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FINANCIAL DEVELOPMENT – ECONOMIC GROWTH NEXUS IN THE EAST AFRICAN COMMUNITY: DOES LONG-RUN COINTEGRATION WITH STRUCTURAL BREAKS EXIST?

MUWANGA SEBUNYA GERTRUDE, PH.D[1].

Department of Policy and Development Economics,

School of Economics,

College of Business and Management,

Makerere University

Phone: 256-414-530115;

Mobiles: 256-773547955; 256-751070180

Email: gmuwanga@bams.mak.ac.ug/gsmuwanga@yahoo.com

Plot 51, Pool Road, P.O. Box 7062, Kampala-Uganda

(Author acknowledges funding from College of Business, Makerere University)

Abstract: *The East African Community (EAC) countries including Burundi, Kenya, Rwanda and Uganda, have implemented financial sector reforms leading to financial development. This is expected to cause structural breaks in its long run equilibrium with economic growth. A new equilibrium may be established but is not guaranteed. This paper investigated this issue using standard model and structural break specifications; and the Engle- Granger two step and the Gregory-Hansen-Quandt-Andrews-Muwanga cointegration procedures. The study established that: at least one structural break existed based on the SUP F test, and at least one other instability test for all the four countries; detection of cointegration with structural breaks is test statistic/model specification sensitive, thus the need to use more than one test statistic, with SUP F test being superior to all others; failure to capture regime shifts may lead to false rejection of cointegration; the ADF*statistic obtained from structural equations with breaks identified using the Quandt-Andrew procedure can be used to test for cointegration with structural break(s) using the standard ADF tables (desirable) or the Gregory-Hansen critical values (with* *caution); and that cointegration between economic growth and financial development exists but with structural breaks corresponding to key political developments in the four countries studied.*

JEL classification: C10, C22, C24, C40, C50, E44, G20, O47, O40, E44,

Key words: structural breaks, threshold cointegration, regime shifts, economic growth, financial development, Quandt –Andrew instability tests, Hansen Lc test, equilibrium relationships

1. INTRODUCTION

A solid and well-functioning financial sector plays a significant role in economic development by: promoting economic growth; reducing poverty; assisting the growth of small to medium sized enterprises (SMEs); generating local savings, thus productive investments; facilitating the transfer of international private remittances; among other things. Ultimately, it provides the rudiments of income growth and job creation. Empirical evidence has showed that financial sector development, regardless of the definition is a pre-requisite for economic development, poverty alleviation and economic stability (Levine 1997; Levine 2005; Beck (2006); Čihák et al 2013). In most developing countries, the emphasis on the private sector as a major engine of growth begun with the IMF and World Bank driven Structural Adjustment Programs (SAPs). To-date, the role of the private sector in development is still emphasized by most development agents. Financial sector development is part and parcel of the private sector strategy to stimulate economic growth and reduce poverty.

The EAC member countries in a bid to boost economic growth and reduce poverty in the region implemented several financial sector reforms since 1990 (Abuka and Egesa 2007 and Egesa 2010). It is expected that the reforms will lead to either gradual changes in the cointegration parameter and/or lead to structural breaks, implying different cointegration relationships before and after the reforms. It is thus necessary to determine whether cointegration with structural breaks exist. Unfortunately, the traditional approaches used for cointergrations tests (Engle and Granger two – step, the Johansen Full Information Maximum Likelihood (FIML), and the Johansen and Juseius

(1990) procedures in the presence of structural breaks may lead to misleading results as they tend to reject the null hypothesis of cointegration, or fail to reject the null of a unit root even when stable cointegration parameters exist.

In order to address the gap identified above and to be able to determine whether cointegration between financial development and economic growth exists, this study set out to: i). to determine the power of various tests including the Sup F, mean F, and Exp F) and the Hansen Lc test to detect cointegration in the presence of unknown identified using the Quandt-Andrew test procedure (Quandt 1960, Andrews (1993), Andrews and Ploberger 1994); ii) develop a threshold cointegration approach referred to as the Gregory-Hansen-Quandt-Andrews-Muwanga $(GHQAM)$ cointegration approach that can be used to determine whether cointegration with structural break exists; iii). use the model to determine whether cointegration with structural breaks exist between financial development and economic growth measured by real gross domestic product (GDP); iv). estimate the ADF* statistic for the structural models with the structural breaks identified and use them to test for cointegration in the presence of structural breaks; v). determine whether the ADF* test obtained for the structural models estimated can be used as the $ADF(\tau)$ test statistic equivalent ($ADF(\tau^e)$) used in the Gregory and Hansen (196b) approach to test for cointegration with structural breaks using the Gregory –Hansen critical values; compare the ADF* and $ADF(\tau)$ equivalent results with those obtained using the Quandt –Andrews instability tests; and vi). determine whether a estimation of a short-run error correction cointegration model for financial development and economc growth is justified. The findings of this study will be used to guide the selection and estimation of the empirical model for investigating the Long-run and Short-run Structural Break Cointegration Relationships between Economic Growth and Financial Sector Development in the East African Community

2 THEORETICAL, METHODOLOGICAL AND EMPIRICAL REVIEW

2.1 Measures of Financial Development

Based on empirical discussions, three measures of financial development can be identified: i). measures based on the outcomes of the financial development aimed at reducing financial costs referred to as the narrow definition (Alexander and Baden 2000 and World Bank GFDR (2013); ii). those based on the five key functions of the financial sector (Levine 1997, Merton and Bodie 2004, Levine 2005, and Čihák et al 2013); and iii). those based on the overall operation environment of the financial sector (Honohan 2004, Beck et al 2006; Beck 2006, Babihuga 2007, De la Torre et al 2008, and Adnan 2011). Using the narrow definition (outcome based), financial development can be measured using various indicators derived from the four dimensions, that is, financial depth, access, efficiency and stability. This approach is used by The World Bank's Global Financial Development Database –GFDD (2016) to measure financial development worldwide for the two major components in the financial sector, namely the financial institutions and financial markets. It is based on a comprehensive yet relatively simple conceptual 4x2 framework described in The World Bank's Global Financial Development Report (2013) and Čihák et al (2012). Empirically, different researchers have used either individual indicators or indices constructed using selected indicators derived from the four dimensions and varying methodologies to measure the financial health of a country. Adnan (2011) provides an overview of different studies that have used different approaches to measure financial health. According to Adnan 2011), among the most commonly used single indicators, private credit is considered as a superior measure of financial development and was adopted for this study.

