# Structural Breaks and Finance-Driven Growth Hypothesis in ECOWAS: Further Empirical Evidence

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## Abstract

*This study makes a cross sectional case in investigating the validity, or otherwise, of the finance-driven growth hypothesis in the ECOWAS countries using annual data from 1970 to 2008 for seven countries namely: Burkina Faso, Cote d'Ivoire, The Gambia, Ghana, Nigeria, Senegal and Togo. In contrast to earlier studies on developing countries, this study specifically tests for the possibility of structural breaks/regime shifts in the finance-growth long run relationship by employing the Gregory and Hansen (1996) residual based test which accounts for endogenous structural break. While the Gregory-Hansen structural break cointegration result confirms the existence of cointegration relationships among the selected countries despite the breakpoints, the Granger-causality test result indicates a general pattern of causality running from financial development to economic growth in most of the countries. Also, the striking feature of the result of our estimated growth model generally lends credent to the importance of financial development in explaining growth dynamics among the selected countries, thus reinforcing the finance-driven growth hypothesis.*

**Keywords:** Financial development, Economic growth, Structural break, Cointegration

**JEL Classification:** B23, C31, C51, F36, G15

## 1. Introduction

For several years, the relationship between economic growth and financial development has been of paramount research interest to various researchers and policy makers as well. This is not unconnected with the understanding of the crucial role being played by the financial markets and institutions in the mobilization and allocation of financial resources to the productive sector of the economy. To this end, various theoretical and policy-oriented empirical studies have increasingly examined the dynamic causal and long run relationship between financial development and economic. Of course, the theoretical

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paradigm underlying this relationship can be traced back to the work of Schumpeter (1911). Schumpeter opined that financial institutions play a very significant role in the process of economic growth and development. In the same vine, Patrick (1966) argued that financial expansion through the creation of financial institutions and the supply of financial assets do have a positive impacts on the economic growth especially in early stage of development. Thus, financial development is postulated to be playing a supply-leading role in economic development.

Even in more advanced stages of economic development, the importance of efficient financial institutions could also be revealed through increased demand for a greater variety of financial assets. Basically, at the heart of this hypothesis is this submission that a well-developed financial system plays an essential role in fostering a country's economic growth and development through channeling the limited resources from surplus to deficit side of the economy. This implies, therefore, that for efficient allocation of resources, the role of well-developed financial institutions cannot be undermined.

Following the seminal work of McKinnon (1973) and Shaw (1973), the literature on finance and economic development has been flooded with divergent theoretical opinions and empirical evidences as regards the role of financial development in economic growth. Despite the overwhelming theoretical proposition on the importance of finance to growth, starting with the work of Bagehot (1873), Schumpeter (1911), Gurley and Shaw (1955), Goldsmith (1969), McKinnon (1973), findings from many empirical studies still differ with respect to the role of financial institutions in economic growth and development.[1]

The results from these findings could easily be classified into four main groups. The first group of the empirical results pertains to those who reinforce the finance driven growth hypothesis by finding evidence for the unilateral causality running from financial development to economic growth, thus identifying the supply leading relationship between financial development and economic growth (see Levine, 2004; Demetriades, et al., 1996; Luintel et al, 2008 and Ang, 2008). Next, and in sharp contrast too, are those whose findings support the growth-driven finance hypothesis, thus, indicating causality running from

[1] It is worthy of note, however, that various factors could be responsible for the different empirical evidences so far established in the literature as regards the relationship between financial development and economic growth. Factors such as differences in the data definitions and measurement techniques, time frame and methodological approaches employed in various empirical studies could be responsible for the conflicting findings. There are a number of methodological issues arising from the investigation of financial development and economic growth. For instance, econometric methodologies such as single equation Ordinary Least Energy Square (OLS), Engle and Granger (1987), Johansen (1988) and Johansen and Juselius (1990) cointegration procedures have been widely used in the literature. Of course, the application of these methodologies is not without various limitations. For instance, the use of traditional Granger causality test becomes insufficient in a situation where the time series are I (1) and cointegrated (Toda and Yamamoto, 1995; Zapata and Rambaldi, 1997). Also, the application of Johansen (1988) cointegration technique presupposes that the underlining regressors are all integrated of order one, otherwise, the standard statistical inference based on the conventional likelihood ratio tests becomes invalid and could also lead to erroneous inferences (Pesaran et al., 2001).

economic growth to financial development (see, for instance, Dritsakis and Adamopoulos, 2004, Adamopoulos, A. 2010). Again, while some empirical studies have rightly established the fact that the relationship between financial development and economic growth seems to be bidirectional, very few studies in the empirical literature, on the other hand, lay credence to the notion of no relationship between the variables. Evidently, findings from these empirical studies have different policy implications especially in the face of recent global financial/economic meltdown.

The focus of this study is on the relationship between financial development and economic growth in the ECOWAS countries. With a drive for trade competitiveness, strong financial institutional development, sustained economic growth and, of course, in the face of recent global financial meltdown, most of the ECOWAS countries have continued to witness various types of financial reforms and economic restructuring. These developments are, however, often plagued with unstable domestic financial policies, high and frequent rates of political instability and, of course, incessant policy regime shifts and/or policy reversal. These factors do have analytical and policy implications on the long run relationship between financial development and economic growth. To better enhance the formulation of optimal financial and economic policy, there is need to understand the role of domestic economic and financial environment of most of the developing countries in the analysis of finance-growth nexus. To this end, many empirical studies conducted on these countries often fail to give an account of the possibility of structural breaks caused by regime shifts in these countries in their analysis. In lieu of this, this study contributes to the literature by making an ingenious attempt in addressing the issue of structural breaks in the analysis of finance-driven growth hypothesis in the selected ECOWAS countries.

