**How financially integrated are trading blocs in Africa?**

by

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**Abstract**

This paper assesses 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). The paper suggests a measure of financial integration based on the combination of the dynamic conditional correlation-general autoregressive conditional heteroscedastic (DCC-GARCH) and factor models. The results of the empirical analysis show that not all countries within each of the three trading blocs are 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 the results of the empirical analysis 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 Ben-David., Loewy, and Brunner., 2003). The 2011 World Bank report on African Competitiveness supports the notion of the benefit that is derived from trade integration. The report emphasizes 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 translating into low price for consumers and improved specialization (Zinnes, Eilat and Sachs, 2001). Moreover, Ben-David et al. (2003) make use of Neo-Classical theory and predict that opening a 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). By 2010, there were 14 RTAs in Africa (Salami 2011), with every country belonging to at least one regional group. These RTAs are namely 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, Manor 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 member countries attain certain prerequisites. According to the authors, if macroeconomic conditions of countries are at variant, there is no need to set up deliberate convergence institutions such as RTAs. Nicholas (2010) also notes that many members of RTAs are often disconnected from each other and that a number of RTAs display the spaghetti or noodle syndrome ( one country belonging to many RTAs).

A number of factors can contribute to the failure of member countries of an RTA from deriving benefits of free trade. Nicolas (2010) suggests 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 RTA. 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. However, in parts of the world, particularly in Africa, the process was reversed with de facto integration preceding. Moreover, Chambet and Gibson (2008) show that trade openness and financial integration should go hand in hand. This implies that the degree to which a country pursues open trade policies should be coupled with its level of financial integration. Imbs (2006) also recommends 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, an 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 (Mougani, 2012).

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). Hence, this paper intends to assess the extent of, on the one hand, financial integration within each of the three regional blocs, and on the other, the magnitude of financial integration between the three regional blocs. Such an assessment will inform 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. However, 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, studies often correct for this limitation by using multivariate general autoregressive conditional heteroskadastic (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 a conditional correlation, such as the DCC-GARCH, 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) assert that the DCC-GARCH model is a poor measure of correlation across different markets. In fact, the authors criticise the use of correlation between two countries to infer global integration. They assert that 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 have attempted to measure integration. For example, Christiaansen (2014) assesses the time variation in the integration of EU government bond markets. By examining the explanatory power of each bond market, the author measures the extent of integration of European factor portfolios. 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 with 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 determines 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 an r-square related method, correlation can take positive and negative signs and these different signs provide more insight into the nature of integration. Thus, this paper uses 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 the paper is organised as follows; section 2 presents a brief literature review and history of COMESA, SADC, EAC and TFTA; section 3 presents the methodology; section 4 proceeds with the estimation and discussion of results, section 5 deals with the robustness test and section 6 concludes.

1. **Brief Literature Review on Trade Integration and Background on TFTA**

A number of studies have attempted to assess the extent and magnitude of trade and financial integration in Africa. Ebaidalla & Ãbdelrahim (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 in a number of countries on the continent. Eddine & Strauss (2014) further argue that the main factor that hinders Africa to realise its true integration is the fact that it is divided into small autonomous countries which hampers free 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 Egypt[[1]](#footnote-1). 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, liberalisation of investment and business infrastructure across borders and building great capacity for competitiveness. Table A1 in the appendix lists the member countries of COMESA, SADC and EAC.

Given that African markets are still 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 the 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, comprising a number of small states, 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) which made a call for integrating African countries according to their proximities[[2]](#footnote-2). It is in this context that UNECA suggested that the continent be divided into four regions: Southern, Central, West and North regions. Foremost, the aim of this regional grouping was to co-ordinate trade within each region and, eventually, to form the African Economic Community to integrate all the regions. Although, COMESA went beyond that proposition by integrating countries in eastern and southern Africa, its success is not evident. Ebaidalla & Ãbdelrahim (2014) note that overlap of memberships, lack of political leadership, insufficient infrastructure and limited information prevented COMESA from realising its full economic integration unlike its counterparts in the ASEAN grouping. Also, Mayda & Steinberg (2009) note that the other drawback to COMESA integration proposal is that African countries in general and COMESA in particular produce similar resources which they export mainly to same markets, developed economies and China.

