The proposed eco: should West Africa proceed with a common currency?

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THE PROPOSED ECO: SHOULD WEST AFRICA PROCEED WITH A COMMON CURRENCY?

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ABSTRACT

This paper investigates the rationality of proceeding with a common currency in West Africa by testing for symmetry and speed of adjustment to four underlying structural shocks among a pair of 66 ECOWAS economies. The findings reveal that there is relatively high degree of symmetry in the responses of the economies to external disturbances, while about 85 percent of the correlations in supply, demand and monetary shocks among the countries are asymmetric. The size of the shocks and speed of adjustment among countries are also dissimilar, suggesting that ECOWAS should not yet proceed with the eco, since the costs will outweigh the benefits.

Keywords: Monetary union, Structural VAR, ECOWAS, West Africa

1. INTRODUCTION

Inspired by the success of the euro as a common currency of the European Monetary Union, The Economic Community of West African States (ECOWAS) proposed to launch a common currency for 'the community' called the *eco* with the postponed inception date being June 2014. ECOWAS is a regional group of 15 West African countries[1] which already includes a monetary union of the former French colonies known as West African Economic and Monetary Union (WAEMU)[2]. In April 2000, ECOWAS adopted a strategy of a two-track approach to the adoption of a common currency in the whole area. As a first track, the non-WAEMU members of ECOWAS were to form a second monetary union known as the West African Monetary Zone (WAMZ)[3] by July 2005, with the second track being the subsequent merging of WAEMU and WAMZ to form a single currency union in the region with a common currency- the *eco*.

The feasibility of a wider monetary unification in ECOWAS poses several economic and institutional peculiarities as discussed in detail by Tsangarides and Qureshi (2008) and Masson and Pattillo (2005). First, it is unlikely that the French Treasury's guarantee of convertibility of WAEMU's currency (the CFA franc) to the euro at a fixed parity would continue for a monetary union of the expected size. Second, with politically dependent central banks there is an incentive for monetary policy to be used to extract seigniorage which creates distortions and disincentives for countries to join the union since they are likely to lose the seigniorage privilege. Other issues include the membership of the relatively gigantic Nigerian economy and the implications of its fiscal activities, and more recently, the implications of the global financial crises. Also, given the recent debt and financial crisis facing members of the European Monetary Union (EMU), a thorough appraisal of the feasibility of the proposed eco is desirable to ascertain the realizability and sustainability of the proposed union.

The standard framework used by economist to examine the desirability of a monetary union is the Optimal Currency Area (OCA) theory, pioneered by Mundell (1961) and McKinnon (1963) and elaborated by Krugman (1990) (see De Grauwe (2005) and Frank and Rose (1996) for an exposition). The theory places emphases on four key criteria that would impinge on the benefits of adopting a common currency. They are: 1) the degree of openness and intra-regional trade, 2) the degree of labour and factor mobility, 3) the symmetry of shocks across countries and 4) the system of risk sharing. Depending on the extent to which these conditions are met, individual countries may enjoy benefits or suffer losses by joining a currency union. Some of the benefits accruable include: lower transaction costs, price stabilization, improved efficiency of resource allocation, enhanced trade and increased access to factor, labour and financial markets, among others. Costs include loss of siegnorage privilege and the sovereignty

to maintain national monetary and exchange rate polices (Tsangarides and Qureshi, 2008; Karras, 2006; De Grauwe, 2005). Technically, the costs and benefits that may accrue to members of a monetary union can be measured by the symmetry (positive correlation) or asymmetry (negative correlation) of responses to exogenous disturbances affecting the members and the speed with which the economies adjust back to equilibrium after a shock. Costs tend to be lower if the disturbances are symmetric and markets are flexible i.e., factor, labour and financial markets are quick to adjust back to equilibrium, and higher conversely.

A few recent studies have investigated the costs and benefits of adopting a common currency in sub-Saharan Africa and specifically in West Africa. Most of them use a vector auto regressive (VAR) model to estimate the asymmetry of shocks accruing to different sub-regions in Africa. In different works, Bayoumi and Ostry (1997), Fielding and Shields (2001, 2003) and Hoffmaister et al. (1988) find a low degree of correlation between inflation shocks across countries and that terms of trade shocks have greater influences on macroeconomic fluctuations in CFA countries than in other sub-Saharan African countries. Focusing on the Southern African Development Community (SADC), Huizinga and Khamfula (2004) find a low degree of symmetry in real exchange rate shocks across countries. For East Africa, Buigut and Valev (2005) test the symmetry of underlying structural shocks in the region and find that supply and demand shocks are generally asymmetric, although their results show that the speed and magnitude of adjustments to shocks is similar across the countries, they advocate further integration of the economies for an eventual monetary union in the future.

Coming back to the ECOWAS region, Addison et al. (2005) apply a VAR model to WAMZ countries and find very low cross country correlations of terms of trade shocks and real exchange rate shocks. Debrun et al. (2005) use a conjectured model about the

fiscal-monetary policy mix in the region to assess the potential for monetary integration in ECOWAS. Their findings provide evidence of fiscal heterogeneity and abrogates Nigeria's membership of the union as non-beneficial unless it was accompanied by effective containment of Nigeria's financing needs. Benassy-Quere and Coupet (2005) use crisp cluster analysis to examine different monetary arrangements in sub-Saharan Africa. Their results again suggest that Nigeria should not form part of WAMZ, while the creation of the enlarged WAEMU and WAMZ zone in ECOWAS appear to be more economically viable without Nigeria. Tsangarides and Qureshi (2008) update the work of Benassy-Quere and Coupet (2005) by applying hard and soft clustering algorithms to examine the suitability of the proposed monetary union in West Africa. Their results reveal considerable dissimilarities in the economic characteristics of West African countries. Again, among the WAMZ countries, they particularly report a lack of homogeneity, with Nigeria and Ghana appearing as independent singletons. Lastly, Houssa (2008) use a dynamic factor model to examine the economic costs of a monetary arrangement in West Africa. His findings show negative and low positive correlations among supply disturbances across the countries, with greater similarity in the demand shocks among WAEMU countries. Other papers that have examined the feasibility of a monetary union in West Africa include Masson and Patillo (2001), Ogunkola (2005) and Yehoue (2005).

