages saying that if labour can easily move from a country that is negatively affected, to a country that is positively affected, any asymmetric shock between these countries would be outweighed while any central bank policy would be made redundant.

an optimum currency area. Kenen (1969) says that with "diversity in a nation's product mix, the number of single product regions contained in a single country may be more relevant than labour mobility".

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 *(Friedman, 1963)*	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 *(Mundell, 1961)*	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 *(McKinnon, 1963)*	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 *(McKinnon, 1963)*	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 *(Kenen, 1969)*	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 *(Flemming, 1971)*	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 (*Kenen, 1969, De Bandt & Mongelli, 2000***)**	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 (*Mintz 1970; Harberler, 1970; and Cohen, 1993***)**	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 *(Ingram, 1962)*	The higher the level of financial integration, the greater the extent of the need to establish an optimum currency area across geographical blocs. The need for exchange rate adjustments can be reduced by financial market integration. Through capital market inflows, temporary adverse disturbances can be cushioned. 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. For the sustainability of a successful common currency area, tight financial market integration is essential.
Similarities of Shocks and Similarities in Policy Responses to the Shocks (*Bayoumi & Eichengreen, 1996; Masson &Taylor, 1993; Demertizis, Hughes &Rummel, 2000; Alesina, Barro & Tenreyro, 2002.***	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. 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. 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.
Similarities in Monetary Policy Transmission *(Angeloni, Kashyap, Mojon and Terlizzese, 2001)*	Similarities in monetary transmission mechanism among member countries of an optimum currency area speak volume about the similarities in financial structures of these countries.
External Nominal Shocks	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.
Monetary Shocks	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.
Real Shocks	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.
Business Cycle Synchronisation	Flexible exchange rate regime will not be appropriate if the group of countries forming an optimum currency area has synchronised business cycle.
Central Bank's Credibility	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.
Monetary Policy Effectiveness	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.

Sources: Author's compilations

Within the literature, there are many criteria for deciding how suitable countries are for an optimum currency area. However, the general agreement among the proponents[7] 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. This is a position grounded with the assumption that nominal exchange rates are very effective; otherwise countries should not abandon their currencies since it would be meaningless to do so. As a major macroeconomic stabiliser, exchange rate affects relative prices of all goods, terms of trade and wages. Therefore, it is necessary for countries coming together to form a monetary union to have some conditions in place so that the functioning of nominal exchange rates to be less fascination or attractive as an adjustment tool.

Separate economic policies are not necessary if countries within a monetary union have similar business cycles or rather experience identical shocks. On the other hand, asymmetries in output fluctuations and shocks would appropriately necessitate individual policy responses. Within the context of the OCA theory, countries are better suited to form a currency union the more their business (output) cycles are synchronised or symmetric. Negative correlation of business cycles and shocks however, weakens the case for a common currency.

It has be established in literature that flexible exchange rate regime will not be appropriate if the group of countries forming an optimum currency area has synchronised business cycle. Theoretically, if there is a considerable divergence in the business cycles of a countries coming together to form a monetary union, the future common monetary policy will not be optimal for these countries and 'one size would not fit all'. An expansionary monetary policy will then be more appropriate for the union's member countries experiencing downward moving cycle while the upward trending cycle countries with moderate business cycle fluctuations would employ the contractionary monetary policy stance. However, countries with moderate business cycle fluctuations do not require contractionary or expansionary monetary policy. These are issues that undermine the supports for the formation of a currency union hence the

---

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

necessity for the presence of business cycle synchronicity before the formation of a monetary union.

