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**Are Proposed African Monetary Unions Optimal Currency Areas? Real
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Abstract

A spectre is hunting embryonic African monetary zones: the EMU crisis. The introduction of common currencies in West and East Africa is facing stiff challenges in the timing of monetary convergence, the imperative of bankers to apply common modeling and forecasting methods of monetary policy transmission, as well as the requirements of common structural and institutional characteristics among candidate states. Inspired by the premise of the EMU crisis, this paper assesses real and monetary policy convergence within the proposed WAM and EAM zones. In the analysis, monetary policy targets inflation and financial dynamics of depth, efficiency, activity and size while real sector policy targets economic performance in terms of GDP growth at macro and micro levels. Findings suggest overwhelming lack of convergence; an indication that candidate countries still have to work towards harmonizing cross-country differences in fundamental, structural and institutional characteristics that hamper the convergence process.

JEL Classification: F15; F36; F42; O55; P52

Keywords: Currency Area; Convergence; Policy Coordination; Africa

1. Introduction

With much attention currently being placed on convergence criteria and preparedness of the aspiring member states of embryonic African Monetary zones, candidate countries of the West African Monetary Zone(WAMZ) have twice postponed the take –off for the single currency. Bank experts in the up-coming East African Monetary Zone(EAMZ) fear that plans for a common currency in 2012 may be too ambitious as central banks in the five countries

are given little time to prepare for the monetary union. These could be the result of the European Monetary Union(EMU) crisis that has sent a strong signal to other common currency regions on the goal of real and monetary policy convergence. A paramount lesson of the EMU crisis is that serious disequilibria results from regional arrangements not designed to be robust to a variety of shocks(Willet, 2010; Willett & Srisorn, 2011). In designing the EMU, institutions' almost exclusive concern was placed on mitigating crises caused by financial sectors. The official stance of the German government today appears to remain that failure of these safeguards is the predominant cause of the crisis. A position which can be reasonably argued for Greece, although its loss of competitiveness has also been a major factor.

Borrowing from AON(2012), today some experts asserts that knowledge is lacking in several central banks in the EAMZ to implement reforms needed for a single currency region. In a recent meeting, bankers agreed on the need for capacity-building in economic forecasting and modeling among staff in order for them to be ready for the upcoming monetary union. A report evaluating the capacities of each of the central banks found there were great needs for training programs, especially in key modeling and forecasting methods as participants noted great gaps in their usage. In an opening statement, Claver Gatete, Deputy Governor of the Rwanda National Bank made it clear that the importance of economic modeling and forecasting could not be underestimated¹. In order to ensure timely and effective implementation of the road map to a single currency in the WAMZ, the Convergence Council has urged members states to pursue appropriate monetary and fiscal policies as well as rigorous implementation of the structural and institutional policies under the ECOWAS Multilateral Surveillance Mechanism, in order to achieve convergence and a durable

¹ He stressed these were key instruments in monetary policy formulation as well as a way of providing the central bank with clear and efficient ways to assess trends and developments in domestic and external economies. *"It is useful in monitoring where the economy stands and how to make short and long-term projections in order to determine what monetary policy to follow. There is a need for a central bank to have a clear understanding of its monetary transmission mechanisms"*Gatete(AON,2012).

monetary union on a sustainable basis. Three issues result from these stylized facts: (1) the need for monetary policy convergence; (2) the imperative of bankers to understand modeling and forecasting methods in monetary policy transmission and; (3) the requirement of common structural and institutional characteristics among members.

In this paper we examine the three issues by assessing real and monetary policy convergence in the WAM and EAM zones. This work contributes to the current debate on single currency unions by dissecting elements of macroeconomic and monetary policies into financial intermediary dynamics(of depth, efficiency, activity and size), inflation and economic performance. In so doing, it provides an in depth picture of the state of convergence, the speed of convergence and the time required to achieved full convergence in real and monetary policies. The rest of the paper is structured in the following manner. Section 2 examines existing literature. Data and methodology are respectively presented and discussed in Section 3. Empirical analysis, discussion and policy implications are covered in Section 4. We conclude with Section 5.

2. Existing Literature

2.1 Motivations for convergence in the run-up to a monetary zone

Putting aside the premise of the EMU crisis highlighted above, the absence of studies that focus on financial convergence in the African continent constitute a concrete motivation for this paper. Though a number of studies have focused on financial market convergence worldwide, the emphasis has often been on developed and the emerging economies of Latin America and Asia. Borrowing from Alagidede(2008), such neglect is not unexpected as African financial markets are viewed as too risky and little developed in operating and institutional environmental settings. Political strife and economic instability have plagued most African countries and continue to pose a significant threat to foreign investments and private capital flows(Kenyan post election crises in 2007/2008, Zimbabwe's economic

downturn, Nigeria's marred transition in 2008, the unending Egyptian revolution and currently Nigeria's fuel subsidy related social unrest and threat of Islamic fundamentalism). With very few exceptions(South Africa), African countries are yet to rise as emerging economic powers. This might partly elucidate the relative lack of academic research on financial convergence in the continent. Nay, in recent years Africa has witnessed significant economic and financial developments; which has led to growing initiatives on common currency unions.

Single currency unions are expected to provide gains in growth by favoring a breeding atmosphere for competition and efficiency in the banking sector. These gains result from price reductions in financial services which provide direct gains to customers and indirect benefits through reduction of lending rates that favor investment(Weill, 2009). Financial convergence is crucial in assessing the outcome of deregulation policies aimed at ameliorating the performance and efficiency of the financial intermediary sector(Casu & Girardone, 2010). Financial theory considers integrated markets to be relatively more efficient than divergent ones. Thus an integrated financial intermediary market within a monetary zone improves cross-border flow of funds, stimulates trading volume which in-turn improves liquidity. Integrated banking markets provide investors with the opportunity of efficiently allocating capital to economic operators(Chen et al., 2002). The ensuing effect is lower cost of capital for firms and lower transaction cost for investors(Kim et al., 2005). Therefore when banks are integrated within a single currency area, there are positive rewards to financial stability as it diminishes the probability of asymmetric shocks(Umutlu et al., 2010). Financial stability in-turn could attenuate the risk of cross-border financial contagion(Beine et al.,2010) and augment the capacity of economies to absorb shocks(Yu et al., 2010).