Contribution of the present study comes from the use of Hansen (1992) and Gregory-Hanson (1996) co-integration approach with structural break as it helps in determining the presence of cointegration among the variables while adjusting for possible structural break endogenously where most of the study fails to accommodate this approach. This study contributes to the literature by making an ingenious attempt to address the issue of structural breaks in the analysis of finance driven growth hypothesis in some selected ECOWAS countries. Specifically, the contributions of this present study to the literature on the relationship between financial development and economic growth are clear. The study attempts to make a case for cross countries investigation of the finance driven hypothesis in some selected ECOWAS countries. Also, in allowing for the effects of regime shifts in testing for cointegration relationship and following Omisakin et al (2012), the study employs the Gregory and Hansen (1996) residual based test which accounts for endogenous structural break. Gregory-Hansen approach to cointegration helps in determining possibility of structural break endogenously.

The remainder of this study is organized thus: Section 2 presents the basic theory of cointegration with structural breaks/regime shifts as applied in this study. Section 3 involves methodology which entails data employed, measurement, study scope and model specification. While section 4 concerns the empirical analysis and results discussion, conclusion is made in section 5.

## 2. Basic Theory of Cointegration with Structural Breaks/Regime Shifts

In investigating the relationship among economic variables in face of structural breaks, therefore, the concept and dynamics of cointegration in time series econometrics has been further examined. Different types of cointegration with structural breaks haven been identified namely: cointegration with parameter changes, partly cointegration and cointegration with mechanism changes. Simply speaking, cointegration with parameter changes means the parameters of the cointegration equation happen to change at some time, but the cointegration relationship still exists. Partly cointegration means the cointegration relationship exists before or after some time but disappears in other periods. Cointegration with mechanism changes means the former cointegration relationship is destroyed because new variables enter the system and they form a new type of cointegration relationship (see Baochen and Shiying, 2002). For instance, given the following cointegration equation:

$$Y_t = a + bX_t + \varepsilon_t$$

where $X_t$, $Y_t$ are integration time series with order of $d$ and $\{\varepsilon_t\}$ is residual series, the conventional residual-based cointegration test presume that there is no cointegration between variables (Y and X) if the test fails to reject the null hypothesis for a sample period. However, the presence of structural break(s) in this equation simply nullifies, breaks down and disintegrates this assertion or presumption.

Based on the works of Perron (1989), Banerjee, Lumsdaine, and Stick (1992), Perron and Vogelsang (1992), and Zivot and Andrews (1992) where the null of a unit root in univariate time series is tested against the alternative of stationarity while allowing for a structural break in the deterministic component of the series, Gregory and Hansen (1996) developed a residual-based cointegration approach that allows for regime shifts. Gregory and Hansen (1996) residual-based tests for cointegration centers on deriving an alternative hypothesis of one break in the cointegrating vector.[2] According to Gregory and Hansen (1996), the power of the Engle-Granger (1987) test of the null of no cointegration is substantially reduced in the presence of a break in the cointegrating relationship. To overcome this problem, Gregory and Hansen (1996) extended the Engle-Granger test to allow for breaks in either the intercept or the intercept and trend of the cointegrating relationship at an unknown time. Therefore, Given the rejection of cointegration with unknown break in the parameter, Gregory and Hanson (1996) technique allows testing the null of no cointegration of variables with I(1) order in the presence of structural break in the cointegrating relationship.

The GH test allows to test the presence of cointegration among the variables of

[2] In the presence of structural break(s)/regime shift, the common test for cointegration between variables becomes bias since the distributional theory of evaluating the residual-based tests is not the same. In Gregory et al. (1996), the impact of break in the test for cointegration is further explained as the rejection frequency of the ADF test is said to fall dramatically in the presence of a break in the cointegration vector.

interest given the variables are integrated of order I(1) i.e. difference stationary, with regime shift in the long run relationship at an unknown point. As earlier stated, this cointegration technique is an extension of ADF, Zα, and Zt tests for cointegration and can be seen as a multivariate extension of the endogenous break test for univariate series. Basically, in the G-H tests, there are four different models for the analysis of structural change in the cointegrating relationship. These models are: (i) level shift, C; (ii) level shift with trend, C/T; (iii) regime shift where both intercept and slope coefficient change, C/S; and (iv) regime shift where intercept, slope coefficient and trend change, C/S/T. Hence, the following equations represent the specifications of the models, respectively:

$$y_{1t} = \mu_1 + \mu_2\varphi_{t\tau} + \alpha y_{2t} + e_t \tag{1}$$

$$y_{1t} = \mu_1 + \mu_2\varphi_{t\tau} + \beta t + \alpha y_{2t} + e_t \tag{2}$$

$$y_{1t} = \mu_1 + \mu_2\varphi_{t\tau} + \beta t + \alpha_1 y_{2t} + \alpha_2 y_{2t}\varphi_{t\tau} + e_t \tag{3}$$

$$y_{1t} = \mu_1 + \mu_2\varphi_{t\tau} + \beta_1 t + \beta_2 t\varphi_{t\tau} + \alpha_1^T y_{2t} + \alpha_2^T y_{2t}\varphi_{t\tau} + e_t \tag{4}$$

