OPTIMUM CURRENCY AREA IN THE WEST AFRICAN ECONOMIC AND MONETARY UNION: AN EMPIRICAL STUDY DURING THE PERIOD 1998-2017

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Abstract: *The goal of this study is to investigate with the WAEMU countries, constitute an optimum currency area, over the period 1998-2017, by applying the SVAR model and using three variables: Real Gross Domestic Product that represents supply shock, Real Effective Exchange Rate that represents demand shock and consumer price index that represents monetary shock. Our empirical results show that the supply and monetary shocks are symmetric but demand shock is asymmetric, and also, there is dissimilarity in the contribution of each shock in the real GDP of the WAEMU countries. Our study confirms that the WAEMU is not an optimum currency area.*

Keywords: Common currency area, monetary union, Symmetric and Asymmetric Shock, WAEMU, SVAR model.

JEL Classification: F33, O55, C32.

ملخص :تهدف هذه الدراسة الى معرفة امكانية تحقيق منطقة نقد مثالية بين دول الاتحاد الاقتصادي والنقدي لدول غرب افريقيا(الايموا)، خلال الفترة 1998–2017، باستعمال نموذج متجه الانحدار الذاتي الهيكلي (SVAR) ، وباستخدام ثلاثة متغيرات وهي الناتج المحلي الاجمالي الحقيقي والذي يمثل صدمة عرض وسعر الصرف الفعلي الحقيقي والذي يمثل صدمة طلب ومؤشر أسعار الاستهلاك والذي يمثل صدمة نقدية، وأشارت النتائج إلى أن كل من صدمات العرض والنقدية هي متماثلة، في حين عدم تماثل صدمات الطلب، وكذا وجودتباين في مساهمة كل الصدمات في متغير الناتج المحلي الاجمالي لكل دول الايموا، مما يؤكد ان الاتحاد الاقتصادي والنقدي لدول غرب افريقيا لا يعتبر منطقة نقد مثالية .

الكلمات المفتاحية : منطقة نقد مثالية، الاتحاد النقدي، تماثل الصدمات، الايموا، نموذج متجه الانحدار الذاتي الهيكلي.

1. Introduction

Monetary integration is nothing new in Africa. It has been a constant quest since independence. It has undergone six major monetary integrations: the two monetary unions (Franc Zone), the Common Monetary Area (CMA), the East African currency board (Shilling Zone), the currency board West Africa (Sterling Zone) and the Escudo Zone. Nowadays, only the Franc Zone and the CMA are still active.

The Franc Zone is a monetary arrangement between fifteen African countries (Benin, Burkina Faso, Cameroon, Comoros, Congo, Ivory Coast, Gabon, Equatorial Guinea, Guinea-Bissau, Mali, Niger, Central African Republic, Senegal, Chad and Togo) and France.Then, the CFA franc is traded among 14 African countries, but it is divided into

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two monetary unions, namely the West African Monetary Union and the Central African Monetary Union.

The Franc Zone was formalized in December 1945 when France ratified the treaty establishing the Bretton Woods system after independence. A monetary agreement wassigned by France withAfrican countries in 1962 then a second agreement was signed in 1973 Africanizing the previous one a little more(Tapsoba, 2009)

Consequently, this paper have attempted to answer about the following main question: is the West African Economic and Monetary Union (WAEMU) an optimum currency area?.

In order to answer the problematic of this study, we are going to establish the following hypotheses:

- The optimal criteria for the monetary zone in WAEMU countries are determined;

- The existence of shock symmetry in the West African Economic and Monetary Union.

Thus, in this paper we will use the SVAR approach that is the most relevant for this purpose and it will be organized as follows: in the first section, wewillemphasize the literaturereview. Afterthat, wewillgive a BriefHistory of West AfricanEconomic and Monetary Union in the section two. In the section three, wewillpresent an overview on Optimum currency area in West AfricanMonetary and Economic Union. After that, we will test the OCA in the WAEMU countries in section four. Finally, we present the main results of our study.