The need for convergence in the banking sector within the WAM and EAM zones draws on the tenets of arbitrage and hypothesis proffered by the portfolio theory. Dynamics of

financial intermediation converge to mirror the level of arbitrage activity. When they converge, it implies a common momentum such as arbitrage activity is bringing the markets together. This will reduce the potential for making above normal profits through international diversification(Von Furstenberg & Jeon, 1989). In the same spirit, if deterrents or potential barriers generating country risks and exchange rate premiums are absent, the consequence is similar yields for financial assets of similar risk and liquidity regardless of locality and nationality(Von Furstenberg & Jeon, 1989). Hence the motivations for convergence in banking markets has premises on the literature of financial intermediary sector interdependence and portfolio diversification(Grubel, 1968; Levy & Sarnat, 1970). A great chunk of these papers have considered short-term links of stock markets and found the presence of short-spell co-movements. Results which have been extended to long-run financial market co-movements(Bessler & Yang, 2003).

As we have seen, the financial system exerts a significant influence on modern economic literature debates(Scholten & Naaborg, 2005). On a first note, the monetary policy transmission mechanism's effectiveness is contingent on the financial system(Bondt,2000). Secondly, it is believed to affect channels through which finance is tied to economic growth(Allen & Gale, 2000). Therefore, the financial system interacts with the economy by producing information ex-ante about possible investments, monitoring of investments, allocation of capital, facilitation of trade, diversification and management of risks, mobilization and pooling of savings as well as easing of goods and services(Levine, 2004).

The above paragraph is important in the context of this paper because it points to how and why assessing dynamics within a financial system could elucidate the three issues we highlighted above that resulted from stylized facts. Plainly put, investigating convergence in financial intermediary dynamics of depth, efficiency, activity and size within a financial system on the one hand and calculating their corresponding speeds of convergence and time

required for full(100%) convergence on the other hand, addresses quite a number important policy issues in the present debate over timing and monetary convergence of upcoming African single currency zones. To complement monetary policies, this paper also examines real policy convergence in terms of macroeconomic performance(GDP growth) and per capita income growth.

2.1 Literature on the WAM and EAM zones

Literature pertaining to the WAM and EAM zones could be classified into two main strands. While the first is dedicated to the later region, the second is focused on the former region.

To the best of our knowledge only two empirical papers have been dedicated to the EAMZ. Mkenda(2001) employ a Generalized Purchasing Power Parity(GPPP) model to analyze the suitability of the EAC(East African Community) for a single currency union. The results which indicate that the real exchange rates between the EAC countries are cointegrated during the period 1980-98, suggest that the EAMZ is an optimal currency area. However as pointed-out by Buigut & Valev(2005), the limitation of this approach is that movements in macroeconomic variables reflect the combined effects of shocks and responses(Angeloni & Dedola, 1999). Hence this methodology does not distinguish errors from responses. Buigut & Valev(2005) empirically assess the suitability of the East African countries for a regional monetary union by testing for symmetry of the underlying structural shocks. Results suggest that supply and demand shocks are generally asymmetric, which does not support the forming of a single currency union. Buigut & Valev(2005) further stress that the speed and magnitude of adjustment to shocks is similar across the countries. Thus, further integration of the economies could lead to more favorable conditions for a monetary union.

Some studies have also focused on analyzing the feasibility of forming a monetary union in the Economic Community of West African States(ECOWAS). Thus in the second

strand, Celasun & Justiniano(2005) have used a dynamic factor analysis to examine the synchronization of output fluctuations among member countries. Their results indicate that small countries within ECOWAS experience relatively more synchronized output variations. Hence, they suggest that monetary unification among subsets of countries is preferable over wider monetary integration. Debrun et al. (2005) investigate the potential for monetary integration in the ECOWAS using a model of monetary and fiscal policy interactions. Their findings suggest that the proposed monetary union is desirable for most non-West African Economic and Monetary Union(WAEMU) countries but not for the exiting WAEMU member states. Tsangarides & Qureshi (2008) in applying hard and soft clustering algorithms to a set of variables suggested by the convergence criteria and the theory of optimal currency areas, examine the suitability of countries in the West African region to form the proposed monetary union(WAMZ). Findings reveals considerable dissimilarities in the economic characteristics of member countries. Much recently, Alagidede et al.(2011) have examined the inflation dynamics and common trends in the real domestic product in candidate countries of the embryonic WAMZ. Using fractional integration and cointegration method, they establish significant heterogeneity among the countries.

With much attention currently being placed on convergence criteria and preparedness of the aspiring member states, this paper is inspired by the premise of the EMU crisis. Thus we assess if candidate countries of potential African monetary zones have similar fundamental and structural characteristics for real and monetary policy convergence.

3. Data and Methodology

3.1 Data

We examine a sample of 4 West and 5 East African countries with data from African Development Indicators(ADI) and the Financial Development and Structure Database(FDSD) of the World Bank. While openness(trade), inflation, population growth, public investment,

GDP growth and GDP per capita growth indicators are obtained from the former source, financial intermediary dynamics are fetched from the later. Owing to constraints in data availability, our dataset spans from 1981 to 2009. Details on countries(Appendix 4), summary statistics(Appendix 1), correlation analysis(Appendix 2) and variable definitions(Appendix3) are in the appendices. The choice of variables is premised on two facts: (1) real economic sector policies are designed to achieve macroeconomic performance through growth in GDP at national and per capita income levels; (2) monetary policies are designed to keep inflation in check and improve financial intermediary dynamics of depth(money supply and liquid liabilities), efficiency(at banking and financial levels), activity(from banking and financial perspectives) and size. For organizational reasons, selected variables are classified into the following strands.

