DETERMINING THE EXTENT OF FINANCIAL INTEGRATION IN EAST AFRICA USING BETA CONVERGENCE AND CO INTEGRATION ANALYSIS

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ABSTRACT

This paper investigates the extent of financial integration in East Africa over time by examining the degree of convergence in the stock markets. The paper further assesses long-run equilibrium of returns among the East African stock markets. The study was motivated by the current move by the East African member states to establish a monetary union in the region. The position on the stage of financial integration could offer a way of overcoming impediments to the development of the envisaged monetary union. Data analysis has been done using beta convergence and co-integration method.

Findings of the study indicate that financial markets have some level of integration as evidenced by the beta coefficient of 0.61 and absence of long-run equilibrium. Based on these findings we conclude that, the integration of the East African stock markets is far from being successful. Further study using rigorous econometric analysis is recommended in order to be able to control for other variables not considered in this paper which affect the integration process. Alongside this, there is need for a study on sigma convergence, necessary to determine the dispersion of the investment returns.
Capital market development is an important component of financial sector development and supplements the role of the banking system in economic development. In other words, capital markets are needed as an alternative source of financing, supplementing commercial banks, which dominate the EAC financial sector with low competitiveness (Gaertner, Sanya, and Yabara, 2011). Specifically, capital markets assist in price discovery, liquidity provision, reduction in transactions costs, and risk transfer. They reduce information cost through generation and dissemination of information on firms leading to efficient markets in which prices incorporate all available information [Yartey and Adjasi (2007), Garcia and Liu (1999)].

A large body of research has found evidence that capital market development contributes to economic growth, including in sub-Saharan African countries (Levine and Zervos, 1998; Adjasi and Biekpe, 2006b). Developed capital markets promote growth by mobilizing domestic savings and investments and by efficiently allocating mobilized resources to local companies. In addition, deep and liquid local capital markets can lessen vulnerability of an economy to external shocks, by reducing currency and duration mismatches in raising funds. Cross-country evidence shows that financial development can reduce income inequality by increasing the income of the poor (MFW4A, 2007). (Eichengreen and Luengnaruemitchai, 2004) suggest that there exists a certain minimum-efficient size of bond markets, because large issuance and trading volumes are more economical. Capital markets in the East African Community (EAC) face common challenges of low capitalization and liquidity, but to different degrees due to the low level of development in the markets. To this effect, the respective countries have been pursuing development of capital markets through regional integration.

Regional integration is a process through which states enter into a regional agreement in order to enhance regional cooperation through regional institutions and regulations. The objectives of the agreement could range from economic to political, although it has generally become a political economy initiative where commercial purposes are the means to achieve broader socio-political and security objectives. The agreement could be organized either on a supranational or an intergovernmental decision-making institutional order, or a combination of both.
explains financial integration in the sense that, financial of one price holds. This states that assets generating identical cash flows command the same return, regardless of the domicile of the issuer and of the asset holder. Given this definition, financial market integration can be measured by comparing the returns of assets that are issued in different countries and generate identical cash flows. Identifying such assets is of course a difficult task.

When identical assets command different returns one would tend to conclude that financial markets are not integrated, for instance because legal barriers prevent capital from freely flowing between countries. Such barriers may reflect capital controls, tax codes, accounting and auditing differences, different bankruptcy law, different quality of judicial enforcement, etc. However, some caution is warranted. Countries may share a common legal and regulatory framework, but still identical assets may command different returns. Beyond legal barriers, there might be economic barriers, for instance situations of asymmetric information that induce investors to evaluate differently assets that are otherwise identical.

We can therefore argue that, the East African countries have been pushing for the integration of the capital markets through a regional approach as a way of developing the capital markets. As such, this paper focuses on the stock market, because its more organized than the bond market, there is observed consistency in trading and hence the availability of data.

**Research Problem**

Financial markets are integrated when the law of one price holds. This means that, investment returns and prices of similar assets within different countries in a given region converge to a common figure. Beta convergence acts as a good measure of determining the extent of financial integration and so is the law of one price. Existing literature in general indicates that, there is evidence of increased beta convergence in the financial markets Î’s stocks, bonds and treasury bills. The literature in this area is quite rich in Asia which is a key emerging market and Europe, more so the European Union (developed market). Further empirical evidence in the two markets points to faster integration/convergence within the money market compared to the stock market and the bonds market. However, narrowing to the case of the EAC, empirical findings discuss
Research Objectives and Research Questions

Given the above research problem, the objectives of the study were to examine the degree of integration in the East African stock markets, and to investigate long-run equilibrium of returns among the East African stock markets.