Given the studies conducted so far, this paper applies an extended method with updated information based on a multivariate structural VAR model to assess the feasibility and desirability of proceeding with a common currency union in ECOWAS. The objective of the study is to investigate the symmetry of shocks and speed of adjustment among countries to external shocks, domestic supply shocks, demand shocks and monetary shocks. This study brings a different contribution to the literature in many ways. First,

rather than using the conventional two variable modelling approach consisting of only supply and demand shocks, I use a four-variable structural autoregression model to capture the correlation of external shocks including the global financial crises and the correlation of domestic monetary shocks among the countries, which has hitherto been neglected in previous research. In addition, the paper also examines the extent to which the individual economies satisfy the other three criteria of forming an OCA i.e.: intra-trade and openness, labour and factor mobility and fiscal/ geo-political conditions.

The balance of the paper is as follows. Section 2 examines the economic profile of all the ECOWAS economies, with a view to identifying patterns and dissimilarities. Section 3 assesses the extent to which ECOWAS economies satisfy the conditions for an optimal currency area. Section 4 contains the methodology while Section 5 presents the results and the conclusion is contained in Section 6.

2. ECONOMIC PROFILE OF WEST AFRICAN ECONOMIES

A similar profile of economic development is crucial in facilitating integration among potential members of a currency union. Similarities in economic structure, social structures and external relations make policy synchronization easier. Table 1 presents the economic profile of ECOWAS economies as at 2010. The table indicates that the range of economic growth among the countries is wide. With Benin growing at the slowest rate of 3% per annum and Burkina Faso growing at the fastest rate of 9.2% per annum, there is likely to be some dragging-effect within a monetary union, with the slow growing economies dragging the fast growing ones down and vice-versa. However, the production structure for most of the economies seems to be similar, with

an influential agricultural sector contributing an average of 33.4 to GDP and a weak manufacturing sector contributing an average of 8.1% of GDP.

The profile of each country's external balances are highly variegated with Sierra Leon having the highest current account deficit at 16.8 percent of GDP and an external debt stock of 133per cent of GNI. Burkina Faso has the highest external debt stock at 542 percent of GDP while Nigeria has the lowest at 12.5 percent of GDP. With an average external debt stock of 140 percent of GNI, most West African economies have a critical and unsustainable debt profile. Tax revenue as a percentage of GDP in the region seem to be similar in most of the countries with an average of 13 percent. Nigeria however is an exception as tax revenue is less than one percent of GDP. This can be explained by the predominant oil-export base of its economy.

The structure and pattern of trade in the ECOWAS economies are generally similar. For most of the economies, the trade to GDP ratio appear to be significant with an average value of 64.6 percent. Social indicators such as life expectancy (which is an indicator of health quality) and poverty headcount among the economies are highly congruous. However, the malnutrition and literacy rates in these economies are highly variegated. For example, literacy rate (which can be used as a crude estimator of the quality of the labour force) is as low as 15.1 percent of the population in Niger, while it is as high as 60.4 percent of the population in Ghana.

Table 1 Economic profile of ECOWAS countries (2010)

	BEN	BFA	CIV	GMB	GHA	GIN	GNB	MLI	NER	NGA	SEN	SLE	TGO	*Avg*
Economic structure														
GDP growth (annual %)	3	9.2	3	5	6.2	1.9	3.5	4.5	8.8	7.9	4.2	4.9	3.4	*4.9*
GDP per capita (constant 2000 US$)	1424	1127	1703.6	1265	1469	978.4	1064	955	653	2136	1732	742	895	*1242*
Inflation, consumer prices (annual %)	2.3	-0.8	1.7	5	10.7	15.5	2.5	1.1	0.8	13.7	1.3	16.6	1.8	*5.6*
Agriculture, value added (% of GDP)	32.2	33.3	22.9	26.9	30.2	13	57.3	36.5	39.6	32.7	16.7	49	43.5	*33.4*
Manufacturing, value added (% of GDP)	7.5	13.6	19.2	5	6.5	4.8	10.6	3.1	6.3	2.6	12.8	3.7	10.1	*8.1*
Industry, value added (% of GDP)	13.4	22.4	27.4	15.7	18.6	47.4	13.1	24.2	17.1	40.7	22.1	20.7	23.9	*23.6*
Services, etc., value added (% of GDP)	54.4	44.4	49.7	57.3	51.1	39.6	29.6	39.1	43.2	26.6	61.1	30.4	32.6	*43*
Real effective exchange rate index (2005 = 100)	n.a	n.a	99.7	101.1	97.8	n.a	n.a	n.a	n.a	118.1	n.a	99.8	98.2	*102*
Internal and External Balances														
Current account balance (% of GDP)	-8	-21	7.2	6.5	-7.2	-7.2	-3.3	-7.3	-12.1	1.3	-14.2	-16.8	-5.5	*-2.7*
External debt stocks (% of GNI)	55.3	542	100	158.1	72.3	212	n.a	80.1	99.1	12.5	84.7	133	135	*140*
Net ODA received (% of GNI)	10.3	13.5	10.7	18.5	6.1	5.8	17.8	11.5	9	1	8	24.3	17.7	*11.9*
Broad money (% of GDP)	37.5	26.3	34	56.2	27.1	16.4	25.8	26.5	19.1	36.7	37.5	25.8	42.7	*31.7*

Tax revenue (% of GDP)	16.1	12.9	16.6	18.2	12.5	11.1	n.a	14.7	11.3	0.3	16.1	11	15.4	*13*
Gross national expenditure (% of GDP)	114	115	95.4	119.4	113	104.4	121.4	109.4	109	n.a	119.5	112	117	*113*
Trade (% of GDP)	41.9	38.3	77.2	78	63.7	74.4	81	61.8	39.3	66	68.6	46.6	103	*64.6*
Social Indicators														
Life expectancy at birth, total (years)	53.4	53.5	53.1	56.7	62.5	51.6	45.9	49.5	53.4	50.2	57.6	46.4	54.8	*53*
Poverty headcount ratio at $2 a day (PPP) (% of pop.)	75.3	81.2	46.8	56.7	56.3	87.2	77.9	77.1	75.9	83.9	71.3	76.1	69.3	*71.9*
Malnutrition prevalence (% of children under 5)	20.2	37.4	16.7	15.8	13.9	22.5	17.4	27.9	39.9	26.7	14.5	28.3	22.3	*23.3*
Literacy rate, adult total (% of people ages 15 and above)	29	21.6	45.3	35.8	60.4	28.1	38	18.2	15.1	49.8	38.7	30.1	44.4	*35*

Source: World Development Indicators, World Bank 2011

Note: When figures for 2010 are not available, the most recent available figures are used.