3.1.1 Financial variables

a) Financial depth

Lining on recent finance literature(Asongu, 2011abcd) and the FDSO, we measure financial depth both from overall-economic and financial system perspectives with indicators of broad money supply ($M2/GDP$) and financial system deposits ($Fdgd$) respectively. Whereas the former denotes the monetary base plus demand, saving and time deposits the later represents liquid liabilities. The premise for distinguishing these aspects of financial depth is the fact that we are dealing exclusively with developing countries, where-in a significant chunk of the monetary base does not transit through the banking sector(Asongu, 2011e). Both measures are in GDP ratios(see Appendix 3) and can robustly cross-check one another as either account for over 98% of variability in the other(see Appendix 2).

b) Financial efficiency

In the context of this paper, financial intermediation efficiency neither refers to the production efficiency of decision making units nor to the profitability-oriented concept in the

banking industry. What we aim at eliciting is the ability of banks to effectively meet their fundamental role of transforming mobilized deposits into credit for economic operators. Thus, we employ proxies for banking-system-efficiency and financial-system-efficiency (respectively ‘bank credit on bank deposits: *Bcbd*’ and ‘financial system credit on financial system deposits: *Fcfd*’). Like with financial depth, these 2 intermediation efficiency proxies can cross-check each other as either reflects more than 92% of variability in the other (see Appendix 2).

c) Financial size

Lining on the FDSO we measure financial intermediary size as the ratio of “deposit bank assets” to the “total assets” (deposit bank assets on central bank assets plus deposit bank assets: *Dbacba*).

d) Financial activity

The concept of financial intermediary activity highlighted here is the ability of banks to grant credit to economic operators. In order to ensure robustness we proxy for both banking intermediary activity and financial intermediary activity with “private domestic credit by deposit banks: *Pcrb*” and “private credit by domestic banks and other financial institutions: *Pcrbof*” respectively. The later measure cross-checks the former as it represents more than 95% of variability in the former (see Appendix 2).

3.1.2 Other variables

Borrowing from the convergence literature we also measure the outcome of monetary policy with inflation (Bruno et al., 2011). Macro economic performance is accounted for at macro and micro levels with GDP and GDP per capita growth rates respectively. In accordance with past studies, we control for control for openness, public investment and population growth in the regressions (Pritchett, 1997; Bruno et al., 2011; Narayan et al., 2011).

In the literature on convergence of per capita incomes and the root of the convergence theory, an important clue is that per capita incomes of countries identical in structural characteristics such as preferences in technologies, rate of population growth and government policies have the tendency to converge to one another if the countries share similar fundamental characteristics(Prichett, 1997). In the current paper, these fundamental conditions are monetary and real policies. Hence we proxy for preferences in technology, population growth and government policy with openness(trade), population growth rate and public investment respectively.

3.2 Methodology

As underlined by Fung(2009;3) the two equations below are the standard approaches in the literature for investigating conditional convergence if $W_{i,t}$ is taken as strictly exogenous.

$$\ln(Y_{i,t}) - \ln(Y_{i,t-\tau}) = \beta \ln(Y_{i,t-\tau}) + \delta W_{i,t-\tau} + \eta_i + \xi_t + \varepsilon_{i,t} \quad (1)$$

$$\ln(Y_{i,t}) = \sigma \ln(Y_{i,t-\tau}) + \delta W_{i,t-\tau} + \eta_i + \xi_t + \varepsilon_{i,t} \quad (2)$$

Where $\sigma = 1 + \beta$, $Y_{i,t}$ is the proxy for per capita financial or real sector growth in country i at period t . $W_{i,t}$ is a vector of macroeconomic determinants(openness, public investment and population growth) of per capita finance(or real sector per capita), η_i is a country specific effect, ξ_t is a time specific constant and $\varepsilon_{i,t}$ an error term. In line with the exogenous growth model, a statistically significant negative coefficient on β in Eq. (1) means that countries relatively close to their steady state of per capita growth will experience a slowdown in growth of the per capita banking(real sector) development, known as conditional convergence(Narayan et al.,2011;2). Concurring with Fung(2009;3), if $0 < |\sigma| < 1$ in Eq.(2),

then $Y_{i,t}$ is dynamically stable around the path with a trend growth rate the same as that of W_t , and with a height relative to the level of W_t . The variables contained in $W_{i,t-\tau}$ and the individual effect η_i are indicators of the long-term level the market(real sector) is converging to. Thus, the country specific effect η_i highlights the existence of other determinants of a country's steady state not captured by $W_{i,t-\tau}$.

Conditions for convergence elucidated above are conditional on the strict exogeneity of $W_{i,t}$. Unfortunately, this is not practical in the real world because, whereas openness, public investment and population growth(components of $W_{i,t}$) influence per capita financial(real sector) development, the reverse effect cannot be ruled-out. Thus we are confronted with an issue of endogeneity where openness(trade), public investment and population growth are correlated with the error term($\varepsilon_{i,t}$). More so country and time specific effects could be correlated with other variables in the model, which is often the case when lagged dependent variables are part of the equations. A means of dealing with the problem of the correlation between the individual specific-effect and the lagged endogenous variables involves getting rid of the individual effect by first differencing. Thus Eq. (2) becomes:

$$\ln(Y_{i,t}) - \ln(Y_{i,t-\tau}) = \sigma \ln(Y_{i,t-\tau} - Y_{i,t-2\tau}) + \delta (W_{i,t-\tau} - W_{i,t-2\tau}) + (\varepsilon_{i,t} - \varepsilon_{i,t-\tau}) \quad (3)$$

