

# Capital Account Liberalization and Growth in the WAMZ: An Empirical Analysis

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## Abstract

The paper employed recent time series econometrics to analyze and determine relationships between capital account liberalization and economic growth in the West African Monetary Zone<sup>2</sup> (WAMZ) for the period 1980–2012. For the purpose of clearly ascertaining the impact of the variables of interest on economic growth, a country by country estimation was carried out. The short-run and long-run relationships between capital account openness and economic growth were investigated by applying the autoregressive distributive lag (ARDL) bounds testing approach suggested by Pesaran et al. (2001). The empirical results of the ARDL models showed a significant positive relationship between capital account liberalization and growth in Ghana and Sierra Leone. This suggests that the removal of restrictions on capital accounts in Ghana and Sierra Leone would promote economic growth in these countries in the long-run. Liberalization had positive and significant impact on growth in Ghana even in the short-run. However, there was no significant long-run relationship between liberalization and growth in The Gambia, Guinea, Liberia and Nigeria, implying that opening of the capital account should be gradual and complemented with sound macroeconomic and financial policy. Overall, the diagnostic tests indicated that our ARDL models were stable.

**Keywords:** West African Monetary Zone (WAMZ), capital account, economic growth

## 1. Introduction

### 1.1 Problem Statement

Capital account liberalization has become an important policy choice in an increasingly integrated global economy. Theoretical and empirical evidence suggest that capital account liberalization promotes a more efficient global allocation of capital, as the flow of resources reduces cost of capital in the liberalizing/recipient countries, thereby increasing investment and raising economic output. Generally, capital account liberalization refers to the easing of restrictions on capital flows. The flow of resources into the liberalizing countries would reduce cost of capital, increase investment, and raise output (Fischer, 1998; Summers, 2000). In addition, access to capital enables countries to cushion fluctuations in national incomes and smoothen out consumption levels. Capital account liberalization may also signal a country's commitment to credible economic policies since a perceived deterioration in the policy environment of a country with an open capital account could potentially lead to capital flight. Capital account liberalization therefore provides a strong incentive for policymakers to adopt and maintain sound macroeconomic policies, with obvious benefits in terms of long-term growth. Inflows due to liberalization are expected to facilitate the transfer of technological and managerial know-how; encourage competition and financial development, thereby promoting growth.

Literature is awash with evidence that capital account liberalisation is a necessary but not sufficient condition for growth. While developing economies that have liberalized their capital accounts typically have had higher growth rates on the average, empirical analysis suggests that, after controlling for the effects of other factors, the causal effect of capital account liberalization on growth is not monotonic (Prasad et al., 2003). Evidence also show that developing and emerging economies have not been able to effectively leverage on international financial markets, as there seems to be an underlying pro-cyclical element to capital flows. This point is made even more pungent by international investors' willingness to lend to developing economies in 'good times' only to retreat in 'bad times', thereby exacerbating macroeconomic imbalances. Cross-country evidence further suggests that countries, including those which have open capital account, do retain some regulations on inward

and outward capital flows. While there is a tendency among countries to lift controls on capital movement, most countries retain a variety of controls with specific provisions relating to banks and credit institutions as well as institutional investors (IMF, 2005).

The West African Monetary Zone is a group of six (6) countries (Note 1) that plan to introduce a single currency in 2015, with the ultimate goal of merging with the West African Economic and Monetary Union (WAEMU). The WAMZ economy, with a combined GDP of \$340 billion (PPP), represents 73.0 percent and 19.0 percent of ECOWAS and Africa, respectively. Nigeria is the dominant economy in the WAMZ, with over 78.0 percent of the population and 86 percent of the zone's GDP. While the zone is relatively large within the ECOWAS sub-region, it is still a small open economy globally, accounting for less than one percent of the global GDP. As a result, even after full integration of the economies, the zone will still be considered a small open economy, with a strong possibility of imported inflation, with implications for the conduct of monetary policy, the choice of targets and instruments within the Monetary Union.

The recent financial crisis, and the ensuing credit crunch, coupled with rising global inflation, and slowdown in demand in most advanced economies engendered significant uncertainty over the outlook for the WAMZ economies. Although the effects of the current financial crisis on the WAMZ economies are still unfolding, some adverse impacts have filtered through either directly or indirectly. The direct effects emanated from exposure to the international financial system, and affect countries like Nigeria and Ghana with relatively developed financial systems. Nigeria and Ghana were particularly vulnerable through their stock exchanges.

Given the foregoing it is therefore imperative to identify the policy instruments available to the WAMZ countries in mitigating contagion from the global economy. On the other hand, the decline in exports and the concomitant reduction in government tax revenue and foreign exchange earnings which exacerbated fiscal position and external balance in the WAMZ were clear indications that the global crisis was already affecting the WAMZ countries. This coupled with the decline in remittances and capital flows as well as aid flows adversely affected some WAMZ countries. This study reveals the policy response of WAMZ countries to these developments.

Ultimately, restricting the free flow of capital over an extended period might be counterproductive. The increasing openness to international trade has made it unattractive for countries to maintain closed capital accounts. Moreover, the increasing sophistication of investors and global financial markets makes it easier to move capital around under different pretexts. It is also argued that the predominance of extensive capital controls may create distortions during the transition to liberalization thereby making liberalization ineffective and unsustainable. Opening up the domestic economy by relaxing controls on capital account transactions in a gradual and orderly way appears to be the appropriate strategy for developing countries such those in the WAMZ. This gradualist approach encompasses the phasing and sequencing of capital account liberalization while retaining a robust 'capital account management framework' which underpins macroeconomic and financial stability.

The study therefore aims to determine, empirically, the impact of capital account liberalization on economic growth in member countries of the WAMZ. The results will help to inform policy makers on the requisite liberalisation strategy to be adopted by WAMZ countries.

### *1.2 Justification*

Capital account liberalisation permits the free flow of capital from capital-abundant countries where marginal return of investment is low to capital-scarce countries where marginal return on investment is high, thereby promoting growth and fostering convergence. Thus, it is clear that full capital account liberalisation within the WAMZ will enhance growth and convergence with the unfettered flow of capital and investment across the Zone. Indeed, the European Union still emphasizes full capital account liberalisation for accession countries that desire to join the euro zone.

Member countries of the WAMZ have, in recent times, not only been showcasing the abundant investment opportunities, but also pointing the rest of the world to the region's resolve to develop and implement policies that are in line with international best practices. This is consistent with the region's move towards a common monetary and economic union, with the ultimate aim of making West Africa the destination of choice for investors, the world over. This is being clearly demonstrated by on-going banking, financial, and fiscal reforms across the zone as the member countries strive to satisfy the prescribed macroeconomic convergence criteria for the establishment of a common central bank. These steps, which are capable of reinforcing investor confidence in the Zone, could be undermined if foreign investors are restricted from either bringing in capital or repatriating capital and interest.

The launch of the single currency has been postponed thrice. In order to increase the chances of success of the single currency programme, member countries of the WAMZ developed a comprehensive blueprint known as the “*Banjul Action Plan*” (BAP). The BAP expanded the WAMZ programme to include structural measures and benchmarks. Key elements of the structural measures are the liberalization of financial markets and capital accounts, as well as the establishment of a customs union by the WAMZ. As the 2015 deadline for the launch of the single currency approaches, it is an opportune time to evaluate the implementation of this important benchmark vis a vis growth in the zone. Full capital account liberalisation especially between WAMZ countries will enhance the effectiveness of the monetary policy of the envisaged West African Central Bank (WACB) by allowing all WAMZ citizen participate in the open market operations of the Bank.

### 1.3 Literature Review

In practice, the impact of liberalization on growth depends crucially on the initial conditions and policies in the country, including a supportive and consistent macroeconomic and institutional framework. The capital account liberalization is a complex process as its success requires proper sequencing and coordination with macroeconomic and structural policies to strengthen the domestic financial system. Choosing different approaches in addition to their initial conditions, some countries have been able to liberalize their capital accounts while successfully maintaining financial sector stability, whereas other countries have experienced financial crises. Thus, the experience with liberalization has been quite varied, raising difficulty in identifying “the impact” of capital account opening on growth. A plausible approach, however, is to examine the main channels through which liberalization affects the economy. Theoretical models have identified both a direct and an indirect channel through which financial openness can promote economic growth in developing countries.

Capital account liberalization can stimulate growth directly through risk sharing by raising savings, as well as by allowing better risk diversification and greater consumption smoothing. Furthermore, FDI flows in particular can provide technology spillovers via the transfer of knowledge. On the other hand, the indirect positive effects of financial openness on economic growth could come through its effect on the development of domestic financial markets via two channels (Brezigar-Masten et al., 2008). First, increased competition between foreign financial intermediaries can lead to reduced intermediation cost which in turn stimulates demand for funds thereby increasing the size of domestic financial markets. In addition, liberalization can affect domestic markets through the improvements of institutional framework; as a result of improved regulation and corporate governance that can enhance the overall stability of the financial system and reduce asymmetric information problems. Second, financial openness affect economic growth both positively and indirectly by allowing access to foreign financial markets in the form of direct lending by foreign financial intermediaries.

