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Impact of Misaligned Real Exchange Rate on Economic Performance: A case study of West African Monetary Zone

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Abstract **:** *The study assessed the impact of real exchange rate misalignment on economic performance of WAMZ economies. The study uses Generalised Method of Moment of Dynamic Panel Estimation Method, supported with Cross Country Correlation Approach which comprises Gambia, Ghana, Guinea, Liberia, Nigeria and Sierra Leone covering the period from 2000 commencement of the zone to 2010 from international financial statistics of international monetary fund with aid of quarterly data.*

The study discovered that the zone experiences asymmetrical correlations between real exchange rate misalignment and economic performance while the inclusion of equilibrium real exchange rate revealed a symmetrical relationship with economic performance. Further revelation in the study happened to be the cross country correlations which unveiled that two countries (Ghana and Nigeria) emerged to have a moderate degree of symmetrical relationship using the study macroeconomic variables of interest, real exchange rate and misaligned real exchange rate.

Keywords: *currency union, economic performance, misaligned real exchange rate, GMM, WAMZ*

I. Introduction

Theory of comparative advantage is the genesis of international trade indicating that for living standard to be improved or an economy to grow and expand developmentally such an economy needs to be opened, i.e., calling presence of external economy. In an external economy, international finance plays crucial roles where there is presence of external factors over the economy generates an influence which is hard to manage and control. Globally, the international finance of real exchange rate instability has adverse effects on economic performance of most economies due to inability to achieve expected realistic exchange rate and price stability. The real exchange rate emerges as a crucial variable as a result of exchange rate policy for countries entering trade liberation which calls for effective and efficient exchange rate management. Wrong exchange rate policies turn out to be harmful to the economies. Presence of overvalued exchange rate resulted to increase living standard above productivity level and an undervalued exchange rate resulted in excess in the current account of balance of payment and depresses the living-standard.

However, the problems of exchange rate variability and misalignment lead countries or region to currency area in order to eliminate the costs such as creating towards ensuring internal and external balance in the form of full employment and balance payment equilibrium respectively. Currency union or monetary integration enhances easy currency convertibility and less exchange rate risk. With credible monetary integration, it encourages policy stability which promotes economic growth. When countries decide towards monetary union, their national currencies will be abandoned which leads to loss of exchange rate as a policy tool while the monetary policy is handled by a common central bank, i.e., member nations of the union lose the control of their national monetary policy as well as loss of seigniorage. This implies that a country joining a currency union will not be able to change the price of its currency (by devaluation and revaluation), to determine the quantity of the national money in circulation or to change the short run interest rate and not only that there is no likelihood of any assurance of liquidity support in time of crisis for domestic commercial banks. The cost of monetary union in currency area literature referred to as the presence of asymmetric shocks. Despite, optimal currency area (OCA) is expected to discharge element of benefits to nations joining the union by outweighing the cost associated with currency area. The potential benefits of currency union are: an improved price stability, reduced exchange rate variability, reduced transportation cost, improved price transparency, interest on saving from pooling of foreign exchange reserve, resources savings from centralization of monetary policy and dynamic gains. In addition, monetary union's benefits include creation of a large regional market, enhancement of healthy economic competitiveness, increase in intra-regional trade via lower transaction cost and reduction of exchange rate uncertainties.

Therefore, the global trend in economic integration ranging from preferential trading arrangement, free trade arrangement, custom union to common market arrangement and to ultimate economic and currency union in both developed countries and developing countries or region have kindled great interest in the subject for both academicians and economic policy makers in which Anglo-phone countries in West Africa are not excluded. The Anglo-phone nations comprise of Gambia, Ghana, Guinea, Liberia, Nigeria and Sierra Leone

who signed a declaration in the creation of a second monetary zone in West African region on April 20, 2000 in Accra, Ghana. The zone's objective is known as The West African Monetary Zone (WAMZ) by establishing a common monetary and exchange rate policy by January 2003. Prior to the adoption of a single currency, the creation of an economic and monetary union requires a high degree of convergence of economic policies and performance. It implies that member countries would need to fulfill various economic criteria geared towards greater convergence of economic policies. The convergence of the economies is measured by four criteria namely: inflation, interest rate, exchange rate stability and sustainability of fiscal position in which all member countries had agreed to embark upon in order to achieve a single currency in their zone.

In spite of the various studies towards assessing monetary union in West African monetary Zone, to our knowledge, there is hardly any concrete empirical study that has been conducted to assess the impact of misaligned real exchange rate on economic performance as an implication for macroeconomic unionisation in the zone. Studies such as Alagidede, Tweneboah and Adam (2008) based on nominal exchange rate and price convergence in WAMZ countries while Tamsir Chan (2010) investigated real exchange rate misalignment in West African Monetary Zone (WAMZ) countries. Consequently, a research gap thus exists.

Thus, the present study tends to seek an answer if real exchange rate and misaligned real exchange rate of participating countries have importance in the determination of macroeconomic out turn in the WAMZ countries which could imply significant losses when the countries involved give up of control for the period of a declaration of second monetary zone in West African region between 2000 and 2010. The objective is to investigate the impact of misaligned real exchange rate on economic performance of WAMZ. This paper is divided into five sections, section two reviews literature survey in the area of monetary and economic union. While section three specifies the model and exposes some econometric issues of RER misalignment estimation and economic growth model using Keynesian approach, section four discusses results and finally, section five provides conclusion.

II. Literature survey

Several authors on the research of Optimum Currency Areas (OCA) discussed that such area constitutes economies with similar kinds of economic shocks as well as free mobility of factors within the area. For optimum currency area to be adopted, literature asserts that meeting OCA criteria are necessary and sufficient conditions where countries involved can share single currency with absence of an adverse effect. In entering OCA, it is meaningful for an economy to abandon its own currency provided certain conditions that make the functioning of nominal exchange rate less appealing.