Even with this individual fixed effect elimination, modelling by Ordinary Least Square(OLS) is still biased because there remains a correlation between the lagged endogenous independent variable and the disturbance term. Arellano & Bond(1991) suggested an application of the Generalized Method of Moments(GMM) that exploits all the orthogonality conditions between the endogenous retarded variables and the error term. This GMM approach has been extensively applied in the convergence literature; and recently used

by Narayan et al.(2011). While Narayan et al.(2011) use Eq.(1) without fixed effects, this paper applies Eq.(3) instead; in accordance with the Fung(2009) definition. We prefer the *second-step* GMM instead of the *first-step* because it corrects the residuals for heteroscedasticity. This is because, in the *first-step* the residuals are considered to be homoscedastic. The assumption of no auto-correlation in residuals is crucial as past lagged variables are to be used as instruments for the endogenous variables. Also, the estimation depends on the assumption that the retarded values of the outcome variable and other explaining variables are valid instruments in the regression. Assuming the error terms of the level equation are not auto-correlated, the first-order auto-correlation of the differenced residuals should be significant while their second-order auto-correlation should not be the case. The validity of the instruments is assessed by the Sargan over-identifying restrictions test(OIR).

As emphasized by Islam (1995;14), annual time spans are too short to be appropriate for studying convergence, as short-term errors may loom substantially in such brief time spans. Therefore owing to our data span of 28 years, we borrow from Narayan et al.(2011) in using a 2 year non-overlapping interval such that we have fourteen time intervals: 1980-1981; 1982-1983 and so on. Thus, by implication in the analysis, the autoregressive order τ is set to 2. For robustness purposes we set τ set to 3 and then to 4 in a bid for consistency of results.

We also assess the implied rate of convergence by computing $(\sigma/2)$ which by virtue of Eqs. (1) and (2) is the equivalent of the Narayan et al.(2011) computation with $(1+\beta)/2$. Thus the paper divides the estimated coefficient of the lagged differenced endogenous variable by 2 because we have used a two year non overlapping span in a bid to absorb short term disturbances. When the absolute value of the estimated autoregressive coefficient is greater than zero but less than one($0 < |\sigma| < 1$), we confirm the alternative hypothesis of convergence. A detail interpretation suggests, past differences have less proportionate impact

on future differences, denoting the variation on the left hand side of Eq.(3) is diminishing overtime as the country is converging to a stable state.

4. Empirical analysis

This section probes into three main issues: (1) assessment of the presence of convergence ; (2) determination of the speed of convergence and; (3) computation of the time needed for full(100%) convergence. Table 1 presents a summary of overall findings and addresses the first two concerns, while Table 2 and Table 3 respectively reveal results for unconditional and conditional convergence.

In assessing unconditional(absolute) convergence only the lagged difference of the endogenous variable is used as exogenous variable while conditional convergence is in respect of Eq. (3). It follows that unconditional convergence is estimated without $W_{i,t}$: vector of determinants(openness, public investment and population growth) of per capita finance(or real sector per capita). In order to assess the validity of the model and correspondingly the convergence hypothesis, we carry-out two tests, namely the Sargan test which examines the over-identification of restrictions, and the Arrellano and Bond test for autocorrelation which assesses the null hypothesis of no autocorrelation. The Sargan OIR test investigates if the instruments are uncorrelated with the error term in the estimated equation. Its null hypothesis is the stance that the instruments collectively are strictly exogenous(do not suffer from endogeneity), which is needed for the validity of the GMM estimates. We also report the Wald statistics for the collective significance of estimated coefficients.

The Sargan, autocorrelation and Wald tests statistics with corresponding p-values for each of the panels are reported in the tables. The Sargan test statistics often appear with a p-value greater than 0.10, hence its null hypothesis is not rejected for the majority of models.

Only results for the AR(2) test are reported because as opposed to the AR(1), it detects autocorrelation in levels. For all estimated models we are unable to reject the AR(2) null hypothesis of no autocorrelation. There is therefore robust evidence that all the models are free from autocorrelation.

4.1 Summary of results

In Table 1, we provide a synthesis of results. This summary is premised on details presented in Tables 2-3. We report the state of convergence and corresponding speeds, respectively denoted in terms of AC(Absolute Convergence), CC(Conditional Convergence), SAC(Speed of Absolute Convergence) and SCC(Speed of Conditional Convergence). We notice that for the two panels, with regard to all real and monetary policy dynamics, only banking system efficiency within the EAMZ reflects AC.

Table 1: Summary of results on convergence

	Financial Depth							
	Money Supply				Liquid Liabilities			
	AC	CC	SAC	SCC	AC	CC	SAC	SCC
WAMZ	No	No	---	---	No	No	---	---
EAMZ	No	No	---	---	No	No	---	---
	Financial Efficiency							
	Banking System Efficiency				Financial System Efficiency			
	AC	CC	SAC	SCC	AC	CC	SAC	SCC
WAMZ	No	No	---	---	No	No	---	---
EAMZ	Yes(1%)	No	28.90%	---	No	No	---	---
	Financial Activity							
	Banking System Activity				Financial System Activity			
	AC	CC	SAC	SCC	AC	CC	SAC	SCC
WAMZ	No	No	---	---	No	No	---	---
EAMZ	No	No	---	---	No	No	---	---
	Financial Size and Inflation							
	Financial Size				Inflation(CPI)			
	AC	CC	SAC	SCC	AC	CC	SAC	SCC
WAMZ	No	No	---	---	No	No	---	---
EAMZ	No	No	---	---	No	No	---	---
	Economic Performance (GDP Growth)							
	GDP Growth				GDP per capita Growth			
	AC	CC	SAC	SCC	AC	CC	SAC	SCC
WAMZ	No	No	---	---	No	No	---	---
EAMZ	No	No	---	---	No	No	---	---

AC: Absolute Convergence. CC: Conditional Convergence. SAC : Speed of Absolute Convergence. SCC: Speed of Conditional Convergence. WAMZ: West African Monetary Zone. EAMZ: East African Monetary Zone. CPI: Consumer Price Index.