SADC, formally constituted in 1992, does not possess a vast history as COMESA. The goal of SADC is to expand socio-economic cooperation and integration as well as enhance 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 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 without resistance from the 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. 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 differs across countries. Some member states depict financial integration whereas others are outside the system. 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 have had a railway connecting them from the Kenyan port of Mombasa to the Ugandan capital, Kampala since 1902. Uganda, being a land-locked country, its imports are mainly 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 disagreements 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 that lack of political leadership, uneven distribution gains from integration, territorial imbalances and currency divergence were the major causes of the rifts. Indeed Magu (2016) notes that Tanzania strongly felt that it was being short-changed in the entire integration development as benefits of integration were biased towards Kenya due to its superior industrial advancement. The EAC trade agreement resurrected in 2001. Later in 2006 Rwanda and Burundi application for membership was accepted, and the formal treaty was signed on the 18 June 2007 (Katembo 2008).

1. **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 2013). 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:

 (1)

or in a form of a vector as:

 (2)

where  is the vector of stock exchange returns for each country within a specific region, is the vector of common factors within each region. These factors are common to all stock exchange returns within each region. is the matrix of factor loadings and is the vector of idiosynchratic 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 be determined by using principal component and then a dynamic correlation be established between  and the weighted average of . 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. To avoid the case where the derived global factors are actually country specific, we abstract from using one specific factor. In this sense, the estimation of Equation (2) is reduced to individual countries correlation.

With the dynamic correlation, a positive correlation should indicate that a 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 thus: firstly, a mean equation is estimated as:

+  (3)

with  and  is a 2-variable vector containing the country stock exchange return and the specific regional common factor. Xt represents the vectors of deterministic and exogenous variables and the residual combines the white noise process  and the heteroscedastic component. Parameters ,  and 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]](#footnote-3) model is represented as follows:

** (4)**

where the parameter ω refers to the long-term conditional variance and α is the lag coefficient. is an indicator variable that takes the value of 1 when  and zero otherwise. Thus, the impact of  on  is for negative shocks and 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:

 (5)

Where is the diagonal matrix of conditional variances such as =diag . Rt is a positive definite N x N correlation matrix and is defined as follows:



Where a, b >0 and .  is a scalar for constant conditional correlation in that R=  if a=b=0.  is the conditional correlation and is expressed as:

** for  and  (6)**

and  (7)

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



1. **Data, Empirical Estimation and Discussion of Results**

The empirical aspect of this paper assesses the depth of financial integration of each member country of COMESA, SADC and EAC in the respective trading bloc. This is done with respect to the availability of the data. 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 relevant 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 have 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 proceed 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 in 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 model[[4]](#footnote-4) in each region. Figure 1 presents the 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 periods. This reality shows that not all countries within COMESA grouping are financially integrated into the grouping. 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 susceptibility 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 billion 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 exchange[[5]](#footnote-5).

Figure 1. conditional correlation between COMESA’s countries and COMESA factor





Figure 2 presents the conditional correlation between SADC countries’ stock exchange returns and the SADC factor. Besides Mauritius and Botswana that have shown a positive correlation with the SADC factors during the sample period June 2009 to May 2016, other SADC countries have shown either partial or total decoupling with the SADC factor. An interesting observation in Figure 2 is that although South Africa relatively drives the SADC factor, as reported in Table 2, there are times when South Africa decouples with SADC. The rationale behind this finding should be that the South African financial cycle co-move with most developed economies (Mustafa and Kabundi, 2009). This occurrence is attributed to the developed nature of its financial market. The consequence of this co-movement is that shocks to developed economies affect South Africa more than other African countries at large and SADC countries in particular. The fact that South Africa decouples from SADC during periods of financial crises in developed economies, such as the 2009 global financial crises and the 2010-2012 European debt crises confirm the dependence of South Africa on developed economies rather than African economies. Just like COMESA countries, SADC countries are not all financially integrated to the SADC factors.

Figure 3 reports the results of the dynamic correlation between EAC countries and the EAC factor. Kenya and Tanzania are correlated with the EAC factor, supporting the finding reported in Table 3 that the two countries drive the EAC factor. This is no surprise, especially for Kenya being the largest economy within the EAC region. The Nairobi Stock Exchange, Kenya’s stock exchange, has a long standing history and relatively more sophisticated than that of its EAC counterparts. Its market capitalization is the biggest in the EAC region (Davoodi, 2012).