Keys: N.A- not available, BEN-Benin, BFA- Burkina Faso, CIV- Cote d' Ivories, GMB- The Gambia, GHA-Ghana, GIN-Guinea, GNB- Guinea Bissau, MLI- Mali, NER-Niger, NGA-Nigeria, SEN- Senegal, SLE- Sierra Leon TGO- Togo.

3. DO ECOWAS ECONOMIES HAVE THE NECESSARY CONDITIONS TO FORM AN OPTIMAL CURRENCY AREA?

(a) Criterion 1: trade and openness

The literature on optimal currency area emphasises trade as the main channel through which benefits from a common currency will be enjoyed. The more countries trade with each other, especially in a particular region, the more they will value regional exchange rate stability. In other words, the larger the volume of intra-regional trade, the greater the benefits for countries in a region to form a currency union. In this regard, currency unions are expected to be welfare enhancing because they reduce the potential disruptions to intra-regional trade brought about by relative price fluctuations and disturbances in bi-lateral exchange rates. Moreover, Frankel and Rose (2000) provide empirical evidence to show that trade has positive impacts on growth and a common currency encourages trade in turn.

Table 2 depicts the trade concentration and diversification indices of ECOWAS economies in 2009 and 2010. The pattern of concentration and diversification among the countries are variegated. Togo had the lowest trade concentration index in 2009 and maintained the status in 2010. While Guinea-Bissau had the highest concentration index at 0.89 followed by Guinea at 0.61, indicating that in 2009, these economies had high product and trade direction concentration. The diversification index for most of the economies in 2010 is relatively high, with Togo having the least at 69% and Mali with the highest at 87%. Following the diversification criterion, one can conclude that the ECOWAS region would likely benefit from adopting a common currency.

Table 2 Trade concentration and diversification indices for ECOWAS economies 2009-2010

Economy	2009 Absolute Value	2009 Concentration Index	2009 Diversification Index	2010 Absolute Value	2010 Concentration Index	2010 Diversification Index
Benin	140	0.35	0.75	138	0.37	0.75
Burkina Faso	93	0.52	0.81	118	0.50	0.82
Côte d'Ivoire	166	0.36	0.71	180	0.35	0.70
Gambia	18	0.35	0.72	23	0.32	0.69
Ghana	222	0.46	0.83	228	0.46	0.82
Guinea	92	0.61	0.80	92	0.44	0.81
Guinea-Bissau	12	0.89	0.75	12	0.89	0.75
Mali	167	0.57	0.83	137	0.63	0.87
Niger	84	0.43	0.86	100	0.38	0.80
Nigeria	250	0.83	0.84	185	0.77	0.80
Senegal	195	0.24	0.72	190	0.27	0.75
Sierra Leone	217	0.24	0.64	220	0.27	0.71
Togo	167	0.20	0.69	165	0.21	0.69

Source: UNCTAD, UNCTADstat

(b) Criterion 2: labour and factor mobility

Mundell (1961) argues that an optimal currency area is a group of countries in which labour and factor mobility is relatively high. If for example a member of an OCA is hit by negative asymmetric demand shocks, then labour and other factors of production will move from this country to other member countries, thereby restoring employment to its original level. With high labour and factor mobility, there will be movements in the region so as to equalize wages and factor prices from areas with excess supply to areas with deficit supplies.

Labour mobility varies across ECOWAS economies; however, there is unfortunately scant official data on labour mobility among West African economies. While labour mobility is relatively high between Nigeria and Benin[4], there is very little mobility between most of the other economies. Ghana is relatively immobile because of some

legal immigration and social security hurdles which are more relaxed in other economies.

Table 3 Total labour force and agric labour force in ECOWAS economies 2005-2010 (thousands)

YEAR		2005	2006	2007	2008	2009	2010
ECONOMY	SECTOR						
Benin	All sectors	3212	3334	3456	3580	3698	3825
	Agric	1556	1582	1607	1631	1653	1674
Burkina Faso	All sectors	6275	6488	6699	6908	7137	7366
	Agric	5677	5892	6120	6351	6589	6835
Côte d'Ivoire	All sectors	7522	7709	7911	8126	8367	8606
	Agric	3053	3052	3057	3062	3068	3074
Gambia	All sectors	681	701	722	743	765	788
	Agric	535	550	565	581	596	612
Ghana	All sectors	9851	10114	10379	10647	10944	11232
	Agric	5411	5516	5664	5790	5922	6058
Guinea	All sectors	4397	4500	4610	4720	4850	4988
	Agric	3606	3668	3731	3801	3879	3964
Guinea-Bissau	All sectors	605	617	631	645	660	676
	Agric	449	457	462	470	478	486
Mali	All sectors	3388	3480	3578	3672	3767	3869
	Agric	2420	2464	2511	2551	2592	2635
Niger	All sectors	4198	4326	4463	4592	4803	4973
	Agric	3639	3764	3895	4036	4183	4336
Nigeria	All sectors	44906	46110	47330	48613	49998	51349
	Agric	12376	12341	12312	12285	12257	12230
Senegal	All sectors	4769	4923	5078	5242	5408	5580
	Agric	3454	3541	3642	3742	3845	3952
Sierra Leone	All sectors	1952	2007	2055	2102	2141	2188
	Agric	1215	1241	1261	1281	1300	1320
Togo	All sectors	2594	2680	2772	2866	2962	3059
	Agric	1329	1352	1375	1399	1424	1449

Source: UNCTAD, UNCTADstat

Table 3 depicts the structure of the labour force in ECOWAS economies, showing clearly the thousand number of labour employed in all sectors and those employed in the agricultural sector between 2005 and 2010. An examination of the structure indicates that agriculture is the dominant employer of labour in all the economies accounting for between 53 and 95 percent of the employed labour in these economies.

As a result of the high concentration of labour in the agricultural sector (which is a primary sector that does not necessarily require skilled labour), one may not expect perfect labour and factor mobility in the near future because primary sectors are not skilled-labour intensive and they are not usually affected by domestic demand shocks rather they are affected by exogenous and mostly climatic shocks which are likely to cut across the region. Nevertheless, the parties to the conference (i.e. ECOWAS governments) would need to install institutional frameworks that will remove hurdles to labour mobility, something similar to what is obtainable in the Euro zone.