2. LITERATURE REVIEW

Optimal currency area adopts an irrevocablyfixed exchange rate regime or a single currencywithinits area, and maintains a flexible exchange rate regimewith the rest of the world.Asitisknown, the OCA is a pre-required condition for adopting a common exchange rate policy, and thus, a commoncurrencyamong the integrated countries. The empiricaltesting of the optimum currency area criteria has takenseveralformsincludingmeasuringshockasymmetry of the countries in the region. Furthermore, testing the level of similarity in the movements of the real exchange rate againsta central anchorcurrency.

A large number of studiesrevealedthat the WAEMU is a quasi-optimum currency area see(Sireh-Jallow, 2013);(Amaefule, 2019). Furthermore, a considerablenumber of studiesalsofoundthat the WAEMU is not an optimum currency area see(Couharde, et al., 2012);(Mensah, 2015); whilerelativelyfewerstudies have discoveredthat the WAEMU is an optimum currency area see(Tapsoba, 2009); (Nkwatoh, 2019).

Table1: Literaturesummary

Study	Period	Method	Main findings
Sampawende Jules Armand Tapsoba (2009)	1970-2004	ordinary least squares (OLS) approach	West African currency could be Optimal Currency Areas compliant by the intensification of regional trade and the development of regional credit markets which facilitate the risk-

			sharing strategies.
Cécile Couharde , IssiakaCoulibaly , David Guerreiro& Valérie Mignon (2012)	1985-2009	Panel unit root and cointegration tests	The CFA zone can be more accurately described as a sustainable currency area rather than an optimal one
AbdoulieSireh-Jallow (2013)	1970 - 2010	Vector AutoRegression (VAR) models & Generalized Purchasing Power Parity (GPPP)	The study shows mixed results of the Economic Community of West African States (ECOWAS), the GPPP model support the optimality as a currency area, while some asymmetrical shocks have been identified by the VAR model
Isaac Mensah (2015)	2002-2012 (coversfivecountries)	Analysis of convergence criteria	Monetary and economic union in West Africa does not qualify as an OCA
Louis SevitenyiNkwatoh (2019)	1975 - 2015	Hodrick-Prescott filter (HP)	The degree of business cycles' synchronization of ECOWAS sub-economies are similar
ChukwuemekaA maefule (2019)	1970-2017	Least Squares and NARDL	The West African Monetary Zone is entirely not an optimum currency Area (OCA), is a quasi-OCA

Source: authors' construction

From the above, this study have focused on test the achievement of the Optimal Currency Area (OCA) among the WAEMU countries, using the SVAR estimation method during the period 1998- 2017.

This study differs from Previous studies in treatment of important sample of monetary blocs in Africa, that had the objective of deepening economic integration between them since 1994, and membership ofGuinea Bissau in1997,which allowed us to apply the ampirical study in the same period, From 1998 to 2017, take into consideration its different achievements, which obtain more accurateand realistic results.

3. A BRIEF HISTORY OF WEST AFRICAN ECONOMIC AND MONETARY UNION

With economic crises, the economic integration has become an essential element in the prevention of those crises, to resolve this issue, The West African Monetary Union (WAMU) countries should the progressive deepening and widening of regional integration.

Thus the West African Monetary Union, to be transformed into a West African Economic and Monetary Union. Which from monetary union to economic integration. The stages of West African Economic and Monetary Union are as follows(Strauss-Kahn, 2003):

❖   **The colonial period**

1939: The CFA franc zone was created.

1945: The CFA franc was created and pegged at 0.02 French franc.

1951: The Monetary Committee of the CFA franc zone was created: follow-up of monetary relations and coordination with local central banks.

❖   **Following independence.**

1959: The BCEAO was created, in charge of issuing the "Franc de la Communautéfinancièreafricaine" (or CFA franc), parity unchanged at 0.02 French franc.