Mundell (1961),McKinnon (1963) and Kenen (1969) asserted that three criteria need to be satisfied before OCA could be established in a region, namely mobility of factors associated with Mundell (1961), openness to trade criteria forwarded by McKinnon and diversification of individual economies criteria connected with Kenen (1969).

The genesis point for every literature on optimum currency area (OCA) theory is Mundell (1961). According to him, an OCA is one which brings about automatic adjustment of internal and external balance in the form of full employment and balance of payment equilibrium respectively. He related optimum currency areas to the labour market. The achievement of internal and external balance is possible through the mobility of factors of production within the area, the more mobile factors are in the region forming a monetary union, the less the effect adverse shocks on such economy so far factors can migrate from the affected area to the unaffected area where equalisation of factor costs will tend to equate inflation rates within the area.

McKinnon (1963) emphasised the significance of open economies and internal price stability in an OCA. He argued that the more a region is opened to trade, the less effective the nominal exchange rate since most prices are determined at the regional levels as well as the higher the financial integration, the less it needs exchange rate variations.

Kennon (1969) suggested that for OCA to be established the degree of product or industry diversification is a crucial element towards assessing the costs and benefits of a currency union. The more diversified an economy is, the less it suffers from economic shocks.

Scitovsky (1958) stated that the common currency arrangement would tend to make some nations similar that such single currency would encourage a greater volume of trade among the member countries of such currency union. Since transaction costs would be reduced and uncertainty in the movement of exchange rate would completely be eliminated, such could stimulate trade. He posited that where there was an evolving single market due to currency union, volume of intra-union trade would increase, economic divergence would decrease and each nation would become more like each other, eliminating or reducing asymmetric shocks that might result to OCA criteria being gradually indigenized.

Masson and Pattillo (2001) and Frankel and Rose (1998) concluded in their findings over currency union that optimum currency areas were to some extent endogenous and that currency union might be of help to make the shocks hitting member nations more symmetric which might expand intra-union trade.

Beetsma and Bovenberg (1995) discovered that under fiscal leadership, monetary union might discipline fiscal and monetary policies which could lead to reduction in inflation, taxes and public spending .These disciplining effects of monetary union which rose with number of fiscal players in the union were likely to raise welfare. They noted that a larger monetary union with an optimally designed common central bank could raise welfare even if the fiscal authorities fail to care about inflation. In conclusion, optimum price stability weight of the common central bank converges to that, in the second best, if the union becomes infinitely large.

Jayaraman (2004) examined a case for a currency union for the four Melanesian Spearhead Group (MSG) countries which comprises of Fiji, Paupua New Guinea, Solomon Island and Vanuatu, all in Pacific Island countries. He showed that optimum currency area criteria in terms of large pre-union volume of trade, factor mobility, downward wage and price flexibility and fiscal transfers were not fulfilled in this MSG. He further highlighted the convergence criteria associated with exchange rate stability, import cover and external debt-GNP, and debt service ratio, the result was that non-MSG county had made the grade.

Bjorksten, Grimes, et.al (2004) focused on a study using Taylor Rule where the study revealed that inflation in New Zealand and Australian economies was highly correlated. The rule evidence suggested that the cost to New Zealand associated with abandoning its independent currency and monetary policies might not be substantially greater than the cost connected with individual Australian states not having independent monetary policies. The implication submitted was that shocks to the Australian economy transmitted to New Zealand as a result of similarity in the inflation rates as well as employment gap cycles across the two economies.

Foresti (2007) designed a study towards monetary integration in Latin American countries. The study revealed absence of monetary integration even at a sub-regional level. He noted that the structural shocks correlation between countries strengthened the impression that Latin American was with low level of economic synchronizations and integration. The correlation levels showed negative or low coefficients, implying that there was high presence of likelihood of asymmetric shocks for Latin American Countries.

Masson (2006) investigated currency union in African. The investigation concluded that asymmetries across African countries would make even regional currency much less a single African because of undesirable presence for some countries despite potential doubling of trade.

Fourie and Santana-Gallego (2009) verified the gain from currency union membership in southern Africa. The study indicated that aggregate countries stood to gain substantially from single currency where these benefits were greater for a select few. In Southern African Development Community such as Malawi, Mozambique, Zambia, Zimbabwe were economies that were predicated to have benefit from larger trade flow provided they adopted south Africa's rand, i.e., south African currency as union's currency. He further stated that there was no great gain in ECOWAS adopting common currency but some African countries could have small gain from trade in "dollarization" while adoption "Euro" can bring significant gain for some African economies like Algeria and Libya.

Carmignani (2009) examined the endogenous optimal currency area case study of Central African Economic and Monetary Community (CAEC). His study highlighted that the degree of synchronization of business cycle across CAEC countries between 1960 and 2007 which remained low. Such implied that CEAC currency union was not as endogenous as the expectation would be from previous empirical studies. The weak 'endogeneity' effect could be traced to poor channels of transmission and poor intra-regional trade which signaled macroeconomic policies across union members failed to converge.

Buiguit and Valev (2005) verified eastern and southern Africa monetary integration using a structural Vector Auto -regression Analysis. His study discovered that supportive evidence was relatively weak towards a broad monetary union encompassing all countries in the region when decomposing the economic shocks experienced by eastern and southern African countries into supply and demand disturbance and correlations. The external anchor-currency revealed that linking an island (IOC) currency to the" euro" could be welcomed and weaker evidence for linking an EAC currency to euro as well as absence of evidence to support linking a Southern African Currency (SADC) to any of the hard currencies considered.