In sum, the theoretical literature suggests that financial development and capital flows liberalization are determining factors for economic growth because they provide a favorable support for financial integration between countries. This is echoed in the findings of Manganelli and Popov (2010), who posited that financial integration helps domestic financial systems to allocate resources optimally across industrial sectors in a way that improves the overall diversification of the economy and lowers its volatility. Notwithstanding the foregoing, excessive capital inflows facilitated by lax financial supervision, macroeconomic policy inconsistencies, or excessive enthusiasm by foreign investors can overwhelm the ability of the domestic financial system to allocate funds efficiently, leading to future financial instability and other macroeconomic difficulties. This point is buttressed by the model developed by Eicher and Turnovsky (1999), wherein capital market imperfections, in the form of debt subsidies, leads to an initial acceleration in investment and growth but a subsequent increase in debt service costs and slower growth.

A review of the empirical literature revealed that the majority of studies have explored the link between capital account liberalization and economic growth. Despite the existence of numerous studies, the results remain contentious about whether liberalization plays a positive or negative role in real economic growth. In most of the studies, the basic growth model which includes variables such as investment, population growth, level of schooling and the initial level of GDP is augmented with a measure of capital account liberalization.

A summary of the large and growing body of work on capital account liberalization and growth is provided in Appendix 1. The information presented in the annex shows a wide disparity in results across studies reflecting the country coverage (industrial versus developing countries), sample period (important for developing countries given the recent nature of financial openness) as well as the methodology and estimation technique. Moreover, there are some general shortcomings in the literature on capital account liberalization and growth. First, the rules-based measures of capital account controls and liberalization used in majority of the studies are relatively crude even though the various measures offer a broadly consistent evidence of the time-series and cross-sectional

behaviour of capital account liberalization. Second, while capital account liberalization is conceptually considered as exogenous to the growth process, in practice countries may be inclined to liberalise their capital accounts in line with their particular growth experiences or levels of development. This suggests the potential for reverse causality wherein a country experiencing weak economic performance will be persuaded to adopt capital controls and there is a danger in such a case to incorrectly interpret that the country's low growth is due to capital controls. However, many studies now recognise this potential weakness and attempt to mitigate it through the use of instrumental variable estimation.

Grrilli and Milesi-Ferretti (1995) was one of the first studies to examine whether capital account liberalization promotes growth using a cross-section of 61 countries over the period 1966–1989. Using instrumental variables regressions (IV) with lagged variable as instrument, five-year growth rates were regressed on three liberalization measures of share, current Account and multiple exchange rate system. In addition, they included other variable such as initial income, level of schooling and political variables. They found that capital account liberalization does not support economic growth. A similar result was found by Rodrik (1998) in a widely cited paper. He used a sample of 100 developed and developing countries to study the effect of capital account liberalization on growth and found no significant effect over the period 1975 to 1989. He also found no relationship between capital account liberalization and investment-to-income or between capital account liberalization and inflation. Eichengreen (2001) offers several possible reasons for differences in the findings of the Rodrik and Quinn studies, including that there were fewer developing countries in the Quinn's sample as well as the different liberalization measures employed. He also noted that various theoretical models implied inconsistent or weak effects from capital account liberalization.

On the other hand, Quinn (1997) found a positive relationship between capital account liberalization and growth using a standard growth regression augmented by Quinn's indicator of the change in financial openness or the change in broad measure openness. The empirical results indicated that the change in capital account liberalization has strong significant effect on the growth in real per capita GDP in a cross-section of 58 countries over the period 1960–1989. However, the finding of a significant effect of the change in capital account liberalization on growth may reflect the correlation of changes in restriction on the capital account and current account given that it was hard to disentangle the separate effects of financial openness and the broad measure of openness in Quinn's results as he did not include a regression with both of these indicators. Klein and Olivei (2000) also found positive relationship between liberalisation and growth by focusing on the role of capital account liberalization on financial development and then considering the effect of financial development on growth. Regressing the capital account liberalization indicator using share of change in financial depth over the period 1986–1995, they found that the effect of open capital accounts on financial depth in a cross-section of countries was statistically significant and economically relevant. This result was, however, largely driven by the developed countries included in the sample.

Bekaert, Harvey, and Lundblad (2001) identified the impact of stock market liberalization on economic growth by augmenting the standard growth model with an indicator of stock market liberalization using moving average panel data. They found that financial sector liberalization led to a 1 percent increase in annual per capital GDP growth over a five-year period and that the effect was statistically significant. They also validated the robustness of this result with respect to the various sets of liberalization dates, different country groupings, and different economic growth horizons. The results, in addition to those of Quinn, gave the strongest evidence of the positive effect of capital account liberalization on growth among developing countries.

Bailliu (2000) found that capital account liberalization is instrumental to growth by promoting financial development while Levine (2001) showed that financial sector liberalization can strengthen domestic financial systems leading to more investment, better efficiency in the allocation of capital and higher growth eventually.

Kraay (1998) examined the impact of capital account openness on economic growth through ordinary least squares (OLS) and instrumental variable (IV) estimations using cross-sections, with one observation per country (where the dependent variable is output growth), over the period 1985–1997 for a sample of 117 countries, and found no significant effect of the IMF's restrictions or Quinn's measure of liberalization on economic growth. However, when these indicators were interacted with the average balance of the financial account, some significant effects were found.

Edison et al. (2002) explored role of the differences between the Quinn and Rodrik papers. They estimated a dynamic panel by OLS, two-stage least squares (2SLS) and generalized method of moments (GMM) using a sample that included 57 countries with capital account liberalization measured by "Share" and Quinn over the period 1980–2000. They found that international financial liberalization does not significantly affect economic

growth. Ishii and Habermeier (2002) also found that an extensive public sector involvement in the financial sector in connection with capital account liberalization had been harmful in most, but not in all, instances.

Edwards (2001) found evidence similar to Klein and Olivei (2000) that the growth effects of capital account liberalization depended on the level of development of an economy. Using weighted least square (WLS) with national income as weights for a sample of 60 countries in the 1980s, Edwards found that capital account liberalization reduces growth for low income countries but promotes growth in industrial countries and in the richer emerging market countries. Arteta, Eichengreen and Wyplosz (2001) also found some supporting evidence that the differences in capital account liberalization across countries depended on the degree of macroeconomic stability. Using two capital account interaction terms and multiplying the Quinn openness measure by both the Sachs-Warner (1995) openness measure and the black-market premium, they found that the interaction term representing the product of capital account openness and the black market premium were significant while the other interaction term (the product of the Sach-Warner openness measure and capital account openness) was not significant. They argued that this implied that countries that open their capital account grow faster, but only if they first eliminate the black market premium.

Chinn and Ito (2002) also examined the link between capital account liberalization and financial development and economic growth using aggregate data on a large sample of countries over the period 1977–1997. They found that the magnitude of the effect of financial openness was quite different between the less developed countries and emerging market group. They conclude that both private credit and equity market variables were significantly associated with financial development and output growth in emerging markets but that only stock market value traded was significantly affected by financial openness in less developed countries. Baltagi et al. (2009) examined whether trade and capital account openness can help to explain the recent progress in financial development. Based on annual data from developing and industrialized countries, they estimated a dynamic panel and concluded that both types of openness (private credit and stock market capitalization) were statistically significant determinants of banking sector development. They also found that there was no evidence to affirm that opening up capital account without opening trade could have a negative impact on financial sector development.

O'Donnell (2001) applied a different approach to examine the impact of capital account liberalization on growth using both the IMF rules-based measure and a quantitative measure of financial openness. He found that the rules-based measure tended to be too crude an indicator of the degree of capital account liberalization as it did not take into consideration the nature of the different types of controls. Nonetheless, using the quantitative measure, he found that capital account liberalization promotes economic growth although the benefits are not evenly distributed across countries. Chanda (2001) also found similar evidence and suggested that the impact of capital account liberalization may vary with the level of ethnic and linguistic heterogeneity in the society, a proxy for the number of interest groups. He also showed that capital controls led to greater inefficiencies and lower growth among countries with high degree of ethnic and linguistic heterogeneity. Shahbaz et al. (2008) explored the relationship between capital account openness and economic growth in a small developing economy like Pakistan using an advanced Autoregressive Distributive Lag (ARDL) technique for long run relationship and error correction model (ECM) for short run dynamics. They found that capital account openness in addition to past economic policies promotes economic growth in the long-run.

#### *1.4 Hypothesis*

The main research hypotheses are stated as thus:

H1: There is a short-run positive relationship between capital account liberalisation and growth.