Equations (1) to (4) represent the generalized standard model of cointegration. The idea here is to allow for both a regime trend shift under the alternative hypothesis (Gregory and Hansen, 1996). The observed data are $y_t = (y_{1t}, y_{2t})$ where $y_{1t}$ is a scalar variable, $y_{2t}$ is a vector of explanatory variables and μ is the disturbance term. While φ represents the dummy variable both $y_{1t}$ and $y_{2t}$ are expected to be I(1) variables. The dummy variable is then defined as:

$$\varphi_{t\tau} = \begin{cases} 0, \; if \; t \le [n\tau] \\ 1, \; if \; t > [n\tau] \end{cases} \tag{5}$$

The unknown parameter, $\tau \in (0,1)$ is the relative timing of the change point and [ ] denotes integer part. Parameters μ, α and β measure, respectively, the intercept, slope coefficients and trend coefficient before the break and $\mu_1$, $\alpha_1$ and $\beta_1$ are the corresponding changes after the break. Following the computed cointegration test statistic for each possible regime shift by Gregory and Hansen (1996), equations (1) to (4) are estimated for all possible break date in the sample. The smallest value of ADF(τ), $Z_\alpha(\tau)$ and $Z_t(\tau)$ across all possible break points are selected to reject the null hypothesis of no cointegration.[3]

## 3. Methodology

### 3.1 Data Sources and Measurement

With the overall aim of examining the relationship between financial development and growth in the selected ECOWAS countries, this section delves into issues concerning

[3] The critical values for the break test are reported in Gregory and Hansen (1996).

data employed and study scope among other things. The variables used in this study include the following: real gross domestic product per head; ratio of gross domestic investment to gross domestic product; trade (the sum of exports and imports of goods and services) measured as a share of gross domestic product; the ratio of government consumption to gross domestic product; the consumer price index; money supply (M2, % of GDP) and the domestic credit provided by banking sector (% of GDP)[4]. All variables are sourced from World Development Indicator (2009) and the International Financial Statistics. The study scope ranges from 1970 to 2008. The availability of data informed our choice of countries and scope. The countries included in our analysis are: Burkina Faso, Cote d'Ivoire, The Gambia, Ghana, Nigeria, Senegal and Togo.

### 3.2 Model Specification

Over time, financial development and economic growth relationship have been subjected to rigorous empirical investigation especially in the developing countries. Following recent developments in time series econometrics, a number of authors have been able to model various determinants of core growth models augmented with indicators of financial development. Until now, these varied specifications reflect mainly differences in data employed and theoretical underpinning. Following the work of Levine et al., (2000) which searched for a set of robust variables to model growth, this study shall employ the Aggregate Production Function (APF) framework. This production function which has been widely applied in the analysis of financial development and economic growth assumes unconventional inputs such as trade openness, financial development and government consumption along the conventional input of capital in the model. The aggregate growth model is thus specified as:

$$Y_t = A_t K_t^{\beta_1} \tag{6}$$

From [1], $Y_t$ represents the aggregate production of the economy (proxied by GDP) at time t; $A_t$, $K_t$ and $L_t$ also denote the total factor productivity (TFP), capital stock and labour stock at time t respectively. Consequently, TFP is therefore specified thus:

$$A_t = C_t OPENESS_t^{\beta_2} GOVC_t^{\beta_3} INF_t^{\beta_4} FD_t^{\beta_5} \tag{7}$$

Hence, the model used in this study not only reflects theoretically enriched but also parsimonious specification models of core growth. Therefore, to estimate [1], we take the natural logs of both sides which result in the following equation:

$$y_t = \beta_0 + \beta_1 \left( \frac{INV}{GDP} \right)_t + \beta_2 OPENESS_t + \beta_3 GOVC_t + \beta_4 INF_t + \beta_5 FD_t + \varepsilon_t \tag{8}$$

[4] Both the money supply (M2, % of GDP) and domestic credit provided by banking sector (% of GDP) are the two financial development indicators we use in this study.

where $y_t$ = real GDP per head; $\left(\frac{INV}{GDP}\right)$ = the ratio of gross domestic investment to GDP; $OPENESS_{i,t}$ = trade openness measure; GOVC = the ratio of government consumption to GDP; INF = represents the change in the consumer price index and FD is the financial development indicator. The term $\varepsilon_t$ is the error term bounded with the classical statistical properties. The selected countries are: Burkina Faso, Cote d'Ivoire, The Gambia, Ghana, Nigeria, Senegal, and Togo.

### 3.3 Econometric Analytical Procedures

The standard econometric analytical procedures of time series model estimation are strictly adhered to in this study. We commence our empirical exercise by performing unit roots test with the aim of confirming the integration properties of the variables employed. Basically, the idea is to test whether the variables are integrated. We, consequently, employ the Augmented Dickey-Fuller (ADF) and Phillips-Peron (PP) tests (Dickey and Fuller, 1979; Phillips and Peron, 1988). Also, since we are more interested in investigating the long run relationship of the variables under consideration allowing for the incidence of structural breaks, this study employs batteries of cointegration techniques including the more recent and robust Gregory and Hansen (1996) approach which allows for endogenous identification of break in the variables. This is also needful in order to further present a more rigorous cointegration analysis especially when external shocks or policy shift/reversal are assumed in the model[5]. Finally, following the results of the cointegration tests (where cointegration relationship is established), we proceed to estimating the growth model with special emphasis on the influence of financial development on growth.