Houssa Romain (2004) examined monetary union in West Africa and asymmetric shocks. His study hinted there was a positive demand shocks correlation between French speaking countries except for Togo and Niger as well as presence of such with English speaking countries except for Gambia which displayed asymmetric demand shocks with Nigeria. Supply shocks were less correlated and more asymmetric between these countries reflecting the different specialisation in commodity goods produced in West African Nations. The implication suggested presence of some costs for a monetary union in the region, West Africa.

Debrun, Masson and Pattillo (2003) asserted that West Africa currency union: rationale and sustainability. The study observed that the costs of sacrificing monetary autonomy were often more than offset by the gains deriving in the partial separation of macroeconomic powers (monetary and fiscal powers). This implied that large economies with relatively ambitious public spending objectives would not be attractive partners in the union due to the pressure that would be on the common central bank, creating excessive inflation

in the union. The study emphasised fiscal discipline among member nations would result to desirability and sustainability of a currency union critically. In conclusion, the desirability of an ECOWAS monetary union called for a strong fiscal surveillance procedure both at transition phrase and after establishment of the union.

Akinbobola and Akinlo (2005) examined whether or not ECOWAS constitutes OCA. The study adopted VAR modeling technique to investigate where the conclusion revealed that a low trade link exists among member nations of ECOWAS with their export competitive rather than complimentary. The study observed that sub-region could not effectively form a successful OCA due to the asymmetric disturbance of real exchange rate shocks as well as the low degree of openness across the countries.

Ogunkola (2005) attempted to evaluate the variability of a single monetary zone in ECOWAS countries. The study reported that historically CFA zone of west African economies by low standard deviation of real exchange rate shocks have been empirically characterised; there was no wide variation of real exchange rate shocks among those economies while opposite existed in the case of non-CFA zone nations with high standard deviation of real exchange rate shocks are historically characterised in the region which ruled out possibility of a viable two-speed monetary union unless drastic policy reforms and strong political commitment were in place.

Hefeker (2003) studied the connection between fiscal reform and monetary union in West Africa. The study suggested that the effects depended on the extent of similarity of member nations. A union of similar economies, such member economies ran more distortive fiscal policy while the structural reforms efforts failed. The reverse was the case in a monetary union with dissimilar economies. The study further disclosed that diverse economies would induce those economies that were below average in term of financial needs and distortion to adopt a more restrictive fiscal policy due to the average inflationary pressure on the central bank had increased, which called for keeping inflation rate down by pursuing a less distortive fiscal policy. The implication of the study signaled that West African Monetary Zone (WAMZ) of ECOWAS were characterised by high inflation and large fiscal distortion. The study concluded that planned union needed to check structural effect in order to have convergent fiscal policies and that it favoured non-WAMZ nation to run a less distortive fiscal policy after the inclusion of other members of ECOWAS.

Tamsir (2009) assessed macroeconomic convergence and optimal currency area criteria of WAMZ. The OCA criteria examined were openness synchronization shocks and labour mobility. The study showed that openness criteria did well but conclusion implied absence of macroeconomic convergence criteria.

Balogun (2008) identified an alternative recommendation of macroeconomic convergence criteria for WAMZ. The study realised that substantial macroeconomic losses had been associated with monetary autonomy reflected in the wide divergence of outcomes from set benchmarks without much prospects due to absence of international binding monetary policy coordination framework. Further exchange rates failed to perform stability role envisioned by traditional OCA theory within the intra-WAMZ export but translated into higher domestic inflation. In this study, trade gravity model with dummies in the regression was inclusive which confronted that central monetary policy would be more effective than nationally differentiated policies even with the presence of strongly asymmetric hocks produced. The strong convergence of aggregate output/demand pattern between WAMZ economies based on trade gravity model which emerged as possible positive attribute of countries participating in efficient currency areas, the study concluded.

Balogun (2009) further high-lightened the determinants of inflation in WAMZ economies where the study discovered that macroeconomic (price) stabilisation around a desire target was not attained in which monetary policy instrument determinants of inflationary divergence were the pursuit of distorted interest rates, exchange rates. There were overvaluation and expansionary monetary policies which penalised credit and accentuated output supply/demand gap.

Anokye M.A, Daniel Agyapong and Gyamfi E.N (2010) investigated the dynamic macroeconomic convergence in the WAMZ countries where the study found emerging convergence in exchange rate of four candidate countries (Ghana, Gambia, Nigeria, and Sierra-Leone) but high distance to convergence and divergence in Guinea and Liberia as well as a high degree of divergence and distance to convergence amongst inflation rates in the zone. The study advised the WAMZ union to be postponed till 2015 due to their unpreparedness for single currency in the zone.

Balogun (2007) realised that independent monetary and exchange rate policies have been relatively ineffective in influencing domestic activities due to counter-productivity in WAMZ. The study showed that expansionary monetary policy contributed more to fuelling prices than did to economic growth as well as adverse effects of interest rate policy towards GDP. The study also posited that exchange rate devaluation manifests mainly in domestic inflation without effect on growth. In conclusion, the study recommended that WAMZ countries would be better off to surrender its independence over these policy instrument to the planned regional body under appropriate monetary union arrangement.

Alagidede, Tweneboah and Adam (2008) attempted to carry out a study on nominal exchange rate and price convergence in WAMZ economies where exchange rates in all countries followed a random walk pointing

towards significant long run relationship between nominal exchange rates and prices. The study further found that deviation from purchasing power parity (PPP) were offset by an increase in real exchange rate (depreciation) to restore equilibrium calling for well coordinated macroeconomic policies and minor divergence in prices and exchange rates to eliminate excessive arbitrage profits that may arise.

Tamsir Chan (2010) assessed real exchange rate misalignment in WAMZ countries. The study revealed that across WAMZ nations between 2000 and 2005, real exchange rate variability has increased substantially with uneven degree of real exchange rate across the zone. The study finalised that the increase in misalignment of real exchange rate 2000and 2005 rose the cost associated with entering into monetary union in the zone.

