

How financially integrated are trading blocs in Africa?

Abstract

This paper endeavours to assess the degree of financial integration between three African trading blocs, namely, the Common Market of Eastern and Southern Africa (COMESA), the East African Community (EAC) and the Southern African Development Community (SADC). For this end, the paper suggests a combination of the dynamic conditional correlation general autoregressive conditional heteroscedastic (DCC-GARCH) and factor models. The results of the empirical analysis show that countries within each of the three trading blocs are not all integrated to their regional factors. Moreover, the finding of the paper shows a ‘decoupling’ between some of the trading blocs. Robustness test is conducted to support these results and shows that the proposed method provides a better way to measure integration than other methods, such as the multi-factor R-square method proposed by Pukthuanthong and Roll (2009).

1. Introduction

The benefit of trade integration is well documented in international economics literature (Wang et al. 2003 ; Piesse & Hearn 2005 ; Frey & Volz 2013; Ahmed 2011 and David et al. 2015). The 2011 World Bank report on African Competitiveness supports the notion of the benefit that is derived from trade integration. The report emphasises that international trade, particularly trade integration, is one of the key factors that aid economic growth, because countries can seize global opportunities through engaging in mutual beneficial terms. Other well-known benefits of economic integration include economies of scale, increased market share, improved technologies, increased competition translated into low price for consumers and improved specialization (Zinnes, Eilat and Sachs, 2001). Moreover, David et al. (2003) make use of Neo-Classical theory and predict that opening country to trade has positive effect on long-run economic growth, mostly through knowledge spill-overs.

Effort has been made in the past to integrate Africa through trade by means of grouping the African countries into regions, that is, Regional Trade Agreements, RTA henceforth (Golit & Adamu 2014). It is in that context that the South African Custom Union (SACU) and Eastern African Community (EAC) were formed in 1910 and 1919, respectively (Geda & Kibret 2002).

Today Africa is proliferated with an unprecedented number of RTAs for a single continent. Salami (2011) notes a total number of 14 RTAs in 2010, with every country belonging to at least one regional group, which are ; Arab Maghreb Union (AMU), Community of Sahel- Saharan States (CEN-SAD), Economic and Monetary Community of Central Africa (CEMAC), Economic Community of Great Lake Countries (CEPGL), Common Market of Eastern and Southern Africa 1993 (COMESA), East African Community (EAC), Economic Community of Central African States (ECCAS), Economic Community of West African States (ECOWAS), Inter-Governmental Authority for Development (IGAD), Indian Ocean Commission, Manoir River Union, Southern African Customs Union, Southern African Development Community (SADC) and West African Economic and Monetary Union (WAEMU).

A number of authors have questioned the importance and worth of RTAs. For example, Jenkins and Thomas (1996) caution against the formation of RTAs before country members adhere to a number of prerequisites. According to the authors, if macroeconomic variables of countries do not converge there is no need to set up deliberate convergence institutions like RTAs. However, Nicholas (2010) indicates that many country members of RTA are disconnected to each other and that a number of RTAs are often diagnosed of spaghetti or noodle syndrome. According to Nicholas, the syndrome occurs when one country belongs to many RTAs that often result in policies that are not well coordinated.

A number of factors contribute to the drawback of RTA from deriving benefits from free trade. Nicolas (2010) alluded to the fact that *de facto* integration should precede *de jure* integration. To substantiate his opinion, the author indicates that the Association of Southeast Asian Nations (ASEAN) managed to integrate economically in the absence of a formal RTAs, this characteristic is known as *de facto* integration, whereas stimulation of integration through formalized RTA institutions is known as *de jure* integration. The same opinion is expressed by Jenkins and Thomas (1996) who argue that *de Jure* integration should always follow *de facto* integration, not the other way round as observed in many parts of the world, particularly in Africa. Moreover, Chambet and Gibson (2008) show that countries' trade openness policies should be positively related to their level of financial integration, implying that trade openness and financial integration should go hand in hand. Imbs (2006) shows that integration in the goods and assets markets should be connected. This connection justifies the link that exists between financial integration, trade integration and business cycle synchronisation in many regions (Dées and Zorell, 2012). Still in emphasising the importance of the link between trade openness and financial integration, the African Development Bank report reveals that the success in

stimulating intra-African trade and growth depends, among other things, to the depth of financial integration and commitment by African countries to reform (AfDP, 2016).