1962: Treaty establishing West African Monetary Union.

1962: First monetary cooperation agreement between West African Monetary Union and France.

1973: Treaty consolidating West African Monetary Union.

1973: Cooperation agreement between the Republic of France and the members of West African Monetary Union (currently in effect).

1994: The CFA franc was devalued by 50% to 0.01 French francs.

1994: Treaty establishing West African Economic and Monetary Union: deepening of economic integration.

1994: The West African Monetary and Economic Union (also known under the French acronym, UEMOA) was established with the Treaty signed in Dakar by the Heads of State and Government of seven West African countries(Anon., 2020).

The West African Economic and Monetary Union members are Benin, Burkina Faso, Côte d'Ivoire, Mali, Niger, Senegal and Togo. On 2nd May 1997, Guinea Bissau became the 8th Member State of the Union(Anon., 2020).

Furthermore, the main objectives of the West African Monetary and Economic Union WAEMU as follows(Anon., 2020):

- To strengthen the economic and financial competitiveness of the Member States in an open and competitive market environment and within a streamlined and harmonized legal context.

- To secure convergence in the economic performances and policies of Member States by instituting multilateral monitoring procedures.

- To create a common market among the Member States, based on the free movement of persons, goods, services, and capital, the right of establishment of self-employed or salaried persons, as well as a common external tariff and common market policy.

- To institute the coordination of national sector-based policies by implementing joint actions and eventually administering joint policies, particularly on: human resources, territorial administration, agriculture, energy, industry, mines, transport, infrastructure and telecommunications.

- To harmonize, to the extent necessary, all actions taken to ensure the smooth running of the common market, the legislative systems of member states, and particularly the taxation system.

4. OPTIMUM CURRENCY AREA IN WAEMU CONTRIES

In order to test the OCA criteria in WAEMU countries and the achievements that they reached, we will distinguish two approaches the traditional approach and the Cost-

benefit approach (Grauwe, 1999), and then, we will give a table that illustrate the eligibility test for OCA.