However, this study will compliment from the methodological angle by exploring panel data approach and Generalised Method of Moment (GMM) through the GMM dynamic panel estimation method to investigate the correlation between misaligned real exchange rate and economic performance of WAMZ countries. Most existing studies used least square methods, descriptive statistics and Vector autoregressive (VAR) modeling technique in their empirical assessments.

III. Model specification

3.1 Theoretical framework

In this research work, the study intends to adopt the concept of inter-temporal model of the determinants of real exchange rate. By this framework as a guide will permit the study to separate the effect of short run and long run determinants of real exchange rate and compute the real exchange rate. "Effective real exchange rate is the relative price of tradable to non-tradable which for given (equilibrium) sustainable values

of other relevant variables such taxes, international prices and technology result in the simultaneous attainment of internal and external equilibrium". Edward (1989)

Effective real exchange rate can be defined as:

$\mathbf{q_{it}= E \cdot P^{x*\alpha} \cdot P^{m*1-\alpha} \div P^{n}}$ .....eq.(1)

where $\mathbf{P^n}$ is the domestic price level of non-tradable, **E** is nominal exchange rate in form of domestic unit. $\mathbf{P^{x}*}$ is the world price level of exportable, $\mathbf{P^{m}*}$ is the world price level of importable. $^{\alpha}$ and $^{1-\alpha}$ refer tom ratio of exportable and importable in the world price level respectively. An increase in RER is here depreciation and decrease in RER implies appreciation.

$\mathbf{q_{it}}$ =RER can be generally expressed as a function variables by adopting Edward 1989 and decomposed variability of real exchange rate into (fundamentals) long run variables and transitory variables (short run variables). That is by assessing to be a linear function of two groups of determinants of real exchange rate.

$\mathbf{q_{it}}=\alpha W_{it}+ \beta \mathbf{Z_{it}} + \mu_{it}$ ……eq.(ii)

where $\mathbf{q_{it}}$ is the log of RER of a country $_i$ at time **t**, W_{it} is a vector of variables for country $_i$ at time t which capture real or structure or long run determinants of RER , $\mathbf{Z_{it}}$ is a vector of variables for country $_i$ at time **t** which captures the monetary source or transitory factors or short run determinants of RER and μ_{it} is the error term for country $_i$ at time **t**.

An expanded linear version of above equation (1) can be written as:

$\mathbf{q_{it}} = _{\theta} +\alpha$(term of trade (tot), open trade (open), real productivity (Prod), government expenditure (govt), trade Balance (nki))+ β(inflation (inf), money supply shock (m^2), output shock (m^3))……eq.(iii)

Terms of trade improvement would raise the consumption of tradable thereby increase labour supply in tradable and reduce labour supply to non-tradable. This leads to an increase in relative price of non-tradable, hence, RER appreciates, and term of trade is defined as price of exports divided by price of import. Openness is included since a shift in a country's trade policy towards greater liberalization leads to an increase in demand for tradable goods. The RER is required to depreciate in order to switch the demand from tradable goods towards non-tradable goods and then restore the equilibrium. The RER is positively related to the degree of trade liberalization. Labour productivity is proxy to be real GDP per capita income. If traded goods productivity relative to non-traded goods productivity is growing faster at home than abroad, home currency should appreciate in real terms (Balassa-Samuelson effect). Government consumption is 'proxied' to be fiscal policy. Increase in fiscal policy on non-tradable goods appreciates RER. Higher sustainable net capital inflows ensure higher sustainable domestic absorption. Where there is an increase in interest rate either due to a rise in international interest rate or an increase in expected real depreciation of RER will increase the demand for saving and hence reduces absorption.

$\mathbf{q_{it\ =\theta} + \alpha_1 logtot + \alpha_2 logopen + \alpha_3 logprod + \alpha_4 loggovt + \alpha_5 lognki + \beta_{\ 1} loginf + \beta_2\ logm^2 + \beta_{\ 3} logm^3}$ **……..eq.(iv)**

Adopting a linear specification for fundamental equation (iv), it can be solved for RER in the following above equation with the sign of derivatives as indicated above: where $_{\theta \text{ is constant}}$, $\alpha_1 >0$, $\alpha_2<0$, $\alpha_3>0$, $\alpha_4>0$, $\alpha_5 >0$, $\beta_1<0$, $\beta_2 <0$

However, misalignment indicators are then constructed, where misaligned RER is defined as:

$\mathbf{Mis_{it}= (q_{it} -\alpha W_{it}) = (\beta Z_{it} + \mu_{it})}$…….eq.(v)

A sustainable increase in any of these components would lead to an equilibrium RER appreciation. It specifies and estimates an empirical model for the RER that permit the equilibrium RER to be more appreciated with higher term of trade, larger productivity in the traded goods sector relative to the non-traded sector, lesser open trade, higher government expenditure, and larger net foreign income. Therefore the specification is model built. Thus, a misalignment is the deviation of the actual RER from a linear combination of variables that proxy the flexible price RER due to the short run shock proxies and the errors terms of the regression according to Razin and Collins (1997).

From the above equation (iii), the actual RER is composed of two key components which are medium to long run fundamentals (term of trade, open trade, productivity, net capital inflow, and government) and monetary variables (transitory variables). Therefore, RER misalignment is the deviation of actual RER from its (fundamentals) equilibrium RER. That is,

RER misalignment = $\beta \mathbf{Z_{it}} + \mu_{it}$ ……. Eq. (v).