(c) Criterion 3: fiscal transfers and geo-political factors

At the present, no official fiscal transfer mechanisms exists in the region except for some form of official and military aid provided by Nigeria to some other countries in the region. This issue has to be addressed before the actual take-off of the common currency regime. While the economic criteria discussed above are essential for determining the suitability of a common currency regime in West Africa, the geo-political factors play an equally important role in this process. Two developments in the international environment make the prospects of a successful monetary union more challenging and at the same time needful. First is the global financial crisis which has weakened the growth in the world economy, thereby adversely affecting the export performance of the region. Second, with the proliferation of regional economic blocs and growing protectionism in the developed and developing regions, West African countries may find it difficult to gain access to these markets. Given these trends, it will be beneficial for West African economies to focus on intra-regional trade. Again, this

may not be adequate because of the primary product based nature of most of the economies in the region.

4. METHODOLOGY

(a) The model

As already mentioned, to ascertain the appropriateness of proceeding with a common currency in West Africa, I examine the symmetry and/or asymmetry of responses to macroeconomic shocks among countries in the region with a view to ascertain whether the ECOWAS region meets the criteria for an optimal currency area (OCA). Blanchard and Quah (1989) provided the empirical foundation for this examination, and their model has consistently been refined in subsequent studies. For examples, see Bayoumi (1992), Bayoumi and Eichengreen (1994), Saxena (2005), Buigut and Valev (2005), Huang and Guo (2006), Houssa (2008). The Blanchard-Quah model is premised on the AD-AS framework in which demand shocks have no effects on output in the long-run, while supply shocks can influence output and the price level both in the short and long run. The decision whether to adopt a common currency or not is determined by the symmetry or asymmetry of the correlation of shocks affecting the participating economies.

Following Mundell's (1961) arguments, countries facing positively correlated economic shocks will be better suited for a currency union because this will allow the use of union-wide policies to correct distortions. However, if the underlying shocks are highly idiosyncratic, it would not be ideal to proceed with a common currency since the costs are likely to be very large and policy synchronization will be ineffective.

Rather than the conventional two-shock (demand and supply) model which has been applied to study the appropriateness of a currency union in Africa (see Alagidede et al., 2011: Houssa, 2008; Buigut and Valev, 2005; Kose and Reizman, 2001; Huizinga and Khamfula, 2004), I consider a four-shock model similar to the one used by Huang and Guo (2006) to study the appropriateness of a common currency in East Asia. The shocks consist of an external (global) shock, and three domestic shocks including; domestic demand shock, domestic supply shock and a monetary shock. The rational for incorporating an external global shock into the model is to account for the primary export-oriented structure of West African economies. Including a monetary shock is important to enable us estimate how ECOWAS economies respond to changes in their real effective exchange rate. Such an assessment is useful for the contemplation of the choice of an optimal exchange rate policy for the proposed eco.

The framework is as follows. Consider a structural moving average of a vector of variables X_t, and an equal number of shocks ε_t, so that

$$X_t = A_0\varepsilon_t + A_1\varepsilon_{t-1} + A_2\varepsilon_{t-2} + \cdots = \sum_{i=0}^{\infty} A_i\varepsilon_{t-i} \qquad (1)$$

In matrix form, the model can be written as

$$X_t = \boldsymbol{A}(\dot{L})\varepsilon_t \qquad (2)$$

Where $X_t = [\Delta y_t^*,\ \Delta y_t,\ \Delta e_t,\ \Delta p_t]'$, comprising world real GDP denoted by y_t^*, domestic real GDP denoted by y_t, real exchange rate denoted by e_t and domestic price level denoted by p_t all in log difference forms. $\boldsymbol{A}$ is a 4 * 4 matrix that defines the impulse responses of endogenous variables to structural shocks $\varepsilon_t = [\varepsilon_t^{s*}, \varepsilon_t^s, \varepsilon_t^d, \varepsilon_t^m]'$ consisting of external world supply shock (ε_t^{s*}), domestic supply shock (ε_t^s), domestic

demand shock (ε_t^d), and monetary shock (ε_t^m) respectively. It is assumed that they are serially uncorrelated and orthonormal, with a variance-covariance matrix normalized to the identity matrix.

(b) The Structural decomposition

Since we specified world real GDP, domestic real GDP, real exchange rate and inflation as consisting of four types of shocks, we decompose the series as follows.

$$\Delta y_t^* = A_{11}(L)\varepsilon_t^{s*} \tag{3}$$

$$\Delta y_t = A_{21}(L)\varepsilon_t^{s*} + A_{22}(L)\varepsilon_t^{s} + A_{23}(L)\varepsilon_t^{d} + A_{24}(L)\varepsilon_t^{m} \tag{4}$$

$$\Delta e_t = A_{31}(L)\varepsilon_t^{s*} + A_{32}(L)\varepsilon_t^{s} + A_{33}(L)\varepsilon_t^{d} + A_{34}(L)\varepsilon_t^{m} \tag{5}$$

$$\Delta p_t = A_{41}(L)\varepsilon_t^{s*} + A_{42}(L)\varepsilon_t^{s} + A_{43}(L)\varepsilon_t^{d} + A_{44}(L)\varepsilon_t^{m} \tag{6}$$

The decomposition presented in Equations (3) to (6) is simple and intuitive. They imply that world GDP is exogenous to country-specific domestic shocks, while all domestic variables are affected by shocks to global output. To further refine the decomposition, we rely on underlying economic theory to make assumptions about the effects of domestic shocks on each of the other domestic variables.

(i) Global real GDP is posited to be strictly exogenous. This assumption is plausible because all the ECOWAS economies are relatively small and open economies, having no significant contribution to global output. This will probably not have been appropriate if a country like China were to be a participating member.

(ii) Domestic real GDP is affected only by shocks in global real GDP and shocks from itself in the long-run. However, it is not affected by monetary shocks ε_t^m nor demand shocks ε_t^d. This restriction is in line with Balnchard's natural rate hypothesis and it implies that $\sum_{i=0}^{\infty} A_{21i} \neq 0,\ \sum_{i=0}^{\infty} A_{22i} \neq 0, \sum_{i=0}^{\infty} A_{23i} = 0$ and $\sum_{i=0}^{\infty} A_{24i} = 0$.

(iii) The real effective exchange rate is assumed to be affected by shocks from the global economy, domestic supply shocks and domestic demand shocks, but it is not affected in the long-run by a monetary shock. This restriction implies that $\sum_{i=0}^{\infty} A_{34i} = 0$.

(iv) The domestic price level is assumed to be strictly endogenous, implying that the prices are affected by shocks in global GDP, domestic supply and demand shocks and monetary shocks too.