4.2 Results of absolute convergence

Table 2 below reports results of AC regressions. On a first note, in all models, the instruments are valid as the null hypotheses of the AR(2) and Sargan-OIR tests are not rejected. Where the lagged endogenous estimated coefficient is significant, the corresponding Wald statistics is also significant. This was not unexpected since only one endogenous variable is employed in the absolute convergence regressions: implying by definition the statistics pertaining to the estimated coefficient is the same as the Wald statistics. We notice significant evidence of convergence only for the EAMZ in banking system efficiency. The speed of this AC is 28.90% per annum(p.a) and the time required to achieve full(100%) convergence is 6.92 years(yrs).

Table 2: Absolute convergence

	Financial Depth				Financial Efficiency				Financial Size	
	Money Supply		Liquid Liabilities		Banking	Efficiency	Financial	Efficiency	WAMZ	EAMZ
	WAMZ	EAMZ	WAMZ	EAMZ	WAMZ	EAMZ	WAMZ	EAMZ	WAMZ	EAMZ
Initial	0.021 (0.975)	0.204 (0.718)	-0.729 (0.417)	0.147 (0.812)	-0.997 (0.333)	0.578*** (0.000)	-0.288 (0.772)	-0.022 (0.932)	0.117 (0.791)	0.814 (0.241)
AR(2)	-0.371 (0.710)	0.271 (0.786)	0.489 (0.624)	0.820 (0.412)	-0.455 (0.648)	0.853 (0.393)	-0.724 (0.468)	-0.051 (0.959)	0.734 (0.462)	0.047 (0.962)
OIR	1.934 (1.000)	1.670 (1.000)	0.943 (1.000)	1.886 (1.000)	0.765 (1.000)	3.509 (1.000)	2.879 (1.000)	4.048 (1.000)	1.528 (1.000)	4.276 (1.000)
Wald	0.000 (0.975)	0.130 (0.718)	0.657 (0.417)	0.056 (0.812)	0.933 (0.333)	41.52*** (0.000)	0.083 (0.772)	0.007 (0.932)	0.069 (0.791)	1.370 (0.241)
Countries	4	5	4	5	4	5	4	5	4	5
Observations	50	56	50	56	51	63	50	56	51	60

	Financial Activity				Inflation(CPI)		Economic Performance			
	Banking		Financial		GDP		Growth		GDPpc	
	WAMZ	EAMZ	WAMZ	EAMZ	WAMZ	EAMZ	WAMZ	EAMZ	WAMZ	EAMZ
Initial	-1.059 (0.236)	0.168 (0.653)	-1.095 (0.231)	0.233 (0.506)	-1.670 (0.128)	0.577 (0.343)	-0.628 (0.352)	-1.384 (0.107)	0.484 (0.516)	0.107 (0.924)
AR(2)	0.340 (0.733)	0.462 (0.644)	0.531 (0.595)	0.759 (0.447)	-0.968 (0.333)	0.494 (0.621)	-1.059 (0.289)	-1.515 (0.129)	1.003 (0.315)	0.030 (0.975)
OIR	0.270 (1.000)	2.298 (1.000)	0.203 (1.000)	2.500 (1.000)	0.220 (1.000)	4.812 (1.000)	2.225 (1.000)	1.288 (1.000)	3.791 (1.000)	3.269 (0.999)
Wald	1.399 (0.236)	0.201 (0.653)	1.429 (0.231)	0.441 (0.506)	2.315 (0.128)	0.897 (0.343)	0.865 (0.352)	2.598 (0.107)	0.421 (0.516)	0.009 (0.924)
Countries	4	5	4	5	3	5	4	5	4	5
Observations	50	56	50	56	39	56	36	42	21	20

*,**,***: significance levels of 10%, 5% and 1% respectively . WAMZ: West African Monetary Zone. EAMZ: East African Monetary Zone. Syst: System. Initial: lagged autoregressive estimated coefficient. AR(2): Second Order Autocorrelation test. OIR: Overidentifying Restrictions Sargan Test. Wald: statistics for joint significance of estimates. Obser: Observations. CPI: Consumer Price Index. GDP: Gross Domestic Product. GDPpc : GDP per capita.

4.3 Results of conditional convergence

Table 3 below presents results of conditional convergence. We confirm the validity of the models, as the instruments are valid since the null hypotheses of the AR(2) and Sargan-

OIR tests are not rejected. Unfortunately we do not find any support for CC in any monetary or real policy. Owing to constraints in degrees of freedom requisite for the OIR test, we use the macroeconomic conditioning information set(population growth, public investment and trade) interchangeably and find the same results; details of which are presented in the following section.