It implies that misaligned RER is the sum of transitory or monetary variables and error terms. Equation (iv) indicates the point at which misaligned RER can be decomposed into the effect of transitory factors, error term and the extent to which the fundamental determinants of RER are deviated from the sustainable value or equilibrium value .

3.2 Estimating Growth Regression: the Time series Approach

The study investigates the channel through which the misaligned RER operate in WAMZ whether through the aggregate demand or supply channel. Following Keynesian income approach the standard framework for demand side of economic growth in an open economy is as follows:

$Y=C+I+G+(X-M)$ ……..(vi) where Y,C,I,G,X and M indicate economic growth, consumption, investment, government expenditure, export and import respectively. Private sector consumption is a positive function of income and negative function of real interest rate while investment is a negative function of real interest rate. Government expenditure is the exogenous factor known to be a stock and net export is a negative function of RER.

To estimate real economic growth, equation (i) can be manipulated as follows:

$Y=+ (-)b_1(r-p^e) (-b_2)(q)+b_3(g)+ \mu_t$ ……..eq.(vii)

$Y=-b_1(r-p^e)-b_2 (q) +b_3 (g) + \mu_t$ ……eq. (viii)

r,q,p,e,g, and μ_t imply nominal interest rate, real exchange rate, expected inflation rate ,government expenditure and error term. Nominal interest rate is a function of money supply, subsisting $(r-p^e)$ by money supply equation three can be derived as:

$Y= + b_1(m)-b_2(q)+b_3(g)+U_t$……eq.(ix)

Thus, the money supply has positive impact on real income. With an increase in nominal money supply, nominal interest rate falls. Investment depends on real interest rate where a fall in nominal interest rate improves investments; there is an increase in real income.

Hence, the study adopts the following growth regression in the case of panel data analysis.

$Y = y_{t-1} + ms + govt + rer + open + tot + prod + \mu_i$ ……eq.(x)

$dlogy = d_{11}ogy_{t-1} + d_2logms + d_3log\ govt + d_4log\ rer + d_5logopen + d_6loginf + d_7log\ tot + d_8log\ prod + d_9log\ misr + d_{10}logerer + \mu_t$ ……eq. (xi)

The symbols are defined as follows y is the real GDP growth, y_{t-1} is the lag of real GDP growth, ms is the money supply, govt is the real government spending, rer is the real exchange rate, open is the real export +import, tot is the term of trade, prod is the real productivity, misr is the real exchange rate misalignment, erer is the equilibrium real exchange rate. The variables' symbols defined are to determine their impact on the economic performance of WAMZ countries. The study is expected that d_1, d_6 and d_9 will be negative while d_2, d_4, d_7 and d_8 will be positive.d_3 is indeterminate depending on whether or not government consumption crowds out private investment, if the government spending crowds out private investment, d_3 will be negative and positive, otherwise. d_4 is indeterminate depending on whether the real exchange rate operates through the aggregate demand or supply channel. If it is positive, it operates through the aggregate supply and negative, it is otherwise. d_5 is indeterminate whether real openness is import dependent or not. If it is negative, the economy is import dependent and if it is positive, it indicates that export boost the output growth rate.

The estimation method proposed is Generalised Method of Moment (GMM) which addresses the issue of endogeneity and unobserved country characteristics. The study applies GMM to ensure presence of the first order lag of the dependent variable as explanatory in order to consider the possible appearance of endogeneity. The instrumental variables applied are lagged values of the explanatory variable, misaligned RER and other independent variables as instruments in order to avoid weak instrumentation

3.4 Panel Data Approach to Misaligned RER and economic performance in WAMZ

The dynamic panel model specification

The study also explores panel data analysis whether the correlation targeted holds within the WAMZ. To account for problem endogeneity and unobserved country specific effects, the study adopts Generalized Method of Moment (GMM) dynamic panel estimation method which comprises of six countries between 2000 and 2010.

$Y_{it}=\alpha_0 + \alpha_1 Y_{t-1} + \alpha_2(X^3) + \mu_i + X_t + \varepsilon_t$ ……eq.(xiii)

Where y represents economic performance, μ_i is a period-specific effect; μ_i is the unobserved country specific factors. The time-specific effect, μ_i allows controlling the international conditions that change over time and affect the growth performance of countries in the sample while μ_i accounts for unobserved country-specific factors that both drive growth and are potentially correlated with explanatory variables

The above dynamic panel model developed by Arelleno and Bover (1995) and Blundell and Bond (1998) uses lagged values of dependent and independent variables as instruments and combines regressions in differences with the regression in level to avoid weak instrumentation. The GMM estimators are assessed by specification test known as the Sargen test of over- identifying restriction test, the overall validity of the instruments, failure to reject the null hypothesis gives support to the model.

3.5 Data

The study focuses on six countries in West African Monetary Zone namely, Gambia, Ghana, Guinea, Liberia, Nigeria and Sierra Leone targeting towards currency union in the year 2015. The full sample series are from the inception year of the zone, April, second quarter, 2000 to fourth quarter of 2010 in order to find out how convergent or symmetrical macroeconomic indicators of the countries are towards currency union in the zone. The study uses a set of data to estimate the system equation, simple linear regression model to determine real exchange rate in order to estimate misaligned real exchange rate and Generalized Method of Moment (GMM) so as to evaluate growth using dynamic panel estimation method which comprises of six countries between 2000 and 2010 obtained from the International Financial statistics, IMF. The set of data consists of real exchange rate(nominal effective local currency exchange rate multiplied by the domestic price index of the respective economy of the zone to the price index of the US), real income growth (GDP growth), productivity (real GDP per employee, real GDP is at constant prices of year), government expenditure (a ratio of government spending on GDP), openness (a ratio of the sum of exports and imports to GDP), trade balance (a ratio of difference between exports and imports to GDP), term of trade(standard ratio of prices of export and import), inflation rate (growth rate of consumer price index), money supply shock (change in ratio of broad money supply (m2) to GDP), output shock(percentage change in GDP) and financial development (a ratio of broad money supply to GDP)

IV. Estimation

4.1. Estimation of real exchange rate misalignment

To address the measure of real exchange rate misalignment, the first task is to establish the real exchange rate equilibrium. There is no simple answer to what determines the real exchange rate misalignment. Estimating real exchange rate equilibrium and the extent of real exchange rate misalignment remain one of the most challenging empirical problems in open economic macroeconomics. The fundamental problem is that the equilibrium value of real exchange rate is not observable while the misaligned RER is referred to as deviation of actual RER from unobservable equilibrium. The unobservable equilibrium real exchange rate was estimated and the result is shown in table 1.