H2: There is a long-run positive relationship between capital account liberalisation and growth.

## **2. Methodology and Model**

### *2.1 Methodology*

The econometric approach employed recent developments in time series econometrics to analyze and determine relationships between capital account liberalization and economic growth in the WAMZ member countries (The Gambia, Ghana, Guinea, Liberia, Nigeria and Sierra Leone). The time series data used in the study cover the period 1980 to 2012. For the purpose of ascertaining clearly the impact of our variable of interest on economic growth, a country by country estimation was carried out. In this regard, both short-run and long-run relationships between capital account openness and economic growth were investigated by applying advanced econometric techniques, namely, the autoregressive distributive lag (ARDL) bounds testing approach suggested by Pesaran et al. (2001) for long run relationship and error-correction modelling (ECM) for short run dynamics. The ARDL

bounds testing approach is viewed as the most appropriate specification to carry out co-integration analysis due to its many advantages. The main advantage is that it can be applied irrespective of whether the variables are integrated of order  $I(0)$  or integrated of order  $I(1)$ , unlike other widely used co-integration techniques (Pesaran & Pesaran 1997). Another advantage is that, it has better small sample properties than that of the Johansen and Juselius cointegration technique (Pesaran & Shin, 1999). Besides, a dynamic error correction model (ECM) can be derived from the modified ARDL model through a simple linear transformation (Banerjee et al. 1993). In addition, ARDL method is free of any problem faced by traditional techniques in the literature such as problems resulting from non-stationary time series data. The ECM integrates the short-run dynamics with the long-run equilibrium without losing long-run information. However, both analyses (ARDL and ECM) are preceded by an examination of the unit root properties of the data.

## 2.2 Model Formulation

The model adopted in this study draws heavily from Peter Blair Henry (2006) that illustrated the link between the fundamental prediction of Neo-Classical Growth (NCG) model and the capital account liberalization in developing economies. The contrivance formulated by assuming a Cobb-Douglas production function with a labor augmenting technological progress:

$$Y=F(K,AL)=K^{\infty}(AL)^{1-\infty} \quad (1)$$

Denoting the amount of capital per unit of effective labor as  $k = \frac{K}{AL}$ ; amount of output per unit of effective labor,  $y = \frac{Y}{AL}$ ; and following further assumption of a homogenous production function in equation (1), the output per unit of effective of labor can be stated as:

$$y=f(k)=k^{\infty} \quad (2)$$

To determine the evolution of capital within this framework, let  $s$  represents the proportion of national income that is saved in each period with accretion effect on national capital stock. With further assumption that capital depreciates at the rate,  $\delta$ ; labor grows at the rate,  $\eta$ ; and total factor productivity grows at the rate,  $\lambda$ , such that these three structural parameter cause capital to become less abundant; hence, the evolution process for capital per unit of effective labor is specified thus:

$$\dot{k}(t)=s f[k(t)]-(\eta+\lambda+\delta)k(t) \quad (3)$$

Equation (3) summarizes the net effect of forces of the structural parameters. It indicates that national savings have positive effect on growth of capital by increasing capital stock. However, capital depreciation, population growth, as well as the total factor productivity, because of diminishing return effect, has a negative impact on capital. In the steady state,  $\dot{k}(t) = 0$ , that is, the growth rate of capital per unit of effective labor,  $(k)$ , is constant. However, the level of capital ( $K$ ) will grow at the rate,  $(\eta + \lambda)$ , and output per worker,  $\frac{Y}{AL}$ , grows at  $\lambda$ .

Finally, the steady state general equilibrium condition for investment is assumed to hold, such that the marginal productivity of capital,  $f'(k_{st,s})$ , equals interest rate,  $r$ ; plus the depreciation rate, that is:

$$f'(k_{st,s}) = r + \delta \quad (4)$$

Equation (4) represents the basis for the “allocative efficiency” view, inherent in the Neo Classical Growth model. It helps to understand the dynamics of the impact of capital account liberalization on investment and growth, given that such impact works through the cost of capital,  $r$ . According to this view, capital account liberalization leads to a more efficient international allocation of resources as resources flow from capital-abundant economies with low return on capital into capital-scarce countries having higher return on capital, resulting in increased investment and growth in these economies. The standard assumption is:

$$r^* < r \quad (5)$$

Where  $r^*$  is the world interest rate, exogenously determined outside of the country, and  $r$  is the domestic interest rate determined within the representative small open economy. To seek arbitrage opportunity from the interest rate differential, capital inflow is experienced in the country that liberalizes, causing a surge in post liberalization capital output ratio, i.e.,  $k_{s,st}^*$ , and post liberalization steady state occurs with marginal productivity of capital equals to the world interest rates ( $r^*$ ) plus the rate of depreciation ( $\delta$ ), that is:

$$f'(k_{s,st}^*) = r^* + \delta \quad (6)$$

To account for the impact of capital account liberalization in the WAMZ countries' economies, we formulate a

capital-flow augmented output process within the NCG model, such that:

$$y = \left\{ \frac{sf(k_t)}{(\delta+\eta+\lambda)} \right\}^\alpha \kappa_t^\gamma; \text{ where } \kappa = g(e, r') \quad (7)$$

Where all variables ( $y$ ,  $s$ , and  $k$ ) and the structural parameters ( $\alpha$ ,  $\delta$ ,  $\eta$ , and  $\lambda$ ) are as previously defined. Here,  $\kappa$  enters into the model in a multiplicative form to capture any impact of capital flow. Such capital flow is, as specified, assumed to be simultaneously influenced by the prevailing exchange rate and interest rate differential ( $r' = r - r^*$ ). The parameter  $\gamma$  measures the elasticity of such flow, which is assumed to take any value ranging from zero to unity, that is, ( $0 < \gamma \leq 1$ ).

Notice that equation (7) also allows for the specification of the overall investment in the steady state terms of both domestic and foreign components, such that  $k_{s,st}^* = (k_{s,st}^d) \cdot (k_{s,st}^f)$ . In a simplistic manner of the assumption in equation (2), the analogous output per unit of effective labor in post liberalization regime becomes:

$$y = \{k^*\}^\alpha = \{(k_t^d) \cdot (k_t^f)\}^\alpha \quad (8)$$

Showing the joint-relevance and the interplay of both domestic and foreign components of capital in measuring the output per unit of effective labor, equation (8) also allows us to reformulate the capital flow augmented output process in equation (7) as:

$$y = \left\{ \frac{sf(k_t^d)}{(\delta+\eta+\lambda)} \right\}^\alpha * \left\{ \frac{er'(k_t^f)}{(\delta+\eta+\lambda)} \right\}^\alpha \quad (9)$$

Taking the logarithm of equation (9) and differentiating with respect to time, the post liberalization output growth is derived thus:

$$\frac{\dot{y}}{y} = \alpha s \left( \frac{\dot{k}^d}{y} \right) + \alpha er' \left( \frac{\dot{k}^f}{y} \right) \quad (10)$$

As equation (10) demonstrates,  $\left( \frac{\dot{k}^d}{y} \right)$  represents the contribution of domestic capital-output ratio to growth, which is influenced by the rate of national savings. Similarly, the other term,  $\left( \frac{\dot{k}^f}{y} \right)$  accounts for the contribution of foreign capital inflow to output ratio, also influenced by both exchange rate and interest rate differential.

Finally, we specify the econometric representation of the behavioral relations in equation (10) as:

$$y = \beta_0 + \beta_1 INV + \beta_2 CA + \beta' CV + \varepsilon_t \quad (11)$$

Where:

$y$  = real gross domestic product (Real GDP) growth;

$INV = dk = \left( \frac{DK}{GDP} \right)$ ; i.e., the growth rate of domestic capital formation to GDP;

$CA = fk = \left( \frac{FK}{GDP} \right)$ ; i.e., the growth rate of private capital flows to GDP, which is measured by the ratio private capital flows to GDP.

$CV$  = A row vector of other control variables that have been found in literatures as principal determinants of growth, such as Inflation (INF); and Trade Openness [(Import + Export)/GDP].

$\beta'$  = A column vector of the associated coefficients for X.

$\varepsilon$  = error term.