3. Review of Literature Empirical Studies Literature on OCA Perspectives of WAMZ Monetary Integration

From the perspectives of the properties of OCA, a few number of empirical studies have evaluated the feasibility of the monetary integration of the WAMZ as well as the viability of the membership of the proposed monetary union for prospective member countries. Findings and results of some of these empirical researches are discussed in this section. An evaluation of the economic rationale for monetary union in Sub-Saharan Africa was performed by Benassy-Quere and Coupet (2003) through the use of cluster analyses of a sample of 17 countries by adapting variables emanating from the OCA theory (and the fear-of-floating literature) to conclude that the creation of the WAMZ around Nigeria is not supported by data. The result however, supported the inclusion of The Gambia, Ghana and Sierra Leone in an extended WAEMU arrangement or creation of a separate monetary union with the 'core' of the WAEMU and The Gambia. Further to this study by Benassy-Quere and Coupet (2003), Bankage (2008) used the methodology initiated by Bayoumi and Eichengreen (1997) to compute OCA indices for 21 African countries. This study got a high predicted volatility for Nigeria in relation to other ECOWAS countries, leading to the suggestion that the inclusion of Nigeria in the WAMZ (and in the extended WAEMU) is not suitable according to the OCA theory. Cham (2011) assessed the feasibility of the WAMZ as a monetary zone using the combination of both macroeconomic convergence and the OCA properties (openness, shock synchronisation and labour mobility) to gather evidence towards concluding that the degree of labour mobility is low, shocks were not synchronised and the degree of openness of members (apart from The Gambia and Nigeria) were below average. Omotor and Niringiye (2011) used simple bivariate of vector autoregressive model to assess WAMZ's feasibility as an OCA from the perspective of economic shocks and got results suggesting that the WAMZ is feasible to form an OCA. Coleman (2011) investigated business cycle synchronisation in five member countries of the WAMZ (The Gambia, Ghana, Guinea, Nigeria and Sierra Leone) applying Pearson correlation of trend and cyclical component of GDP to investigate co-movements at high frequencies between computed Z-scores for pairings of the five candidate countries. The results indicated lack of a consistent pattern of synchronised growth cycles which raised concerns over economic sustainability of the WAMZ. With the application of

cointegration and fractional cointegration methods, inflation dynamics and common tendencies of real GDP of the WAMZ countries were investigated by Alagidede et al. (2012) to gather evidence of substantial heterogeneities in these respects, across the WAMZ. Raji (2012) applied dynamic GMM and cross country correlation to assessed the real exchange rate misalignments and economic performance of the WAMZ to determine the implications of these for economic unionisation of the WAMZ to conclude that the WAMZ experiences asymmetrical correlations between real exchange rate misalignments and economic performances. The cross-country correlation test however revealed moderate degree of symmetrical relationship using some macroeconomic variables such as real exchange rate, misaligned real exchange rate, openness, inflation and output. Costs and benefits of a common currency in the WAMZ were estimated by Okafor (2013) by means of behavioural models to capture costs elements (asymmetric shocks, loss of monetary autonomy, fiscal distortion) and benefits (trade creation, financial integration effects and policy coordination gain) to yield evidences towards suggesting that potential benefits of common currency in the WAMZ will likely be lower than marginal costs due to loss of monetary policy sovereignty which could be monumental in spite of extended trade creation benefits. In a correlation investigation of structural shocks across the WAMZ, Harvey and Cushing (2015) concluded that the WAMZ countries responded asymmetrically to common supply, demand and monetary shocks and so, will respond differently to a common monetary policy. Assessments of the extent of convergence and business cycle synchronisation of business cycles within the WAMZ was performed by Alagidede and Tweneboah (2015) in the analyses of growth rate convergence. The results gathered suggested dissimilarities in business cycles within the WAMZ. Analyses of trade within the WAMZ and WAMZ's trade with other countries with West Africa, Europe and Asia were made by Mensah (2016) who found strong evidence against trade symmetry in the WAMZ as well as some evidences of marginal convergence in inflation, real GDP growth and monetary policy rate, with reasons to infer that partial convergence in the WAMZ as well as significantly low trade within the WAMZ and the WAMZ countries with outside world. It is apparent that the body of literature reviewed in this section made efforts in examining the OCA perspective of monetary integration of the WAMZ.

Despite this, it still significant to augment the value of the compendium of these empirical feasibility research works through added knowledge introduced into such evaluation

through various business cycles synchronicity assessments of monetary integration of the West African sub-region performed through this paper.