Subsequent to the above research objectives our research questions were formulated as follows:

1. To what extent has integration of the East African stock markets been achieved in the last five years?
2. Is there a long-run relationship in the returns of the East African stock markets?

LITERATURE REVIEW

THEORETICAL REVIEW

Definition of Financial Integration

The literature provides various alternative definitions of financial integration.

Baele et al. (2004) assume that the market for a given set of financial instruments and/or services is fully integrated if all potential market participants have the same relevant characteristics, i.e.:

1. They face a single set of rules when they decide to deal with those financial instruments and/or services.
2. They have equal access to the same set of financial instruments and/or services.
3. They are treated equally when they are active in the market.

The definition of financial market integration is closely linked to the law of one price. The law of one price states that if assets have identical risks and returns, then they should be priced identically regardless of where they are transacted. If the law of one price does not hold, then
there is room for arbitrage opportunities. However, if the investment of capital is non-discriminatory, then any investors will be free to exploit any arbitrage opportunities, which will then cease to exist, thereby restoring the validity of the law of one price.

Brouwer (2005) argues that financial market integration is the process through which financial markets in an economy become more closely integrated with those in other economies or with those in the rest of the world. This implies an increase in capital flows and a tendency for prices and returns on traded financial assets in different countries to equalize. Ho (2009) shows that financial market integration could proceed with enforcement of a formal international treaty.

**Types of Financial Integration**

The literature, e.g. Oxelheim (1990) or Guha et al. (2004), distinguishes between total, direct and indirect financial integration. The total financial integration embraces direct and indirect integration. Total or perfect integration means that expected real interest rates are the same on the markets concerned. Where total financial integration is not perfect, the reason may be imperfect direct and/or indirect financial integration.

Direct financial integration, which is also called capital market integration, is expressed in deviations from the law of one price for financial securities. Under perfect direct financial integration this law obtains, and an investor can expect the same return on investments from different markets (and borrower the same loan costs), after the requisite adjustment has been made for risk. If the differential in expected risk-adjusted returns is greater than zero but less than or the same as the transaction cost, we can say that markets are disintegrated but are nonetheless efficient.

Financial integration can also vary in strength from perfect integration to perfect disintegration or segmentation (Oxelheim, 1990). When expected real interest rates are not the same in the markets in question (not perfect integration), then the markets are said to be segmented. Financial integration includes not only integration of financial markets or services but can take other forms as well. These forms need not be interconnected nor are they advanced forms
• Monetary integration, either through currency unions (Europe, Western and Central Africa) or through dollarization, such as in Latin America and the Caribbean.
• Liberalization of the capital account.
• Subcontracting abroad of financial services or infrastructure, such as in the case of listing of securities on foreign stock exchanges.
• Foreign entry.
• Regulatory convergence and harmonization.

Measuring Financial Integration

Various measures exist in the literature for assessing the level of financial integration. The methods which are used most are connected with growing investment opportunities.

Financial integration is often measured following the approach adopted by Baele et al. (2004).

They consider three broad categories of financial integration measures:

• Price-based measures, which capture discrepancies in prices or returns on assets caused by the geographic origin of the assets. This category of measures is divided into two methods of measurement: yield-based and country effects.
• News-based measures, which measure the information effects from other frictions or barriers. If the global news has relatively bigger importance than local news, the degree of systematic risk should be identical across assets in different countries.
• Quantity-based measures, which quantify the effects of friction faced by the demand for and supply of investment opportunities.
In an era of increasing globalization, the transmission of movements in international financial markets is an important issue for economic policy, especially in periods where markets are highly volatile. The determination of diversification strategies by an international investor also depends crucially on the nature and magnitude of the relationships existing between different stock markets. Thus it becomes important for international investors to understand the interrelations among the various markets to diversify risk and to derive high return. A number of theories can be applied in carrying out co integration analysis; Wavelet theory and Fourier Transform.

**EMPIRICAL LITERATURE REVIEW**

Review of existing empirical literature points to adequate empirical studies, particularly within the European Union and Asia. This is so because these were the first markets to embrace the concept of financial integration. Some literature is also available on South Africa, West Africa and a bit on East Africa, the region with the least developed financial market relative to the rest of the regions mentioned above. Below we highlight some of the empirical studies across all the regions mentioned above;

Most of the empirical work done in this field has focused on OECD countries and East Asia. Kaminsky and Schmukler (2002) studied the dynamic aspects of international financial integration and suggested that equity prices tend to be more internationally connected than interest rates. Moosa and Bhatti (1997) provide conclusive empirical evidence on the high level of integration between goods and financial markets of Japan and six Asian countries by testing uncovered interest parity (UIP) and ex ante purchasing power parity (PPP).