2.2 Testing for Cointegration

Cointegration is used to refer to a linear combination of non-stationary variables which have a stationary relationship in the long-run (Banik and Yoonus 2009). This implies that cointegration is tested for only those series which are integrated of order one (I(1)) or above. Since most economic series are integrated of order 1 or I(1), it is expected that the test involves series that are I(1). The most widely used cointegration methods in empirical studies include the Engle and

Granger two –step procedure (Engle and Granger 1987), the Johansen Full Information Maximum Likelihood (FIML) procedure (Johansen 1988), and the Johansen and Juseius (1990) procedure. However, these methodologies in the presence of structural breaks may lead to misleading results as they tend to reject the null hypothesis of cointegration, or fail to reject the null of a unit root even when stable cointegration parameters exist. The false rejection of the null hypothesis is the consequence of the non-stationarity of the residuals obtained from the cointegration equation resulting from unaccounted for structural breaks. The presence of unaccounted for structural breaks leads to inefficient estimation and lowers the testing power as established by Gregory and Hansen (1966a, 1966b). Further evidence on the sensitivity of the outcomes of the tests to structural breaks can be obtained from Wu (1998), Lau and Baharumshah (2003). **S**everal researchers have avoided these shortcomings by resorting to non-linear testing techniques, including those based on threshold cointegration, single structural breaks and multiple structural breaks, known and unknown structural breaks, among others. Research based on the concept of threshold cointegration includes but is not limited to that of Gregory and Hansen (1996a, 1996b), Hansen and Seo (2002) and Esso (2010a and 2010b). Empirically, researchers have tested structural breaks using either the null of the Engle-Granger cointegration or the null of no cointegration with power against the various structural change regimes (Hansen 1990; Hansen 1992; Andrews 1993; Quintos and Philips 1993; Gregory and Hansen 1966a; 1996b; Breitung and Eickmeier 2011; Calvori et al 2014).

2.3 Testing for Structural Breaks

Hansen (1990) and Zeileis (2005) outline the general theories for testing for parameter instability in econometric models based on the above models. According to Zeileis (2005), various classes of tests including fluctuation tests such as the CUSUM and MOSUM tests; F-statistic tests such as the Wald, LR and LM test statistics and ML scores; and Hansen (1992) statistics have been used to test for structural breaks. Other researchers have used the Phillip Perron Z_α (r) and Z_t (r) and/or the Augmented Dickey Fuller- $ADF(\tau)$ (Gregory and Hansen 1996a; Benerjee et al 1992; Zivot and Andrews 1992; and Nwaobi 2011) to test for the same. Other tests which are

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suitable for testing the null of cointegration include the $SUP\,F$, F_{nt} and the Mean F tests. These are used to test for parameter stability in cointegrated relationships based on the residuals of a Fully Modified – Ordinary Least Squares (FM-OLS) regression. The asymptotic distribution theory developed for the F_{nt} test is only valid when t can be chosen independently of the sample, which is a very restrictive assumption in practice. The $SUP\,F$, Mean F and L_c have the same null hypothesis but differ in their choice of alternative hypothesis, but all tend to have power in the same direction. The $SUP\,F$ statistic, like the recursive Chow test, tests for the null of cointegration with no regime shifts against the alternative of cointegration with a discrete shift in the parameter vector at an unknown point. The Mean F and L_c statistics test for the null of cointegration against the alternative of a random walk type variation in the parameter vector. Hansen (1992) provides details on asymptotic distributions and computational aspects of these test statistics.

The choice among $SUP\,F$, Mean F and L_c depends on the computational grounds and the purpose of the test. On computational grounds, L_c is much easier to compute. The $SUP\,F$ test is preferred when a regime shift or shifts are expected in the data since its alternative hypothesis is that of a sudden shift in the regime at an unknown point in time. It is based on the classical Chow F-tests. The Mean F test is suitable for determining whether parameter stability exists while the L_c is the most appropriate if the likelihood of parameter variability is expected throughout the model period. Various researchers such as Darbha (2000), Panopoulou (2006), and Esso (2010a, 2010b), have used these tests to test for stability. Esso (2010a and 2010b) following Hansen (1992) and Gregory and Hansen (1996a) used the tests to test for linearity or stability of the relationship in the first stage of the analysis to establish whether the cointegration relationship has been subject to a structural change**,** and then proceeded to the second stage where he used the Gregory –Hansen like-cointegration tests. For this study, the $SUP\,F$ and L_c are expected to be superior to the others since the model linking financial development and economic growth is expected to be characterized by parameter instability and/or structural breaks throughout the investigation period due to the effect of financial sector reforms which have been implemented over the period.

2.4 Models of Cointegration: Standard and Regime Shift Models

Given the observed data Y_t whereby $Y_t = (Y_{1t}, Y_{2t})$, Y_t is real – valued and Y_{2t} is an *m*-vector, the standard model of cointegration with no structural change as well as single-equation regression models for structural change as described by Gregory and Hansen (1996a) and Olusegun et al (2012) are presented in models 1 to 6. There are five different models corresponding to the five assumptions concerning the nature of the shift in the cointegration vector, that is: standard model of cointegration (SMC)-Model 1, level shift (C)-Model 2, level shift with trend(C/T)-Model 3, regime shift (C/S)-Model 4 and regime shift with a shift in trend (C/S/T)-Model 5. This paper also considers an additional alternative of a modification to the standard model referred to as standard model of cointegration with trend-(SMC-T or modified SMC-Model 1a) which incorporates a trend in the standard version. It is not counted as one of the structural change alternatives since the constant, the trend and the slope are not allowed to change. This modified model is presented in model 1a in equation 2. The assumption behind the standard models is that there is no structural break in the cointegration relationship.

The dependent variable is the logarithm of Real Gross Domestic Product ($Y_{1t} = \ln(GDP)$, and the independent variable is the logarithm of Financial Sector Development (FSD) measured ratio of domestic credit to private sector to gross domestic product $(Y_{2t} = \ln(DCP/GDP) = In(FSD))$.

Model 1: $Y_{1t} = \mu + \alpha^T Y_{2t} + e_t, \quad t = 1,..., n$ (1)

Model 1a: $Y_{1t} = \mu_1 + \beta t + \alpha^T Y_{2t} + e_t, \quad t = 1,..., n$ (2)

Model 2: Level shift (C): $Y_{1t} = \mu_1 + \mu_2 D_{tr} + \alpha_1^T Y_{2t} + e_t, \quad t = 1,..., n$ (3)

Model 3: Level shift with trend

(C/T): $Y_{1t} = \mu_1 + \mu_2 D_{tr} + \beta_1 t + \alpha_1^T Y_{2t} + e_t, \quad t = 1,..., n$ (4)

Model 4: Regime shift (C/S):

$$Y_{1t} = \mu_1 + \mu_2 D_{tr} + \alpha_1^T Y_{2t} + \alpha_2^T Y_{2t} D_{tr} + e_t, \qquad t = 1,..., n \qquad (5)$$

Model 5: Regime shift with a trend (C/S/T):

$$Y_{1t} = \mu_1 + \mu_2 D_{tr} + \beta_1 t + \beta_2 t D_{tr} + \alpha_1^T Y_{2t} + \alpha_2^T Y_{2t} D_{tr} + e_t \qquad t = 1,..., n \qquad (6)$$

where

$Y_{1t} = \ln(GDP)$; $Y_{2t} = \ln(DCP/GDP) = In(FSD)$, e_t is a white-noise disturbance; μ is the intercept (without a structural break) in the SMC and SMC-T models; t is time trend; μ_1 is the intercept before the shift; μ_2 is the change in the intercept at the time of the shift; α^T is the slope coefficient or the long-run cointegration parameter (without a structural break) in the SMC and SMC-T models, and the level shift model; α_1^T is the cointegrating slope coefficient before the regime shift; D_{tr} is the dummy variable which is equal to 0 for the period before the structural break and 1 after the period of the structural break, that is: $D_{1t} = 0$ if $\{t \le \{[n\tau]\}\}$ otherwise $D_{1t} = 1$ if $\{t \succ \{[n\tau]\}\}$, with the unknown parameter τ ϵ (0,1) denoting the (relative) timing of the change point, while $[]$ denotes integer part; α_2^T is the change in the slope coefficient after the shift; β is the trend coefficient without a trend structural break; β_1 is the slope of the trend before the structural break; and β_2 is the change in the slope of the trend after the structural break. As described by Engle and Granger (1987), Y_{2t} is $I(1)$, e_t is $I(0)$ while μ_i and α_i's are the 'long-run cointegration parameters. With no structural break, these parameters are time invariant, but in other cases, these parameters may hold for a certain period, and then shift to another new 'long-run' relationship implying new cointegration parameters. The timing of the shift may be known but is often unknown. In some empirical situations, the possibility of more than one shift cannot be ruled out. The structural change(s) would be reflected in changes in the intercept μ, the slope coefficient α and/or the trend coefficient β.