4. Data and Methods

The approach of this study to the assessment of the business synchronisation of the WAMZ countries was the investigation of the similarity and the co-movements between the two main components of business cycles: (i) the classical business cycles and (ii) the deviation business cycles. The classical business cycle, through examination of the swings in the real GDP growth rates, pays attention to the upward and downward movements in economic activities of the WAMZ countries while the emphasis of the deviation business cycle is on the investigation of the output gap, which is the deviation of the real GDP from a trend, and this is synonymous with the concept of recessions and booms. The assessment of classical and deviation business cycles in this study applied annual data real GDP and real GDP growth respectively for the WAMZ countries employing simple correlation analyses and the analysis of variance (ANOVA).

The ANOVA tests performed here showed 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:

$$H_0 = \mu_1 = \mu_2 = \ldots \ldots \mu_j$$

The alternative hypothesis is:

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

Where: μ = the population mean.

Specifically for this analysis, the null hypothesis is:

$$H_0 = Gambia = Ghana = Guinea = Liberia = Nigeria = Sierra\ Leone$$

and the alternative hypothesis is:

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

The null hypothesis was that the mean of the classical and deviation business cycles in the six WAMZ countries are equal. For analysis 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.

The ANOVA method would check how significantly different are the means of the two components of business cycles in the WAMZ countries under investigation. Further efforts in the investigation was made in measuring synchronicity of business cycle through the observation of the closeness of coefficient of variations of classical and deviation business cycles of individual WAMZ country. It is important to compare patterns of business cycles in the WAMZ countries in times when there were no necessities for meeting criteria for memberships of a monetary union (pre-convergence period) and the monetary union member run-on period when convergence criteria are to be met (convergence period). The business cycle assessment was therefore split into two periods: (i) pre-convergence period (1981-2000); (ii) convergence period (2001 - 2015). The comparison of the results in these two periods is necessary because of the possibility of these WAMZ countries behaving 'artificially' in their business attitudes during the convergence era, when efforts were being made to meet the convergence criteria. The Hodrick-Prescott (HP) filtering method (at *lambda=100*) was applied in filtering and decomposing the real output (GDP) of individual WAMZ countries into transitory and permanent components required for the assessment of classical and deviation business cycles in these countries. Correlation tests as well as tests of homogeneity of variance (Levene Statistics) in business cycles were performed. There were further investigations of the transitory and deviation (output gap) business cycles so as to determine the extent of cyclical convergence of members of the proposed monetary union, which is relevant for the conduct of the future common monetary policy in the zone. Fifteen bilateral Euclidean distances between output gaps in the

WAMZ countries were also measured in order to reveal the extent of business cycle co-movements among member countries. Statistically, Euclidean distance between two variables *x* and *y* (specifically, of output gaps in this study) can be defined as:

$$d = \sqrt{\Sigma_{i=1}^{n}(x_i - y_i)^2}$$

Euclidean distance investigates the root of square difference between coordinates of a pair of variable or objects, in this case, output gaps.

Levene's test is an inferential statistic test applied in examining the equality of variance for a variable for two or more groups. The assumption of Levene's test is that there is equality in the variance of the population from which different samples are drawn. The statement of null hypothesis of the Levene's test tested is:

$$H_0 = \sigma_i^2 = \sigma_j^2 \dots\dots = \sigma_k^2$$

while the alternative hypothesis is:

$$H_A \neq \sigma_i^2 \neq \sigma_j^2 \dots\dots \neq \sigma_k^2$$

The null hypothesis is that the population variance are equal (that is, there homogeneity in variance). The Levene's test uses an F-test statistic to test the null hypothesis; and a statistically significant statistic violates the assumption in the null hypothesis. Therefore, if the probability value (*p*-value) generated from the test reflects statistically significance at the set level of significance, the null hypothesis of equality of variances should be rejected with the conclusion that the variance in the population are not equal.

5. Results and Findings

The patterns of the variations in the real GDP of the WAMZ countries for the Pre-convergence period (1991 to 2000) and the Convergence Period (2001-2015) was displayed in Figure 1 below. Liberia recorded the highest degree of dispersion from the mean in both periods, and followed by Ghana. Although, The Gambia appears a bit steady, the pattern of variations demonstrated by the WAMZ countries in these two periods were heterogeneous.