Bhoi and Dhal (1998) have attempted to empirically evaluate the extent of integration of India’s financial markets in the post-liberalization period. According to them, there exists a fair degree of convergence of interest rates among the short-term money markets, credit and gilt markets but the capital market exhibits fairly isolated behaviour. Furthermore, they find that the integration of domestic and overseas financial markets is not robust.
According to Makin (1994), there is a consensus that UIP fails to provide any information about the degree of financial integration. This is based on concerns regarding time varying currency risk premia or irrational expectations about exchange movements. But UIP can be restated with the focus on the relationship between domestic and foreign interest rates, given expectations about movements in the exchange rate. In particular, if interest rates and exchange rates are non-stationary processes, then it could be interesting to see whether domestic and foreign interest rates have long-run co-movements.

There is some debate over whether it is the lack of financial integration that is contributing to the lack of intra-regional trade or whether the causation is the other way round. Eichengreen and Park (2004) subscribe to the former view and Fukao et al. (2003) and Ronci (2004) to the latter. However, these authors use different data, with Eichengreen and Park focusing on banks, Fukao et al. on FDI and Ronci on short-term credits. Simple correlations of trade and financial flows among the East Asia countries (China and Taiwan excluded through lack of data) undertaken by Cowen et al. (2006) for the period 2001-2004 suggest that correlations are positive but relatively small (compared to OECD countries). One year lags or leads have little effect so it is not possible to judge any causal impact. They conclude with the suggestion that East Asian financial and economic integration is likely to increase over the future, as it is lower than in regions where the barriers are lower, and the general trend is towards a reduction in barriers.

Cowen et al. (2006) place a lot of importance on the lack of vehicles for mobilizing savings within the Asian region. Their principal argument is in favour of pension funds and indeed of pension reform that makes people more concerned to establish pensions.

Co-integration studies that investigated long-run relationships focus on the extent to which nascent stock markets in Asian countries are internationally integrated and, in turn, have important implications to diversification potential in Asian stock markets (Chan et al. 1992; Hung and Cheung, 1995; DeFusco et al. 1996; Masih and Masih, 2001). Studies that have estimated short-run dynamic causal linkages seek to better understand the propagation mechanism driving stock market fluctuations in different countries, especially with respect to market crashes (Masih and Masih, 1997a, 1999; Ghosh et al. 1999; Sheng and Tu, 2000). These and other related studies (Chung and Liu, 1994; Arshanaapalli et al. 1995; Cheung, 1997; Janakiramanan and Lamba, 1998; Dekker et al. 2001) employ vector auto regression (VAR).
techniques, including Co-integration, Granger causality, impulse response analysis, and forecast error variance decomposition. In general, the empirical evidence presented in these studies is mixed with respect to both long run relationships and short-run dynamic causal linkages.

Countries in Southern and Eastern Africa are working towards regionally integrated markets and trading platforms with central depositories and settlement systems that conform to common internationally recognized Group of Thirty (G30) standards (Appiah et al., 1998). In addition, a high proportion of countries in Sub-Saharan Africa have a long history of very low savings and deposit ratios (Kenny and Moss, 1998), and incomplete credit markets with inefficient financial intermediation.

In assessing real convergence in the East African region, research has paid more attention to real GDP growth. In a bid to establish if the EAC is a viable MU, Buigut and Valev (2005) investigated the symmetric nature of demand and supply shocks belying real GDP growth in partner states from 1980-2001. Theory asserts that partner countries within a monetary union should have monetary policies similar to that of the monetary union as whole and thus cannot apply monetary and exchange rate policies to respond to country specific shocks (Mundell, 1961; McKinnon, 1963). Results from this study showed that, short run shocks were not symmetric, but lagged supply shocks associated with trade patterns were. In addition the speed of adjustment to shocks and the effect of variability on real output (real GDP) also appeared to be symmetric with the exception of Uganda. In particular Uganda experienced large shocks and adjustments were very slow which could prove costly in a monetary union.