To generate equilibrium rate and misaligned RER, the study takes misalignment to be percentage deviation of real exchange rate and its estimated equilibrium value from equation:

$\mathbf{qm_t = (q_{et} - q_t)}$ where q_{et} is equilibrium RER and q_t is the actual or observed RER and qm_t is misaligned RER in percentage.

There are two categories of models being estimated in this section towards real exchange rate using least squared estimation method, firstly long term real exchange which compresses of real productivity, government spending, openness, trade balance and a lagged period of dependent variable, real exchange rate which then study used towards estimating real exchange rate misalignment while the second model incorporates short term determinants of real exchange rate (output shock, inflation and money supply shock). The study is expected to observe the real factors having significant impact in the long term real exchange rate while monetary factors would have an importance influence in the short term real exchange rate.

Table1. Long Run Determinants Of Real Exchange Rate in WAMZ Countries using Panel Data Technique

Variables	Coefficient	t-statistics
Constant	-51.41	-9.06***
Log real exchange rate(-1)	0.19	11.06***
Log real productivity	-1.09	-1.43*
Log government spending(-1)	-6.61	-6.60***
Log trade openness	-0.44	-1.23
Log trade balance(-1)	-1.22	-1.54*
R-squared 0.89 D.W Statistics 2.24 F-statistic 30.32		

Table2 . Real Exchange Rate and its determinants of WAMZ countries using panel data technique

Variables	coefficient	t-statistics
Constant	-56.7	-1.29*
Log real exchange rate(-1)	-0.30	-1.60*
Log real productivity (-2)	-8.74	-1.52*
Log government spending	-22.5	-2.05*
Log trade openness(-2)	3.90	1.57*
Log trade balance(-2)	12.52	2.31**
Log inflation(-2)	13.52	2.14**
Log money supply shock(-1)	-3.04	-0.72
Log output shock	9.24	1.69**
R-squared 0.47 D.W statistics 2.3 F-statistic 1.88		

Table 1 indicates the panel regression of long term real exchange rate on the long term factors. The outcome of the regression is quite interesting and consistent with the model developed above. An evaluation of this result shows that all the co-efficient of explanatory variables including a lagged value are statistically significant except openness whose significant level is beyond normal percent. It should be noted that all the explanatory variables have right signs according to economic theory. It implies that the explanatory variables depreciate real exchange rate in West African Monetary Zone. Table 2 incorporates the fundamental factors and short term factors of real exchange rate. The evaluation suggested that inclusion of inflation, money supply shock and output shock have an important influence on the real factors of real exchange rate where openness and trade balance happened to be contrary to economic theory indicating wrong signs. This implies presence of instability in openness and trade balance across the zone, WAMZ. Money supply shock appreciates real exchange rate while inflation and output shock depreciates real exchange rate in the zone. The transitory explanatory variables in the model are all at statistically significant level of five per cent likewise permanent explanatory variables happen to be statistically significant as well. The implication of presence of short term real exchange rate determinants is that WAMZ nations are addressing their exchange rate problems in the short run by pursuing stable exchange rate and monetary policies as correlation estimation indicates presence of symmetrical relationship in the zone.

4.2. Economic Performance Analysis

4.2.1. Misaligned Real Exchange Rate and Economic performance

This section empirically investigates the impact of real exchange rate misalignment on economic performance of WAMZ countries using panel data analysis and generalized method of moment towards the zone monetary union. Prior to the analysis of the study growth rate regression results, the study would mention that the specification test-Sergan test of over-identifying restrictions validate the study regressions for inference i.e. the study instruments are not correlated with error term. The explanatory variables are grouped into four, namely structural policies (financial development, trade openness, and government, money supply), stabilisation policies (real exchange rate, misaligned RER, inflation-price instability) and external factors (term of trade and trade balance) as well as lagged of dependent variable.

Table 3. Misaligned Real Exchange Rate and Economic Performance: baseline regression

Variables	coefficient	t-statistic
Log real growth rate(-1)	-0.29	-2.97***
Log Government spending(-1)	-0.45	-2.23**
Log Financial development(-1)	0.36	1.40*
Log term of trade	-8.85	-2.10**
Log trade openness	0.05	1.43*
Log real exchange rate(-1)	0.005	0.82
Log inflation(-1)	-0.04	-0.31
Log money supply(-1)	0.17	2.50***
Log trade balance(-1)	-0.19	-1.92**
Log misaligned RER(-1)	***-0.007***	***-1.73****
R-Square 0.66 J-statistics 0.29		

From the baseline equation of growth regression, table 3, there is presence of positive sign between growth rate and the following explanatory parameters in the model such as financial development, trade openness, supply of money and real exchange rate. Where financial development at first lag and openness with five per cent of statistical significance level ,that a percentage increase in them lead to 0.36 and 0.06 percent rise in economic growth respectively , while money supply at first lag, statistical significance is one percent with one percent growth in its, response to 0.17 percent in economic growth . The real exchange rate happens to be statistical insignificance. While the next explanatory parameters show negative relationship in the model: government spending, term of trade and trade balance and inflation. The parameters of government spending at first lag, term of trade and trade balance at first lag have their statistical significance at one percent, five percent and ten percent respectively. One percent fall in them result to 0.45%, 8.6% and 0.19% decline in economic growth respectively. The inflation in the equation has negative sign without statistical significance. To conclude the baseline model, sixty six percent of the variation in the growth rate is explained by the variables tested.