Table 3: Conditional convergence

	Financial Depth				Financial Efficiency				Financial Size	
	Money Supply		Liquid Liabilities		Banking	Efficiency		Efficiency		
	WAMZ	EAMZ	WAMZ	EAMZ	WAMZ	EAMZ	WAMZ	EAMZ	WAMZ	EAMZ
Initial	-0.871 (0.310)	-0.809 (0.417)	-0.577 (0.684)	-0.784 (0.401)	-1.248 (0.371)	-0.115 (0.812)	-1.655 (0.407)	-1.582* (0.083)	-0.754 (0.443)	-0.707 (0.388)
Intercept	-0.127 (0.207)	0.132 (0.340)	-0.142 (0.682)	0.177 (0.332)	-0.011 (0.748)	0.132 (0.261)	-0.067 (0.316)	-0.022 (0.448)	-0.022 (0.775)	0.083** (0.034)
Trade	-0.002 (0.106)	0.008 (0.141)	-0.002 (0.538)	0.009 (0.178)	0.004 (0.526)	0.0003 (0.921)	0.003 (0.345)	0.014 (0.114)	-0.004*** (0.000)	-0.002** (0.014)
Pop. Growth	---	---	---	---	---	---	---	---	---	---
Pub. Investment	---	-0.016 (0.337)	---	-0.021 (0.290)	---	-0.007 (0.762)	---	0.003 (0.801)	---	-0.003 (0.579)
AR(2)	1.126 (0.259)	0.057 (0.953)	0.915 (0.359)	0.412 (0.680)	-0.618 (0.536)	1.079 (0.280)	-0.669 (0.503)	-1.655 (0.097)	0.226 (0.821)	0.949 (0.342)
OIR	0.080 (1.000)	0.152 (1.000)	0.212 (1.000)	0.017 (1.000)	0.035 (1.000)	0.979 (1.000)	0.159 (1.000)	0.010 (1.000)	0.309 (1.000)	0.062 (1.000)
Wald	2.818 (0.244)	4.323 (0.228)	0.480 (0.786)	3.189 (0.363)	0.799 (0.670)	0.564 (0.904)	0.953 (0.620)	3.065 (0.381)	16.52*** (0.000)	14.02*** (0.002)
Countries	4	5	4	5	4	5	4	5	4	5
Observations	50	53	50	53	51	55	50	53	51	52

	Financial Activity				Inflation(CPI)		Economic Performance			
	Banking Activity		Financial Activity		GDP Growth		GDPpc Growth		GDPpc Growth	
	WAMZ	EAMZ	WAMZ	EAMZ	WAMZ	EAMZ	WAMZ	EAMZ	WAMZ	EAMZ
Initial	-1.020 (0.337)	-0.716 (0.264)	-1.064 (0.324)	-0.583 (0.277)	84.643 (0.626)	-0.535 (0.609)	-1.417* (0.080)	1.325 (0.899)	0.621 (0.212)	-1.490 (0.273)
Intercept	0.067 (0.848)	0.290 (0.145)	0.059 (0.839)	0.206 (0.212)	115.96 (0.618)	0.689 (0.737)	4.288 (0.275)	-0.365 (0.892)	-5.988 (0.286)	0.221 (0.725)
Trade	-0.002 (0.522)	0.014 (0.174)	-0.001 (0.600)	0.012 (0.215)	-1.124 (0.622)	0.017 (0.679)	0.013 (0.731)	0.259 (0.801)	-0.088 (0.619)	0.039 (0.750)
Pop. Growth	---	---	---	---	---	---	---	---	---	---
Pub. Investment	---	-0.016 (0.496)	---	-0.008 (0.708)	---	0.108** (0.035)	---	---	---	0.277 (0.262)
AR(2)	0.528 (0.597)	0.067 (0.946)	0.678 (0.497)	-0.059 (0.952)	0.427 (0.668)	0.405 (0.685)	0.879 (0.379)	-0.154 (0.877)	0.847 (0.396)	-1.196 (0.231)
OIR	0.007 (1.000)	0.247 (1.000)	0.001 (1.000)	0.004 (1.000)	0.000 (1.000)	0.084 (1.000)	0.544 (1.000)	1.700 (1.000)	0.908 (1.000)	0.474 (1.000)
Wald	1.546 (0.461)	2.081 (0.555)	1.572 (0.455)	1.931 (0.586)	0.929 (0.628)	7.731* (0.051)	4.253 (0.119)	2.190 (0.334)	1.559 (0.458)	2.344 (0.504)
Countries	4	5	4	5	3	5	4	5	4	5
Observations	50	53	50	53	39	49	36	41	21	18

*,**,***: significance levels of 10%, 5% and 1% respectively. WAMZ: West African Monetary Zone. EAMZ: East African Monetary Zone. Syst: System. Initial: lagged autoregressive estimated coefficient. AR(2): Second Order Autocorrelation test. OIR: Overidentifying Restrictions Sargan Test. Wald: statistics for joint significance of estimates. Obser: Observations. CPI: Consumer Price Index. GDP: Gross Domestic Product. GDPpc : GDP per capita. Pop: population. Pub: Public.

4.4 Robustness checks

In a bid to assess the validity of our results we perform three types of robustness tests: (1) firstly, for every regression (whether in AC or CC terms) we use the conditioning information set singly and in pairs; (2) secondly, we set τ to 3 and replicate the same analysis in tables 2 and 3; (3) lastly, we set τ to 4 and still replicate the analysis. In so doing we find results not significantly different from those in Tables 2-3.

4.4.1 Setting τ to 3

When τ is set to 3 we notice no significantly different results from those in tables 2 and 3. There is still evidence of AC in banking system efficiency within the EAMZ at a speed of 14.23% per annum and time required to achieve a complete convergence of 21.08 years. No significant results are noticed for the WAMZ. We replicate the analysis with different pairs of the conditioning information set to further assess the robustness of the findings.

4.4.1 Setting τ to 4

With τ set to 4, the following new findings emerge. For the WAMZ there is evidence of AC in real sector policies; with the speeds (time) of (for full) convergence in GDP and GDP per capita growths respectively: 12.57% p.a (31.82yrs) and 11.82% p.a (33.84yrs). The analysis is replicated with different pairs of the conditioning information set.

With regard to the EAMZ we find significant results only for financial depth. With respect to the money supply dimension, convergence is at 22.25% p.a with a full convergence period of 17.97yrs. The liquid liability dimension of financial depth has a convergence rate (full convergence period) of 21.45% p.a (18.64yrs). This EAMZ analysis is also replicated with different pairs of the conditioning information set.

Overall, even after all available combinations of $\tau(3 \text{ \& } 4)$ and alternating macro economic variables, results are not substantially different from those summarized in Table 1 and detailed in Tables 2-3.