Recently, three regional blocs in Africa, namely COMESA (common market for Eastern and Southern Africa), SADC (Southern African Development community) and EAC (East Africa Community) proposed to sign a free trade agreement between them and form a regional trade bloc known as the Tripartite Free Trade Area (TFTA). Given the premise that trade integration should go hand in hand with financial integration, this paper intends to assess the extent of financial integration within each of the three regional blocs as well as the magnitude of financial integration between the three regional blocs. Such an assessment will contribute to determine the prospect of a successful *de jure* trade integration between the three regional blocs in the context of TFTA.

Different methodologies have been used to assess the magnitude of financial integration between countries and markets. Voronkova (2004) and Raj and Dhal (2008) make use of the cointegration methodology by showing that financial integration exists if there is a long-run relationship between a group of markets. Nonetheless, vector autoregressive (VAR) cointegration methodology can only include a limited number of variables due to the problem of degrees of freedom. Although, simple correlation technique is often criticised as a way of measuring the extent of financial integration between countries, there are studies that remedy to the limit of simple correlation techniques in assessing the extent of financial integration by using multivariate general autoregressive conditional heteroskedastic (GARCH) models. For example, Kim et al. (2005) make use of the time-variation in the conditional correlation from the EGARCH model to assess the magnitude of European stock market integration with the introduction of the European monetary union (EMU). The advantage of a time-varying model in modelling conditional correlation, such as the DCC-GARCH model, over simple correlation models, is that they are able to explain the evolution or dynamics of financial market comovement or integration. However, Pukthuanthong and Roll (2009) criticises the use of the DCC-GARCH model showing that the correlation across market is a poor measure for correlation. In fact, the authors criticise the use of correlation between two countries to infer global integration. They propose the use of the multi-factor R-square, the proportion of a country's returns explained by the common factor, as a better measure of integration. The multi-factor R-square method gained prominence among studies that attempted to measure integration. For example, Christiansen (2014) assesses the time variation in the integration of EU government bond markets. The

author measures the extent of integration by the explanatory power of European factor portfolios for the individual bond market for each year. The study finds that the integration of the government bond market is stronger for the European Monetary Union (EMU) than the non EMU.

Contrary to past studies, this paper proposes a measure of integration that combines the benefits of the multi-factor models to those of the DCC-GARCH model. With the proposed measure, dynamic conditional correlation is estimated between country's returns and the global/regional factor using the VAR-DCC GARCH model. With the case in hand, the paper makes use of the factor model to construct the COMESA, SADC and EAC factors and determine the dynamic correlation between each country's stock market returns and the constructed common factors. The combination of the two models is important in the context of this study for three reasons; firstly, given that stock market integration has often been used as proxy for financial integration (Richards, 1995 and Voronkova, 2004), one needs to account for heteroscedasticity when using stock returns data, thus the importance of the use of a family of GARCH models. Secondly, financial integration is assessed with the use of dynamic correlation in the context of common factors rather than a correlation between individual countries. A number of authors have criticised the use of correlation between individual countries to measure integration (See Aydemir, 2004; Chambet and Gibson, 2008). Thirdly, dynamic correlation is relevant in explaining the changing nature of financial integration and contrary to a r-square related method, correlation can take positive and negative signs and these different signs provide more insight about the nature of integration. Thus, this paper will use the factor model to construct the COMESA, SADC and EAC factors and determine the dynamic correlation between each country's stock market returns and their respective common factor. In addition, the paper will estimate the dynamic correlation between the COMESA, SADC and EAC factors to infer the degree of financial integration between the three regional trading blocs. It is important to note that the paper considers the hypothesis that financial integration and trade integration should go hand in hand. To the best of our knowledge, this is the first paper that combines the VAR-DCC GARCH model and factor model in assessing the extent of financial integration within and between regional trading blocs in Africa. The rest of paper is divided as follows; section 2 presents a brief literature review and history of COMESA, SADC, EAC and TFTA; section 3 presents the methodology used in the paper; section 4 proceeds with the estimation and discussion of results, section 5 deals with the robustness test and section 6 concludes the paper.