Figure 1: Coefficients of Variation of Real GDP of the WAMZ Countries
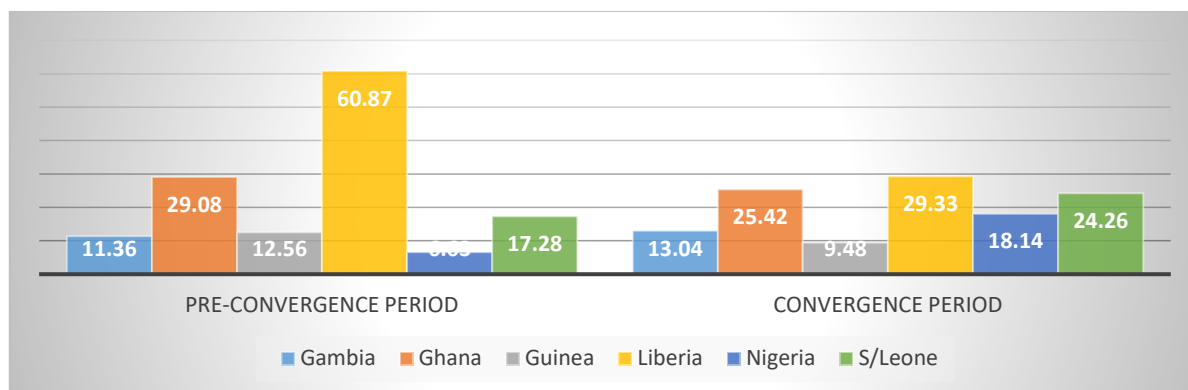
Source: EIU database and author's calculations

Tables 7 and 8 below reveal that the degrees of correlation of the classical business cycles in the two periods under study were evidently weak generally, given the low coefficients of correlation. There was a mix of negative and positive correlations in the two periods.

Table 7: Correlation Matrix of Classical Business Cycles in the WAMZ (Pre-Convergence Period)

	The Gambia	*Ghana*	*Guinea*	*Liberia*	*Nigeria*	*Sierra Leone*
The Gambia	1					
Ghana	0.37	1				
Guinea	-0.05	-0.01	1			
Liberia	0.22	0.36	0.27	1		
Nigeria	0.17	-0.09	-0.46	0.20	1	
Sierra Leone	0.18	0.33	-0.25	-0.25	0.31	1

Sources: Author's Estimation and EIU Database and Eviews 7 Output

Table 8: Correlation Matrix of Classical Business Cycles in the WAMZ (Convergence Criteria Period)

	The Gambia	*Ghana*	*Guinea*	*Liberia*	*Nigeria*	*Sierra Leone*
The Gambia	1					
Ghana	-0.52	1				
Guinea	-0.57	0.34	1			
Liberia	-0.41	-0.05	0.41	1		
Nigeria	0.24	0.26	-0.54	-0.83	1	
Sierra Leone	-0.42	-0.30	0.62	0.39	-0.55	1

Sources: Author's Estimation and EIU Database and Eviews 7 Output

In Table 7, in the PC phase, the highest degree of correlation of 37% was between Ghana and The Gambia while 61.5% correlation between Guinea and Sierra Leone was the highest in the CC period as shown in Table 8.

Table 9: Correlation Matrix of Transitory Component Business Cycles in the WAMZ

(Pre-Convergence Period)

	The Gambia	Ghana	Guinea	Liberia	Nigeria	Sierra Leone
The Gambia	1					
Ghana	-0.06	1				
Guinea	0.38	0.43	1			
Liberia	0.50	-0.08	0.15	1		
Nigeria	0.47	-0.27	-0.07	0.69	1	
Sierra Leone	-0.14	-0.10	0.01	0.40	0.59	1

Sources: Author's Estimation and EIU Database and Eviews 7 Output

Table 10: Correlation Matrix of Transitory Component Business Cycles in the WAMZ (Convergence Criteria Period)

	The Gambia	Ghana	Guinea	Liberia	Nigeria	Sierra Leone
The Gambia	1					
Ghana	-0.17	1				
Guinea	-0.38	0.48	1			
Liberia	0.49	0.40	0.29	1		
Nigeria	-0.49	-0.48	-0.05	-0.87	1	
Sierra Leone	-0.57	0.38	0.89	-0.14	0.272546	1