Taking logarithms equation (11) becomes:

$$\ln y = \beta_0 + \beta_1 \ln INV + \beta_2 \ln CA + \beta_3 \ln CV \quad (12)$$

### 2.3 Estimation Technique

The ARDL framework for equation (12) is given as:

$$\begin{aligned} \Delta \ln y_t = & \beta_0 + \sum_{i=1}^n \beta_{1i} \Delta \ln y_{t-i} + \sum_{i=1}^n \beta_{2i} \Delta \ln INV_{t-i} + \sum_{i=1}^n \beta_{3i} \Delta \ln CA_{t-i} + \sum_{k=0}^{\rho} \beta'_{4i} \Delta \ln CV_{t-k} \\ & + \beta_1 \ln y_{t-i} + \beta_2 \ln INV_{t-i} + \beta_3 \ln CA_{t-i} + \beta'_4 \ln CV_{t-k} + \mu_i \end{aligned} \quad (13)$$

Theoretically, the ARDL approach to cointegration does not require prior test of the series for unit roots. Nonetheless, some recent empirical studies have indicated that testing for unit root were necessary to avoid spurious results (Jalil et al., 2008; Shrestha & Chowdhury, 2005). In this regard, we start by investigating the time series properties of the data using Augmented Dickey Fuller test and Philip Peron tests. The ARDL model testing procedure begins with conducting the bounds test for the null hypothesis of no cointegration  $H_0 = \beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$  against the alternative hypothesis  $H_1 = \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq 0$  using F-test. The null hypothesis implies no evidence of existence of long run relationship while alternative hypothesis is while the alternative hypothesis indicates the existence of long run relationship among relevant variables embodied in the model. Following Pesaran et al (2001) and Narayan (2004), two sets of asymptotic critical values are reported; the upper critical bound that assumes that all the series are I(1) and the lower critical bound values assume that the series are all I(0). The bounds provide a test for co-integration when the independent variables are  $I(d)$  (Where  $0 \leq d \leq 1$ ).

If the F-statistic is higher than the upper critical value, we conclude that a long run relationship exists regardless of whether the underlying order of integration of the variables is I(0) or I(1), i.e., we reject the hypotheses of no long run relationship. If the F-statistic is below the lower critical values, we fail to reject the null hypothesis of no co-integration. However, if the F-statistic falls between these two bounds, inference would be inconclusive. Moreover, when the order of integration between the variables is known, and if all the variables are I(1), the decision is made based on the upper bound. Similarly, if all the variables are I(0), then the decision is made based on the lower bound.

After establishing the long-run relationships between the variables, i.e, if the variables are co-integrated, the conditional long run model can then be obtained from the reduced form solution of equation (13), when the variables in first difference jointly equal to zero.

These long run coefficients are estimated by the ARDL, model in equation (13) by OLS. The ADRL method obtains the optimal lag length of each variable using the model selection criteria like Schwartz-Bayesian Criteria (SBC) and Akaike's Information Criteria (AIC). SBC is known as the parsimonious model, selecting the smallest possible lag length, whereas AIC is known for selecting the maximum relevant lag length. When there is long relationship between variables, there exists an error correction representation. Therefore, the error correction model is estimated generally as represented in following reduced form equation:

$$\Delta \ln y_t = \sum_{i=1}^{\rho} \beta_i \Delta \ln y_{t-i} + \sum_{j=1}^m \beta_j \Delta \ln INV_{t-j} + \sum_{s=1}^n \beta_s \Delta \ln CA_{t-s} + \sum_{k=1}^{\rho} \beta'_k \Delta \ln CV_{t-k} + \theta ECM_{t-1} + \omega_t \quad (14)$$

The error correction model result indicates the speed of adjustment to the long run equilibrium after a short run shock. To ascertain the goodness of fit of the ARDL model, the diagnostic and the stability tests were performed. The diagnostic test examined the serial correlation, functional form, misspecification normality and heteroscedasticity associated with the model. The stability test is conducted by employing the cumulative sum of recursive residuals (**CUSUM**) and the cumulative sum of squares of recursive residuals (**CUSUMsq**). Examining the prediction error of the model is another way of ascertaining the reliability of the **ARDL** model. If the error or the difference between the real observation and the forecast is infinitesimal, then the model can be regarded as having the best fit.

## 2.4 Data and Sources

The data are drawn from a number of sources, primarily the West African Monetary Institute's database, World Bank's World Development Indicators, and the IMF's International Financial Statistics. The study utilized annual data for the period 1980–2012 for all WAMZ countries. Economic growth is measured by changes in the log of real GDP per capita while investment is measured as national gross fixed capital formation as a percentage of GDP. The capital account liberalization indicator is measure by the ratio of private capital flows to GDP following Kraay (1998) and Lane and Milesi-Ferretti (2001). Inflation is the annual changes in the log of the consumer price index while trade openness is calculated as the sum of exports and imports as percentage of GDP.

## 3. Empirical Results

### 3.1 Unit Root Test

Even though the bounds test for cointegration does not depend on prior knowledge about the order integration, testing for unit root is necessary to avoid the possibility of spurious regression since Ouattara (2004) showed that the bounds test is based on the assumption that the variables are I(0) or I(1), thus, in the presence of I(2) variables the computed F-statistics provided by Pesaran et al. (2001) becomes invalid. To determine the order of the series



the ADF and Philip and Peron Tests were employed at level and first difference under the assumptions constant and no trend. The results reported in Table 1 A and B suggest that all the variables included in this study are integrated at level and order one, I(0) and I(1). The bounds test approach is therefore appropriate. It is worth mentioning that results are robust under assumption of constant and no trend as well as with trend.

Table 1A. Unit root test results

| Variable          | ADF test statistics (intercept with no trend) |        |                  | Variable | PP statistics (intercept with no trend) |                  |
|-------------------|-----------------------------------------------|--------|------------------|----------|-----------------------------------------|------------------|
|                   | Lag                                           | Level  | First difference |          | Level                                   | First difference |
| <b>The Gambia</b> |                                               |        |                  |          |                                         |                  |
| Ln Y              | 2                                             | 1.56   | 6.50**           | Ln Y     | 2.47                                    | 6.93**           |
| ln INV            | 2                                             | 2.35   | 6.88**           | ln INV   | 3.35*                                   | 7.89**           |
| CAL               | 2                                             | 2.06   | 6.78**           | CAL      | 1.87                                    |                  |
| INF               | 2                                             | 2.57   | 7.02**           | INF      | 2.49                                    | 8.70**           |
| ln TO             | 2                                             | 2.55   | 8.07**           | ln TO    | 3.50*                                   |                  |
| <b>Ghana</b>      |                                               |        |                  |          |                                         |                  |
| Ln Y              | 2                                             | 0.03   | 3.89**           | Ln Y     | 0.07                                    | 3.72**           |
| ln INV            | 2                                             | 1.57   | 5.62**           | ln INV   | 1.77                                    | 5.76**           |
| CAL               | 2                                             | 2.21   | 5.42**           | CAL      | 2.41                                    | 5.27**           |
| INF               | 2                                             | 4.31** |                  | INF      | 4.31**                                  |                  |
| ln TO             | 2                                             | 7.40** | 5.52**           | ln TO    | 4.77**                                  |                  |
| <b>Guinea</b>     |                                               |        |                  |          |                                         |                  |
| Ln Y              | 2                                             | 1.57   | 4.19**           | Ln Y     | 1.74                                    | 4.32**           |
| ln INV            | 2                                             | 2.13   | 5.86**           | ln INV   | 2.91                                    | 10.86**          |
| CAL               | 2                                             | 2.24   | 5.86**           | CAL      | 2.89                                    | 10.81**          |
| INF               | 2                                             | 2.32   | 6.36**           | INF      | 3.31*                                   |                  |
| ln TO             | 2                                             | 2.80   | 7.41**           | ln TO    | 2.73                                    | 8.37**           |

Note: \*\*indicate significance at the 1% level and hence stationarity while \* indicate significance at the 5% level.

Table 1B. Unit root test results

| Variable            | ADF test statistics (intercept with no trend) |        |                  | Variable          | PP statistics (intercept with no trend) |                  |
|---------------------|-----------------------------------------------|--------|------------------|-------------------|-----------------------------------------|------------------|
|                     | Lag                                           | Level  | First difference |                   | Level                                   | First difference |
| <b>Liberia</b>      |                                               |        |                  |                   |                                         |                  |
| Ln Y                | 2                                             | 1.30   | 3.21*            | Ln Y              | 1.46                                    | 3.21*            |
| ln INV              | 2                                             | 1.62   | 3.92**           | ln INV            | 1.58                                    | 3.93**           |
| CAL                 | 2                                             | 2.54   | 6.21**           | CAL               | 3.26*                                   |                  |
| INF                 | 2                                             | 6.51** |                  | INF               | 6.42**                                  |                  |
| ln TO               | 2                                             | 1.59   | 5.17**           | ln TO             | 1.81                                    | 5.23**           |
| <b>Nigeria</b>      |                                               |        |                  |                   |                                         |                  |
| Ln Y                | 2                                             | 2      | 0.48             | Ln Y              | 0.84                                    | 4.41**           |
| ln INV              | 2                                             | 2      | 4.07**           | ln INV            | 3.02*                                   |                  |
| CAL                 | 2                                             | 2      | 2.91             | CAL               | 2.64                                    | 9.03**           |
| INF                 | 2                                             | 2      | 1.96             | INF               | 1.91                                    | 3.93**           |
| ln TO               | 2                                             | 2      | 2.01             | ln TO             | 2.01                                    | 4.68**           |
| <b>Sierra Leone</b> |                                               |        |                  |                   |                                         |                  |
| Ln Y                | 2                                             | 2      | 1.62             | Ln Y              | 1.68                                    | 4.66**           |
| ln INV              | 2                                             | 2      | 2.92             | ln INV            | 2.80                                    | 8.44**           |
| CAL                 | 2                                             | 2      | 2.58             | CAL               | 2.58                                    | 7.19**           |
| INF                 | 2                                             | 2      | 1.88             | INF               | 1.88                                    | 14.21**          |
| ln TO               | 2                                             | 2      | 2.13             | ln TO             | 3.03*                                   |                  |
| 1% Critical Value   |                                               | 3.66   | 3.66             | 1% Critical Value | 3.65                                    | 3.66             |
| 5% Critical Value   |                                               | 2.96   | 2.96             | 5% Critical Value | 2.95                                    | 2.96             |

Note: \*\*indicate significance at the 1% level and hence stationarity while \* indicate significance at the 5% level.