Although the findings could not confirm a viable monetary union at the time, they pointed towards a potential MU if there is deeper trade integration emphasizing the importance of well-functioning common market. This study utilized data ending just the time of EAC, but outcomes involving use of recent data sets have not been that different. In particular Opolot and Osoro (2009) who examine the synchronization of business cycles of real GDP from 1981 to 2007 across the region find peculiar differences. While business cycle co movements across the region have improved since the 1990’s, they are still very low. Only Tanzania and Uganda have optimistic synchronizations within the region casting more doubt on assuming the monetary union at the moment. Further assessments of catch-up growth have been conducted based on per capita real GDP. Sigma tests carried out by IMF (2011) indicate that with the exception of
Incomes across the region have grown closer over the last 15 years (1996-2010). All other countries' per capita incomes appear to be catching up Kenya. Findings by Opolot and Lavunda, (2009) further confirm this, but add Burundi to the group of 4. This dissimilarity in result could be explained by differences in data sample and might imply that in the recent years all other economies have grown much faster and there institutional structures and policies have become more similar compared to Burundi.

In regards to the nominal variables, investigations have mostly turned to exchange rate behavior. Buigut (2011) looks at both nominal and real exchange rates regions using data from 1991 to 2009. He finds partial convergence due to that fact that some countries exhibited show convergence in the short run. He is unable to find a common trend in long run for these EAC countries urging caution for taking on an MU.

Largely, studies have found no evidence of budget deficits (including and excluding grants) convergence in the region in the region (IMF, 2011; Opolot and Lavunda, 2009). Analyses of the evolution of the criteria have instead shown increasing patterns of dispersion and divergence across states. Findings concerning inflation rates convergence appear to be mixed. While some found divergence across states (IMF, 2011), others discovered convergence (Kishor and Ssozi, 2010; Opolot and Lavunda 2009). Even so in later case, the effect attributed more to the three original countries Tanzania, Uganda and Kenya. Upon isolation from trio, Rwanda and Burundi appear to exhibit inflation divergence. Yet others Buguit (2011) have found partial convergence.

In general, there is very little research on the convergence of current account deficits and national savings. However, Opolot and Lavunda (2009) picked interest in the variables. Their panel unit root tests show convergence of the current accounts and national savings of the group of 5. However a more detailed examination reveals that, affects appear to be attributed to Kenya, Burundi and Rwanda in the case of current accounts deficits. While for the case of national savings convergence is mostly attributed to Kenya and Rwanda. These findings are quite surprising given that Rwanda and Burundi have just recently emerged out of civil strife compared to Uganda or Tanzania. In addition it should not be forgotten that data range used is for earliest period of the EAC as a five block.
Critical review of the above literature, specifically the East African Region, indicates partial convergence of some countries largely attributable to the adoption of different/independent policies by the countries.

Research Gap

From the above literature there seems to be no empirical evidence of stock market convergence/integration and long-run equilibrium of stock market returns (measured using the respective stock indices) in East Africa, which serves as our motivation to explore for the empirical evidence in this study and add some knowledge based on our findings to the existing literature.

Conceptual Framework

The concept of financial markets integration discussed in this paper will be analyzed by examining beta convergence and co integration. Essentially, the focus is on the relation between the 20-share index of the Kenyan market as the benchmark market (our independent variable and both the Tanzania and Uganda stock markets as the dependent variables. Regression analysis on these three variables shall be seeking to determine the extent of the spread in the stock returns, in which case a spread of zero is interpreted to mean perfect integration while the value of the beta coefficient tells the degree of convergence. The ultimate objective from the established regression model is to establish whether there is a long-run equilibrium relationship between the stock returns (measured using the respective market indices) of the three key East African stock markets.
From the above conceptual framework we derive the following postulates;

- **Postulate 1**: The East African stock markets have achieved financial integration of degree zero over the last five years
- **Postulate 2**: There is no long-run relationship in the returns of the East African stock markets.

The two postulates which translate into our research questions are answered by analyzing the data in the data analysis section.

**DATA ANALYSIS MODELS**

The study employs the concept of beta convergence and co integration analysis in analyzing data in line with the set research objectives.