First, the traditional approach, which consist of the following criteria: international factor mobility (Mundell, 1961), financial integration, degree of openness of the economy, product diversification, fiscal integration, inflation rates similarity, growth rates similarity, of exchange rate volatility and shocks similarity.
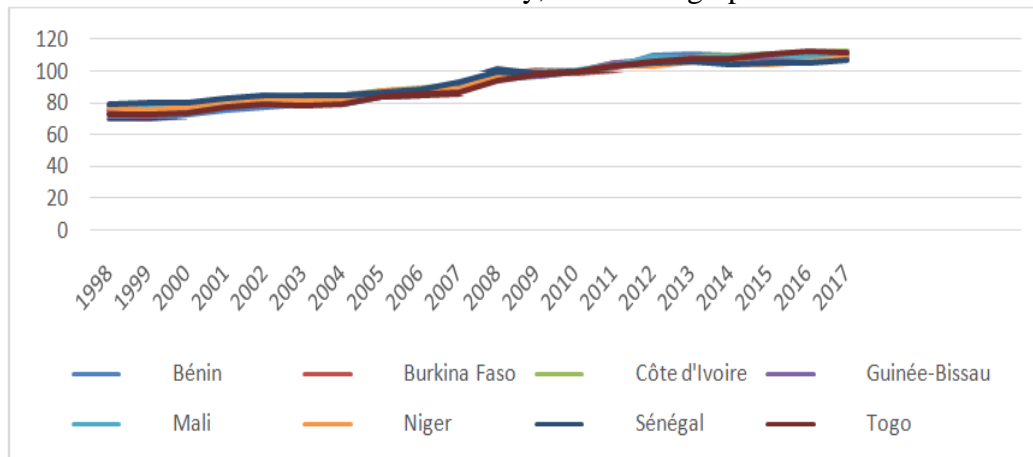
In fact, the WAEMU countries have not reached: a high degree of openness towards the external world and between each other except for the Côte d'Ivoire (see graph 1).
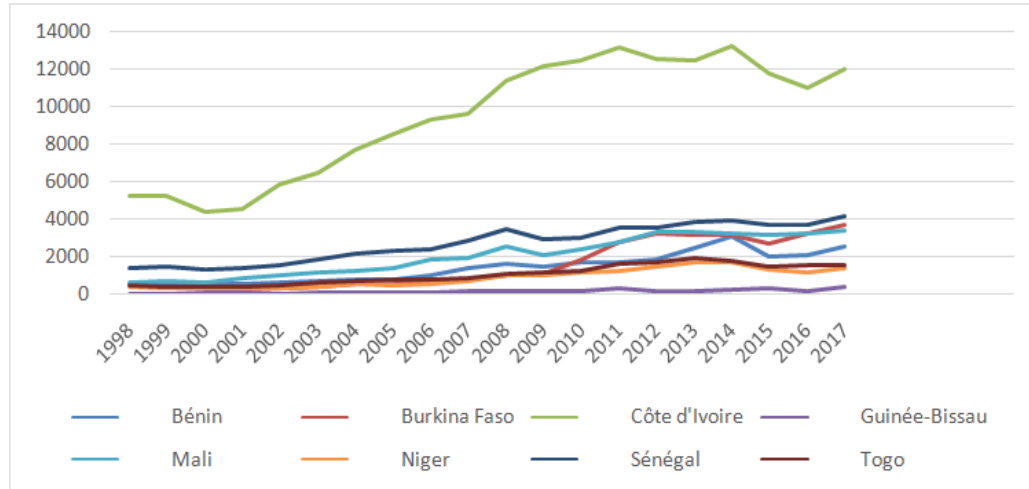
Source :authors' construction based on UNCTADSTAT database.
**Graph 1: Degree of openness of WAEMU countries**

In addition to the inflation rates similarity, which the graph 2 illustrates.

Source: authors' construction based on UNCTADSTAT database.
**Graph 2: Inflation rates of WAEMU countries**

Besides this, there is a dissimilarity of growth rates among the WAEMU countries because the region members are exposed to potential external asymmetric shocks, due to the specialization of many countries' exports in raw materials (including oil), and also to the effects of climatic conditions on agriculture. The graph 3 shows the growth rates.
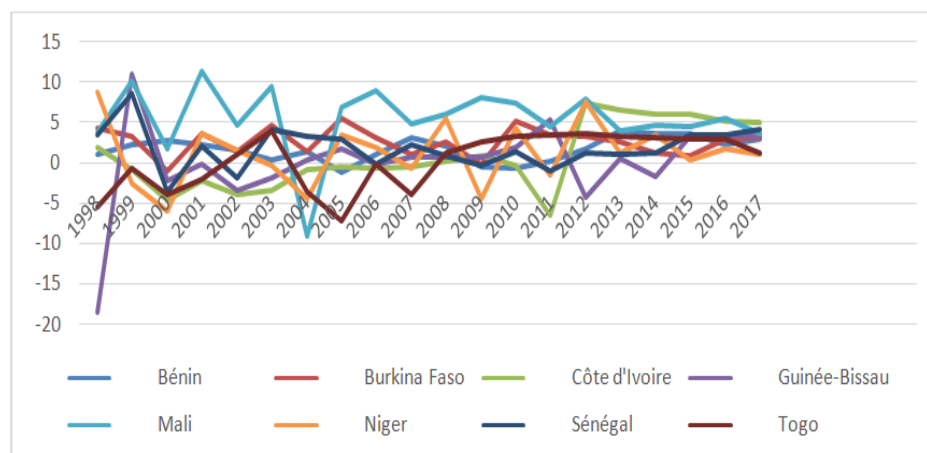
Source: authors' construction based on UNCTADSTAT database.
Graph 3: Growth rates of WAEMU countries