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3. METHODOLOGY

This paper employed a two-step error-correction model (ECM) to investigate the relationships between financial sector development (FSD) and real gross domestic product (RGDP) for four East Africa member (Burundi, Kenya, Rwanda and Uganda) using a procedure that is similar to the Gregory and Hansen 1996a and 1996b) threshold cointegration test which explicitly incorporate a break in the cointegration relationship referred to as the Gregory-Hansen-Quandt-Andrews (GHQA) approach and the Fully Modified Ordinary Least Squares (FMOLS) approach. It involves two-stages. The first stage involved testing for cointegration using the conventional Augumented Dickey Fuller (ADF) (Dickey and Fuller (1979) and Phillips-Perron (Phillips 1987; Phillips and Perron 1988) test statistics to establish whether cointegration exists using the conventional test statistics. In the second stage, cointegration tests were conducted by allowing a break in the long-run equation estimated using FM-OLS.

The approach used is similar to the Gregory and Hansen approach since it incorporates a structural break at an unknown period of time, and estimates the structural break equations using ordinary least squares (OLS) and a unit root test is applied to the regression errors (Gregory and Hansen, 1996a) but differs from it in that instead of using the smallest values of the standard Augumented-Dickey-Fuller (ADF) and Phillip test statistics across all values $r \in$ T, to test for existence of an endogenously determined structural break and cointegration and selecting the smallest value (largest negative value as the test statistic), this approach uses the Quandt-Andrews (Quandt 1960, Andrews (1993), Andrews and Ploberger 1994) instability tests (SUP F, Exp F and Mean F) estimated using the FMOLS procedure across all values $r \in$ T to determine the structural breaks; the OLS procedure is then used to estimate the corresponding OLS cointegration relationship that incorporates the structural breaks identified; and finally tests for cointegration either i) using the standard Augmented-Dickey-Fuller (ADF) procedure yielding the $ADF*$ statistic or ii) by treating the ADF statistic obtained for the structural equation as the test statistic ($ADF(\tau^e)$) for the Gregory-Hansen procedure and subjecting it to the Gregory-Hansen critical values. The time break (T_b) is initially treated as unknown and is determined using the Quandt-Andrews instability tests computed for each break point in the interval [0.15T, 0.85T], where T denotes the sample size. The date of the structural break corresponds to the Supremum F, Exponent F and Mean F test statistics computed on the trimmed sample. This procedure is hereafter referred to as the Gregory-Hansen-Quandt-Andrews-Muwanga $(GHQAM)$ cointegration approach. Existence of cointegration provides the basis for estimating the of error-correction model (ECM) as follows:

$$\Delta Y_T = \gamma_0 + \gamma_1 t + \pi e_{t-1} + \sum_{i=1}^{m} \varphi_i \Delta Y_{1t-i} + \sum_{i=0}^{m} \psi_i \Delta Y_{2t-i} + \nu_t \tag{7}$$

where π is the short-run adjustment parameter, e_t is the equilibrium error lagged one-period, ν_t is a stationary process with zero mean, m is the lag order to include in the short-run relationship, Y_{1t} and Y_{2t} are as defined earlier and Δ is the difference operator. This approach has the advantage of endogenously identifying the presence of a break and at the same time determining whether cointegration exists. Details description of the two stages of the approach follows.

3.1 Stage 1: Testing for Cointegration Using Engel-Granger Two Step Methodology

As recommended by Gregory and Hansen (1996), cointegration tests were initially conducted using the conventional tests for cointegration, namely ADF (Dickey and Fuller 1979) and Phillips-Perron (PP) (Phillips 1987) tests in the contest of model 1 and model 1a, following the usual Engel-Granger Two step Cointegration Methodology (Engle and Granger 1987). The first step involved testing the data series for stationarity using the standard ADF (Dickey and Fuller 1979) and PP Phillips and Perron (1988) unit root tests. For the ADF^* and ADF tests, the lag length K was selected on the basis of a Schwatz Information Criteria (SIC). The maximum lag length was set at 10 (K_{max} = 10) for Kenya, Rwanda, and Burundi; it was set at 7 for Uganda due to lack of sufficient data for the $RGDP$ variable. The second step involved testing for cointegration and estimating the ECM if cointegration existed.

3.2 Stage 2: Simultaneous Testing for Structural Breaks and Cointegration

This first step in this stage involved testing for structural breaks using the Quandt-Andrews instability tests ($SUP\,F$, $Exp\ \ F$ and Mean F) across all values $\tau \in T$ to endogenously determine the structural breaks and test for cointegration (parameter); and the Hansen L_c test to test for parameter stability (cointegration) versus parameter variability. The second step involved using the structural break alternative that incorporates the detected structural break to test for cointegration using the standard ADF (ADF^* statistic) procedure or the $ADF(\tau^e)$ with the Gregory- Hansen critical values. Incorporation of the structural breaks detected in stage one above in the standard model and/or modified Standard Model is equivalent to removing the random walk variation present in the model if a structural break exists and is not accounted for. It is this random walk that causes the standard ADF to fail to reject the null hypothesis of no cointegration yet cointegration exist with a structural break. Suppose the true structural alternative is the true model, for example Model 5 but the researcher estimates the modified standard model Model 2. This implies that equation 2 will be estimated instead of equation 5. The model estimated will be equation 8 but with $e_t \equiv I(1)$.

$$Y_{1t} = \mu_1 + \beta t + \alpha^T Y_{2t} + e_t \tag{8}$$

Gregory and Hansen (1996a; 1996b) provide critical values for such situations where the cointegration may exist but the error term is $e_t \equiv I(1)$. A similar approach is implemented by the structural break test in stage 1 of this paper. Having identified the structural break and incorporated these breaks in the model, for example Model 5, is equivalent to breaking the $e_t \equiv I(1)$ term in equation 8 into its two component that is, the effect of the structural break, ω_t which is I(1) (represented by structural break terms) and the random effect υ_t which is I(0), yielding equation 9 with $\omega_t \equiv I(1)$ and $\upsilon_t \equiv I(0)$.

$$Y_{1t} = \mu_1 + \beta t + \alpha^T Y_{2t} + \omega_t + \upsilon_t \tag{9}$$

Rewriting and setting $\omega_t = \mu_2 D_{tr} + \beta_2 t D_{tr} + +\alpha_2^T Y_{2t} D_{tr}$ yields Model 5 with error term $\upsilon_t \equiv I(0)$, as in equation 10 which can be tested for stationarity using the standard ADF and PP tests since the error term $\upsilon_t \equiv I(0)$.