## 4. Empirical Analysis and Discussion

### 4.1 Unit root test

The study performs the unit root tests on all variables under consideration for all the selected countries. As earlier highlighted, two unit root tests- ADF and PP- are used. While the null hypothesis for both tests is that there is a unit root, the optimal lag lengths selection is done by the Schwarz Bayesian criteria. All unit root test regressions are run with a constant and trend term. The results as detailed in Table 1 indicate the existence of unit root for all the variables at their levels. In other words, the tests were unable to reject the null hypothesis for all the variables. However, the variables appear to be stationary at first difference, i.e. integrated at order 1. This result, therefore, implies that examination of possible cointegration relationship among the variables is worthwhile.

[5] This is quite prevalent in the ECOWAS region.

**Table 1: Unit Root Test Result for the Selected Countries**

| Country | Variables Level | ADF | | PP | |
|---|---|---|---|---|---|
| | | First Diff. | Level | First Diff. | |
| **Burkina Faso** | y | -2.154558 (0.4984) | -4.503866 (0.0056) | -1.154481 (0.9044) | -3.764751 (0.0316) |
| | OPENNESS | -2.167772 (0.4919) | -3.926651 (0.0213) | -1.932991 (0.6168) | -3.92665 (0.0213) |
| | GOVC | -2.008722 (0.5770) | -5.231487 (0.0008) | -2.260405 (0.4437) | -5.24553 (0.0008) |
| | INF | -2.002350 (0.5804) | -6.051710 (0.0001) | -2.008085 (0.5773) | -6.05888 (0.0001) |
| | FD1 | -1.670274 (0.7282) | -5.461752 (0.0011) | -3.606375 (0.0481) | -3.652 (0.04289) |
| | FD2 | 0.609014 (0.9992) | -4.885953 (0.0020) | 0.609014 (0.9992) | -4.87313 (0.0020) |
| | $\left(\frac{INV}{GDP}\right)$ | -2.210005 (0.4696) | -7.770975 (0.0000) | -2.108985 (0.5231) | -7.78574 (0.0000) |
| **Cote D'Ivoire** | y | 0.719465 (0.9995) | -5.489108 (0.0004) | 3.133991 (1.0000) | -5.760836 (0.0002) |
| | OPENNESS | -1.391850 (0.8459) | -5.026372 (0.0014) | -1.477203 (0.8184) | -5.79570 (0.0002) |
| | GOVC | -2.571428 (0.2947) | -5.448403 (0.0004) | -2.701719 (0.2419) | -6.25346 (0.0000) |
| | INF | -2.665746 (0.2562) | -4.366883 (0.0094) | -1.708635 (0.7267) | -6.19813 (0.0001) |
| | FD1 | -3.477104 (0.0586) | -5.445134 (0.0005) | -2.426467 (0.3605) | -5.46967 (0.0004) |
| | FD2 | -1.451463 (0.8276) | -4.563796 (0.0045) | -1.616250 (0.7666) | -4.56481 (0.0045) |
| | $\left(\frac{INV}{GDP}\right)$ | -2.330120 (0.4080) | -6.680391 (0.0000) | -2.526250 (0.3145) | -6.65066 (0.0000) |
| **Gambia** | y | -2.583884 (0.1077) | -3.582059 (0.0114) | -1.752727 (0.3971) | -3.529860 (0.0129) |
| | OPENNESS | -0.661248 (0.8438) | -4.551513 (0.0009) | -0.680591 (0.8391) | -4.465550 (0.0011) |
| | GOVC | -1.025727 (0.7336) | -6.664185 (0.0000) | -0.942314 (0.7629) | -6.676969 (0.0000) |
| | INF | -0.399615 (0.8987) | -5.374684 (0.0001) | -0.399615 (0.8987) | -5.376164 (0.0001) |