As to the exchange rate similarity, the graph 4 shows an approximation between their exchange rates.
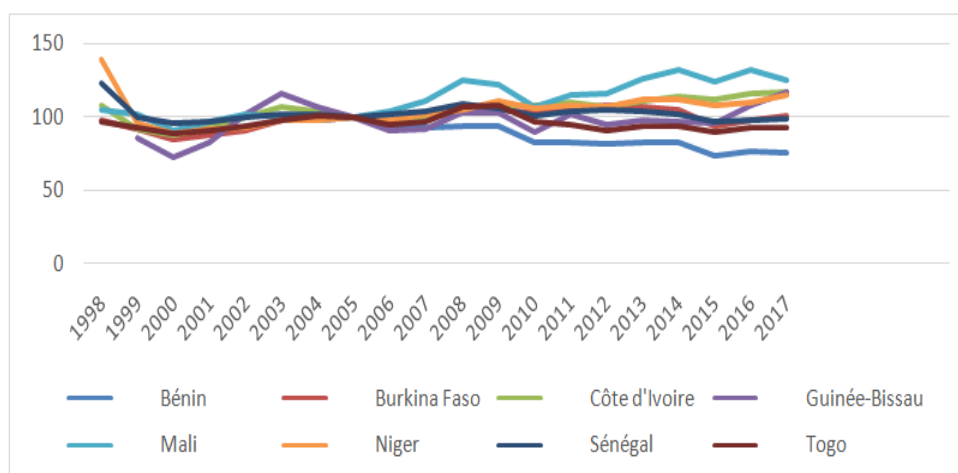
Source :authors' construction based on UNCTADSTAT database.
Graph 4: real effective exchange rate of WAEMU countries

On the other hand, they didn't reach: the international factor mobility because of the difficulty in its movement, financial integration despite the creation of regional stock exchange in Abidjan in 1998, and product diversification because the WAEMU countries are agriculture economies.

Second, the cost-benefit approach consists of assessing the costs and benefits to the country before joining the currency area. In addition, the benefits of the currency area include external and internal benefits, namely: saving foreign exchange reserves, eliminating transaction costs, reducing foreign exchange risk, increasing domestic trade and foreign investment. As for the costs, they include the limitation of the ability to adjust the exchange rate and the loss of individual autonomy in monetary, fiscal and exchange rate policies.

In the WAEMU countries, we found that the benefits outweigh the costs of the currency area, which is due to the similarity of their fiscal and monetary policies, so there is coordination between these two policies and a similarity of external shocks.

Table 1 summarizes the applicability of the OCA in WAEMU countries, based on the criteria of the two approaches.

Table2: Testing the applicability of OCA criteria

OCA criterion	Favorable	Unfavorable
Traditional approach	- inflation rates similarity - exchange rate similarity	- degree of openness - the international factor mobility - growth rates similarity - financial integration - product diversification
Cost-benefit approach	The costs are less than the benefits	/

Source: authors' construction

5. EMPIRICAL RESULTS AND DISCUSSIONS

To start, we build upon the SVARmodel of Bayoumi and Eichengreen (1993) is an extension of the Blanchard and Quah (1989), with some extension in variables.

In this paper, we will apply the SVAR method, which is based on the symmetry and asymmetry of shocks affecting WAEMU countries, and using three variables: Real Gross Domestic Product that represents supply shock, Real Effective Exchange Rate that represents demand shock and consumer price index that represents monetary shock.

Before running the models, we performed a unit roots test in order to see whether the data is stationary or not; fortunately we found all variables at I (0), which we can use SVAR model.

5.1 DATA

The annual values of Real Gross Domestic Product(Y), Real Effective Exchange Rate(R) and consumer price index(P) were extracted from UNCTADSTAT. The sample included eight-8- economies (Benin, Burkina Faso, Côte d'Ivoire, Mali, Niger, Senegal, Togo and Guinea Bissau) and the period of study were 1998 to 2017.