$$Y_{1t} = \mu_1 + \mu_2 D_{tr} + \beta_1 t + \beta_2 t D_{tr} + \alpha_1^T Y_{2t} + \alpha_2^T Y_{2t} D_{tr} + \upsilon_t \qquad (10)$$

Alternatively, the same ADF test statistic corresponding to equation 10 can be treated as the Gregory-Hansen test statistic. In this case, instead of using the smallest value (largest negative value) across all possible break points to test for cointegration using the critical values developed by Gregory and Hansen (1996b), the usual ADF and PP tests can be applied to the Model since the structural break incorporated in the model having been identified by the structural breaks test in stage 1, corresponds to the structural break with the smallest value (largest negative value) that would be obtained using the Gregory and Hansen approach chosen from the set of possible cointegration test statistics for each regime shift $\tau \in T$. The structural break in this case is identified using the Quandt-Andrews tests (Quandt 1960, Andrews 1993, Andrews and Ploberger 1994 and Hansen 1997). The ADF cointegration test statistic corresponding to equation 10, should therefore correspond to the $ADF(\tau)$ statistic corresponding to the same structural break and can as a result be subjected to the critical values developed by Gregory and Hansen (1996b). The results obtained using this approach can be compared to those obtained using standard ADF tests for the same model and those obtained based on FMOLS in stage 1.

The lag length k for ADF is selected on the basis of a Schwatz Information Criteria. Using models 3, 4 or 5 is efficient, since according to Gregory and Hansen (1996), the faulty inclusion of unnecessary explanatory variables to capture breaks that do not exist, is not a problem. The model can then be revised taking into account the shift model signaled. The theory behind the Quandt-Andrews test is based on the simple Chow (1960) breakpoint test for a known structural break point, which tests the null hypothesis of no structural break $(H_0 : \beta_1 = \beta_2)$ against the alternative of the a break point $(H_0 : \beta_1 \neq \beta_2)$ at time $T = k$, for equation 11.

$$Y_t = X'\beta + \varepsilon_t \qquad (11)$$

For a structural break,

$$Y_t = X'\beta_1 + \varepsilon_t \quad \text{if } t = 1,..., k \qquad (12)$$

$$Y_t = X'\beta_2 + \varepsilon_t \quad \text{if } t = k+1,..., T \qquad (13)$$

For a known structural break point, and if $X's$ are stationary and weakly exogenous with errors that are serially uncorrelated and homoskedastic, the appropriate statistic is the usual F-statistic based on the Wald F- statistic used to test the equivalence of the two parameters before and after the break $(H_0 : \beta_1 = \beta_2)$, that is

$$F_T(k) = (T-2k)[SSR_{1:T} - SSR_{1:t} + SSR_{t+1:T})]/(SSR_{1:t} + SSR_{t+1:T}) \quad (14)$$

The above F-statistic is asymptotically $\chi^2(k)$ under H_0 of no structural break. Further, according to Quandt (1960) with normally distributed errors ($\varepsilon's$) and strictly exogenous $X's$, the $F_T(t)$ is the likelihood ratio statistic which is exactly $\chi^2(k)$ under H_0. For an unknown break point t, however, the likelihood ratio statistic for the null of $(H_0 : \beta_1 = \beta_2)$ is

$$QLR_t = MaxF_T(t) = SupLR \quad (15)$$

where t is an element of trimming point, that is $t \in \{\{\tau \min,..., \tau \max\}$. Andrews (1993) showed that the $SupLR$ has a non-limiting distribution and is a "Brownian Bridge" process defined on (0, 1) and presents the percentiles of this distribution as functions of $\{\tau \min - \tau \max\}$ and k. Unlike the chow test, therefore, the Quandt-Andrews tests (Quandt 1960, Andrew 1993, and Andrews and Ploberger 1994) allow for unknown break points by performing the Chow break point test for every observation over the interval [(ϵT, (1- ϵ) T], where ϵ is a trimming parameter and is based on and calculates the supremum of the F_t statistic $(SupF)$, also known as the $SupLR$.

The test essentially consists of performing a single Chow's breakpoint test at every observation between two periods (t_0 and t_1). The n test statistics obtained from the Chow's breakpoint tests are then summarized into one test statistic: the sup or maximum statistic, which is used to test the null hypothesis of no breakpoints between t_0 and t_1. For linear equations, the Wald F statistic and the likelihood Ratio F statistic for each of the chow tests are the equivalent. The test statistics were in this case generated using the Eviews package for Models 4 and 5. The provisions cater for parameter changes for all variables or selected variables.

The appropriate critical values for the $SupWald/SupLR$ are those specifically developed for the Supremum tests provided by Andrews (1993). If the test statistic exceeds the critical value, the null of constant parameters is rejected in favor of the alternative of parameter variability. Alternatively, Hansen 1997 provides a numerical procedure to compute asymptotic probability-values for the above tests. These p-values are automatically provided by the Eviews package.

For the average (ave F) and the exponential (exp F) form developed by Andrews and Ploberger (1994), the null hypothesis of no break is rejected if these test statistics are too large (see Andrews and Ploberger 1994) for details on test). The probabilities for these test statistics are also computer generated using the Hansen procedure. For the L_c statistics developed by Hansen (1992), the null hypothesis of cointegration is tested against the alternative of no cointegration which signals evidence of parameter variability (See Hansen (1992) for details of this test).

3.3 Data sources

Financial development (domestic credit to private sector (% GDP)) data was obtained from the World Bank GFDR (2016) Report while GDP (GDP constant 2005 US $) data was obtained from the IMF database.

4. RESULTS

4.1 Stationarity Tests

The unit root test results indicated that both $\ln RGDP$ and $\ln FSD$ series for Kenya and Uganda and $\ln RGDP$ for Burundi were integrated of order one ($I(1)$) using the standard ADF and PP tests. $\ln FSD$ for Burundi was $I(1)$ based on constant only model but $I(0)$ at the 10% level for the constant and trend model for both ADF and PP tests. Both $\ln RGDP$ and $\ln FSD$ for Rwanda were $I(1)$ based on the ADF test but $I(0)$ based on the PP test. For the situations with mixed results, the variable was assumed to be I(1) as long as one of the tests conducted indicated I(1). This is in line with what is expected of most economic series.

4.2 Stability and Cointegration Tests

This section presents the results for the two standard models and the two structural alternative models-Model 4 and 5. The structural breaks for each country were identified using the Quandt-Andrew structural break test procedure based on the FMOLS procedure. Table 1 presents the structural break test results based the Quandt-Andrew instability tests while Table 2 contains the L_c test results (Hansen, 1992) for all the four models.