The entire model can be rewritten as a system of structural equations thus

$$\begin{bmatrix} \Delta y_t^* \\ \Delta y_t \\ \Delta e_t \\ \Delta p_t \end{bmatrix} = \begin{bmatrix} A_{11}(L) & 0 & 0 & 0 \\ A_{21}(L) & A_{22}(L) & 0 & 0 \\ A_{31}(L) & A_{32}(L) & A_{33}(L) & 0 \\ A_{41}(L) & A_{42}(L) & A_{43}(L) & A_{44}(L) \end{bmatrix} \begin{bmatrix} \varepsilon_t^{S*} \\ \varepsilon_t^s \\ \varepsilon_t^d \\ \varepsilon_t^m \end{bmatrix} \tag{7}$$

Following Amisano and Giannini (1997) and Huang and Guo (2005) estimates from the structural moving average model in Eq. (1) are not directly recovered, rather they are obtained by estimating a reduced form VAR model for the observed variables. In the structural VAR model, the external variable follows an autoregressive process, while the three domestic variables are modelled as functions of their own lags and lags of the external variable. Thus:

$$\Delta y_t^* = \tau + \sum_{i=1}^{n} \Gamma_i \Delta y_{t-i}^* + \mu_t^1 \quad (8)$$

and

$$X_t = \tau + \sum_{i=1}^{n} \Gamma_i X_{t-i} + \sum_{i=1}^{n} \Omega_i \Delta y_{t-i}^* + \mu_t \quad (9)$$

Where $X_t = [\Delta y_t, \Delta e_t, \Delta p_t]'$, Γ_i and Ω_i are coefficient matrixes, while μ_t^1 and $\mu_t = [\mu_t^2, \mu_t^3, \mu_t^4]$ are a mixture of structural innovations of reduced or observed residuals. Given that the first difference transformation will make the variables stationary, in order to obtain the relationships between reduced form innovations for the domestic variables and the corresponding structural stocks, we can write Eq. (9) as a MA representation of the form:

$$X_t = \theta + \sum_{i=1}^{n} G_i \mu_{t-i} \quad (10)$$

Where

$$\theta = (I - \sum_{i=1}^{n} \Gamma_i)^{-1} (\tau + \sum_{i=1}^{n} \Omega_i \Delta y_{t-i}^*) \quad (11)$$

The G_i is called impulse response and procured form:

$$\sum_{j=0}^{\infty} G^j L^j = (I - \sum_{i=1}^{n} \Gamma_i L^i)^{-1} \quad (12)$$

Recovering structural shocks involves a special decomposition of reduced-form innovations, which is achieved by OLS estimation of Eq. (9). Since $G_0 \mu_t = A_0 \varepsilon_t$ and $G_0 = I$ (an identity matrix), it follows that $\mu_t = A_0 \varepsilon_t$. This represents a system of 16

equations. In accordance with the assumption that the structural shocks $\varepsilon_t = [\varepsilon_t^{s*}, \varepsilon_t^s, \varepsilon_t^d, \varepsilon_t^m]'$ are serially uncorrelated and orthonormal, we can get: $\Phi = E[\mu_1\, \mu_t'] = A_0 A_0'$. These restrictions together with the other six restrictions imposed from economic theory imply that $A(\boldsymbol{L})$ is the unique Choleski lower triangle. Thus, it is sufficient to identify the structural A_i matrix and the time series of structural shocks $\varepsilon_t = [\varepsilon_t^{s*}, \varepsilon_t^s, \varepsilon_t^d, \varepsilon_t^m]'$ by using $\varepsilon_t = A_0^{-1}\mu_t$. in other words, structural shocks can be recovered as linear combinations of reduced-form innovations. By computing the correlation of the shocks in West African economies, we can evaluate the feasibility of a common currency union in West Africa. Positive and significant (above 50%) correlation coefficients signals that countries will require a synchronous policy response which is crucial for a centralized monetary policy management in the region.

(c) The data

I utilize annual data for 12 ECOWAS economies[5], namely Benin (BEN), Burkina Faso (BFA), Cote d'Ivoire (CIV), Gambia (GMB), Ghana (GHA), Guinea-Bissau (GNB), Mali (MLI), Niger (NER), Nigeria (NGA), Senegal (SEN), Sierra Leone (SLE) and Togo (TGO). Liberia, Cape Verde and Guinea are excluded from the analysis. This is because Liberia declined to participate in the project although they are now beginning to indicate interest in joining, Cape Verda has a currency that is directly linked to the Euro and for Guinea we did not obtain sufficient data series for the analysis. The sample covers the period between 1970 and 2010. This time frame gives us the benefit of also accounting for the effects of the 2007/08 global financial shocks (which is an example of an external global shock) on the domestic economies.

The data sets are extracted from two major sources: the International Financial Statistics IFS CD-ROM published by the IMF and World Development Indicators CD-ROM published by the World Bank. Domestic output is proxied by country GDP at 2000 constant US$. The real exchange rate series are obtained from IMF's IFS and it is computed based on unit labour cost for a basket of 26 advanced countries[6] and the Euro area as a group. All the variables are logarithimized

5. THE RESULTS

(a) Preliminaries

Before implementing the multivariate structural VAR model, it is necessary to first scan the variables for integration properties. I employ the ADF-GLS test for unit root in which the data are detrended so that explanatory variables are taken out of the data prior to running the test regression. This test has the advantage of increased power gains associated with the detrending (Ng and Perron, 2001). The results of the unit root test for the natural logarithm of global GDP, domestic GDP, real effective exchange rate and price level indicates that these variables for each of the countries contains unit roots at levels. However, after taking the first differences of these variables, they all became stationary although this occurred at various levels of statistical significance. Following the results, I conclude that all the time series used in the model are integrated of order one, i.e. they are $I(1)$ stationary.

In other to ensure that the estimates from the structural VAR are consistent, it is necessary to utilize the optimal lag length in the estimation. Lag order 2 is used in the estimation following the result of the lag order selection test using Hannan-Quinn

Information Criterion, and this also helps to capture the dynamics of business cycles in the region.