Regarding the study variable of interest, the study discovered that there is a negative correlation and statistical significance at five percent level between misaligned real exchange rate at first lag (-0.007, its coefficient) and economic growth of WAMZ countries in the study. This implies economic growth decline in response to increase in misaligned real exchange rate in WAMZ zone. It may be inferred that in order to boost growth in the zone, it is advisable for policy makers to over-value their currencies in economic sense, depreciating the currencies beyond its equilibrium level may enhance export to economic growth but the study found that large undervaluation may hurt the economic growth. This further leads the study to evaluate the possible effects on growth of RER overvaluation and undervaluation as well as different movements in exchange rate effects on growth rate through the inclusion of both misaligned real exchange rate and equilibrium real exchange rate in the study model.

4.2.2. Performance and Misaligned Real Exchange Rate for controlling Equilibrium Real Exchange Rate

With respect to different movements in the exchange rate effects on growth rate, following Edward (1989) that changes in the country international competitiveness can be attributed to productivity shifts in trade sector, more favourable term of trade, change in taxation, among other factors. These justified changes as Edward (1989) calls them constitute an equilibrium phenomenon. However, there is unjustified deviation of the actual RER from its equilibrium level or so called misaligned RER. To distinguish both types of shifts in RER, it is important to control for the equilibrium real exchange rate as said by Aguirre and Calderson (2005)

The study includes equilibrium real exchange rate in its growth equation in order to differentiate the effects of these different movement in the exchange rate i.e. equilibrium vs. disequilibrium movement in the real exchange rate. To contrast whether measure of misalignment captures only disequilibrium and their effects on growth, it becomes relevant to include equilibrium real exchange rate in the study regression equation. Otherwise, the omission of the equilibrium real exchange rate in our growth equation may yield inconsistent estimates for the misaligned real exchange rate indicator as explained by Aguirre and Calderson (2005)

Table 4. Real exchange rate misalignment and economic Performance: controlling for Equilibrium Real Exchange Rate

Variables	**coefficient**	**t-statistics**
Log real growth rate(-1)	-0.28	-3.19***
Log Government spending(-1)	-0.44	-2.24**
Log Financial development(-1)	0.34	1.43*
Log term of trade	-11.83	-3.11***
Log trade openness	0.06	1.64*
Log real exchange rate	0.005	1.94**
Log inflation(-2)	-0.14	-1.36*
Log money supply(-1)	0.18	3.16***
Log trade balance(-1)	-0.16	-1.71**
Log Equilibrium RER	***0.009***	***1.87****
Log misaligned RER(-1)	***-0.007***	***-1.83****
R-Square 0.73 J-statistics 0.19		

From table 4, the study incorporates the equilibrium real exchange rate and misaligned real exchange rate in its baseline regression, the equilibrium real exchange rate has a positive and significant coefficient of 0.009 at five percent statistical significant level. While misaligned real exchange rate at first lag has negative significant impact on economic growth of -0.007 at five percent statistically significant level. It implies that growth is hampered by disequilibrium real exchange rate. According to Edward (1989) and Aguirre and Calderson (2006) believed that the positive correlation between growth and equilibrium real appreciation of the country currency may be driven by technology improvement in the traded sector of the home country, improvement in term of trade among others.

It is quite interesting to observe that incorporation of equilibrium real exchange rate into the baseline equation changes the regression outcome of the model leading the entire parameters to be statistically significant. Real exchange and inflation are not statistically significant in the baseline equation while at controlling equilibrium real exchange rate equation, real exchange rate coefficient is 0.005 and inflation coefficient at second lag is -0.14 statistically significant at five percent and ten percent level respectively. To conclude the controlling equilibrium real exchange rate model, seventy three percent of the variation in the growth rate is explained by the variables tested. This indicates that equilibrium real exchange rate plays an economic influence towards economic growth in the WAMZ countries.

4.2 3. Effects of Real Exchange Rate Undervaluation and Overvaluation on Economic Performance

The possible effects on growth of RER overvaluation and undervaluation evaluate whether this impact depends on the size of the deviation from equilibrium level. In order to test these hypotheses the study introduces the dummy variables. Variable P takes the value of 1 when the real exchange rate is overvalued and 0 otherwise. The variables of overvaluation and undervaluation of RER as $q^{m}{}_{+}= (q-x^{b}B)(p_t)$ and $q^{m}{}_{-}= (q-x^{b}B).(1-P_t)$ respectively . The baseline regression is now modified by incorporating real exchange rate overvaluation and undervaluation instead of misaligned real exchange rate including controlling for equilibrium real exchange rate. In this modified baseline equation, $q^{m}{}_{+}$ ($q^{m}{}_{-}$) takes positive (negative) values when the real exchange rate is over (under) valued and 0 otherwise. $q^{m}{}_{+}$ in the modified equation will be negative and significant if growth expect to be hindered by real exchange rate overvaluation. $q^{m}{}_{-}$ will be positive (negative) if real exchange rate undervaluation boosts (harms) economic growth. The study output is shown in table 5 of growth tables.