Table 1: Quandt-Andrews Instability Tests

Country Sample	**Break point**	**Break/no. of Breaks compared/ /trimmed sample**	*Sup F* [1]	*Exp F*	*Mean F*
Rwanda (1964-2005)	No trend Eq3 Model 4	1979 29 (1971-1999)	4.977744 (0.0964)*	1.23059 LR F-stat (0.1095) ns 2.903 Wald F-stat (0.0684)*	1.9398 (0.0886)*
	Trend Eq 4 Model 5	1994 29 (1971-1999)	66.922 (0.0000)***	30.0937 (1.000) ns	8.3697 (0.000)***
Burundi (1964-2013)	No trend **Eq3** Model 4	1984 35 (1972-2006)	34.372 (0.000)***	14.4996 (0.000)***	11.4336 (0.000)***
	Trend Eq4 Model 5	1995 35 (1972-2006)	92.09 (0.000)***	42.9897 (1.000)ns	24.759 (0.000)***
Uganda	*No trend* **Eq3**	1988 23	11.830 (0.0002)***	3.8728 (0.0008)***	5.2656 (0.001)***

(1982-2013)	Model 4	(1987-2009)			
	Trend **Eq4** Model 5	1987 23 (1987-2009)	23.645 (0.000)***	9.0282 (0.0062)***	6.1842 (0.000)***
Kenya Equation sample 1961-2013	No Trend **Eq3** Model 4	1996 38 (1969-2006)	103.655 (0.000)***	48.19 (1.000)^{ns}	33.022 (1.000)^{ns}
	Eq4 Model 5	(1972) 38 (1969-2006)	48.7976 (0.000)***	20.994 (1.000)^{ns}	17.126 (0.000)***

Notes to Table 1*:* [1] *Figures in parentheses below test statistics are proababilites, while the* ^{ns}*, *, ** and *** signify lack of significance, significance at 10%, 5% and 1% respectively.* [2]*Probabilities for* $Sup\ F$*,* $Exp\ F$ *and* $Mean\ F$ *are computed using Hansen's 1997 method.* [2]*A trimming percentage 15% was used.* [3]*Rejection of the null hypothesis for* $Sup\ F$ *implies presence of cointegration with structural break (or regime shift) while rejection of the null of cointegration with no structural break for* $Exp\ F$*,* $Mean\ F$ *and* L_c *tests implies presence of random walk type variations in the parameter vector. Structural break was indicated if either the* $Sup\ F$ *test rejected the null of cointegration without structural shift, while random walk variation in the parameter vector was indicated whenever the null was rejected by either the* $Exp\ F$*,* $Mean\ F$ *and* L_c*.* [4]*Both Wald* F*-statistic and the LR - F statistics were used but only the LR statistic is reported as long as they have the same probability level, otherwise the two are reported.*

Table 2: Parameter Hansen (1992) Instability Tests (L_c **) for all Model Specifications**

Model	**Burundi**	**Rwanda**	**Uganda**	**Kenya**
Standard Model	0.4549	0.1483	0.7666	0.3614

	(0.0535)*	(p>0.2)ns	(p<0.01)***	(0.0996)*
Modified Standard Model	0.7133 (0.0323)**	0.1762 (p>0.2)ns	0.5124 (0.0915)*	0.213 (p>0.2) ns
Regime Shift(C/S)	0.4149 (0.0695)*	0.4029 (0.082)*	0.9766 ((p<0.01)***	0.3007 (0.1635)ns
Regime shift with Trend (C/S/T)	0.8446 (0.0219)**	0.5812 (0.0710)*	0.295 (p>0.2)^{ns}	0.7381 (0.0332)*

Notes to the Table 2: *[1]NS generally signifies no significance at the 10% level of significance. NS before the break signifies a non-significant cointegration coefficient while that after the break signifies a non-significant slope structural break coefficient, implying that the effective cointegration coefficient after the break is the same as that before the break. [2]A significant structural break coefficient increases (if positive) or decreases (if negative) the cointegration slope coefficient. [3]The *, ** and *** signify significance at the 10%, 5% and 1% level of significance. [4]Values in parenthesis are probabilities.*

4.3 Discussion of FMOLS Instability Tests

Based on the $Sup_{Sup} F$ test, the null hypothesis of cointegration with no regime shifts was rejected in favor of the alternative of cointegration with a shift in the parameter vector at an unknown point for Burundi, Uganda and Kenya at the 1% level of significance for both the standard model and the modified standard model; and at the 10% level of significance for the standard model and 1% level of significance for the modified standard model for Rwanda, respectively. These results imply that a long-run relationship cointegration exists between Real GDP and financial development but with at least one structural break for all the four countries implying unstable parameters during the period investigated. The structural breaks for Model 4 and Model 5 were identified in 1979 and 1994, 1984 and 1995, 1988 and 1987, and 1996 and 1972 for Rwanda, Burundi, Uganda and Kenya, respectively. The structural breaks identified for Model 4 and Model 5 were used to estimate Model 4 and Model 5, respectively using OLS. The structural breaks mainly correspond to key political events which occurred in the different countries as evidenced by BBC News (2018) country profiles. In Uganda, the structural break in 1987 may have been due to the change in regime which occurred in 1986 when the NRM Government took over power from the Obote Government and a period of stability and improved human rights; while the 1988 structural break probably reflects the changes in public and private expenditure which preceded the 1989 democratic election. In Rwanda, the structural break of 1979, could be signifying the events that followed the ratification of the new constitution and election of president Habyarimana 1978 - New constitution ratified while that of 1994 could be signifying the ratification of the 1993 Arusha Accords by then President Joseph Habyarimana, his assassination in 1993 and followed by the 1994 genocide in Rwanda. In Burundi, the 1995 structural break probably signifies the 1995 - Massacre of Hutu refugees which led to renewed ethnic violence in the capital, Bujumbura. In Kenya, the 1996 structural break probably signifies the political situation which preceded the 1997 December widely- criticized elections that put President Moi in power.

Based on $Mean\,F$ test, the null of cointegration was rejected in favour of the alternative of a random walk type variation in the parameter vector for Burundi and Uganda at the 1% level of significance for both the standard Model and the Modified model; for Rwanda at the 10% level of significance for the Standard model and 1% level of significance for the Modified model for Rwanda; for Kenya at the 1% level of significance for the Modified standard model but was not rejected for the Standard model. The results imply that the random walk like variations exist in the parameter vector for all situations investigated with the exception of Kenya for standard model where there is cointegration with no proof for random walks in the parameter vector. For Kenya the stanadard model failed to detect the changes in the long-run parameter vector that may have occurred in the period under investigation, including the structural break detected by the $Sup\,F$. These results signify that failure to capture regime shifts may lead to false rejection of the cointegration when it exists.

Based on $Exp\,F$ test, the null of cointegration was rejected in favour of the alternative of random walk variation in the parameter vector for the standard model at the 1% level of significance for Rwanda, Burundi and Uganda but was not rejected for Kenya for the same model. For the modified model, the same test only rejected the null hypothesis of cointegration for only Uganda at the 1% level of significance. For Kenya, cointegration was established for both the standard and modified model.

Based on the L_c test, the null of cointegration was rejected for the standard model for Burundi (10% level), Uganda (10% level), and Kenya (1% level) but was not rejected for Rwanda. For the modified standard model, the null was rejected for Burundi (5% level) and Kenya (10% level) but was not rejected for Uganda and Rwanda. This would imply cointegration for Rwanda based on the two models, random variation in the parameter vectors for Burundi based on the two models, and mixed results for Uganda.