| | | | | | |
|---|---|---|---|---|---|
| | FD1 | -2.156021 (0.2252) | -7.244365 (0.0000) | -2.045541 (0.2670) | -7.473725 (0.0000) |
| | FD2 | -0.423201 (0.8945) | -4.119779 (0.0028) | -0.807467 (0.8049) | -4.119779 (0.0028) |
| | $\left(\frac{INV}{GDP}\right)$ | -3.211259 (0.0275) | | -3.211259 (0.0275) | |
| | | | | | |
| **Ghana** | y | 0.265806 (0.9731) | -4.192181 (0.0023) | 0.126640 (0.9635) | -4.192181 (0.0023) |
| | OPENNESS | -2.710614 (0.0821) | -6.741368 (0.0000) | -2.700393 (0.0838) | -6.695253 (0.0000) |
| | GOVC | -2.336276 (0.1668) | -5.537422 (0.0001) | -2.459508 (0.1338) | -6.278817 (0.0000) |
| | INF | -1.880975 (0.3370) | -8.015277 (0.0000) | -1.880975 (0.3370) | -13.38855 (0.0000) |
| | FD1 | -1.372044 (0.5850) | -6.425870 (0.0000) | -1.372044 (0.5850) | -6.420263 (0.0000) |
| | FD2 | -1.696212 (0.4246) | -5.845192 (0.0000) | -1.713347 (0.4162) | -5.845781 (0.0000) |
| | $\left(\frac{INV}{GDP}\right)$ | -2.157926 (0.2245) | -6.440776 (0.0000) | -2.154418 (0.2258) | -6.876651 (0.0000) |
| **Nigeria** | y | -2.141800 (0.2303) | -4.496896 (0.0010) | -2.206883 (0.2074) | -4.511692 (0.0010) |
| | OPENNESS | -0.584120 (0.8513) | -2.979471 (0.0572) | -0.664184 (0.8318) | -2.819172 (0.0764) |
| | GOVC | -1.601997 (0.4713) | -5.285453 (0.0001) | -1.567885 (0.4883) | -6.949871 (0.0000) |
| | INF | -1.020156 (0.7356) | -5.734233 (0.0000) | -0.947091 (0.7613) | -5.761893 (0.0000) |
| | FD1 | 1.495147 (0.9990) | -6.371900 (0.0000) | 2.120023 (0.9999) | -6.385855 (0.0000) |
| | FD2 | -1.745325 (0.4007) | -5.449437 (0.0001) | -1.758578 (0.3943) | -4.964741 (0.0003) |
| | $\left(\frac{INV}{GDP}\right)$ | -2.455755 (0.1345) | -9.299939 (0.0000) | -2.455755 (0.1345) | -17.08447 (0.0001) |
| **Senegal** | y | -0.864277 (0.7880) | -4.502209 (0.0010) | -1.138264 (0.6898) | -4.470693 (0.0011) |
| | OPENNESS | 1.049889 (0.9963) | -4.113939 (0.0029) | 1.049889 (0.9963) | -4.139798 (0.0027) |

| | | | | | |
|---|---|---|---|---|---|
| | GOVC | -0.610127<br>(0.8560) | -5.208150<br>(0.0001) | -0.775055<br>(0.8141) | -5.218083<br>(0.0001) |
| | INF | -1.020787<br>(0.7354) | -4.508328<br>(0.0010) | -1.206214<br>(0.6611) | -4.504288<br>(0.0010) |
| | FD1 | -0.367587<br>(0.9042) | -4.080140<br>(0.0031) | -0.671850<br>(0.8412) | -4.100981<br>(0.0030) |
| | FD2 | -1.879706<br>(0.3377) | -5.533872<br>(0.0001) | -1.988669<br>(0.2903) | -5.524102<br>(0.0001) |
| | $\left(\frac{INV}{GDP}\right)$ | -1.321937<br>(0.6087) | -6.235579<br>(0.0000) | -1.320960<br>(0.6092) | -6.248737<br>(0.0000) |
| **Togo** | y | -1.953964<br>(0.3050) | -5.880862<br>(0.0000) | -2.128377<br>(0.2352 | -6.086160<br>(0.0000) |
| | OPENNESS | 11.25046<br>(1.0000) | -11.45468<br>(0.0000) | 11.25046<br>(1.0000) | -4.664317<br>(0.0028) |
| | GOVC | -2.034751<br>(0.2713) | -4.444507<br>(0.0012) | -2.269634<br>(0.1869) | -4.223417<br>(0.0021) |
| | INF | -0.307591<br>(0.9140) | -6.645066<br>(0.0000) | -0.307591<br>(0.9140) | -6.765124<br>(0.0000) |
| | FD1 | -0.753544<br>(0.8200) | -4.443611<br>(0.0012) | -1.045758<br>(0.7261) | -4.468782<br>(0.0011) |
| | FD2 | -0.298924<br>(0.9153) | -5.812651<br>(0.0000) | -0.602683<br>(0.8577) | -5.885219<br>(0.0000) |
| | $\left(\frac{INV}{GDP}\right)$ | -0.005177<br>(0.9519) | -5.231253<br>(0.0001) | 0.050018<br>(0.9571) | -5.279029**<br>(0.0001) |

**Notes:**
a. The ADF lag length of the dependent variable used to obtain white noise residuals is 2.
b. The lag lengths for ADF equation were selected using Schwarz Information Criterion (SIC).
c. Mackinnon (1991) critical value for rejection of hypothesis of unit root applied.
d. The bandwidth selected based on Newey West (1994) method using Bartlett Kernel is 2.

## 4.2 Cointegration Test

In this study, we embark on investigating the long run relationships among the variables using both conventional and relatively recent cointegration methodologies[6]. Among the cointegration techniques employed are the VAR-based multivariate Johansen

[6] We earlier tested for the causality principally between financial development and economic growth among the selected countries. There are evidences for the unilateral causality running from financial development to economic growth among these countries by identifying the supply leading relationship between financial development and economic growth. The result is presented in Table 2.

cointegration and Gregory-Hansen cointegration technique which allows for endogenous identification of structural breaks.

***Without structural breaks***

The result of the VAR-based Johansen maximum likelihood tests is presented in Table 3. From the table, the result establishes long run relationship among the variables under consideration in the selected countries using Trace and Max-angel statistics.. It must, however, be noticed that the conventional cointegration test results in the presence of structural break(s)/regime shift become biased following the fact that the distributional theory of evaluating the residual-based tests is not the same (see Gregory and Hansen, 1996 and Gregory et al., 1996). This explains while most findings from earlier studies which predominantly rely on these conventional tests in establishing the long run relationships could be biased. For instance, it would be erroneous, and of course misleading, to conclude and thus deduct policy inference based on the results of cointegration tests as seen in Table 3. More specifically, since the power of this conventional cointegration test often fall dramatically in the presence of a break in the cointegration vector, there is need for an alternative cointegration test which fundamentally allows for the possibility of structural breaks/regime shifts in our models.