2. Brief Literature review on trade integration and background on TFTA

There are a number of studies that endeavoured to assess the extent and magnitude of trade and financial integration in Africa. Ebaidalla & Abdelrahim (2014) show that despite all the efforts to integrate Africa through regional trade agreements, the general outlook is that Africa remains not fully integrated. Salami (2011) attributes the lack of African economic integration to significant legal and institutional frictions that exist. Eddine & Strauss (2014) further argue that the main factor that hinders Africa to realise its true integration is the fact that Africa is divided into small sub-countries that are governed by their own laws, this adds friction to the movement of labour, goods and capital. Moreover, a range of non-tariff and regulatory barriers still raise transaction costs and limit the movement of goods, services, people and capital across borders throughout Africa.

In order to deepen African integration, strengthen intra-Africa trade and to further expand the intra-regional market for the member-states' trade of goods, services and capital, the TFTA was formally constituted in June 2015 in Egypt¹. The Head of States of COMESA, SADC and EAC formed TFTA to achieve a number of objectives namely: elimination of tariffs and non-tariffs barriers to trade of goods and services, liberalisation of investment and business infrastructure across borders and building great capacity for competitiveness. Table A1 in the appendix lists the country members of COMESA, SADC and EAC.

Given that African markets are small relative to world standards, the launch of TFTA provides an opportunity to expand its markets. According to Makochekanwa (2016) the TFTA market consists of 527 million people and has a potential of \$624 billion worth of GDP. Therefore, if TFTA is successful, it will form the largest trading bloc in Africa, made up of 26 countries from the existing three regional trading blocs, namely COMESA, SADC and EAC.

The proponents of COMESA aimed to integrate Eastern and Southern African countries, divided into small states due to former colonial rule, and to reduce trade barriers among these countries. The approach of trade barrier reduction was supported by the United Nations Economic Commission for Africa (UNECA) when they made a call for integrating African countries according to their proximities². It is in that context that UNECA suggested that the continent be divided into four regions: Southern, Central, West and North regions. The aim of this regional grouping was to co-ordinate trade within each region first and later form the

¹ <http://www.bbc.com/news/world-africa-33076917>. Accessed 15 October 2016.

² <http://www.uneca.org/our-work/regional-integration-and-trade>. Accessed 15 October 2016.

African Economic Community to integrate all the regions. Although, COMESA went beyond that proposition by integrating countries in eastern and southern Africa, however, its success is not evident. Ebaidalla & Abdelrahim (2014) note that there are number of factors that hinder COMESA to realise its full economic integration potential relative to its counterparts such as the ASEAN grouping. These are: intersection of membership, lack of political leadership, insufficient infrastructure and information. Mayda & Steinberg (2009) argue that the other factor that is detrimental to trade is that African countries in general and COMESA in particular have the same resources for trade. They are known as exporters of natural resources, which is demanded by developed economies.

SADC, formally constituted in 1992, does not possess a vast history as COMESA. SADC goal is to expand socio-economic cooperation and integration as well as political and security cooperation between its fifteen southern African countries. Like COMESA, the success of SADC is not evident. Two reasons, in particular, have been advanced for its slow progress; the first reason is related to the economic discrepancy of its member states. Amos (2010) argues that South Africa makes up 70% of SADC GDP, which automatically makes the country assume Economic and Political leadership role. However, the author emphasises that South Africa has never assumed this role to the satisfactory of other SADC member states. It is observed that the leaders of SADC member states feel that South Africa has prioritised its trade with the EU and China to the disadvantage of the entire SADC region. As a result this has caused political rift between South Africa and its fellow SADC partners (see Amos, 2010). The other reason is related to the side of the inconsistency in *de facto* financial integration that is observed between SADC countries. According to Jefferis (2007) movement towards financial integration in SADC is divided across countries. Some member states depict financial integration whereas others diverge substantially. For example, South Africa, Namibia, Lesotho, Swaziland and Botswana are members of the Southern Africa Custom Union (SACU) and have solid trade and financial relationship between them, compared to other members of SADC.