Sources: Author's Estimation and EIU Database and Eviews 7 Output

For the de-trended business cycle which is the transitory component (cycle) of output, the correlation for the PC and the CC periods were also characterised by weak and negative correlation coefficients among the WAMZ countries. For the transitory business cycles, Table 9 and 10 above display the correlation in the PC and CC periods. In the PC period, as revealed in Table 9, the highest correlation of 68.6% was between Liberia and Nigeria and this fell to a negative of -87% in the CC period. Table 10 also shows that the 89% correlation between Guinea and Sierra Leone was the highest for the PC period; followed by The Gambia/Liberia 49% correlation. When output gaps were applied in the test of synchronicity of deviation cycles, there were evidences of weak correlation as Nigeria/Liberia association displays the highest of 68% followed by 59% of Nigeria/Sierra Leone and 59% of Liberia/The Gambia as exhibited in Table 11 below. For the CC period, the results in correlation of output gaps in Table 12 also reveal many negative and weak positive correlations. The highest in this phase was the Guinea/Sierra Leone 86% and the Gambia/Liberia 52%. Owing to the implications of high degree of correlation for synchronicity, the results for the PC and the CC periods brought forth the evidences that the classical business cycles, the transitory business cycles and the

deviation business cycles in the WAMZ were not synchronised over the period covered by the investigations. This has negative implications for the feasibility of the proposed currency union the West African region in facing business cycle shocks.

Table 11: Correlation Matrix of Deviation (Output Gaps) Business Cycles in the WAMZ
(Pre-Convergence Criteria Period)

	The Gambia	Ghana	Guinea	Liberia	Nigeria	Sierra Leone
The Gambia	1					
Ghana	0.01	1				
Guinea	0.38	0.50	1			
Liberia	0.59	0.23	0.39	1		
Nigeria	0.53	-0.14	0.06	0.68	1	
Sierra Leone	-0.16	-0.04	-0.03	0.33	0.59	1

Sources: Author's Estimation and EIU Database and Eviews 7 Output

Table 12: Correlation Matrix of Deviation (Output Gaps) Business Cycles in the WAMZ
(Convergence Criteria Period)

	The Gambia	Ghana	Guinea	Liberia	Nigeria	Sierra Leone
The Gambia	1					
Ghana	0.07	1				
Guinea	-0.32	0.33	1			
Liberia	0.52	0.49	0.36	1		
Nigeria	-0.53	-0.61	-0.10	-0.88	1	
Sierra Leone	-0.55	0.07	0.86	-0.11	0.32	1

Sources: Author's Estimation and EIU Database and Eviews 7 Output

Evidences gathered from the analyses of variances (ANOVA test) under the three business cycle scenarios and for the PC and the CC periods are specified in Table 13 below.[8]

Table 13: Results of ANOVA Tests on Business Cycles in the WAMZ Countries

	F-statistic	Probability
Classical Business Cycles:		
* Pre-convergence period	0.5694	0.723
* Convergence	1.7411	0.137
Transitory Components Business Cycles:		
* Pre-convergence period	9.85E-24	1.000
* Convergence	1.91E-25	1.000
Deviation (Output Gaps) Business Cycles:		
* Pre-convergence period	0.0008	1.000
* Convergence	0.0030	1.000

Sources: Author's Estimation and EIU Database

For the classical business cycles, with the p-values of 0.723 for the PC period and 0.137 for the CC period, we cannot reject the null hypothesis to conclude that the means of the

---

[8]The decision to reject the null hypothesis is taken by examining the probability values (p-values) in the results of the tests. At 5% level of significance, if the resulting p-value is less that that 0.05 or 5%, the null hypothesis is rejected, implying statistical significant difference in the means of the business cycles under investigation.

classical business cycles (the output growth paths) of the WAMZ countries were similar during the two periods.

Table 14: Results of Tests of Homogeneity of Variance (Levene Statistics) in Business Cycles

	(Levene) F-statistic	*Probability Value*
Classical Business Cycles:		
* Pre-convergence period	9.8379	0.000
* Convergence	4.0693	0.002
Transitory Components Business Cycles:		
* Pre-convergence period	9.7211	0.000
* Convergence	73.9075	0.000
Deviation (Output Gaps)Business Cycles:		
* Pre-convergence period	13.3961	0.000
* Convergence	7.1337	0.000

Sources: Author's Estimation and EIU Database

Since this p-value is greater than 0.05 (for the 5% significant level), the null hypothesis of equality in means of these business cycles cannot be rejected implying that they do not differ significantly in transitory and deviation business cycles in the WAMZ. However, Table 14 above shows the Levene's tests of homogeneity of variance among the WAMZ countries under the three scenarios of business cycles reporting p-values of 0.00 for both periods.