**Table 2: Granger Causality Test Result for the Selected Countries**

| Country | Direction of Causality | Lag | F-statistics | P value | Status |
|---|---|---|---|---|---|
| **Burkina** | $\Delta FD$ *causes* $\Delta Y$ | 1 | 4.138 | 0.010*** | Accept |
| | $\Delta Y$ *causes* $\Delta FD$ | 1 | 1.285 | 0.325 | Reject |
| **Cote D'Ivoire** | $\Delta FD$ *cause* $\Delta Y$ | 2 | 4.204 | 0.048** | Accept |
| | $\Delta Y$ *causes* $\Delta FD$ | 2 | 1.610 | 0.347 | Reject |
| **Gambia** | $\Delta FD$ *causes* $\Delta Y$ | 2 | 2.676 | 0.049** | Accept |
| | $\Delta Y$ *causes* $\Delta FD$ | 2 | 1.699 | 0.187 | Reject |
| **Ghana** | $\Delta FD$ *causes* $\Delta Y$ | 2 | 6.609 | 0.004*** | Accept |
| | $\Delta Y$ *causes* $\Delta FD$ | 2 | 1.302 | 0.362 | Reject |
| **Nigeria** | $\Delta FD$ *causes* $\Delta Y$ | 2 | 3.084 | 0.061* | Accept |
| | $\Delta Y$ *causes* $\Delta FD$ | 2 | 1.141 | 0.333 | Reject |
| **Senegal** | $\Delta FD$ *causes* $\Delta Y$ | 1 | 1.893 | 0.196 | Reject |
| | $\Delta Y$ *causes* $\Delta FD$ | 1 | 4.301 | 0.046** | Accept |
| **Togo** | $\Delta FD$ *causes* $\Delta Y$ | 1 | 3.060 | 0.032** | Accept |
| | $\Delta Y$ *causes* $\Delta FD$ | 1 | 2.264 | 0.100 | Reject |

**Note:** Δ symbol represents first difference.

**Table 3: Multivariate Johansen Cointegration Test**

| Countries | Model | Test | Statistics | Critical Value | P. value | r | Status |
|---|---|---|---|---|---|---|---|
| ***Burkina Faso*** | 1 | Trace | 135.9706 | 117.7082 | 0.0021 | 1 | Cointegration |
| | | Max-engel | 44.07981 | 44.49720 | 0.0555 | 1 | Cointegration |
| | 2 | Trace | 133.7417 | 117.7082 | 0.0033 | 1 | Cointegration |
| | | Max-engel | 47.13154 | 44.49720 | 0.0252 | 2 | Cointegration |
| **Cote D'Ivoire** | 1 | Trace | 115.2003 | 117.7082 | 0.0712 | 1 | Cointegration |
| | | Max-engel | 42.93271 | 44.49720 | 0.0732 | 2 | Cointegration |
| | **2** | Trace | 142.2389 | 117.7082 | 0.0006 | 3 | Cointegration |
| | | Max-engel | 41.36219 | 44.49720 | 0.1055 | 0 | No cointegration |
| **Gambia** | 1 | Trace | 146.4427 | 117.7082 | 0.0002 | 2 | Cointegration |
| | | Max-engel | 47.12999 | 44.49720 | 0.0252 | 2 | Cointegration |
| | 2 | Trace | 141.4590 | 117.7082 | 0.0007 | 1 | Cointegration |
| | | Max-engel | 53.94627 | 44.49720 | 0.0036 | 2 | Cointegration |
| **Ghana** | 1 | Trace | 135.3632 | 117.7082 | 0.0024 | 1 | Cointegration |
| | | Max-engel | 38.95523 | 44.49720 | 0.1770 | 0 | No cointegration |
| | 2 | Trace | 129.2757 | 117.7082 | 0.0076 | 3 | Cointegration |
| | | Max-engel | 40.76855 | 44.49720 | 0.1204 | 2 | Cointegration |
| **Nigeria** | 1 | Trace | 167.5797 | 117.7082 | 0.0000 | 2 | Cointegration |
| | | Max-engel | 47.04876 | 44.49720 | 0.0258 | 2 | Cointegration |
| | 2 | Trace | 191.6419 | 117.7082 | 0.0000 | 1 | Cointegration |
| | | Max-engel | 57.23427 | 44.49720 | 0.0013 | 1 | Cointegration |
| **Senegal** | 1 | Trace | 127.9505 | 117.7082 | 0.0096 | 1 | Cointegration |
| | | Max-engel | 44.76743 | 44.49720 | 0.0467 | 1 | Cointegration |
| | 2 | Trace | 124.9090 | 117.7082 | 0.0161 | 3 | Cointegration |
| | | Max-engel | 36.43167 | 44.49720 | 0.2864 | 0 | No cointegration |
| **Togo** | 1 | Trace | 140.7962 | 117.7082 | 0.0008 | 3 | Cointegration |
| | | Max-engel | 49.54272 | 44.49720 | 0.0130 | 2 | Cointegration |
| | 2 | Trace | 142.9945 | 117.7082 | 0.0005 | 1 | Cointegration |
| | | Max-engel | 63.81835 | 44.49720 | 0.0002 | 1 | Cointegration |