East Africa countries exhibit a strong pattern of integration, dating back to late 1800s and early 1900s. Kenya and Uganda had a railway connecting them between Mombasa and Kampala in early 1900s. Uganda, being a land-locked country, its imports had to be transported via Kenyan seaports. To further strengthen their economic ties, the East African Currency board was formed in 1905 (see Magu 2016). These un-intended patterns of integration lead to the formation of EAC. EAC dates back to 1965 when the organization for Eastern and Central African countries

was formed. The organization later collapsed in 1975 as a result of disagreement between the founding member states, Tanzania, Uganda and Kenya . Katembo (2008) reviews a number of factors that lead to the collapse of EAC. The author notes the followings: lack of political leadership, uneven distribution gains from integration, territorial imbalances and currency divergence. Indeed this is so, as Magu (2016) note that Tanzania strongly felt that it has been short-changed in the entire integration development as benefits of integration were biased towards Kenya due to its industrial advancement. The EAC trade agreement resurrected in 2001. Later in 2006 Rwanda and Burundi membership was accepted, and the formal treaty was signed in 18 June 2007 (Katembo 2008).

Methodology

As stated above, this paper combines the VAR-DCC-GARCH model and factor model in order to assess the extent of financial integration within and between COMESA, SADC and EAC groupings. The paper makes use of factor model to construct the COMESA, SADC and EAC factors and determine the dynamic correlation between each country's stock market indices and their respective constructed regional factors. The paper makes use of the Principal Component Analysis technique (PCA) to extract the regional factors, namely COMESA, SADC and EAC factors.

The attractive feature of PCA model is that it makes no assumption about the distribution of underlying variable (Volosovych 2012). The number of factors selected within each region is based on eigenvalues of one or higher.

The mathematical representation of the model is as follows:

$$r_{it} = \lambda_{i0} + \lambda_{i1}f_{1t} + \dots + \lambda_{ik}f_{kt} + \varepsilon_{it} \quad (1)$$

or in a form of a vector as:

$$R_t = \Lambda F_t + \Xi_t \quad (2)$$

where $R_t = (r_{1t}, r_{2t}, \dots, r_{nt})$ is the $n \times 1$ vector of stock exchange returns for each country within a specific region, $F_t = (f_{1t}, f_{2t}, \dots, f_{kt})$ is the $k \times 1$ vector of common factors within each region. These factors are common to all stock exchange returns within each region. $\Lambda = (\lambda_1, \lambda_2, \dots, \lambda_k)$ is the $n \times k$ matrix of factor loadings and Ξ_t is the $n \times 1$ vector of idiosyncratic components.

In the most used methodology of Pukthuanthong and Roll (2009), global stock market or financial integration is measured by the R-squared value of the OLS regression of Equation 1. The authors show that an R-squared of 1.00 indicates that the country's market is fully integrated with the global market and an R-squared value of 0.00 indicates full segmentation between the country's market and the global market. This paper shows that Pukthuanthong and Roll's methodology may provide inconsistent estimation in the presence of heteroscedasticity, which is a common feature with stock or bond returns data. In addition, this paper indicates that Pukthuanthong and Roll's methodology may be misleading in cases of "decoupling" or negative correlation between individual countries and their common factors. Given that high negative correlation between two variables result in high R-square, in such a circumstance, Pukthuanthong and Roll's methodology may indicate full integration, while in fact there is decoupling or segmentation. The proposed model, the combination of the VAR-DCC-GARCH model and factor models, should be seen as a general case of Pukthuanthong and Roll's methodology.

Based on equation (2), we suggest that F_t be determined by using principal component and then a dynamic correlation be established between R_t and the weighted average of F_t . We advise the use of the weighted average of the selected factor, with the weight being equal to the proportion or marginal contribution of each factor to the cumulative percentage of factors. We avoid using one specific factor to avoid the case where the derived global factors are actually country specific, in which case the estimation of Equation (2) is reduced to individual countries correlation.