Table 5. Effects of Real Exchange Rate Undervaluation and Overvaluation on Economic performance

Variables	coefficient	t-statistic
Log Real growth rate (-1)	-0.35	-2.54***
Log Government spending(-1)	--0.73	-2.85***
Log financial development(-1)	0.88	2.12**
Log term of trade	1.43	0.26
Log trade openness	0.01	0.14
Log real exchange rate	0.003	0.68
Log inflation(-2)	-0.21	-1.30*
Log money supply(-1)	0.23	2.60***
Log trade balance (-1)	-0.33	-2.63***
RER undervaluation	***-3.02***	***-1.45****
RER overvaluation	***-0.37***	***-0.24***
Log Equilibrium RER	***0.01***	***1.92****
R-squared 0.59	**J- Statistic 1.51**	

The study performs growth regression for real exchange rate overvaluation and undervaluation as well as equilibrium real exchange rate which discloses that coefficient of overvaluation is negative and statistically insignificant in the equation, while coefficient of undervaluation is negative (-3.02) and significant at five percent level. It implies that the larger degree of real exchange rate undervaluation, the lower the economic growth of the economies, WAMZ zone. The growth effect may be positive for small to moderate degree of real exchange rate undervaluation and negative for larger degree of undervaluation as observed in the table 5. Hence, there is positive and significant coefficient for movement in the equilibrium real exchange rate. By implication economic growth may be enhanced by an equilibrium real appreciation while equilibrium real exchange rate depreciation slows down growth and small undervaluation of local currency raise growth prospect. It is quite appalling to notice real exchange rate overvaluation and undervaluation having an influence on economic growth in which the presence of term of trade, openness and real exchange rate in the regression model are

statistical insignificance while these three parameters have positive coefficients in the modified growth equation of effect.

Table 6. Real Exchange Rate Correlation Coefficients

	Gambia	Ghana	guinea	Liberia	Nigeria	Sierra Leone
Gambia	1	0.497703	0.335146	0.503061	0.669704	0.598384
Ghana	0.497703	1	0.286969	0.376769	0.715864	-0.20631
Guinea	0.335146	0.286969	1	0.129763	0.357674	0.397999
Liberia	0.503061	0.376769	0.129763	1	0.345385	0.45265
Nigeria	0.669704	0.715864	0.357674	0.345385	1	0.312158
sierra Leone	0.598384	-0.20631	0.397999	0.45265	0.312158	1

Table 7. Misaligned Real Exchange Rate Correlation coefficients

	Gambia	Ghana	Guinea	Liberia	Nigeria	Sierra Leone
Gambia	1	-0.5422	0.197647	0.51878	-0.26708	0.772264
Ghana	-0.5422	1	0.289205	0.23868	0.616377	-0.30936
Guinea	0.197647	0.289205	1	-0.41588	0.519285	0.726678
Liberia	-0.51878	0.23868	-0.41588	1	-0.29315	-0.54823
Nigeria	-0.26708	0.616377	0.519285	0.29315	1	-0.01421
Sierra leone	0.772264	-0.30936	0.726678	0.54823	-0.01421	1

The study further examines cross country correlations on key variables, real exchange rate and misaligned real exchange rate for WAMZ nations in order to understand the common macroeconomic policies in the zone. Except for Ghana and Sierra Leone, the real exchange rate for all WAMZ countries are all symmetrical aligned which indicates presence of similar exchange rate policy. This was in contrary with the study evaluated by Addison, Okopo-Afari and Kinful (2005). The correlation table of real exchange rate is indicated in table 6 below.

Misaligned real exchange rate correlation coefficients happened to be mixed in the zone except Guinea having positive correlation with the three nations in the zone (Gambia, Ghana, Nigeria and Sierra Leone) , and with that, the coefficients are quite low while Nigeria and Ghana are symmetrical, and Sierra Leone and Gambia are also symmetrical. It suggests that all the countries in the zone are facing different determinants of real exchange rate at different periods which call for better improvement in monetary policies. The correlation table of misaligned real exchange rate is indicated in table 7 below.

V. Concluding Remarks

The study examines the impact of misaligned real exchange rate on economic performance of WAMZ countries to determine the implications of economic unionization of the zone. The analyses are performed using quarterly data derived from international financial statistics, international monetary fund, where panel data estimation was used. The ordinary least square of Panel Generalised Method of Moments model is used to estimate the real exchange rate equation in order to determine equilibrium real exchange rate and misaligned real exchange rate and follow by the estimate of the growth regression equation i.e. economic performance.

The study reveals through panel regression of long term real exchange rate that explanatory variables depreciate real exchange rate in WAMZ zone with fundamental determinants. The presence of monetary factors (inflation, money supply shock and output shock) influenced the real factors of real exchange rate leading to contraction of economic theory (wrong signs of openness and trade balance) in which economic implication stags as presence of instability in openness and trade balance across the zone. The transitory explanatory variables in the zone imply that the zone addresses its exchange rate problems in short run by pursuing stable exchange rate and monetary policies.

Regarding the study variable of interest, the study discovered that there is a negative correlation between misaligned real exchange rate and economic performance at its first lag which implies that economic performance declines in response to increase in real exchange rate misalignment. The inclusion of equilibrium real exchange rate in order to differentiate the effects of these different movement in exchange rate, the study reveals that presence of equilibrium contributes positive correlation while misaligned real exchange rate is negative indicating that economic growth is hampered by misalignment in real exchange rate.

The growth regression of over-valuation and under-valuation of real exchange rate indicates negative relationship, the larger degree of undervaluation, the lower the economic performance of the economies in zone. This calls for small degree of undervaluation of local currencies in the zone to raise growth prospect in the zone.

With respect to assessments on cross country correlations on real exchange rate and misaligned real exchange rate which revealed mixed outcomes, two most promising countries are Ghana and Nigeria in which it is not advisable to commence with base on this outcome. It should be noted that credible institutions that can enhance effective surveillance with stringent rules towards imposing sanctions for non-compliance are strictly applied.

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