### 3.2 The Cointegration Test

The causal relationship between macroeconomic variables was examined using the Autoregressive Distribution Lag (ARDL) approach proposed by Peseran and Shin (2001). Ideally the AIC or SBC is minimized to determine the number of lags. However, in this study the maximum lag length is taken as one since we are using annual data in addition to the small sample size of our series. Importantly, the estimation and identification of cointegration using the ARDL approach is based on the Ordinary Least Square (OLS). Results of the bound test are given in Table 2. The calculated F-statistics for each individual country reported in Table 2 are greater than the upper bound critical value at the 1% and 5% levels. This implies that the null hypothesis of no cointegration is rejected in all cases. There is indeed a cointegrating relationship among the variables (real per capita GDP growth, capital account liberalization, inflation, trade openness and investment) in equation (13) (Note 2). The existence of cointegration between real per capita GDP growth and its determinants in each country implies that there are error correction mechanisms and hence the need to obtain long-run and short-run coefficients.

Table 2. Bound test results based on equation (13)

| Critical Value      |       |                     |       |
|---------------------|-------|---------------------|-------|
| Lower Bounds [I(0)] |       | Upper Bounds [I(1)] |       |
| 5%                  | 1%    | 5%                  | 1%    |
| 2.846               | 4.057 | 4.091               | 5.636 |
| F-Statistics        |       |                     |       |
| The Gambia          |       | 5.89***             |       |
| Ghana               |       | 63.57***            |       |
| Guinea              |       | 46.32***            |       |
| Liberia             |       | 34.85***            |       |
| Nigeria             |       | 9.07***             |       |
| Sierra Leone        |       | 39.18**             |       |

Notes: Critical values from the bounds test are obtained from Narayan (2004)-Case II: restricted intercept and no trend, page 26–27. \*\*\* means significant at 1%.

### 3.3 The Static Long-Run Equations of Member Countries

The long-run coefficients for each country are reported below. The static long run model was obtained from the reduced form solution of equation (13). We proceed by discussing the outcome for each country.

#### 3.3.1 The Gambia

The results show that with exception of the constant all the other long-run coefficients are not significant. An apparent implication of the result is that an important variable explaining growth in the Gambia may be missing. Although not significant, capital account liberalization and inflation carry the correct signs. Liberalization has a positive relationship with growth in the long-run while inflation is negatively related to growth. Trade openness and investment are negatively related to growth but the coefficients are not significant.

Table 3. Estimated long run coefficients using the select ARDL (1,0,0,0,0) model

| Regressor | Coefficient | Standard Error | T-Ratio | Probability |
|-----------|-------------|----------------|---------|-------------|
| CAL       | 0.0012      | 0.0041         | 0.2906  | 0.774       |
| INF       | -0.0424     | 0.4454         | -0.2264 | 0.823       |
| Ln to     | -0.0914     | 0.0772         | -1.1842 | 0.247       |
| Ln INV    | -0.0599     | 0.1068         | -0.5616 | 0.579       |
| C         | 9.9553***   | 0.1872         | 22.3528 | 0.000       |

\*\*\* means significant at the 1% level.

### 3.3.2 Ghana

Table 4 shows that there is a statistically significant relationship between per capita GDP growth and its determinants. In addition, all coefficients have the expected signs. There is positive and significant relationship between capital account liberalization and growth as well as between investment and growth. Trade openness also has a positive impact on growth but only significant at the 10 percent level. The result indicates that a unit increase in capital account openness will increase growth in real per capita GDP by 0.03 percent, while 1 percent increase in investment will raise growth by 0.12 percent. In particular, the positive long-run effect of capital account liberalization on economic growth has been supported by Quinn (1997), Klein and Olivei (2000), Edwards (2001) and several other authors. Similarly, a 1 percent rise in trade openness will result in a 0.04 percent increase in growth. On the other hand, inflation has a negative impact on growth in the long-run as a unit increase in inflation decreases growth by 0.62 percent.

Table 4. Estimated long run coefficients using the select ARDL (1,1,0,1,0) model

| Regressor | Coefficient | Standard Error | T-Ratio | Probability |
|-----------|-------------|----------------|---------|-------------|
| CAL       | 0.0291***   | 0.0040         | 7.252   | 0.000       |
| INF       | -0.6297***  | 0.1397         | -4.508  | 0.000       |
| Ln to     | 0.0491*     | 0.0273         | 1.796   | 0.086       |
| Ln INV    | 0.1234***   | 0.0340         | 3.625   | 0.001       |
| C         | 5.9329***   | 0.1314         | 45.142  | 0.000       |

\*\*\* means significant at the 1% level while \* means significant at the 10% level.

### 3.3.3 Guinea

The long-run equation for Guinea shown in Table 5 indicates that only the coefficients of investment and the constant are significant. Nonetheless all coefficients carried their expected signs. The result showed that a 1 percent rise in investment will trigger a 5.4 percent rise in economic growth in the long-run. Capital account liberalization and trade openness have positive relationships with growth as expected but the coefficients are not significant. On the other hand, inflation is negatively related to growth but its coefficient is also not significant.

Table 5. Estimated long run coefficients using the select ARDL (1,0,0,0,0) model

| Regressor | Coefficient | Standard Error | T-Ratio | Probability |
|-----------|-------------|----------------|---------|-------------|
| CAL       | 1.4895      | 8.6807         | 0.562   | 0.579       |
| INF       | -1.6511     | 1.7674         | -0.934  | 0.359       |
| Ln to     | 0.3699      | 1.4106         | 0.263   | 0.795       |
| Ln INV    | 5.4082**    | 2.1046         | 2.569   | 0.017       |
| C         | 23.0839***  | 2.6522         | 2.659   | 0.013       |

\*\*\* means significant at the 1% level while \*\* means significant at the 5% level.

### 3.3.4 Liberia

The long-run equation for Liberia shown in Table 6 revealed that the coefficients of the trade openness, investment and the constant were significant while the coefficient of capital account liberalization and inflation were not significant. While the coefficient of trade openness was significant it carried the wrong sign implying that a percentage rise in trade openness will reduce growth by 1.18 percent. Such results may reflect the weak internal capacity of Liberia to benefit from technological diffusion and knowledge transfers that usually accompany trade openness. Indeed, Bhagwati (1992) as well as Frankel et al. (1995) reported negative relationships between trade liberalization and economic growth. There was a positive and significant relationship between investment and growth wherein a percentage rise in investment will increase growth by 0.88 percent.

Table 6. Estimated long run coefficients using the select ARDL (0,1,0,1,1) model

| Regressor | Coefficient | Standard Error | T-Ratio | Probability |
|-----------|-------------|----------------|---------|-------------|
| CAL       | -0.0026     | 0.0018         | -1.482  | 0.152       |
| INF       | 0.8310      | 0.7994         | 1.039   | 0.309       |
| Ln to     | -1.1805***  | 0.0838         | -14.079 | 0.000       |
| Ln INV    | 0.8812***   | 0.1145         | 7.698   | 0.000       |
| C         | 13.3923**   | 0.4574         | 29.279  | 0.000       |

\*\*\* means significant at the 1% level while \*\* means significant at the 5% level.

The coefficient of inflation and capital account liberalization had the wrong signs but were not significant. Inflation was positively related to growth while capital account liberalization had a negative relationship with growth.

### 3.3.5 Nigeria

The result in Table 7 revealed that only trade openness and the constant were significant in explaining long-run growth in per capita income in Nigeria. Essentially, a percentage increase in trade openness will raise economic growth by 1.58 percent. The wrong signs were reported for the coefficients of investment, inflation and capital account liberalization even though they were not significant. Inflation was positively related to growth while capital account liberalization and investment had a negative relationship with growth.