A brief summary of evident derived from the correlation and ANOVA tests carried out suggest that while business cycles in the WAMZ were not well synchronised as evident by the correlation analyses,[9]ANOVA tests revealed homogeneity of business cycles in the zone, though there was heterogeneity in the variances of the zone's business cycles.

Table 15: Standard Deviations of the Classes of Business Cycles of the WAMZ Countries (Pre-Convergence Criteria and Convergence Periods)

	Gambia	*Ghana*	*Guinea*	*Liberia*	*Nigeria*	*S/Leone*
Classical Business Cycle:						
* Pre- convergence period	3.018	0.678	0.934	41.827	9.7135	8.468
* Convergence period	3.942	2.650	1.632	15.715	1.329	7.240
Transitory Component Business Cycle:						
* Pre- convergence period	0.026	0.733	0.033	0.097	0.930	0.053
* Convergence period	0.030	0.781	0.049	0.110	8.689	0.066
Deviation(Output Gap) Business Cycle:						
* Pre- convergence period	5.857	8.849	1.597	54.251	1.539	6.918
* Convergence period	4.400	3.801	1.590	18.232	8.665	4.804

Sources: Author's Estimation and EIU Database

---

[9]Correlation is an indicator of business cycle synchronisation.

Another look into business cycle synchronicity in the WAMZ was the investigation of the transitory and deviation (output gap) business cycles so as to determine the extent of cyclical convergence of members of the proposed monetary union, which is relevant for the conduct of the future common monetary policy in the zone. This test was carried out through the evaluation of the evolution of (dispersions) standard deviations of these classes of business. The smaller the degree of dispersion (measured by standard deviation) over the period investigated, the closer the clustering of individual WAMZ countries' business cycle. This measures absolute degree of dispersion. Table 15 above shows that for all the WAMZ countries, the standard deviations of the transitory business cycles for the PC and the CC periods generally were low and less than unity while the deviation (output gaps) business cycles and the classical (growth) business cycles for all the WAMZ countries exhibit single digits standard deviation apart from Liberia which recorded for the deviation (output gaps) business cycle, highs of 54.25 and 18.23 standard deviations in the PC period and the CC period respectively as this country displayed 41.83 and 15.71 standard deviation for the growth business cycle in the two periods.

Table 16: Results of Estimates of Euclidean Distances between Output Gaps in WAMZ Countries

	Euclidean Distances (Pre-Convergence Period)	*Euclidean Distances (Convergence Period)*
Gambia-Ghana	0.002617	0.12601
Gambia-Guinea	0.001836	0.001689
Gambia-Nigeria	0.51388	0.00578
Gambia-Liberia	0.001957	0.297233
Gambia-Sierra Leone	0.04867	0.00603
Ghana-Guinea	0.00078	0.127698
Ghana-Liberia	0.5165	0.12023
Ghana-Nigeria	0.00066	0.423242
Ghana-Sierra Leone	0.05129	0.132039
Guinea-Liberia	0.51572	0.00747
Guinea-Nigeria	0.000121	0.295544
Guinea-Sierra Leone	0.05051	0.004341
Liberia-Nigeria	0.515839	0.303012
Liberia-Sierra Leone	0.465208	0.011809
Nigeria-Sierra Leone	0.05063	0.2912

Sources: Author's Estimation and EIU Database

From Table 16 above, the evidences gathered from the estimates of the fifteen bilateral Euclidean distances between output gaps in the WAMZ further revealed the degree of business cycle co-movements among member countries. The rule is that the lower the value of the bilateral Euclidean distance, the higher the degree of similarities in business cycles of the two countries.