5.2 METHODOLOGY

First we performed a unit roots test in order to see whether the data is stationary or not, Moreover, the optimal number of lags was chosen on the basis of Akaike and Schwartz information criteria. As a general rule, we opted for 1 lag;   Secondly, we evaluated the Stability of a VAR Model, fortunately we found all variables at I (0) and roots are all less than 0, which we can use Structural Vector Auto Regression (SVAR) model. Thirdly, we examined a symmetry and asymmetry of shocks. Finally, we estimated the variance decompositions.

This paper uses a three variables SVAR model to examine the shocks according to the OCA predictions. These variables are Domestic Real GDP (Y), Real Effective Exchange Rate (R) and Domestic Price Level (P).

$$\Delta X_t = A_0 \varepsilon_t + A_1 \varepsilon_{t-1} + A_2 \varepsilon_{t-2} + \cdots = A(L)\varepsilon_t$$

Or

$$\begin{bmatrix} \Delta Y_t \\ \Delta R_t \\ \Delta P_t \end{bmatrix} = \begin{bmatrix} A_{11}(L) & A_{12}(L) & A_{13}(L) \\ A_{21}(L) & A_{22}(L) & A_{23}(L) \\ A_{31}(L) & A_{32}(L) & A_{33}(L) \end{bmatrix} \begin{bmatrix} \varepsilon_{st} \\ \varepsilon_{dt} \\ \varepsilon_{mt} \end{bmatrix}$$

Where, $X_t = [\Delta Y, \Delta R, \Delta P]$ is the vector which includes the variables Domestic Real GDP, Real Effective Exchange Rate and Domestic Price Level. Thus, the matrix is (3,3), and $\varepsilon_t = [\varepsilon_t^s, \varepsilon_t^d, \varepsilon_t^m]$ comprising supply shock, demand shock, and monetary shock respectively.

5.3 SYMMETRIC AND ASYMMETRIC SHOCKS

To determine the symmetric or asymmetric of the shocks between Benin, Burkina Faso, Côte d'Ivoire, Mali, Niger, Senegal, Togo and Guinea Bissau, the study used cross country correlation analysis to examine the co-movements of economic disturbances in the WAEMU Countries. A positive correlation between structural shocks (supply, demand and monetary shocks) shows the symmetry of shocks, while negative correlations show asymmetric shocks. As the correlations get positive and high, for these economies would be more feasible to establish an OCA(Sheikh, et al., 2013).

Table 3 shows the correlation coefficients of domestic supply shocks across WAEMU countries. Most of the supply shocks of WAEMU members are positively correlated; therefore, the adjustments in these different countries will be similar to the supply shocks to which they are exposed.

Table3: Correlations of SupplyShocks

	BEN(Y)	BURK(Y)	COTE(Y)	GUIN(Y)	MALI(Y)	NIGER(Y)	SENE(Y)	TOGO(Y)
BEN(Y)	1							
BURK(Y)	-0.48	1						
COTE(Y)	0.48	-0.02	1					
GUIN(Y)	0.07	-0.05	-0.08	1				
MALI(Y)	-0.18	0.38	-0.02	0.14	1			
NIGER(Y)	-0.05	0.59	0.41	0.50	0.33	1		
SENE(Y)	0.08	0.44	0.29	0.26	0.12	0.11	1	
TOGO(Y)	0.14	-0.01	0.31	0.29	0.27	0.03	-0.08	1

Source: authors' construction using EVIEWS 9.

Table 4 shows that demand shocks between the WAEMU countries are dissimilar with the exception of SENEGAL and Burkina Faso, because the correlation coefficients are negative, which explains that the economies of these countries are not characterized by the similarity of adjustments to the shocks of demand.