Table 7. Estimated long run coefficients using the select ARDL (1,0,0,0,0) model

| Regressor | Coefficient | Standard Error | T-Ratio | Probability |
|-----------|-------------|----------------|---------|-------------|
| CAL       | -0.1378     | .29706         | -0.464  | 0.647       |
| INF       | 2.9737      | 5.9523         | 0.499   | 0.622       |
| Ln to     | 1.5853***   | 0.6926         | 2.289   | 0.043       |
| Ln INV    | -0.2543     | 1.5658         | -0.162  | 0.872       |
| C         | 5.5170***   | 1.5910         | 3.467   | 0.029       |

\*\*\* means significant at the 1% level.

### 3.3.6 Sierra Leone

The results in Table 8 revealed that with exception of inflation, all the long-run coefficients of the determinants of growth were significant. Importantly, capital account liberalization has a positive and significant effect on economic growth in the long-run such that a unit change in liberalization will raise per capita income by 0.001 percent. O'Donnell (2001) found similar result by using a quantitative measure of liberalization. Investment also had a positive long-run effect on growth as predicted with a percentage rise in investment resulting in a 0.43 increase in per capita income. A surprising result was the positive long-run effect of inflation on the growth in real per capita income in Sierra Leone since demand theory suggests that inflation is harmful to growth in the long-run. Given the high inflation history of the country, the result may suggest the reallocation of portfolios from money to physical capital as purported by Tobin (1965) and Sidrauski (1967). On the other hand, trade openness had a negative relation with growth but its coefficient was not significant.

Table 8. Estimated long run coefficients using the select ARDL (1,0,0,1,0) model

| Regressor | Coefficient | Standard Error | T-Ratio | Probability |
|-----------|-------------|----------------|---------|-------------|
| CAL       | 0.0005***   | 0.0002         | 2.500   | 0.008       |
| INF       | 0.3860***   | 0.0946         | 4.083   | 0.000       |
| Ln to     | -0.0239     | 0.1075         | -0.223  | 0.826       |
| Ln INV    | 0.4322***   | 0.0757         | 5.706   | 0.000       |
| C         | 9.0038***   | 0.3789         | 23.759  | 0.000       |

\*\*\* means significant at the 1% level.

### 3.4 The Short-Run Coefficient of Member Countries

The dynamic short-run equation was estimated for each country given the evidence of cointegration among the variables. The short-run coefficients were obtained by the estimating the error correction representation of the reduced form of equation (13). The results for each country are reported below.

#### 3.4.1 The Gambia

The results The Gambia in Table 9 are similar to the long-run results whereby only the constant was significant. However, the error correction term (ECM) was significant and negative as expected. Nonetheless, the coefficient of ECM indicates that the speed of adjustment to long-run equilibrium is very slow, a mere 2.4 percent.

Table 9. Error correction representation for the selected ARDL (1,0,0,0,0) model

| Regressor                | Coefficient | Standard Error | T-Ratio | Probability |
|--------------------------|-------------|----------------|---------|-------------|
| $\Delta$ CAL             | 0.0005      | 0.0016         | 0.2871  | 0.776       |
| $\Delta$ INF             | -0.0169     | 0.0736         | -0.2305 | 0.820       |
| $\Delta$ Ln to           | -0.0366     | 0.0291         | -1.2564 | 0.221       |
| $\Delta$ Ln INV          | -0.4004     | 0.0434         | -0.5536 | 0.585       |
| $\Delta$ C               | 3.9861***   | 1.3901         | 2.8676  | 0.008       |
| $\Delta$ ECM (-1)        | -0.0240***  | 0.1445         | -2.7756 | 0.010       |
| $R^2$                    |             |                | 0.3058  |             |
| Adjusted $R^2$           |             |                | 0.2659  |             |
| AIC                      |             |                | 61.45   |             |
| SBC                      |             |                | 57.15   |             |
| F Statistics             |             |                | 1.811   |             |
| F Significance           |             |                | 0.147   |             |
| Durbin Watson Statistics |             |                | 1.71    |             |

Where ECM is the error correction term.

$$ECM = Ln Y - 0.0011774 * CAL + 0.042383 * INF + 0.091379 * Ln TO + 0.059980 * Ln INV - 9.9553 * C \quad (15)$$

#### 3.4.2 Ghana

The result in Table 10 shows that there is a significant dynamic relationship between economic growth and its determinants. Capital account liberalization, inflation and trade openness have positive impacts on short-run growth as predicted. A unit change in capital account liberalization will raise growth by 0.003 percent while a unit rise in inflation will increase short-run growth by 0.146 percent. In addition, a unit change in trade openness will raise growth by 0.02 percent. On the contrary, the result showed a negative relationship between investment and growth in the short-run. Such a result may reflect the crowding out of productive investment by the huge government borrowing requirement for deficit financing.

Table 10. Error correction representation for the selected ARDL (1,1,0,1,0) model

| Regressor                | Coefficient | Standard Error | T-Ratio | Probability |
|--------------------------|-------------|----------------|---------|-------------|
| $\Delta$ CAL             | 0.0025**    | 0.0013         | 1.888   | 0.071       |
| $\Delta$ INF             | 0.1459***   | 0.0287         | 5.0856  | 0.000       |
| $\Delta$ Ln to           | 0.0193***   | 0.0085         | 2.271   | 0.032       |
| $\Delta$ Ln INV          | -0.0286***  | 0.0125         | -2.282  | 0.031       |
| $\Delta$ C               | -1.3754***  | 0.3084         | -4.459  | 0.000       |
| $\Delta$ ECM (-1)        | -0.2318***  | 0.0514         | -4.507  | 0.000       |
| $R^2$                    |             |                | 0.9242  |             |
| Adjusted $R^2$           |             |                | 0.9009  |             |
| AIC                      |             |                | 80.528  |             |
| SBC                      |             |                | 74.792  |             |
| F Statistics             |             |                | 55.94   |             |
| F Significance           |             |                | 0.000   |             |
| Durbin Watson Statistics |             |                | 2.5     |             |

$$ECM = LRGI - 0.029122*CAL + 0.62965*INF - 0.049100*LTO - 0.12340*LINV - 5.9329*C \quad (16)$$

The coefficient of the ECM was negative and significant as expected. The result indicated that the speed of adjustment to long-run equilibrium when there was shock was 23.2 percent.

### 3.4.3 Guinea

The short-run equation for Guinea reported in table 11 shows that investment and the constant have significant effects on economic growth. Importantly, a percentage increase in investment will raise economic growth by 1.07 percent. Capital account liberalization and trade openness had a positive relationship with growth as predicted but their coefficients were not significant. In addition, inflation had a negative short-run relationship with growth contrary to expectations but its coefficient was also not significant. However, the coefficient of the ECM was negative and significant as expected. The speed of adjustment to long-run equilibrium was estimated at 32.8 percent, implying that only 32.8 percent of the deviation in the long-run will be corrected annually.

Table 11. Error correction representation for the selected ARDL (1,0,0,0,0) model

| Regressor                | Coefficient | Standard Error | T-Ratio | Probability |
|--------------------------|-------------|----------------|---------|-------------|
| $\Delta$ CAL             | 0.2961      | 0.0690         | 0.549   | 0.588       |
| $\Delta$ INF             | -0.1988     | 0.3437         | -0.955  | 0.349       |
| $\Delta$ Ln to           | 0.0735      | 0.2829         | 0.259   | 0.797       |
| $\Delta$ Ln INV          | 1.0750***   | 0.3751         | 2.866   | 0.008       |
| $\Delta$ C               | 4.5886***   | 1.7832         | 2.573   | 0.016       |
| $\Delta$ ECM (-1)        | -0.3282***  | 0.5391         | -2.879  | 0.008       |
| $R^2$                    |             |                | 0.3431  |             |
| Adjusted $R^2$           |             |                | 0.2382  |             |
| AIC                      |             |                | -2.179  |             |
| SBC                      |             |                | -6.482  |             |
| F Statistics             |             |                | 2.612   |             |
| F Significance           |             |                | 0.049   |             |
| Durbin Watson Statistics |             |                | 1.87    |             |

$$ECM = LRGI - 1.4895*CAL + 1.6511*INF - 0.36995*LTO - 5.4082*LINV - 23.0839*C \quad (17)$$

### 3.4.4 Liberia

The short-run equation for Liberia which is depicted in Table 12 shows that the coefficients of the constant, trade openness and the ECM are significant. However, the sign of the coefficient of trade openness was negative contrary to expectation, implying that a percentage increase in trade openness will reduce growth by 0.36 percent. As mentioned earlier, the weak internal capacity particularly with regard to the poor state of the infrastructure as well as lack of favourable trade policies may explain such results. In addition, the coefficient of the ECM indicates that any deviation from long-run equilibrium is immediately corrected in the following (an automatic adjustment mechanism). Capital account liberalization, inflation and investment have positive short-run relationship with

growth but their coefficients are not significant.