(b) Correlation of structural shocks

As already specified, I examine the pairwise correlations of disturbances affecting ECOWAS economies. Along this line, I concentrate on the correlations of four underlying structural shocks: external shocks, supply shocks, demand shocks and monetary shocks. The decision criterion to assess the symmetry and asymmetry of the correlations of the structural shocks is as follows. If the correlation is positive, the shocks are categorized as symmetric or synchronous. On the other hand, if the correlation turns out to be negative or not statistically different from zero or less than 0.5, the shock is categorized as asymmetric. To test for the statistical significance of the correlation results, I use the Kendall and Stuart (1973) correlation statistic to test whether the correlation is statistically significant at 5% level. The statistic $(1/2)\ln[(1+r)/(1-r]$ has a distribution that approaches normality with a mean of $(1/2)\ln[(1+\rho)/(1-\rho]$ and a variance of $1/(N-3)$. Where r is the estimated correlation coefficient, ρ is the null value (i.e. 0) of the correlation coefficient and *N* is the number of observations. Hence, I test the null hypothesis that the correlation coefficient is equal to zero, that is, $(\rho = 0)$. In the following subsections, the results of the correlations of the four structural shocks among the ECOWAS economies for 1970 – 2010 are reported and discussed.

(i) Correlation of external shocks

Table 5 contains the correlations of external shocks to ECOWAS economies. The positive and statistically significant results are underlined. From the results, it is obvious that the correlations of external shocks are highly significant for most of the ECOWAS economies except for Burkina Faso, Gambia and Guinea-Bissau. The likely reason why external shocks to most of the countries are highly correlated could be as a result of the similar primary product oriented export base of most of the countries. Ceteris paribus, the higher the correlation of shocks from an external source, the greater will be the benefits for countries in the region to form a currency union. This is because under a single currency, the potential bilateral exchange rate distortions brought about by external disturbances are greatly reduced, if not totally eliminated. Following this criterion all the other economies but Burkina Faso, Gambia and Guinea-Bissau will be better-off adopting a common currency.

Table 5 Correlation of external shocks

	BEN	BFA	CIV	GHA	GMB	GNB	MLI	NER	NGA	SEN	SLE	TGO
BEN	1											
BFA	-0.59	1										
CIV	0.55	0.01	1									
GHA	0.82	-0.39	0.74	1								
GMB	-0.59	0.93	0.11	-0.2	1							
GNB	-0.15	0.78	0.35	0.22	0.88	1						
MLI	0.95	-0.59	0.5	0.91	-0.48	-0.02	1					
NER	0.89	-0.57	0.35	0.67	-0.58	-0.16	0.87	1				
NGA	0.76	-0.42	0.67	0.97	-0.2	0.21	0.89	0.7	1			
SEN	0.82	-0.12	0.86	0.9	-0.05	0.37	0.81	0.69	0.83	1		
SLE	0.75	-0.33	0.88	0.95	-0.15	0.19	0.78	0.53	0.9	0.89	1	
TGO	0.28	0.04	0.21	0.44	0.19	0.47	0.45	0.58	0.6	0.46	0.28	1

Red underlined numbers denote symmetry, i.e. positive correlations at the 5% level.

(ii) Correlation of domestic supply shocks

Symmetry of supply shocks are considered to be the most critical determining factor in forming a currency union since supply shocks are expected to have permanent effects and are more likely to be invariant to demand management policies (Bayoumi and Eichengreen, 1994; Buigut and Valev, 2005). Table 6 contains the correlation coefficients of the identified supply shocks among ECOWAS economies.

Table 6 Correlation of domestic supply shocks

	BEN	BFA	CIV	GHA	GMB	GNB	MLI	NER	NGA	SEN	SLE	TGO
BEN	1.00											
BFA	0.84	1.00										
CIV	0.01	-0.05	1.00									
GHA	-0.21	0.01	0.55	1.00								
GMB	-0.31	-0.52	-0.32	-0.72	1.00							
GNB	-0.14	0.07	-0.49	-0.18	-0.27	1.00						
MLI	0.10	-0.36	0.02	-0.06	0.35	-0.63	1.00					
NER	0.23	0.04	0.57	0.65	-0.69	-0.13	0.31	1.00				
NGA	-0.20	-0.28	-0.77	-0.47	0.67	-0.11	0.44	-0.59	1.00			
SEN	-0.56	-0.63	0.24	-0.35	0.74	-0.22	-0.03	-0.48	0.07	1.00		
SLE	-0.25	-0.26	-0.55	-0.47	0.13	0.88	-0.33	-0.22	0.10	0.07	1.00	
TGO	-0.25	-0.05	0.37	0.64	-0.08	-0.68	0.16	0.04	0.07	0.04	-0.83	1.00

Red underlined numbers denote symmetry, i.e. positive correlations at the 5% level.

It is disappointing to note that out of the 66 pairs of ECOWAS economies studied 57 of the correlations of domestic supply shocks are not statistically significant, meaning that they are asymmetric and this may reflect the major differences in the core export commodities of these economies, which ranges widely from crude oil in Nigeria to gold in Ghana and cashew nuts in Guinea-Bissau. Despite the overwhelming asymmetry in the correlation of supply shocks in the region, eight pairs of countries still have symmetrical (positive and significant) supply shocks. For example, Benin and Burkina Faso have a high correlation coefficient of 0.84. Others include Cote d'Ivoire and Ghana (0.55), Ghana and Niger (0.65), Ghana and Togo (0.64), Nigeria and Gambia

(0.67), Gambia and Senegal (0.88) and finally, Guinea-Bissau and Senegal (0.74). This result implies that ECOWAS economies need different policy responses to adjust to supply shocks. At a given time, a group of countries in ECOWAS may need an expansionary monetary policy to respond to cyclical downturns while others might require contractionary monetary policy to respond to cyclical booms. Consequently it will be difficult for ECOWAS economies to operate the proposed e*co* if wages are rigid and or factor mobility is limited as we have already seen in the previous sections.

(iii) Correlation of domestic demand shocks

Table 7 presents the correlation of domestic demand shocks among ECOWAS economies. The correlation of domestic demand shocks and domestic supply shocks of ECOWAS economies are very similar in the sense that they are generally asymmetric, i.e. most of them are negative with a few positive and statistically significant correlation coefficients. Out of the 66 pairs of ECOWAS economies examined, only eight economies have significant symmetry in domestic demand shocks. They are: Benin and Cote d'Ivoire (0.58), Benin and Ghana (0.81), Benin and Senegal (0.90), Burkina Faso and Senegal (0.59), Cote d'Ivoire and Niger (0.87), Ghana and Gambia (0.56), Ghana and Senegal (0.79), and Nigeria and Mali (0.66). My result is different from Houssa's (2008) result that only finds significant symmetry in domestic demand shocks between Cote d'Ivore and Benin. The insight from this result is the revelation of the weak inter-economic relationships among ECOWAS economies.