Table 4: Correlations of DemandShocks

	BEN(R)	BURK(R)	COTE(R)	GUIN(R)	MALI(R)	NIGER(R)	SENE(R)	TOGO(R)
BEN(R)	1							
BURK(R)	-0.04	1						
COTE(R)	-0.81	0.19	1					
GUIN(R)	-0.14	0.01	0.53	1				
MALI(R)	-0.69	0.29	0.78	0.30	1			
NIGER(R)	-0.76	0.44	0.88	0.37	0.85	1		
SENE(R)	0.42	0.71	-0.30	-0.15	0.03	-0.03	1	
TOGO(R)	0.71	0.23	-0.36	0.14	-0.19	-0.24	0.66	1

Source: authors' construction using EVIEWS 9.

5.4 VARIANCE DECOMPOSITIONS OF GDP

Variance decompositions show the contribution of each shock to the movements in the variables. In other word, it indicates which shock is more predominant in the variability of variables. If the cause of variability is different between countries then the transmission mechanism in countries would be different and they have to follow different policy strategies. Thus, the chance of establishing a common currency area among the countries, they are shown in Table 6.

Table 6: Variance Decompositions of GDP

Countries	Period	Supply Shocks	Demand Shocks	Monetary Shocks
Benin	1st	100.0000	3.351602	0.179876
	5th	70.48392	3.350739	9.449178
	10th	67.01237	3.644367	11.13944
Burkina Faso	1st	0.069595	99.93041	1.612289
	5th	26.41556	47.00078	5.449326
	10th	25.74661	46.41218	5.767805
Cote d'hivoir	1st	25.58027	0.476471	73.94325
	5th	20.73139	3.766465	63.39624
	10th	19.86955	3.691595	63.76192
Guinee	1st	0.094321	15.79177	83.25317
	5th	0.865112	38.57074	44.16366
	10th	1.078749	38.36188	43.76088
Mali	1st	3.222868	2.542127	91.69143
	5th	5.641520	16.98663	35.51280
	10th	5.582068	16.97686	35.33168
Niger	1st	4.175966	30.26170	35.20220
	5th	4.169351	28.71346	27.05741
	10th	4.148649	28.40805	27.05430
Senegal	1st	14.21265	21.03066	28.24514
	5th	8.506508	23.70274	15.22022
	10th	8.429206	23.06036	14.93559
Togo	1st	2.278584	28.37017	32.14433
	5th	2.862084	15.73945	17.39505
	10th	2.851259	16.14190	17.50811

Source: authors' construction using EVIEWS 9.

The obtained results indicate that supply shocks have contributed mainly to GDP variability in Benin, Burkina and Cote d'hivoir. Demand Shocks have contributed mainly to GDP variability in Burkina Faso, Guinee, Niger, Senegal, Senegal and Monetary Shocks mainly to GDP variability in Cote d'hivoir, Guinee Bissau, Mali, Niger, Senegal and Togo. In general, the results show that the sources of variations in GDP.

6.Conclusion

In this paper, we attempted to examine whether the West African Economic and Monetary Union (WAEMU) countries constitute an optimum currency area, using the Structural Vector Auto Regression (SVAR) model, during the period from 1998 to 2017.

The obtained results shows that the correlation analysis reveals that the supply and monetary shocks are symmetric but demand shock is asymmetric, according to variance decomposition analysis, there is dissimilarity in the contribution of each shock in the real GDP of the WAEMU countries, which indicate that the WAEMU economies are dissimilar. Based on these results, the WAEMU countries not satisfy all the pre-conditions for the establishment of OCA. However, the failure of the realization of the optimum

currency area criteria among these countries based on the one hand on economic factors and on other hand on political factors.

We conclude that at the present time the West African Economic and Monetary Union (WAEMU) countries as a whole does not meet the prerequisite conditions of an OCA, which confirms that, the West African Economic and Monetary Union is entirely not an optimum currency Area (OCA).

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