Table 12. Error correction representation for the selected ARDL (0,1,0,1,1) model

| Regressor                | Coefficient | Standard Error | T-Ratio | Probability |
|--------------------------|-------------|----------------|---------|-------------|
| $\Delta$ CAL             | 0.0009      | 0.0015         | 0.5613  | 0.580       |
| $\Delta$ INF             | 0.8310      | 0.79935        | 1.039   | 0.308       |
| $\Delta$ Ln to           | -0.3672***  | 0.15858        | -2.315  | 0.029       |
| $\Delta$ Ln INV          | 0.4109      | 0.27650        | 1.486   | 0.150       |
| $\Delta$ C               | 13.3923***  | 0.4574         | 29.279  | 0.000       |
| $\Delta$ ECM (-1)        | -1.0000***  | 0.000          | None    | None        |
| $R^2$                    |             |                | 0.6636  |             |
| Adjusted $R^2$           |             |                | 0.5612  |             |
| AIC                      |             |                | -3.544  |             |
| SBC                      |             |                | -9.279  |             |
| F Statistics             |             |                | 9.072   |             |
| F Significance           |             |                | 0.000   |             |
| Durbin Watson Statistics |             |                | 1.803   |             |

$$ECM = LRGI + 0.0026365 * CAL - 0.83101 * INF + 1.1805 * LTO - 0.88119 * LINV - 13.3923 * C \quad (18)$$

### 3.4.5 Nigeria

The results in Table 13 show that inflation trade openness and the ECM are significant in the short-run. A percentage rise in trade openness leads to a 0.059 increase in growth while 1 percent rise in inflation will increase growth by 0.11 percent in the short-run. However, the speed of adjustment is very slow since only 6.58 percent of the deviation in long-run equilibrium is corrected annually. Capital account liberalization and investment have negative short-run relationship with growth contrary to expectations but their coefficients are not significant.

Table 13. Error correction representation for the selected ARDL (1,0,0,0,0) model

| Regressor                | Coefficient | Standard Error | T-Ratio | Probability |
|--------------------------|-------------|----------------|---------|-------------|
| $\Delta$ CAL             | -0.0052     | 0.0056         | -0.937  | 0.358       |
| $\Delta$ INF             | 0.1115**    | 0.0617         | 1.807   | 0.083       |
| $\Delta$ Ln to           | 0.0595***   | 0.0293         | 2.030   | 0.053       |
| $\Delta$ Ln INV          | -0.0095     | 0.0561         | -0.169  | 0.866       |
| $\Delta$ C               | 0.2069      | 0.7015         | 0.295   | 0.770       |
| $\Delta$ ECM (-1)        | -0.0658***  | 0.0317         | -2.075  | 0.048       |
| $R^2$                    |             |                | 0.2167  |             |
| Adjusted $R^2$           |             |                | 0.0599  |             |
| AIC                      |             |                | 47.721  |             |
| SBC                      |             |                | 43.419  |             |
| F Statistics             |             |                | 1.383   |             |
| F Significance           |             |                | 0.264   |             |
| Durbin Watson Statistics |             |                | 1.79    |             |

$$ECM = LRGI + 0.13780 * CAL - 2.9737 * INF - 1.5853 * LTO + 0.25432 * LINV - 5.5170 * C \quad (19)$$

### 3.4.6 Sierra Leone

The results of the short-run equation depicted in Table 14 indicate that inflation and investment are significant determinants of short-run growth in Sierra Leone. Both inflation and investment have positive effects on growth in the short-run as was predicted by demand theory. Essentially, a percentage increase in inflation will raise growth by 0.18 percent while a percentage increase investment will increase growth by 0.20 percent. The coefficient of the ECM was negative and significant as expected. The result showed that 47.1 percent of the deviation in long-run equilibrium is corrected annually. Capital account liberalization and trade openness have positive short-run relationship with growth but their coefficients are significant.

Table 14. Error correction representation for the selected ARDL (1,0,0,1,0) model

| Regressor                | Coefficient | Standard Error | T-Ratio | Probability |
|--------------------------|-------------|----------------|---------|-------------|
| $\Delta$ CAL             | 0.0002      | 0.0009         | 0.259   | 0.798       |
| $\Delta$ INF             | 0.1818***   | 0.0551         | 3.298   | 0.003       |
| $\Delta$ Ln to           | 0.0705      | 0.0434         | 1.623   | 0.117       |
| $\Delta$ Ln INV          | 0.2035***   | 0.0407         | 5.004   | 0.000       |
| $\Delta$ C               | 4.2405***   | 0.8486         | 4.997   | 0.000       |
| $\Delta$ ECM (-1)        | -0.4709***  | 0.0896         | -5.255  | 0.000       |
| $R^2$                    |             |                | 0.6915  |             |
| Adjusted $R^2$           |             |                | 0.6144  |             |
| AIC                      |             |                | 38.85   |             |
| SBC                      |             |                | 33.83   |             |
| F Statistics             |             |                | 10.759  |             |
| F Significance           |             |                | 0.000   |             |
| Durbin Watson Statistics |             |                | 2.41    |             |

$$ECM = LRGI - 0.0005*CAL - 0.3861*INF + 0.02395*LTO - 0.4322*LINV - 9.0038*C \quad (20)$$

### 3.5 Diagnostic Test Results

The results of the diagnostic test of the ARDL model for each country are shown in appendix II. Generally, the results indicate that usual econometric problems such as autocorrelation, hetero-scedasticity as well as conflict to normal distribution were not observed except for Guinea where the null hypothesis of homo-scedasticity was rejected. However, Shrestha (2005) states that presence of hetero-scedasticity does not affect ARDL estimates since time series in the equation may be of mixed order of integration and thus, it is natural to detect heteroscedasticity. Moreover, no model specification error exists with reference to Functional form in all cases. Finally, CUSUM and CUSUMSQ plots were drawn to check the stability of short-run and long-run coefficients in the ARDL error correction model. The results showed the plots of CUSUM and CUSUMSQ for all countries. The results indicate that both CUSUM and CUSUMSQ are within the critical bounds of 5% in all cases. This implies that our growth models that are structurally stable.