**Note:**
a. Critical values derive from Mackinnon-Hang-Michelis (1999).
b. r denotes the number of cointegrated vectors.
c. The order of VAR model is 2 using the Akaike and Schwarz criterion are used for

***With structural breaks***

Since the Gregory-Hansen structural break test is based on the notion of regime change, it thus allows for an endogenous structural break in the cointegration vector by considering three alternative models: a level shift (model C), a level shift with a trend (model C/T), and a regime shift which allows the slope vector to shift as well (model C/S). Given the short-coming of the earlier conventional test in identifying any meaningful long run relationship in the presence of structural breaks, this study finds it needful to further subject the long run relationship among the variables in the selected countries to a more rigorous and robust test which consents to possibility of structural breaks in the relationship.[7] This, therefore, informs our choice for the Gregory-Hansen test in this study. The result of this test is depicted in Table 4 for the two measures of financial development (hence two models). From the table, evidence of cointegration relationships is clearly established when assuming a shift which allows the slope vector to shift (model C/S), otherwise known as structural break in all the selected countries. Having identified plausible breaks in the systems, the test does suggest that a structural break in the cointegration vector is important and needs to be taken care of in the specification of growth-finance relationship in these countries. Also, the structural breakpoints as identified in the results of seem to match clearly with the corresponding critical economic incidents in the selected countries.

**Table 4: Gregory-Hansen Structural Break Cointegration Result**

| Country | Model | ADF* | Estimated breakpoint | $Z_t$* | Estimated breakppoint | $Z_\alpha$* | Estimated breakpoint |
|---|---|---|---|---|---|---|---|
| **Burkina** | 1 | -3.377(1) | 1993 | -3.167 | 1994 | -16.48 | 1994 |
| | 2 | -6.132(1)* | 1995 | -5.619* | 1994 | -22.48 | 1996 |
| **Cote d'Ivoire** | 1 | -4.076(1) | 1994 | -5.275 | 1992 | -33.82 | 1993 |
| | 2 | -5.70 (1)* | 1993 | -5.742* | 1997 | -72.71* | 1992 |
| **Gambia** | 1 | -4.504(2) | 1985 | -4.109 | 1988 | -23.897 | 1990 |
| | 2 | -5.500 (2)* | 1987 | -5.60* | 1986 | -29.00 | 1991 |
| **Ghana** | 1 | -5.715(1)* | 1982 | -3.822 | 1984 | -20.844 | 1979 |
| | 2 | -12.56 (1)* | 1980 | -10.60* | 1980 | -59.69* | 1981 |
| **Nigeria** | 1 | -6.008(1)* | 1986 | -6.125* | 1988 | -53.139 | 1986 |
| | 2 | -10.23 (1)* | 1989 | -11.38* | 1987 | 67.88* | 1987 |
| **Senegal** | 1 | -4.346(2) | 1984 | -4.406 | 1984 | -26.094 | 1983 |
| | 2 | -3.90 (2) | 1984 | -3.80 | 1987 | -32.71 | 1985 |
| **Togo** | 1 | -4.288(1) | 1993 | -4.806 | 1978 | -29.204 | 1981 |
| | 2 | 5.504(1)* | 1991 | -7.444* | 1979 | -24.722 | 1981 |

**Note:** * indicates 5% level of significance. The 5% critical values are -5.50 and -58.33 for the ADF/ Zt*and Zα* tests, respectively (see Table 1 of Gregory and Hansen, 1996). Model is C/S.

[7] See, for instance, Dritsakis (2012), on the application of Gregory-Hansen structural breaks test on demand for money in Greece.

### 4.4 Long Run Estimates

Table 5 depicts the output of estimated growth models with emphasis on the role of financial development in influencing growth dynamics in the selected countries. To start with, following the Granger-causality test which supports the finance-driven growth hypothesis for all the countries under consideration[8], the result of the estimated growth model generally lends credent to the importance of financial development in explaining growth dynamics among the selected countries, thus reinforcing the finance-driven growth hypothesis. Also, while the roles of trade openness, capital investment and government consumption in enhancing growth are clearly revealed in most of the countries as they seem to follow the *a priori* expectation in terms of their relationships with respect to signs and magnitudes, the result with respect to the role of inflation are, however, mixed across countries.