**Beta Convergence**

Beta (β) convergence is measured by the following regression with panel data:

\[
\Delta S_{i,t} = \alpha + \beta S_{i,t-1} + \sum_{l=1}^{Y_l} \Delta S_{i,t-l+1} + \varepsilon_{i,t}
\]
where $\Delta S_{i,t}$ denotes a spread of yields on a relevant portfolio investment between country $i$ and a benchmark market at time $t$, and $l$ represents lag. If financial markets are perfectly integrated, this spread should be zero as long as securities traded have the same risks and maturity structures, following the law of one price (mean reversion). Therefore, a negative $\beta$ coefficient indicates mean reversion taking place across the markets, and an absolute value of the coefficient represents the speed of convergence at which the spread is dissolved and investment returns on securities in country $i$ converge with those in the benchmark market. $\gamma/l$ measure lagging effects from $\Delta S_{i,t}$ in previous periods. A beta coefficient of 0 means there is no convergence taking place between the investment returns, that of any value above 0 but below 0.5 would indicate weak/low convergence while any value above 0.5 indicates strong convergence taking place between the investment returns.

**Co Integration Approach**

In the literature, one of the methods used to examine the long-run relationship between two variables, is the co-integration approach. Some of the empirical studies which implement this approach include; Serletis and King (1997) and Bley (2010) who investigate stock market integration across the EU. Manning (2002), Click and Plummer (2005), and Yu, Fung, and Tam (2010) apply the technique to assess integration of Asian stock markets.

This issue of testing long-run relationships was addressed first by Engle and Granger (1987). But the most popular test for co-integration was developed by Johansen and Juselius (1990) that tests for the presence of multiple long-run relationships. In this study we use this co-integration approach to examine the integration of returns in both Kenya/domestic and other East African markets. One of the pre-requisites for undertaking the co-integration framework is that the variables that are expected to have long-run relationship should be non-stationary at their levels and should be stationary at the same order (or difference).
The long-run relationship that we are examining here can be expressed as below:

\[ I = \alpha + \beta i^* \]

Where \( \hat{I} \) and \( \hat{i}^* \) are the returns in the East African markets of Tanzania and Uganda against the Kenyan market as the benchmark respectively. As specified earlier, first we check the stationarity properties of the variables and then test whether they are co-integrated by the maximum likelihood technique outlined by Johansen and Juselius (1990).

The essence of the co-integration approach is to identify \( r \), a number of co-integrating vectors. If \( n \) variables with unit roots have \( r \) co-integrating relationships, they have \( n - r \) common stochastic trends. Thus if \( r \) equals \( n - 1 \), stock markets are perfectly integrated under one common long-run trend. Alternatively if \( r \) equals 0, all data series are independent (Kasa, 1992). Johansen and Juselius (1990) derive two likelihood-ratio tests to infer on \( r \), known as the trace statistics and the maximum-eigenvalue statistics.

**Research Data used**

The study used secondary data on market indices (as a measure of returns) on a monthly basis for the period January 2007 to August 2012. Secondary data was used because of its availability and reliability compared to primary data. The secondary data used was for Kenya, Uganda and Tanzania stock markets. Rwanda and Burundi were excluded because of unavailability of data. Essentially, the focus was on price-based measures of integration to determine the convergence of investment returns.

The main sources of the data are the Handbooks of Statistics on the respective securities and stock exchanges published by the stock exchanges themselves. In the next section we discuss the empirical results based on the multiple co-integration method.
Given below is a presentation of results and findings obtained from data analysis applying multiple co-integration method to investigate the existence of long-run relationship in the returns of the three East African markets.

**Beta Convergence**

The first three columns in Table 1 show the estimated beta coefficients using the panel data with ordinary least squares (OLS), fixed effects, and random effects models. The beta coefficients, estimated at -0.61 in the panel regressions, are negative and significant. This is indicative of market convergence taking place. The fixed effects model implies that, there is no significant difference in the beta coefficient across the countries. Two columns on the right side of the table present the results of OLS regressions using individual spreads of Tanzania, and Uganda from the benchmark Kenyan market. The results are consistent with those from the panel data regressions except that the beta coefficient for Uganda is not statistically significant. In other words the individual regressions suggest that integration between the Ugandan and the Kenyan stock markets is stronger than that between the Tanzanian and the Kenyan markets, although the fixed effects model indicates there is no significant difference in beta convergence between Uganda and Tanzania. A system of three variables with co-integration relations have been generated from the trivariate time series data with $y^1$, $y^2$ and $y^3$ representing the three lagged differences.
Overall, beta convergence implies mean reversion taking place in the three stock markets.