Compared to other tests, the $Exp\ F$ test fails to reject the null hypotheses of cointegration more often (4 out of 8 cases) compared to $Mean\,F$ *and* L_c which failed to reject the same null hypothesis for 1 out of 8 cases and 3 out of 8 cases, respectively, at either the 10% or 1% levels of significance. This may mean that the $Mean\,F$ test is stronger at detecting parameter instability, followed by L_c and last by $Exp\ F$. Overall, a random walk variation in the parameter vector is indicated whenever either of the above tests rejects the null hypothesis of cointegration,, which in this case would tally with the $Sup\,F$ test results, which indicated cointegration with a structural break. Having a structural break indicates that there is variability in the parameter vector.

These results confirm the expectation of structural breaks in the cointegration models since the EAC countries have been implementing reforms geared at increasing the financial development, with the aim of increasing growth. Compared to empirical findings, for example, those of Eso (2010), structural breaks, thus parameter variability following reforms are not unusual. The next question is whether the structural break after it has occurred has led to a situation where financial development positively (or negatively) and significantly influences economic growth as measured by RGDP and/or GDP.

Comparison of cointegration test results for standard and regime shift models

The L_c statistic was computed for all the models including Models 4 and 5 with structural breaks to compare the results for the different models, For Burundi, parameter variability was indicated for all model specifications. For Uganda, parameter variability is indicated for all models except the regime shift with trend model, implying that the structural break variables have accounted for the variability that was being detected by other models, thereby indicating cointegration. For Rwanda, cointegration is detected by the standard model and the Modified standard model but parameter variability is indicated by the other two regime shift models. For Kenya parameter variability is indicated for the Standard Model and the regime shift model with a trend. These results indicate that even after accounting for the structural break, indicated by the $Sup\,F$ test, there still remains some variability in the parameter vectors implying the possibility of multiple structural breaks and or parameter variability throughout the period being investigated. This would be the case if reforms which are being implemented over time continually affect the long-run cointegration relationship. These changes can be obtained using rolling cointegration analysis. Overall, based on the L_c statistic and the 1% level of significance, cointegration existed for all countries for structural regime with a trend model; for all countries except Uganda for the regime shift model; for all countries for the modified standard model; and for all countries except Uganda for the standard model. This leads to the conclusion that either trend and/or slope structural breaks existed for the four countries.

ADF, ADF* and ADF Tau Cointegration Test Results for the Standard and Structural/ Models

The standard/modified standard and the structural shift models were estimated and the corresponding standard ADF tests for cointegration were performed. Table presents the results.

Table 3: ADF, ADF* and ADF Tau presents the ADF test statistics Results

Model	Test statistic	Burundi	Rwanda	Uganda	Kenya
Stand. Model	ADF	-2.0341 ** Coint.	-3.447*** Coint.	-4.454*** Coint.	-1.248 ^{NS} No. Coint.
Mod. Stand. Model	ADF	-2.141** Coint.	-2.9241*** Coint.	-3.97*** Coint.	-4.7039*** Coint.
C/S	ADF^*	-3.172 Coint.	-3.187*** Coint.	-5.6376*** Coint.	-4.884*** Coint.
	$ADF(\tau)$	-3.172ns No. Coint.	-3.187^{ns} No. Coint.	-5.6376*** Coint.	-4.884* Coint.
C/S/T	ADF^*	-4.952 Coint.	-4.728*** Coint.	-3.712*** Coint	-5.6702*** Coint
	$ADF(\tau)$	-4.952ns No. Coint.	-4.728 ^{ns} No. Coint.	-3.712^{ns} No. Coint.	-5.6702** Coint.

Notes to the Table 3: *NS generally signifies no significance at the 10% level of significance. The *, ** and *** signify significance at the 10%, 5% and 1% level of significance. The Gregory and Hansen ADF-tau 1%, 2.5, 5%, and 10% critical values are -5.47, -5.28, -4.95 and -4.68 for the regime shift model (Model 4); and -6.02, -5.72, -5.50, and -5.24 for the regime shift with trend model (Model 5), respectively (Gregory and Hansen (1996a and 1996b).*

The tests revealed cointegration for the standard model and the modified model at the 1% level of significance in all cases with the exception of i) the standard model in Kenya where the residuals were integrated of order one; ii) for both the standard model and Modified standard model for Burundi where cointegration was detected at the 5% level of significance and not the 1% level. These results compare well with those for the L_c test which revealed i) cointegration for the two models at the 1% level but no cointegration at the 10% level for Burundi; for Rwanda where cointegration was detected for the two model at the 1% level; cointegration was detected for Kenya at the 1% level but not for the 10% level for model 1 and cointegration for model 1a at the 1% level; and for Uganda, for the modified standard model where cointegration was detected at the 1% level but not at the 10% level but differed for the standard model where no cointegration was detected for the 1% level of significance. The same result was obtained for the standard model for Kenya (no cointegration), and for both models for Rwanda (cointegration) at the 10% level of significance regardless of whether the usual ADF test was used or the Lc test.

For structural alternatives, tests were based on the standard $ADF*$ and the $ADF(\tau^e)$ tests. The standard $ADF*$ tests are based on the argument that the inclusion of the structural break has eliminated the effect of the structural break from the residuals as illustrated in the methodological section if only one structural break exists, leaving a stationary error term if cointegration exists. The tests based on the $ADF(\tau^e)$, in this case, involved treating the standard $ADF*$ associated with each of structural shift alternative as the $ADF(\tau^e)$ with the argument that it should correspond to the smallest (largest negative value) which would be obtained using the Gregory and Hansen approach. The test statistic was tested for significance using the Gregory and Hansen (1996a and 1996b) critical values.

The tests based on the standard $ADF*$ indicated existence of cointegration for all the structural alternatives considered as did the Sup F test; while those based on $ADF(\tau^e)$ indicated cointegration for only Model 4 corresponding to Uganda at the 1% level of significance as well as Model 4 and Model 5 for Kenya at the 10% and 5% level of significance, respectively. All other test statistics were non-significant at the 10% level of significance. This test therefore yields the same results as the standard $ADF*$ for 3 out of 8 times. The results obtained are compared to those based on the Quandt -Andrews tests in the next sub-section.

Significance of cointegration tests at 1% level of significance

The ADF* test applied to the structural alternatives indicated cointegration with structural breaks as did the $SUP\,F$ test for both Model 4 and Model 5 for all countries. The other tests yielded mixed results. For Uganda, the parameter variability was detected for $Exp\ F$, Mean F and L_c tests for Model 4 but stability was detected based on the $ADF(\tau^e)$ test while for Model 5, parameter variability was detected based on $ADF(\tau^e)$, $Exp\ F$ and Mean F tests but stability was detected based on the L_c test. For Kenya, the parameter stability was detected for $Exp\ F$, Mean F and L_c tests for Model 4 but instability was detected based on the $ADF(\tau^e)$ test (though stability was established at the 5% level). On the other hand, parameter stability was detected for Model 5 based on $Exp\ F$ and Mean F tests but instability was detected based on L_c and $ADF(\tau^e)$ tests. For Rwanda, parameter stability was detected for $Exp\ F$, Mean F and Lc tests for Model 4 but instability was detected based on the $ADF(\tau^e)$ test while for Model 5, parameter stability was detected based on Lc and $Exp\ F$ tests but instability was detected based on the $ADF(\tau^e)$ and Mean F tests. For Burundi, the parameter variability was detected for $Exp\ F$, Mean F and $ADF(\tau^e)$ tests for Model 4 but stability was detected based on L_c test. For Model 5, parameter stability was indicated based on $Exp\ F$ and L_c tests but instability was detected based on $ADF(\tau^e)$ and Mean F tests.