With the dynamic correlation, a positive correlation should indicate that country's market is integrated to a certain extent with the regional (global) market, while the correlation of 1.00 shows full integration. A negative correlation should indicate segmentation or decoupling between countries and their respective trading bloc.

The estimation of the DCC-GARCH model follows the following steps: firstly, a mean equation is estimated as:

$$Y_t = \phi_0 + \sum_{i=1}^n \phi_i Y_{t-i} + \theta X_t + \varepsilon_t \quad (3)$$

with $\varepsilon_t = \nu_t \sigma_t$ and $Y_t = (R_t, F_t)$ is a 2-variable vector containing the country stock exchange return and the specific regional common factor. X_t represents the vectors of deterministic and exogenous variables and the residual ε_t combines the white noise process ν_t and the heteroscedastic component σ_t . Parameters ϕ_0 , ϕ_i and θ need to be estimated. Secondly, the residuals obtained from Equation 3 in the first stage is used as an input into the univariate conditional-variance model specified for the country and common factors stock exchange returns, respectively. To account for possible equity-market asymmetry, we use the Glosten, Jagannathan and Runkle (GJR) (1993) GARCH model, which accounts for the asymmetric effect of stock exchange market returns. The GJR GARCH (1,1)³ model is represented as follows:

$$\sigma_t^2 = \omega + \alpha \sigma_{t-1}^2 + \beta \varepsilon_{t-1}^2 + d \varepsilon_{t-1}^2 I(\varepsilon_{t-1} < 0) \quad (4)$$

where the parameter ω refers to the long-term conditional variance and α is the lag coefficient. $I(\cdot)$ is an indicator variable that takes the value of 1 when if $\varepsilon_{t-1} < 0$ and zero otherwise. Thus, the impact of ε_{t-1}^2 on σ_t^2 is $\beta + d$ for negative shocks and β for positive shocks.

The last stage in a DCC GARCH model consists of determining the time-variant conditional correlation matrix from the conditional variance expressed as:

$$H_t = D_t R_t D_t \quad (5)$$

Where D_t is the diagonal matrix of conditional variances such as $D_t = \text{diag}(h_{11t}^{1/2} \dots h_{nnt}^{1/2})$. R_t is a positive definite N x N correlation matrix and is defined as follows:

$$R_t = (1 - a - b) \bar{R} + a \Psi_{t-1} + b R_{t-1}$$

Where $a, b > 0$ and $a + b < 1$. \bar{R} is a scalar for constant conditional correlation in that $R = \bar{R}$ if $a=b=0$. Ψ_{t-1} is the conditional correlation and is expressed as:

$$\Psi_{ij,t-1} = \frac{\sum_{m=1}^M u_{i,t-m} u_{j,t-m}}{\sqrt{(\sum_{m=1}^M u_{i,t-m}^2)(\sum_{h=1}^M u_{j,t-h}^2)}} \quad \text{for } \forall i \neq j \text{ and } M = t - 1 \quad (6)$$

$$\text{and } u_{it} = \varepsilon_{it} / \sqrt{h_{iit}} \quad (7)$$

The logarithm of the likelihood function of the DCC GARCH model is represented as:

³ The order of the EGARCH is determined by the log likelihood of the model estimation.

$$\ln L = -\frac{T}{2} \ln(2\pi) - \frac{1}{2} \sum_{t=1}^T \left(\ln |D_t R_t D_t| + \ln |R_t| + \varepsilon_t' (R_t)^{-1} \varepsilon_t \right)$$

Data , Empirical estimation and discussion of results

The empirical aspect of this paper endeavours to assess how financially integrated are each individual country member of COMESA, SADC and EAC to their respective trading bloc. Moreover, the paper evaluates how the three trading blocs are integrated with each other. The proposed measure of integration consists of two steps; firstly, the regional factor namely, COMESA, SADC and EAC factors are estimated with the aid of principal component. Secondly, the DCC GARCH model is used to derive the dynamic conditional correlation between individual countries stock returns and their respective regional factor to infer their degree of integration within the region.