### Table 1: Beta Convergence

<table>
<thead>
<tr>
<th></th>
<th>Panel Regression</th>
<th>Individual Regression</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>OSL</td>
<td>Fixed Effects</td>
</tr>
<tr>
<td></td>
<td>OSL</td>
<td>Random Effects</td>
</tr>
<tr>
<td>OSL</td>
<td>-0.610</td>
<td>-0.610</td>
</tr>
<tr>
<td>(0.252)</td>
<td>(0.264)</td>
<td>(0.075)</td>
</tr>
<tr>
<td>y₁</td>
<td>-0.132</td>
<td>-0.123</td>
</tr>
<tr>
<td>(0.243)</td>
<td>(0.244)</td>
<td>(.0.074)</td>
</tr>
<tr>
<td>Y₂</td>
<td>-0.235</td>
<td>-0.235</td>
</tr>
<tr>
<td>(0.201)</td>
<td>(0.202)</td>
<td>(0.086)</td>
</tr>
<tr>
<td>y₃</td>
<td>-0.001</td>
<td>0.000</td>
</tr>
<tr>
<td>(0.159)</td>
<td>(0.150)</td>
<td>(0.068)</td>
</tr>
<tr>
<td>Tanzania- Kenya</td>
<td>0.045</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>0.519</td>
<td>0.512</td>
</tr>
<tr>
<td>(0.603)</td>
<td>(0.693)</td>
<td>(0.071)</td>
</tr>
</tbody>
</table>

**Co integration Analysis**

The steps undertaken include;

i. Verifying whether the data series are nonstationary, containing a unit root

ii. Selecting the number of lags used in the model.

For the first step, augmented Dickey-Fuller and Phillips-Perron tests are conducted on the stock price data.

The results indicated in table 2 below confirm that all data series are modeled as integrated of order one and appropriate for the co integration analysis. The same results are obtained whether or not the data are converted to the US dollar.

Overall, given the absence of a co integrating vector in the three stock markets, we conclude that there is no long-run relationship among the EAC stock markets. We have tabulated critical values for the test statistic up to three cointegration relations; i.e. r = 0, 1, 2. Besides the trace statistic, Johansen and Juselius [1990] have suggested the maximal eigenvalue statistic 2. This statistic has been named the trace statistic.
Besides the trace statistic, Johansen and Juselius [1990] have suggested the maximal eigenvalue statistic defined as 

\[-2 \ln (1 - \hat{\lambda}_{r+1}) = -T \ln (1 - \hat{\lambda}_{r+1})\]

for testing the existence of \( r \) versus \( r + 1 \) cointegration relationships. Critical values for both test statistics and different specifications with respect to the inclusion of deterministic regressors are provided in the last three columns in Table 2 below.

**Table 2. Co-integration Tests**

<table>
<thead>
<tr>
<th>Number of Cointegrating Vectors</th>
<th>Trace Statistics</th>
<th>Maximum Value Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adjusted for Exchange Rates</td>
<td>Not Adjusted for Exchange Rates</td>
</tr>
<tr>
<td>( r=0 )</td>
<td>28.450</td>
<td>26.432</td>
</tr>
<tr>
<td>( r=1 )</td>
<td>7.530</td>
<td>4.325</td>
</tr>
<tr>
<td>( r=2 )</td>
<td>0.179</td>
<td>0.181</td>
</tr>
</tbody>
</table>

**CONCLUSION AND RECOMMENDATIONS**

**Conclusion**

Based on the results above, we conclude that integration is still taking place but it is far from being perfect as indicated by the beta coefficient of -0.61. Therefore, our first research question is answered. The absence of long-run equilibrium based on our findings is good grounds for us to conclude that, the integration of the East African stock markets is far from being successful. As we put forward this argument, we do acknowledge that, there is an element of integration (as discussed above). However the issue of whether the markets are moving towards integration has not been addressed in this paper. We are of the view that, further research on the same is necessary, using sigma convergence.
It should also be noted, the results may suffer from a spurious relationship: the estimated beta convergence may, to some extent, reflect each market’s response to outside shocks of the active participation of foreign investors in these markets, rather than the convergence in the region. Secondly, due to the thinness of the markets in terms of number of listed companies and the small size of transactions, the data series is feared not to fully reflect the actual market performance.

**Recommendations for further Research**

Given that the co integration analysis indicates there is no long-run equilibrium among the EAC stock markets, estimated convergence in the stock markets needs to be subjected to further scrutiny by carrying out more rigorous analysis. We are of the view that, more robust findings can be established if the data series can be subjected to sigma convergence analysis. Such an analysis would address the issue of the dispersion of the returns (not discussed in this paper). We propose the use of coefficient of variation as an appropriate tool for this exercise unlike a linear time trend as applied by the World Bank study of 2010.

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