Taking into account the above results of the tests at the 1% level of significance; it can be concluded that: i). ADF^* test applied to structural break models yields similar results as the $SUP\ F$ test and is as such equally good; and ii). cointegration with a structural breaks exists based on either Model 4 or Model 5 based on the ADF^* and $SUP\ F$ tests for all four countries, justifying estimation of corresponding short-run ECM models corresponding to long-run specification used to perform the cointegration tests (*the detailed empirical models as well as the discussion thereof is the subject of a related paper on* "*Long-run and Short-run Structural Break Cointegration Relationships between Economic Growth and Financial Sector Development in the East African Community*"); iii). the ADF obtained from structural model formulations can be used as the test statistic $ADF(\tau^e)$ for testing cointegration using the Gregory–Hansen critical values but may often fail to detect cointegration even after structural break has been accounted for as did the $Exp\ F$, Mean F and L_c tests; unlike the $SUP\,F$ and $ADF*$ statistics, the $Exp\ F$, Mean F and L_c tests should be used with caution even after incorporating structural breaks in the test models; and the $ADF*$(ADF standard statistic) is suitable for testing for cointegration for models that incorporate structural breaks identified using the Quandt-Andrew procedure and the *Gregory-Hansen-Quandt-Andrews-Muwanga cointegration procedures* in particular. Overall, cointegration with a structural break was indicated for Model 4 using the $SUP\,F$ and $ADF*$ tests for all countries; and at least one of the other four tests for Kenya and Uganda.

These results show that whether cointegration is detected or not for the structural models depends on the test statistic used and/or specific model used to test for cointegration, therefore cointegration tests based on structural alternative should be based on two or more test approaches, with $SUP\,F$ test being superior to all the others. For models that incorporate structural breaks identified prior to estimation using the Quandt-Andrew procedure, the standard ADF test procedure can be used to test for cointegration and will yield similar results to the $SUP\,F$ test. Basing the $ADF*$and $SUP\,F$ tests results for the structural models estimated, it can be concluded that cointegration with a structural break existed between financial development and economic growth for the four countries based on either Model 4 or Model 5.

5. CONCLUSION

Overall, cointegration was indicated for Model 5 using $SUP\,F$ and standard $ADF*$tests applied to structural models for all countries; and at least one of the other four tests including $Exp\ F$, Mean F, L_c and $ADF(\tau^e)$ for at least two of the four countries. Unlike the argument advanced by Gregory and Hansen (1996a and 1996b) that using the standard ADF would be inappropriate for the structural alternatives, the standard ADF ($ADF*$) test results show the same conclusion of cointegration as the $SUP\,F$ for both structural models investigated; and at least one of the other tests for Model 5 for all countries; and for the $ADF(\tau^e)$ which indicated cointegration for Uganda (Model 4) and for Kenya (Models 4 and 5); Mean F for Kenya and Burundi, $Exp\ F$ for

Kenya and Burundi, and L_c for Kenya, Burundi and Rwanda at the 1% level of significance. Based on these test results, it is concluded, that cointegration with structural breaks exists for all countries. These results imply that the standard ADF test derived from structural break models, with structural breaks determined using the Quandt –Andrew procedure can effectively be used to detect cointegration in the presence of structural breaks and that the ADF statistic obtained from the structural equation can be used as the $ADF(\tau^e)$ test statistic to test for cointegration of the specific structural model using the Gregory-Hansen critical values. The disagreement between the different tests could due to random variability which is not due to structural breaks but occurs throughout the period even after capturing the identified structural break and/or more than one structural break inherent in the data. Empirically, the results indicate that cointegration exists between real gross domestic product (economic growth) and financial development but with structural breaks corresponding to key political developments in the different countries.

REFERENCES

1. Abuka C. A. and Egesa K. A. (2007). An Assessment of Private Sector Credit Evolution in the East African Community: The Candidates for a Region Wide Reform Strategy for the Financial Sector. Paper presented at the CSAE Conference 2007.
2. Adnan N. (2011). Measurement of Financial Development: A Fresh Approach. 8th International Conference on Islamic Economics and Finance.
3. Alexander P. and Baden S., (2000). Glossary on Macroeconomics from a Gender Perspective. Institute of Development Studies, University of Sussex + investopedia.com. www.bridge.ids.ac.uk/reports/re48c.pdf (February 05, 2020).
4. Andrews D.W.K., 1993, Tests for Parameter Instability and Structural Change with Unknown Change Point. *Econometrica*, 61, pp. 821-856.
5. Andrews D.W.K. and Ploberger, W. (1994). Optimal Tests When a Nuisance Parameter is Present Only Under the Alternative. *Econometrica*, 62(6), pp. 1383-1414.
6. Babihuga R. (2007**).** Macroeconomic and Financial Soundness Indicators: An Empirical Investigation. IMF Working Paper No. WP/07/115. International Monetary Fund. Available at: https://www.imf.org/external/pubs/ft/wp/2007/wp07115.pdf. (April 21, 2016).

7. Banik N., and Yoonus C. A. (2009). Single Currency in the ECOWAS Region: Is it a Plausible Option? Paper presented at the First Congress of African Economists: "Towards The Creation of A Single Currency", Organised by the Economic Affairs Department, African Union, 2-4 March 2009, Nairobi, Kenya.
8. BBC news (2018) Country Profiles. [online] https://www.bbc.com/news/world-africa-13087604 (March 6, 2020)
9. Beck T. (2006). Creating an Efficient Financial System: Challenges in a Global Economy. *World Bank Working Paper # 3856*. Available at: https://ideas.repec.org/p/wbk/wbrwps/3856.html (February 05, 2020)
10. Beck T. Demirgüç-Kunt and Peria M. S. (2006). Banking Services for Everyone? Barriers to Bank Access and Use around the World. World Bank Policy Research Working Paper 4079. World Bank. Available at: https://ideas.repec.org/p/wbk/wbrwps/4079.html. (April 21, 2016)
11. Benerjee A., Lumsdaine R. L., and Stock J. H. (1992). Recursive and Sequential Tests of Unit Root and Trend Break Hypotheses: Theory and International Evidence. *Journal of Business and Economic Statistics*, 10(3), pp. 271-288.
12. Breitung J. and Eickmeier S. (2011). Testing for Structural Breaks in Dynamic Factor Models. *Journal of Econometrics*, 163(1), pp. 71-84.
13. Calvori F., Creal D., Koopman D. J. and Lucas A. (2014). Testing for Parameter Instability across Competing Modeling Frameworks. *Tinbergen Institute Discussion Paper TI 14-010?IV/DSF71, Duisenberg School of Finance.*
14. Chow G. C. (1960). Tests of Equality between Sets of Coefficients in Two Linear Regressions. *Econometrica*, 28, pp. 591-605.
15. Čihák M., Demirgüç-Kunt A., Feyen E. and Levine R. (2012). *Benchmarking financial systems around the world (English)*. Policy Research working paper ; no. WPS 6175. Washington, DC: World Bank. Available at: http://documents.worldbank.org/curated/en/868131468326381955/Benchmarking-financial-systems-around-the-world (April 04, 2020).