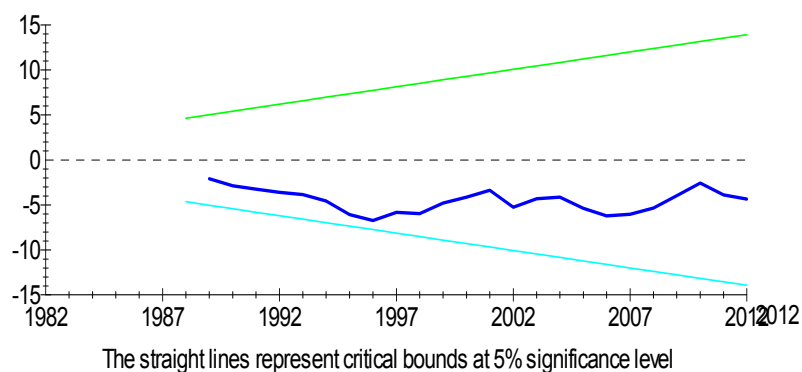


Figure 1a. The Gambia



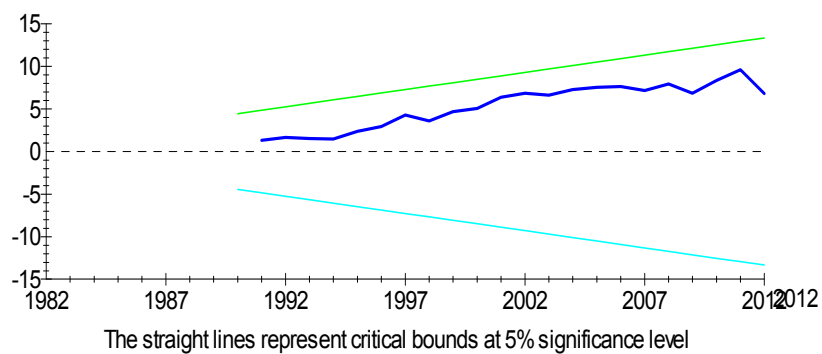


Figure 1b. Ghana

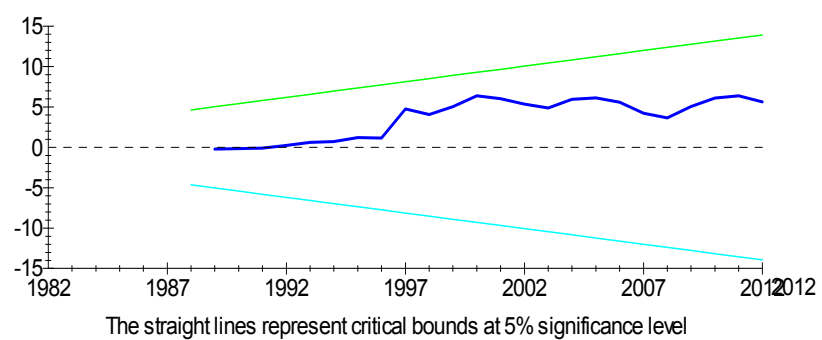


Figure 1c. Guinea

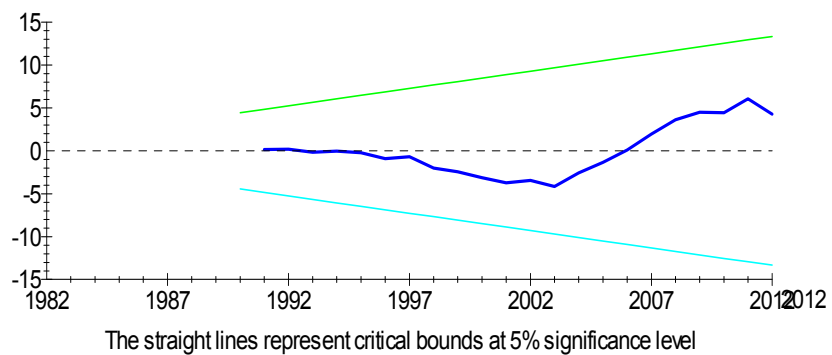


Figure 1d. Liberia

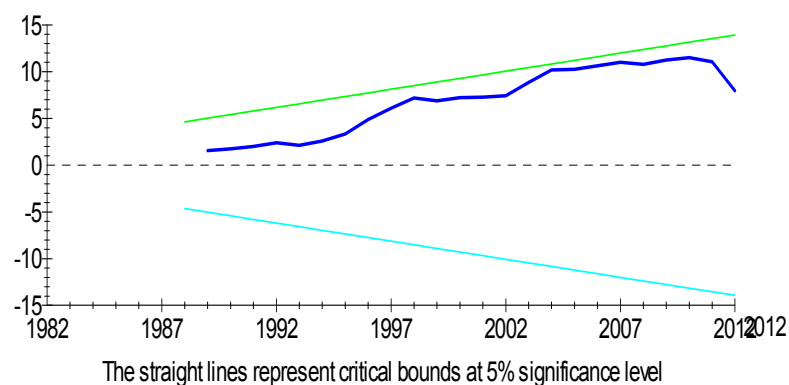


Figure 1e. Nigeria

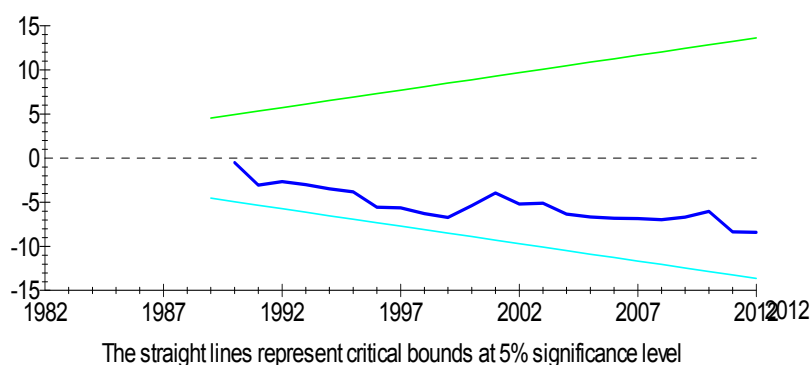


Figure 1f. Sierra Leone

Figure 1. Diagnostic test results. Plot cumulative sum of recursive residuals

#### 4. Conclusion, Policy Implication and Recommendation

##### 4.1 Conclusion and Policy Implication

This paper examined the relationship between liberalization and growth by employing the ARDL bounds testing approach suggested by Pesaran et al. (2001). Growth equations were estimated for each country using annual data for the period 1980–2012. The empirical results of long-run coefficients of the ARDL models showed a significant positive relationship between capital account liberalization and growth for Ghana and Sierra Leone. This suggests that further liberalisation in Ghana and Sierra Leone would promote economic growth in the long-run. Liberalization had positive and significant impact on growth in Ghana even in the short-run. However, there was no significant long-run relationship between liberalization and growth in The Gambia, Guinea, Liberia and Nigeria. The lack of a significant relationship between liberalization and growth it is an indication of the presence of policies inconsistent with liberalization that could adversely affect growth when the capital account is opened and hence, the opening of the capital accounts should be gradual and complemented with sound macroeconomic and financial policy.

Investment and trade openness were also found to be significant determinants of growth in member countries, with the exception of The Gambia. Investment had a positive significant relationship with growth in Ghana, Guinea, Liberia and Sierra Leone, while trade openness had positive and significant impact on growth in Ghana and Nigeria but negative and significant impact on growth in Liberia. Inflation had a negative long run relationship with growth in Ghana but positive and significant impact on growth in Sierra Leone. Overall, the short run and long run results were similar. However, capital account liberalization was not a significant determinant of short run growth in Sierra Leone while inflation had positive and significant impact on short run growth in Ghana, Nigeria and Sierra Leone. The error correction term was significant and negative in all cases, reinforcing the existence of cointegration among the variable. The speed of adjustment nonetheless deferred

from country to country with Liberia recording the fastest adjustment to long run equilibrium (100 percent) while The Gambia and Nigeria recorded the slowest. The speed of adjustment was below 50 percent for all countries with the exception of Liberia.

The robustness of the results was supported by standard diagnostic tests, namely, Serial Correlation LM test, Ramsey Reset test, Normality test, and White heteroscedasticity test. The results indicate that econometric problems like autocorrelation, heteroscedasticity, non-normal distribution were generally not observed. Similarly, no model specification error exists with reference to functional form while the CUSUM and CUSUMSQ plots indicated that the growth models are structurally stable.

Since implementing a major reform like capital account liberalization normally requires an assessment of the impact of such measures, the study will aid and inform policy makers in designing and adopting an appropriate approach to liberalization.

#### *4.2 Recommendation*

We proffer three distinct sets of recommendations reflecting the finding of the study. The first set of recommendations is for countries where there is a significant positive relationship between capital account liberalization and growth (Ghana and Sierra Leone), while the second set addresses countries where no significant relationship between liberalization and growth exists (The Gambia, Guinea, Liberia and Nigeria). Since The Gambia has already liberalised its capital account, we offer an additional set recommendation for the country. However, the recommendation should be viewed holistically. Generally, we recommend that WAMZ countries adopt an integrated approach to liberalization as suggested by the literature. Essentially, long-term flows should be liberalised before short-term flows.

##### *4.2.1 Ghana and Sierra Leone*

Both countries are encouraged to continue to pursue sound macroeconomic and trade policies to minimize the risks associated with capital account openness. In particular, trade policies should be complementary to capital account liberalization efforts. Additionally, the financial systems' architecture and managerial infrastructure should be reinforced to maximize the benefits of liberalisation. Finally, liberalization of the capital account is imperative given its beneficial impact on growth in these countries. Essentially, all obstacles to the free movement of capital particularly in the WAMZ should be minimised subsequent to the strengthening of the macroeconomic policy and regulatory environment.

##### *4.2.2 Guinea, Liberia and Nigeria*

Undertake reforms to tackle key macroeconomic problems like inflation and large public deficits through a sound macroeconomic policy framework. Second, there should be strict monitoring of external indebtedness to ensure that foreign liabilities are low prior to liberalization. In addition, countries should seek foreign investment with lower risks such as FDI and portfolio investment. Thirdly, strong antitrust policies should be developed to enhance competition in the corporate sector. This should be combined with strengthening institutional governance in regulatory institutions. Finally, minimizing restrictions on capital flows especially between WAMZ countries is critical to growth and convergence. It could also be a vital policy option in mitigating domestic macroeconomic distortions.

##### *4.2.3 The Gambia*

The macroeconomic and financial policy environment should be more supportive of the current capital account liberalization policy. Financial sector policies and regulations should be aimed at promoting financial market development and strengthening financial stability. In particular, a strong and vibrant money and capital market should be developed to maximize the benefits of liberalisation. The country should implement sound counter-cyclical macroeconomic policies to strengthen macro stability and support growth. Finally, a minimal tax on capital flows could limit the volume of outflows in periods of high outflows, contain the currency depreciation and support counter-cyclical fiscal policies. This is because under perfect capital mobility and a flexible exchange rate, fiscal policy of a small open economy is ineffective, and any decrease in public spending reduces interest rates and the currency depreciates.

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## Notes

Note 1. The Gambia, Ghana, Guinea, Liberia, Nigeria and Sierra Leone.

Note 2. WAMZ is a group of six countries (The Gambia, Ghana, Guinea, Liberia, Nigeria and Sierra Leone) aiming to form a monetary union.

Note 3. Contact authors for the results of the selected ARDL model for each country from which the Fstatistics were obtained. The ARDL model for each country was selected based on Schwarz Bayesian Criterion.

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