Table 7 Correlation of domestic demand shocks

	BEN	BFA	CIV	GHA	GMB	GNB	MLI	NER	NGA	SEN	SLE	TGO
BEN	1.00											
BFA	0.23	1.00										
CIV	0.58	-0.62	1.00									
GHA	0.81	0.14	0.48	1.00								
GMB	0.23	0.24	0.06	0.56	1.00							
GNB	-0.04	0.05	-0.01	-0.43	-0.76	1.00						
MLI	-0.14	0.48	-0.69	-0.06	-0.29	-0.03	1.00					
NER	0.32	-0.60	0.87	0.11	0.04	0.15	-0.92	1.00				
NGA	-0.67	0.25	-0.81	-0.78	-0.56	0.27	0.66	-0.66	1.00			
SEN	0.90	0.59	0.19	0.79	0.40	-0.19	0.14	-0.06	-0.46	1.00		
SLE	-0.02	-0.63	0.44	0.27	-0.23	0.08	-0.03	0.15	-0.32	-0.26	1.00	
TGO	-0.75	-0.41	-0.15	-0.83	-0.51	0.56	-0.28	0.20	0.41	-0.89	0.14	1.00

Red underlined numbers denote symmetry, i.e. positive correlations at the 5% level.

(iv) Correlation of monetary shocks

Table 8 contains the correlation of monetary shocks in ECOWAS economies. There seems to be less asymmetry in the correlation of monetary shocks for ECOWAS economies. Again, out of the 66 pairs of ECOWAS economies considered, only 10 pairs of economies have symmetric correlations in monetary shocks. Here, the results are not surprising because they intuitively follow from the asymmetric nature of demand shocks among the economies. I particularly observe that the symmetric correlation of monetary shocks among ECOWAS economies is mostly among the WAEMU sub-set. Whereas, countries in the WAMZ sub-set have a divergent or asymmetric correlation of monetary shocks. The symmetry among the WAEMU sub-set can be explained by the already exciting monetary arrangement in that region and the ties between their currency and the French franc and now the Euro. Specifically, symmetry can be observed in monetary shocks between Benin and Sierra Leone (0.55), Cote d'Ivoire and Guinea-Bissau (0.73), Mali (0.53) and Niger (0.51), Guinea-Bissau

and Senegal (0.55) and Togo (0.62), Guinea-Bissau and Niger (0.62) and Mali and Senegal (0.55)

Table 8 Correlation of monetary shocks

	BEN	BFA	CIV	GHA	GMB	GNB	MLI	NER	NGA	SEN	SLE	TGO
BEN	1.00											
BFA	-0.14	1.00										
CIV	0.39	-0.86	1.00									
GHA	-0.53	0.59	-0.41	1.00								
GMB	-0.28	0.13	-0.37	0.19	1.00							
GNB	0.08	-0.91	0.73	-0.46	-0.14	1.00						
MLI	0.39	-0.38	0.53	-0.36	-0.92	0.47	1.00					
NER	0.16	-0.46	0.51	0.16	0.26	0.62	0.03	1.00				
NGA	0.22	-0.12	0.39	0.43	-0.15	0.34	0.31	0.82	1.00			
SEN	0.46	0.02	0.39	-0.13	-0.77	-0.23	0.55	-0.35	0.02	1.00		
SLE	0.55	0.25	-0.08	0.04	0.55	-0.32	-0.51	0.31	0.18	-0.08	1.00	
TGO	-0.32	-0.36	0.32	0.23	0.62	0.19	-0.59	0.48	0.11	-0.29	0.28	1.00

Red underlined numbers denote symmetry, i.e. positive correlations at the 5% level.

(c) The dynamics of the shocks: size of disturbances and speed of adjustment

It is instructive to examine the dynamic effects of the shocks in terms of the sizes of the disturbances and the speed of adjustment. The size of disturbances is an important economic characteristic because larger disturbances translate into higher volatility of the endogenous variables which undermines the effectiveness of a synchronous monetary policy. On the other hand, if the speed with which the economies adjust to disturbances is slow, then the cost of fixing the exchange rate and loosing policy autonomy increases.

In order to assess the size of the disturbances, I use the impulse response coefficients which trace out the effect of a one-unit shock in each of the four endogenous variables. In the case of external shocks, the impulse responses are assumed not to be different.

Table 9 Size of disturbances and speed of adjustment across regions

Countries	Supply disturbances		Demand disturbances		Monetary disturbances	
	Size	Speed	Size	Speed	Size	Speed
ECOWAS						
Benin	0.029	0.006	0.392	0.057	0.117	0.020
Burkina Faso	0.038	0.004	0.459	0.080	0.050	0.005
Cote d'Ivoire	0.045	0.018	0.931	0.395	0.122	0.016
Gambia	0.032	0.006	0.729	0.260	0.159	0.029
Ghana	0.016	0.004	0.476	0.141	0.106	0.017
Guinea-Bissau	0.081	0.051	0.824	0.255	0.272	0.070
Mali	0.064	0.025	1.307	1.115	0.141	0.018
Niger	0.106	0.010	1.233	0.616	0.025	0.011
Nigeria	0.049	0.001	0.622	0.040	0.318	0.062
Senegal	0.038	0.011	0.608	0.328	0.075	0.012
Sierra Leone	0.076	0.015	0.209	0.098	0.338	0.066
Togo	0.059	0.019	0.637	0.097	0.056	0.027
Average	0.053	0.014	0.702	0.290	0.148	0.029
East Asia						
Australia	0.011	0.925	0.017	0.910		
Hong Kong	0.023	1.590	0.044	1.190	0.032	
Indonesia	0.013	1.239	0.071	1.335	0.050	
Japan	0.012	1.667	0.017	0.270	0.013	
Korea	0.029	0.886	0.038	0.115	0.030	
Malaysia	0.032	1.038	0.063	1.607	0.015	
New Zealand	0.060	0.648	0.031	0.291		
Philippines	0.089	0.587	0.081	1.475	0.040	
Singapore	0.032	1.353	0.028	1.072		
Taiwan	0.021	1.466	0.049	0.673		
Thailand	0.026	1.381	0.042	1.279	0.019	
Average	0.032	1.162	0.044	0.929	0.026	
SAARC						
Bangladesh	0.008	0.741	0.028	1.195		
Bhutan	0.023	0.727	0.033	1.532		
India	0.025	0.913	0.040	1.411		
Maldives	0.036	1.053	0.047	0.512		
Nepal	0.016	0.888	0.034	1.138		
Pakistan	0.028	0.612	0.040	0.990		
Sri Lanka	0.023	0.847	0.038	0.968		