**Table 5: Estimated Growth Model (using M2 as a % of GDP)**

| Country | C | $\left(\frac{INV}{GDP}\right)$ | *OPENESS* | *GOVC* | *INF* | *FD* | $R^2$ | Adj$R^2$ | F-stat |
|---|---|---|---|---|---|---|---|---|---|
| **Burkina Faso** | 0.793<br>(4.857) | 1.017<br>(2.600)** | 0.261<br>(2.876)** | 1.066<br>(0.625) | 0.268<br>(2.687)** | 0.637<br>(0.649) | 0.41 | 0.35 | 25.32 |
| **Cote d'Ivoire** | 4.703<br>(3.925) | 0.521<br>(8.597)* | 1.838<br>(1.968)** | 0.326<br>(1.825) | -0.445<br>(-4.829)* | 1.002<br>(3.787)* | 0.65 | 0.60 | 18.12 |
| **The Gambia** | 1.682<br>(5.510) | 0.311<br>(0.664) | 0.331<br>(2.256)** | 0.024<br>(0.087) | -0.292<br>(-2.391)** | 0.092<br>(1.749) | 0.63 | 0.59 | 21.47 |
| **Ghana** | -1.486<br>(-3.816) | 1.488<br>(1.081) | 0.156<br>(0.479) | 0.154<br>(2.244)** | -0.084<br>(-0.844) | 0.367<br>(2.775)** | 0.57 | 0.54 | 12.76 |
| **Nigeria** | -1.613<br>(-7.548) | 0.845<br>(4.681)* | 0.639<br>(2.208)** | 0.537<br>(0.335) | -0.091<br>(-0.685) | 0.631<br>(2.769)** | 0.52 | 0.48 | 10.71 |
| **Senegal** | -1.907<br>(-2.972) | 0.798<br>(2.98)** | 0.651<br>(1.719) | -0.925<br>(-3.082)* | -1.131<br>(-5.602)* | 1.320<br>(2.205)** | 0.40 | 0.36 | 14.6 |
| **Togo** | -2.002<br>(-11.71) | 0.001<br>(0.002) | 1.093<br>(4.239)* | 1.167<br>(0.884) | -0.393<br>(-2.437)** | 1.165<br>(3.020)* | 0.61 | 0.59 | 26.30 |

**Note:** *, ** indicate 1%, 5% levels of significance.

[8] with the exception of Senegal where the causality runs from growth to financial development

**Table 6: Estimated Growth Model (using domestic credit provided by banking sector as a % of GDP)**

| Country | C | $\left(\frac{INV}{GDP}\right)$ | *OPENESS* | *GOVC* | *INF* | *FD* | $R^2$ | Adj$R^2$ | F-stat |
|---|---|---|---|---|---|---|---|---|---|
| **Burkina Faso** | 2.410<br>(12.70) | 0.867<br>(3.777)* | 0.721<br>(1.614) | 0.503<br>(1.056) | 0.137<br>(4.303)* | 0.805<br>(2.783)** | 0.50 | 0.46 | 43.52 |
| **Cote d'Ivoire** | 0.913<br>(3.586) | 0.325<br>(6.768)* | 0.045<br>(3.262)* | 0.271<br>(2.982)** | -0.597<br>(-0.924) | 0.127<br>(1.974)** | 0.71 | 0.68 | 13.45 |
| **The Gambia** | 1.585<br>(2.374) | 0.462<br>(0.816) | 0.816<br>(5.487)* | 0.203<br>(1.076) | 0.442<br>(2.026)** | 0.865<br>(2.633)** | 0.64 | 0.57 | 66.13 |
| **Ghana** | 1.582<br>(5.881) | 1.710<br>(2.782)** | 0.185<br>(2.185)* | 0.932<br>(5.423)* | 0.162<br>(1.405) | 0.609<br>(2.635)** | 0.61 | 0.58 | 34.56 |
| **Nigeria** | 1.276<br>(12.600) | 0.105<br>(3.070)* | 0.363<br>(2.473)* | 1.105<br>(0.872) | -0.120<br>(-0.937) | 0.061<br>(4.682)* | 0.61 | 0.56 | 0.66 |
| **Senegal** | 4.715<br>(5.162) | 0.139<br>(2.733)** | 1.283<br>(1.464) | 0.977<br>(2.926)** | 0.994<br>(1.165) | 0.037<br>(2.919)** | 0.50 | 0.47 | 23.12 |
| **Togo** | 1.661<br>(7.773) | 0.617<br>(0.819) | 1.646<br>(4.780)* | 0.395<br>(9.395)* | 0.755<br>(4.417)* | 0.093<br>(2.487)** | 0.72 | 0.68 | 47.89 |

**Note:** *, ** indicate 1%, 5% levels of significance.

## 5. Summary and Conclusion

For several years, the relationship between economic growth and financial development has been of paramount research interest to various researchers and policy makers as well. This is not unconnected with the understanding of the crucial role being played by the financial markets and institutions in the mobilization and allocation of financial resources to the productive sector of the economy. The theoretical paradigm underlying this relationship can be traced back to the work of Schumpeter (1911). Schumpeter opined that financial institutions play a very significant role in the process of economic growth and development. In the same vine, Patrick (1966) argued that financial expansion through the creation of financial institutions and the supply of financial assets do have a positive impacts on the economic growth especially in early stage of development. Thus, financial development is postulated to be playing a supply-leading role in economic development.

With a drive for trade competitiveness, strong financial institutional development, sustained economic growth and, of course, in the face of recent global financial meltdown, most of the ECOWAS countries have continued to witness various types of financial reforms and economic restructuring. These developments are, however, often plagued with unstable domestic financial policies, high and frequent rates of political instability and, of course, incessant policy regime shifts. To better enhance the formulation of optimal financial and

economic policy, there is need to understand the role of domestic economic and financial environment of most of the developing countries, especially the sub-Saharan Africa in the analysis of finance-growth nexus.

The striking feature of our results as evident in this study, though preliminary, generally lends credent to the importance of financial development in the explanation of growth dynamics among the selected countries, thus reinforcing the finance-driven growth hypothesis. There are evidences for the unilateral causality running from financial development to economic growth among these countries by identifying the supply leading relationship between financial development and economic growth. Again, and more importantly, having identified plausible breaks in the systems, the test does suggest that a structural break in the cointegration vector is important and needs to be taken care of in the specification of finance-growth models in the selected countries. Also, the structural breakpoints as identified among these countries seem to match clearly with the corresponding critical economic, financial and social incidents in the countries.

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