In the PC period, Guinea/Nigeria had the highest degree of business cycle similarity as evident by the lowest Euclidean distance of 0.000121, followed by Ghana/Nigeria, Ghana/Guinea and The Gambia/Guinea recording 0.00066, 0.00078 and 0.001836 bilateral Euclidean distances respectively. The lowest degree of business cycle similarity in the PC era is displayed by Liberia/Nigeria at 0.51584 bilateral Euclidean distance. For the CC period, Gambia/Guinea produced the highest degree of business cycle co-movement at 0.001689 Euclidean distances as Guinea/Sierra Leone (0.00434), The Gambia/Sierra Leone (0.00603) and Guinea/Liberia (0.00747) follow. Displaying a Euclidean distance of 0.42324, Ghana/Nigeria implies the lowest degree of business cycle co-movement in this era. The tests of Euclidean distances showed that in the PC period, Ghana, Guinea, and Nigeria were prominent with high degrees of business cycle co-movements while Guinea, Sierra Leone and The Gambia reflected same during the CC era. However, many of the bilateral Euclidean distance obtained for the PC period differ from the evidence got for the CC period. The results for the PC period were more encouraging than those of the monetary union run-up CC period. For instance, Guinea/Nigeria showing the highest degree of co-movement in the PC period fell to the group of the 'least' during the CC period. Nevertheless, it is encouraging that the results of the monetary union run-up CC period exhibits seven (7) 'drops' in the Euclidean distances when compared to what obtained for the PC period. This depicts appreciable journey towards business cycle co-movements in the WAMZ. The conclusion for the estimates of Euclidean distances between output gaps is the failure of these countries to exhibit many desired low bilateral values that would have suggested reasonable extent of business cycles similarities and co-movements in the WAMZ as this would have arouse the confidence in concluding that the zone is feasible for a monetary union.

6. Conclusions

Within the context of the theory of OCA, countries are better suited to form a currency union the more their business (output) cycles are synchronised or symmetric. If countries within a monetary union have similar business cycles or rather experience identical shocks, separate economic policies are not necessary. On the contrary, asymmetries in output fluctuations and shocks would appropriately necessitate individual policy responses. The business cycle analysis of the monetary integration feasibility of the WAMZ performed in this research study produced evidences to suggest that the extent of business cycle synchronicity was low particularly during the pre-convergence period.

The results for the convergence period were much better. However, on the overall, the assessments here suggest unsynchronised business cycles across the WAMZ. Therefore, in general terms, from the monetary integration feasibility evaluation produced, it can be concluded that the WAMZ has failed the business cycle synchronicity tests. This consequently weakens the case for a common currency for the WAMZ. An extended business cycle evaluation of the 15-country ECOWAS at large is significant in testing if there would be a strong case for a common currency in West Africa at large.

References

Alagidede, P. and Tweneboah, G. (2015). 'Convergence of Growth Rates in the West African Monetary Zone.' *Journal of Economic Cooperation and Development*, Vol. 36(4), pp.29-54.

Alagidede, P., Coleman, S. and Cuestas, J.C. (2012). 'Inflationary Shocks and Common Economic Trends: Implications for West African Monetary Union Membership'. Journal of Policy *Modelling* Vol. 34(3) pp460– 475.

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.

Asongu, S.A. (2013). 'A Short-run Schumpeterian Trip to Embryonic African Monetary Zones'. Vol. 3(1) pp859–873.

Asongu, S.A. (2014b). 'Are Proposed African Monetary Unions Optimal Currency Areas? Real, Monetary and Fiscal Policy Convergence Analysis'. *African Journal of Economics and Management Studies* Vol. 5(1) pp9–29.

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

Balogun, E.D. (2007) "Monetary Policy and Economic Performance of West African Monetary Zones Countries", *Munich Personal RePEC Archive* (MPRS)Paper No 4308 on line http://mpra.ub.uni-muenchenide/4308

Balogun, E.D. (2007) "Monetary Policy and Economic Performance of West African Monetary Zones Countries", *Munich Personal RePEC Archive* (MPRS)Paper No 4308 on line http://mpra.ub.uni-muenchenide/4308

Bangake, C. (2008). 'Exchange Rate Volatility and Optimum Currency Area: Evidence from Africa'. *Economics Bulletin* Vol. 6(12) pp1–10.