4.5 Discussion and policy implications

Before diving into the discussion of the results, it is imperative at the outset to grasp the economic intuition and circumstances motivating absolute and conditional convergence in real and monetary policies within the WAMZ and EAMZ. The European Monetary Union (EMU) crisis has sent a strong signal to other common currency regions on the imperatives of real and monetary convergence. An important lesson of the EMU crisis is that serious disequilibria result from regional monetary arrangements not designed to be robust to a variety of shocks (Willet, 2010; Willett & Srisorn, 2011). In fashioning the euro zone, institutions' almost exclusive concern was placed on limiting crises caused by financial sectors. The official position of the German government today appears to maintain that failure of these safeguards is the principal cause of the crisis.

Member countries of the potential WAMZ have twice postponed the take-off for the single currency. Banking experts in the up-coming EAMZ fear that plans for a common currency in 2012 may be too ambitious as central banks in the five countries are given little time to prepare for the monetary union. In a recent meeting among EAMZ central bank officials, experts have asserted the lack of knowledge in modeling and forecasting monetary policies as well as implementing reforms needed for a single currency union. In another recent meeting among elements of the WAMZ Convergence Council, questions have been raised over the achievement of monetary policy convergence. Three issues have resulted from these stylized facts: (1) the need for monetary policy convergence; (2) the imperative of bankers to understand modeling and forecasting methods in monetary policy transmission and; (3) the requirement of common structural and institutional characteristics among candidate countries.

In order to address the issues, the present analysis has been based on two hypotheses: (1) real economic sector policies are designed to achieve macroeconomic performance through growth in GDP and GDP per capita at macro and micro levels respectively; (2) monetary policies are designed to keep inflation in check and improve financial intermediary dynamics of depth(money supply and liquid liabilities), efficiency(at banking and financial levels), activity(from banking and financial perspectives) and size. We have also calculated the speeds of convergence and period required to achieve full(100%) convergence; where applicable.

4.5.1 Absolute convergence

Absolute convergence is the result from factors such as monetary zones and the adoption of a single currency, among others(Nayaran et al., 2011). Absolute convergence in real and monetary policy implies countries share the same fundamental characteristics with regard to the financial intermediary market such that the only difference across countries is in initial levels of financial intermediary market development.

Since the mid 1980s countries of the WAM and EAM zones have undertaken structural reform programs engineered by the International Monetary Fund(IMF)which include financial liberalization for the most part. The vested agenda has been to reduce barriers to trade and increase foreign investment. Unlike other African countries without prospects for a single currency, the WAM and EAM zones member states are expected to benefit more in the reforms by virtue of reduced risk and low cross-border currency conversion costs in the flows of trade and investments among member countries. Owing to this financial liberalization, capital controls and control on exchange rate transactions have been substantially eased in the WAM and EAM zones; together with advances in information and communication technologies which have rendered the banking industry increasingly synchronized. This synchronization has also increased the speed of shock adjustment;

implying the rate at which one bank in the potential monetary zones adjusts when there is a shock in the other has increased. All these factors should naturally result in absolute convergence. However, our findings do not reveal support for absolute convergence. It follows that despite dissimilar initial levels in financial development, member states within the WAM and EAM zones do not share the same fundamental characteristics. In other words structural reform programs from the IMF and World Bank have not been evenly implemented by candidate countries.

4.5.2 Conditional convergence

According to the economic growth literature (Barro, 1991), conditional convergence depicts convergence whereby one's own long-run stable state (equilibrium) is contingent on the different structural characteristics or fundamentals of each economy or market (Narayan et al., 2011). Still from Narayan et al. (2011), when financial intermediary markets across countries differ in terms of factors relative to the performance of their markets, there could be conditional convergence. The convergence in dynamics of the banking sector is contingent on proxies which we observe and empirically model. Our results are thus conditional on the macroeconomic measures we have used. Note should be taken of the fact that, owing to constraints in data availability and degrees of freedom required for the OIR-Sargan test, we conditioned our analysis to three macroeconomic variables: consistent with the convergence literature (Prichett, 1997; Bruno et al., 2011; Narayan et al., 2011). As we have found no evidence for this form of convergence, it follows that structural characteristics like macroeconomic policies are different across countries. Also, based on stylized facts presented in the motivation of the paper, it could be established that this insignificance is also the result of cross-country differences in institutional characteristics like government quality (democracy, control of corruption, voice and accountability, rule of law, regulation quality, political stability...etc).

On a final note the findings of this paper are broadly consistent with the convergence literature on the EAMZ(Mkenda,2001; Buigut & Valev,2005) and the WAMZ(Celasun & Justiniano,2005; Debrun et al., 2005; Tsangarides & Qureshi, 2008; Alagidede et al.,2011).

4.5.3 Policy implications

In spite of common fundamental characteristics for candidate countries of the WAM and EAM zones(as they are implementing common policies in the run-up to the new monetary zones), we have found substantial insignificance in both types of convergence in the analyses. These findings have four broad implications: (1) initial conditions for financial development are different across countries; (2) fundamental characteristics as common monetary policy initiatives and IMF backed financial reform programs are implemented differently across countries; (3) there is remarkable evidence of cross-country variations in structural characteristics of macroeconomic performance; (4) institutional cross-country differences could also be responsible for the deficiency in convergence within the potential monetary zones.

As a policy implication, heterogeneous structural and institutional characteristics across countries are giving rise to different levels and patterns of financial intermediary development. Thus member states should work towards harmonizing cross-country differences in structural and institutional characteristics that hamper the effectiveness of convergence in monetary and real policies.