16. Čihák M., Demirgüç-Kunt A., Feyen E. and Levine R. (2013). Financial development in 205 Economies, 1960 to 2010. NBER Working Paper No. 18946. NBER Available at: www.nber.org/papers/w18946.pdf (February 05, 2020).
17. Darbha G. (2000). Testing for Long-run Stability- An Application to Money Multiplier in India. *Applied Economics Letters* 9(1), pp. 33-37. Available at: www.researchgate.net/publication/24069986... (February 5, 2020).
18. De la Torre, A., J. Gozzi, et al. (2008). Whither Latin America? Financial Markets Volatility and Performance in Emerging Markets: 121.
19. Dickey D. and Fuller W. (1979). Distribution of the Estimates for Autoregressive Time Series with a Unit Root. *Journal of American Statistical Association*, 74, pp. 427-31.
20. Egesa K. A. (2010). Financial Sector Liberalization and Productivity Change in Uganda's Commercial Banking Sector. AERC Research Paper 202. African Economic Research Consortium, Nairobi. Available at: http://dspace.africaportal.org/jspui/bitstream/123456789/32145/1/RP202.pdf?1 (March 20, 2016).
21. Engle R. and Granger, C. W. J. (1987). Co-integration and Error-Correction: Representation, Estimation and Testing. *Econometrica* 55, pp. 251–276.
22. *Esso L. J. (2010a).* Threshold Cointegration and Causality Relationship between Energy Use and Growth in Seven African Countries. Energy Economics 32(6), pp. 1383-1391.
23. Esso L. J. (2010b). Re-Examining the Finance-Growth Nexus: Structural Break, Threshold Cointegration and Causality Evidence from the ECOWAS. *Journal of Economic Development*, 35(3), pp. 57-79.
24. Global Financial Development Report, GFDR (2013). Available at:
a. http://documents.worldbank.org/curated/en/853761468326979957/pdf/728030PUB0Publ07926B009780821395035.pdf (April 04, 2020)
25. Gregory A. W, and B.E. Hansen (1996a). Residual-based Tests for Cointegration in Models with Regime Shifts. *Journal of Econometrics*, 70, pp. 99-126.
26. Gregory A. W, and B.E. Hansen (1996b). Tests for Cointegration in Models with Regime and Trend Shifts. *Oxford Bulletin of Economics and Statistics*, 58(3), pp. 555-560.

27. Hansen B.E. (1990). Langrange Multiplier Tests for Parameter Instability in Non-linear Model. Available at: http://www.ssc.wisc.edu/~bhansen/papers/LMTests.pdf (March 14, 2016)
28. -------- (1992). Testing for Parameter Instability in Regressions with I(1) Processes. *Journal of Business and Economic Statistics* 10, pp. 321-335.
29. Hansen B.E. (1997). Approximate Asymptotic P-values for Structural Change Tests. *Journal of Business and Economic Statistics,* 15(1), pp. 6067.
30. Hansen B. E. (2012). *Advanced Time Series and Forecasting, Lecture 5, Structural Breaks*, Summer School in Economics and Econometrics University of Crete, July 23 -27, 2012.
31. Honohan P. (2004). Financial Development, Growth and Poverty: How Close are the Links? In: Goodhart, C. (ed.), Financial Development and Economic Growth: Explaining the Links. London: Palgrave. (Paper presented at the British Association Festival of Science Salford University, Manchester, England, September 8, 2003. Available at: www.findevgateway.org/sites/default/files/mfg-en... (February 05, 2020).
32. Johansen S. (1988). Statistical Analysis of Cointegrating Vectors. *Journal of Economic Dynamics and Control,* 12, pp. 231–254.
33. Johansen S. and Juselius K. (1990). Maximum Likelihood Estimation and Inference on Cointegration, with Applications to the Demand for Money. *Oxford Bulletin of Economics and Statistics* 52, pp. 169-210.
34. Lau E., and A.Z. Baharumshah (2003). A Sustainability of External Imbalances: The Case of Malaysia. *Singapore Economic Review*, 48, pp. 61-80.
35. Levine R. (1997). Financial Development and Economic Growth: Views and Agenda. *Journal of Economic Literature* 35 (2), pp. 688-726.
36. Levine R. (2005). Finance and Growth: Theory and Evidence. In Philippe Aghion & Steven Durlauf (ed.), *Handbook of Economic Growth*, Edition 1, Volume 1, Chapter 12, pp. 865–934.
37. Merton R. and Zvi Bodie (2004). The Design of Financial Systems: Towards a Synthesis of Function and Structure. NBER Working Paper Number 10620.

38. Nwaobi G. C. (2011). Macroeconomic Fluctuations, Regime Switching (Structural Breaks) and Impulse Response: Nigerian Evidence. Quantitative Economic Research Bureau, Nigeria. *Munich Personal RePEc Archive (MPRA) Paper No. 38482.*
39. Olusegun A.O., Oluwatosin A. A., and Abimbola M. O. (2012). Structural Breaks, Parameter Stability and Energy Demand Modelling in Nigeria. *International Journal of Economic Sciences and Research,* 5 (2), pp. 129-144.
40. Panopoulou E. (2006). PPP over a Century: Cointegration and Structural Change. Available at http://eprints.maynoothuniversity.ie/294/1/N165_03_06.pdf. (November 20, 2014).
41. Phillips P.C.B. and Perron, P. (1988). Testing for a Unit Root in Time Series Regression. *Biometrika*, 75, pp. 335-34.
42. Phillips P. C. B. (1987). Time Series Regression with a Unit Root. *Econometrica*, 55, pp. 227-301.
43. Quandt R. E. (1960). Tests of the Hypothesis that a Linear Regression System Obeys Two Separate Regimes. *Journal of the American Statistical Association*, 55(290), pp. 324-330.
44. Quintos C. E. and Phillips P. C. B. (1993). Parameter Constancy Tests in Cointegrating Regressions. *Empirical Economics*, 18, pp. 675-703.
45. World Bank GFDR Report (2016). The World Bank's Global Financial Development Database (GFDD). Available at: https://www.worldbank.org/en/publication/gfdr/gfdr-2016/data/global-financial-development-database
46. Wu J.L. (1998). Are Budget Deficits 'Too Large'?: The Evidence from Taiwan. *Journal of Asian Economics*, 9, pp. 519-528.
47. Zeileis A. (2005). A Unified Approach to Structural Change Tests Based on F Statistics, OLS Residuals, and ML Scores. *Econometric Reviews 24(4) Research Report Series / Department of Statistics and Mathematics*, *13.* Institut für Statistik und Mathematik, WU Vienna University of Economics and Business, Vienna. [On line] Available: http://epub.wu.ac.at/714/ (March 22, 2016).
48. Zivot E. and Andrews, D.W.K. (1992). Further Evidence on the Great Crash, the Oil-price Shock, and the Unit-root Hypothesis. *Journal of Business and Economic Statistics* 10, pp. 251–270.