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

Benassy- Quere, A. and Coupet, M. (2003), "On the Adequacy of Monetary Arrangements in Sub-Saharan Africa", *CEPII Working Paper* No 2003-11.

Boyer, R.S. (2009) "Reflections on Milton Friedman's Contributions to Open Economy Money/Macro", Journal *of Internal Money and Finance* pp.1097-1116.

Cesarano, F. (2006). 'The Origin of the Theory of Optimum Currency Areas.' History of Political Economy, Vol. 38(4): 711-731.

Cesarano, F. (2006). 'The Equilibrium Approach to Optimum Currency Areas.' BNL Quarterly Review, Vol. 59(237): 193-209.

Cham T. (2009) "Is WAMZ an Optimum Currency Area*", West African Journal of Monetary and Economic Integration* Vol. 9, No2, West African Monetary Institute (WAMI).

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

Coleman, S. (2011). "Investigating Business Cycle Synchronisation in West Africa," *Working Papers 2011/01*, Nottingham Trent University, Nottingham.

Corden, W. (1972), "Monetary Integration Essays in International Finance" *International Finance* No 93 Princeton University.

Coulibaly, I. and Gnimassoun, B. (2013). 'Optimality of a Monetary Union: New Evidence from Exchange Rate Misalignments in West Africa. Economic'. *Modelling* Vol. 32(May) pp463–482.

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

Debrun, X., Masson, P. and Pattillo, C. (2005). 'Monetary Union in West Africa: Who might gain, Who might lose and why?' *Canadian Journal of Economics* Vol. 38(2) pp454–481.

Dellas, H. and Tavlas, G. S. (2009), "An Optimum Currency Area Odyssey". *Journal of International Money and Finance* pp 1117-1137.

Demertizis, M., Hughes A, and Rummel, O. (2000) "Is European Union a Natural Currency Area or is it Held Together by Policy Maker?" *Weltwertschaftliches 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.

Harvey, S.K. and Cushing, M.J. (2015). 'Is West African Monetary Zone (WAMZ) a Common Currency Area?' *Review of Development Finance* Vol. 5(1) pp53–63.

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.

Ishiyama, Y (1975), 'The Theory of Optimum Currency Areas: A Survey', *International Monetary Fund IMF Staff Papers* 22(2) PP 344-83.

Kawai, M. (1987), 'Optimum Currency Areas' in Eatwell, J and Palgrave R.H.I, *The New Palgrave A Dictionary of Economics* Vol 3: K to P, London: Macmillan.

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

Krahi, T.J. (2010) 'The Optimum Currency Area Discuss and its Recommendations for Monetary Integration in Asia', Unpublished Dissertation Hochsule Bremen University of Applied Sciences.

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.

Mensah, I. (2016). 'Monetary and Economic Union in West Africa: An Analysis on Trade.' *International Journal of Business and Economic Sciences Applied Research*, Vol. 8(2), pp. 87-118.

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

Mongell, F.P. (2005) 'What is European Economic and Monetary Union (EMU) Telling us about the Optimum Currency Area Properties', *Journal of Common Market Studies* Volume 43, No 3 pp 607-35.

Mundell, R. (1973), Uncommon Arguments for Common Currencies'. In Johnson, H and S Woboda, A (eds) *The Economics of Common Currencies* (London, 'Allen and Unwin).

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

Okafor, H. O. (2013). 'Estimating the Costs and Benefits of a Common Currency for the Second West African Monetary Zone'. *Journal of Economic and Behavioural Studies*, Vol. 5(2), pp. 57-68.

Omotor, D.G and Niringiye, A (2011) 'Optimum Currency Area and Shock Asymmetry: A Dynamic Analysis of the West African Monetary Zone' *Romania Journal of Economics Forecasting* No3/2011.

Raji, R. O, (2012). 'Real Exchange Rate Misalignment and Economic Performance of West Africa Monetary Zone: Implications for Macroeconomic Unionisation,' *MPRA Paper 37385*, University Library of Munich, Germany.

Tower, W. and Willett, T. (1976). 'The Theory of Optimum Currency Areas and Exchange Rate Flexibility: A More General Framework', Special Papers in International Economics 11 Princeton University.