Average	0.023	0.826	0.037	1.106
Western Europe				
Austria	0.018	0.999	0.017	0.415
Belgium	0.028	0.668	0.028	0.508
Denmark	0.022	1.104	0.017	0.135
Finland	0.018	0.875	0.027	0.684
France	0.034	0.243	0.014	0.101
Germany	0.022	1.193	0.015	0.659
Ireland	0.021	1.222	0.038	0.382
Italy	0.030	0.427	0.036	0.380
Netherlands	0.033	0.692	0.019	0.511
Noway	0.031	0.651	0.034	0.704
Portugal	0.061	0.426	0.026	0.367
Spain	0.057	0.083	0.015	0.123
Sweden	0.030	0.261	0.012	0.419
Switzerland	0.031	0.997	0.016	0.858
United Kingdom	0.018	0.425	0.019	0.016
Average	0.030	0.684	0.022	0.417
The Americas				
Argentina	0.033	1.141	0.438	1.126
Bolivia	0.069	0.585	0.636	1.302
Brazil	0.084	0.706	0.068	0.983
Canada	0.020	1.052	0.028	0.703
Chile	0.064	1.214	0.251	0.548
Colombia	0.026	0.823	0.027	0.720
Ecuador	0.162	0.402	0.076	0.987
Mexico	0.059	0.775	0.072	0.865
Paraguay	0.094	0.459	0.064	0.719
Peru	0.050	1.169	0.062	0.452
United States	0.028	0.269	0.015	0.078
Uruguay	0.049	1.014	0.074	1.227
Venezuela	0.062	0.810	0.074	0.949
Average	0.062	0.801	0.145	0.820

Note: Figures for Western Europe, East Asia, and the Americas is from Bayoumi and Eichengreen (1994), SAARC figures are from Saxena (2005), size of monetary shocks for East Asia are from Huang and Guo (2006) and ECOWAS figures are author's computations.

Hence, I focus on the other three structural disturbances. For supply shocks, we use the average absolute value of the long-run (20-year horizon) of one unit shock on changes in real GDP as a measure of size since the supply disturbances are expected to have permanent effects on output. On the other hand, since the effects on demand and monetary disturbances are expected to be transitory, I proxy the demand and monetary shock using the average absolute value of the short-run (2 year horizon) effect of one-unit shock consumer price index and real effective exchange rate respectively[7]. For speed of adjustment, I follow Bayoumi and Eichengreen (1994) by estimating the responses after 2 years as a share of the long run effect. To aid appreciation of the circumstances in ECOWAS economies, the results are compared to results that have been obtained in other geographical regions.

Table 9 displays the size of disturbances and speed of adjustment for supply, demand and monetary shocks for different geographic regions[8]. Looking among the ECOWAS economies, I observe that Benin has the lowest size of supply shocks at 2.9 percent, while Niger has the highest at 10.6 percent. Demand shocks are relatively higher with Mali having the highest size of demand shock and the fastest speed of adjustment. For monetary disturbances, I observe that Sierra Leone and Nigeria have the highest rates of monetary disturbance at 33 and 31 percent respectively. The speed of adjustment to monetary shocks are generally slow with that of Nigeria showing that only about 6% of the adjustment is completed within the first two years.

Comparing the average results for ECOWAS economies with the average from other regions, I observe that the average size of supply shocks in West Africa (0.053) is only second to the America's (0.062). When put side-by-side with the results from other regions that have adopted or are about to adopt a common currency, for example Western Europe (0.03), East Asia (0.032), SAARC (0.023), the average size of the

supply shocks in ECOWAS economies is comparatively too large, raising the red light on the proposed Eco! A similar pattern is also observed for demand hocks. Also, the large size of monetary shock and slow speed of adjustment to monetary disturbances for ECOWAS economies is an indication that a one-size-fits-all exchange rate policy across the region will not be ideal. A currency union in West Africa can only be effective if the size of monetary disturbances are low, and the speed of adjustments are high, and this does not seem to be the case.

6. CONCLUSION

In this paper, I have committed myself to asking and answering the question 'should West Africa proceed with a monetary union? A multivariate structural VAR model is used to examine the symmetry of four kinds of disturbances affecting the region. They include external shocks, supply shocks, demand shocks and monetary shocks. The results indicate that there is a relatively high degree of symmetry in the correlation of external shocks to countries in the region. The pattern of supply, demand and monetary shocks among the countries in the region is highly asymmetric, implying that it will be difficult for ECOWAS to operate the eco because the presence of asymmetric shocks indicates the need for different policy responses to adjust to supply, demand and monetary shocks in the region. In addition, the results reveal differing sizes and speeds of adjustment in monetary shocks. The implication is that the responses to real exchange rate shocks in the region do not converge, and therefore it will not be ideal to adopt a one-size-fits all exchange rate policy across the region.

In this light, policy makers in West Africa should consider delaying the introduction of the proposed eco and work further towards stronger integration of the ECOWAS

economies in terms of intra-regional trade and factor and labour mobility within the region. Delaying the take off of the proposed eco will also afford policy makers the opportunity to learn from the prevailing debt and financial crisis being experienced in the Euro zone with a view to build in pre-emptive strategies.

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NOTES

[1] The list includes: Benin, Burkina Faso, Cape Verde, Cote d'Ivoire, The Gambia, Ghana, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone and Togo.

[2] Members of WAEMU include Benin, Burkina Faso, Cote d'ivoire, Guinea-Bissau, Mali, Niger, Senegal and Togo.

[3] WAMZ countries include The Gambia, Guinea, Ghana, Nigeria and Sierra Leone

[4] This can partly be explained by the porous borders between the two counties and their relative proximity.

[5] Liberia, Cape Verde and Guinea are excluded from the analysis. This is because Liberia declined to participate in the project although there are now beginning to indicate interest, Cape Verda has a currency that is directly linked to the Euro and for Guinea we did not obtain sufficient data series for the analysis.

[6] These 26 advanced economies include: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Australia, Canada, Denmark, Hong Kong SAR, Israel, Japan, Korea, New Zealand, Norway, Singapore, Sweden, Switzerland, United Kingdom, and United States.

[7] The approach we adopted is similar to the approach adopted by Huang and Guo (2006) and Bayoumi and Eichengreen (1994). The advantage of this approach is that it enables us to compare results across regions and times.

[8] Figures for Western Europe, East Asia, and the Americas is from Bayoumi and Eichengreen (1994), SAARC figures are from Saxena (2005), size of monetary shocks for East Asia are from Huang and Guo (2006) and ECOWAS figures are author's computations.