5. Conclusion

A spectre is hunting embryonic African monetary zones: the EMU crisis. The introduction of common currencies in West and East Africa is facing stiff challenges in the timing of monetary convergence, the imperative of bankers to apply common modeling and forecasting methods of monetary policy transmission, as well as the requirements of common

structural and institutional characteristics among candidate states. Inspired by the premise of the EMU crisis, this paper has assessed real and monetary policy convergence within the potential WAM and EAM zones. In the analysis, monetary policy targets inflation and financial dynamics of depth, efficiency, activity and size while real sector policy targets economic performance in terms of GDP growth at macro and micro levels. Findings suggest overwhelming lack of convergence; an indication that candidate countries still have to work towards harmonizing cross-country differences in fundamental, structural and institutional characteristics that hamper the convergence process.

Appendices

Appendix 1: Summary statistics(Combined data for WAMZ and EAMZ)

		Mean	S.D	Minimum	Maximum	Observations
Financial Depth	Money Supply	0.223	0.114	0.054	0.747	125
	Liquid Liabilities	0.161	0.102	0.028	0.553	125
Financial Efficiency	Banking Efficiency	0.651	0.315	0.070	1.844	132
	Financial Efficiency	0.730	0.362	0.139	1.968	125
Financial Activity	Banking Activity	0.103	0.069	0.013	0.255	125
	Financial Activity	0.118	0.086	0.013	0.349	125
Financial Size	Financial Size	0.563	0.242	0.054	1.155	130
Other Variables	Openness(Trade)	54.581	26.818	6.320	138.76	129
	Inflation	17.434	27.228	-100.00	196.12	120
	Public Investment	7.180	3.719	0.000	15.734	106
	GDP growth	3.584	6.759	-50.248	27.462	128
	GDP per capita growth	0.752	6.200	-46.892	22.618	128
	Population growth	2.747	1.606	-6.849	10.043	135

S.D: Standard Deviation. GDP: Gross Domestic Product

Appendix 2: Correlation analysis(Combined data for WAMZ and EAMZ)

Fin. Depth		Fin. Efficiency		Fin. Activity		F. Size		Other Variables					
M2	Fdgd	BcBd	FcFd	Pcrb	Prbof	Dbacba	Trade	Infl.	Pub. I	GDPg	GDPpcg	Popg	
1.000	0.983	0.078	0.014	0.790	0.788	0.532	0.460	-0.210	-0.159	-0.010	-0.048	0.119	M2
	1.000	0.084	0.005	0.810	0.823	0.567	0.406	-0.208	-0.238	0.020	-0.019	0.126	Fdgd
		1.000	0.920	0.590	0.565	0.394	0.162	-0.140	0.319	-0.062	-0.074	0.155	BcBd
			1.000	0.473	0.503	0.367	0.035	-0.189	0.434	-0.163	-0.169	0.002	FcFd
				1.000	0.955	0.683	0.420	-0.219	-0.074	-0.049	-0.083	0.100	Pcrb
					1.000	0.640	0.301	-0.209	-0.105	-0.073	-0.108	0.101	Prbof
						1.000	0.292	-0.258	0.043	0.087	0.051	0.174	Dbacba
							1.000	-0.127	0.137	0.008	-0.017	0.084	Trade
								1.000	-0.031	0.290	0.267	0.240	Infl.
									1.000	0.025	0.021	0.057	Pub.I
										1.000	0.973	0.509	GDPg
											1.000	0.301	GDPpcg
												1.000	Popg

M2 :Money Supply. Fdgd : Liquid liabilities. BcBd : Bank credit on Bank deposit. FcFd: Financial credit on Financial deposit. Pcrb:Private domestic credit by deposit banks. Prbof: Private domestic credit by deposit banks and other financial institutions. Dbacba: Deposit bank assets on deposit bank assets plus central bank assets. Pub.I: Public Investment. GDPg: GDP growth. Popg: Population growth. Fin: Financial.

Appendix 3: Variable definitions

Variables	Signs	Variable definitions	Sources
Inflation	Infl.	Consumer Price (Annual %)	World Bank(WDI)
Openness	Trade	Imports(of goods and services) plus Exports(of goods and services) on GDP	World Bank(WDI)
Public Investment	PubI	Gross Public Investment(% of GDP)	World Bank(WDI)
GDP Growth	GDPg	Average annual GDP growth rate	World Bank(WDI)
GDP per capita Growth	GDPpcg	Average annual GDP per capita growth rate	World Bank(WDI)
Population Growth	Popg	Annual population growth rate	World Bank(WDI)
Economic financial depth(Money Supply)	M2	Monetary Base plus demand, saving and time deposits(% of GDP)	World Bank(FDSD)
Financial system depth(Liquid liabilities)	Fdgd	Financial system deposits(% of GDP)	World Bank(FDSD)
Banking system allocation efficiency	BcBd	Bank credit on Bank deposits	World Bank(FDSD)
Financial system allocation efficiency	FcFd	Financial system credit on Financial system deposits	World Bank(FDSD)
Banking system activity	Pcrb	Private credit by deposit banks (% of GDP)	World Bank(FDSD)
Financial system activity	Perbof	Private credit by deposit banks and other financial institutions(% of GDP)	World Bank(FDSD)
Financial size	Dbacba	Deposit bank assets on Central banks assets plus deposit bank assets	World Bank(FDSD)

M2: Money Supply. Fdgd: Liquid liabilities. BcBd: Bank credit on Bank deposits. FcFd: Financial system credit on Financial system deposits. Pcrb: Private domestic credit by deposit banks. Perbof: Private domestic credit by deposit banks and other financial institutions. Dbacba: Deposit bank assets on Central bank assets plus deposit bank assets. WDI: World Development Indicators. FDSD: Financial Development and Structure Database.

Appendix 4: Presentation of countries

Zones	Definitions	Countries	Number
WAMZ	West African Monetary Zone	The Gambia, Ghana, Guinea*, Nigeria, Sierra Leone	4
EAMZ	East African Monetary Zone	Tanzania, Rwanda, Burundi, Kenya, Uganda.	5

*Guinea is not included in the WAMZ Analysis owing to constraints in data availability.

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