The paper makes use of stock exchange indices transformed in returns for the following countries: Egypt, Uganda, Zimbabwe, Kenya, Mauritius and Zambia for COMESA. Zimbabwe, Mauritius, Namibia, South Africa and Zambia for SADC. Tanzania, Kenya and Uganda for EAC. Weekly data from June 2009 to May 2016 are collected from Datastream for all the countries. The sample data is related to the availability and synchronisation of data for all the countries.

In the first step of the proposed financial integration measurement, the eigenvalue criteria suggests three factors for COMESA and SADC and two factors for EAC. To carry on with the second step, we had a choice between using a weighted average of the estimated factors or simply considering the first factor for each of the region, given their high eigenvalue. For reason explained above, we proceeded by considering the weighted average factor for each region, with the weight constituted of the marginal proportion of factors in the cumulative contribution of factors.

First, we report the results of the simple correlation between individual country's stock returns and their respective regional common factors before reporting the results of the dynamic conditional correlation obtained from the VAR-DCC GARCH. These results are reported in Tables 1, 2 and 3. The results reported in Table 1 show a high correlation between Zimbabwe and the COMESA factor as well as Egypt and the COMESA factor. This indicates that the stock exchanges of the two countries drive the COMESA factor. This is due to the relatively high

market capitalisation of the two stock exchanges compared to other COMESA countries during the sample period of this study.

The results of the simple correlation between SADC countries and their common factor reported in Table 2 show the relative dominance of South Africa driving the SADC common factor. The Johannesburg Stock exchange, the South African stock exchange is the most capitalised stock exchange in Africa. Table 3 show that Kenya and Tanzania drive the EAC common factor. However, caution should be exercised as simple correlation do not account for heteroscedasticity.

Table 1 Simple correlation between the common factor and COMESA countries stock exchange returns

	COMESA factor
Egypt	0.659
Uganda	0.320
Zimbabwe	0.678
Kenya	0.320
Mauritius	0.519
Zambia	-0.044

Table 2 Simple correlation between the common factor and SADC countries' stock exchange returns

	SADC factor
Botswana	-0.1389
Mauritius	-0.705
Namibia	-0.454
South Africa	0.11
Zambia	-0.371
Zimbabwe	-0.471

Table 3 Simple correlation between the common factor and EAC countries' stock exchange returns

	EAC factor
Kenya	0.782
Tanzania	0.789
Uganda	-0.034

Then we proceed in the second step to estimate a VAR-DCC GARCH model between each country's stock return and their respective regional factor for COMESA, SADC and EAC. In this step, we make use of the VAR model in the mean equation in order to account for the interaction between the individual stock exchanges within each region. Also, we control for the exogenous effect of the S&P500 in each region. For the variance equation in the DCC GARCH, univariate GJR-GARCH(1,1) is used to account for asymmetric behaviour and leverage effect in respective stock exchanges. Figures 1 to 3 display the dynamic conditional correlation obtained from the estimation of the VAR-DCC GARCH model⁴ in each region. Figure 1 presents the

⁴ Results of the estimated mean and variance equation of the VAR-DCC GARCH models can be obtained on request.

dynamic conditional correlation between each COMESA's country stock exchange returns and the common factor (COMESA factor). It is clear from the figure that Egypt, Mauritius, Kenya and Zimbabwe are positively correlated to the COMESA factor during the sample period June 2009 to May 2016. However, Uganda and Zambia “decouple” from COMESA during some specific periods. This reality shows that not all countries within COMESA grouping are financially integrated to the group. Another very important observation from figure 1 is that during the crisis periods, such as the 2009 global financial crisis, there is a high correlation between COMESA countries and the common factor. This reality should indicate the dependence of COMESA countries to global shocks. The fact that markets are highly correlated during the period of major economic events is well documented (see Volosovych, 2013). The poor financial integration of Uganda and Zambia to the COMESA factor should be justified by the small market capitalisation of their stock exchange and lower number of companies listed in the stock exchange. As in 2013, Zambia's stock market capitalisation was \$US10.2 billions and had only 22 companies listed in the stock exchange. In the same year, Uganda's stock market capitalisation was \$US8.3 billion with 15 companies listed in the stock exchange⁵

⁵ See <http://www.africatrictlybusiness.com/lists/africas-equity-market-capitalization>. Accessed 16 October 2016