Figure 2. conditional correlation between SADC’s countries and SADC factor



Figure 3 Dynamic correlation between EAC countries and EAC factor







Uganda remains decoupled from the EAC factor during the sample period June 2009 to May 2016. This has to do with the size and influence of its stock market in the region. This fact is also supported by Yabara (2012) who shows that Ugandan’s capital markets are not liquid due to weak investment base, as most investors are institutional and hold investment assets for a long time. Yabara (2012) further notes that intra-capital movement hardly takes place in Uganda, with stock-market turnover of almost zero. Overall, the results reported in Figure 3 indicate that all EAC countries are not financially integrated to the region.

Next, we assess the possibility of financial integration between COMESA, EAC and SADC regions by modelling the VAR-DCC GARCH between the three common factors, namely COMESA, EAC and SADC. In the mean equation, we estimate the VAR model of the three variables by controlling exogenously for the S&P 500 returns. The variance equation combines the univariate GJR-GARCH(1,1) for each factor to account for asymmetric behaviour in the stock exchange market. The results of the dynamic conditional correlation between the COMESA, EAC and SADC factors are displayed in Figure 4. The results show that EAC and COMESA are slightly positively correlated, which may suggest a small degree of financial integration between the two regions. However, SADC and EAC as well as SADC and COMESA are not financially integrated. These results suggest that the three regions do not satisfy the precondition of financial integration for a successful *de facto* trade integration. Unless, the three regions improve their level of financial integration, any legislation for trade integration may not be beneficial to all the regions or countries. The findings of the paper that financial decoupling between the countries within each regional grouping (attributed to the difference in the level of the development of their capital market) demonstrate that embryonic capital market remains an impediment for successful trade integration in Africa. While a number of studies find evidence of bidirectional relationship between stock market development and economic growth in Africa (see Enisan and Olufisayo, 2009), it is rational to infer that stock market development could trigger the real sector of the economy in Africa, especially the productive sector that contributes to the enhancement of trade.

The finding of this study shows that the required condition of financial integration for successful trade integration between COMESA, SADC and EAC has not yet been achieved. Furthermore, this paper determines that there is no coordinated financial integration within each of the three regional groupings. With the finding that there is no clear evidence of financial integration within and between the three African trading blocs, extension of trade integration within TFTA may not be beneficial to all its member countries.

Figure 4 Dynamic conditional correlation between COMESA, EAC and SADC



**5. Robustness test**

Pukthuanthong and Roll (2009) Show that the explained variance, the adjusted R-square, from country stock market returns regressed against global factors, represents a good measure of integration. Also known as the multi-factor R-square, this methodology to measure global integration has become prominent in financial economics literature. However, this paper shows that our proposed measure of integration based on the combination of the VAR-DCC GARCH and factor models provides similar results to those of the multi-factor R-square. Moreover, the measure of integration derived from our proposed model is able to indicate instances when countries decouple from the global factors. The multi-factor R-square method cannot determine decoupling episodes.

To substantiate the relevance of the proposed model in measuring integration, Figure 4 contrasts the results of the dynamic correlation obtained from the combination of the VAR-DCC GARCH to those of the multi-factor R-square model in assessing the degree of financial integration of Tanzania and Uganda to EAC. It is important to note that the R-squares reported in Figure 4 are obtained from the 42-week rolling regression of each country’s stock exchange returns and the two factors selected according to the eigenvalue criteria. The regression is adjusted for heteroscedasticity. The trend depicted by the rolling R-squares between Tanzania and the EAC factors is similar to that of the dynamic correlation between Tanzania and EAC factor. For example, the results depicted in Figure 4 show the decrease in the conditional correlation between Tanzania and EAC factors in early 2011. The same results are depicted with the rolling -R square method. Similarly, the two measures of integration indicate upward trending until early 2012 and substantial increasing trend in the last part of 2013. Hence, the two measures of integration provide similar results.

However, when there is negative correlation between countries’ stock exchange returns and the common factors, the two measures of integration trend in opposite direction. This is observed by comparing the results of the dynamic correlation with those of the rolling R-square between Uganda and the EAC factor. High negative conditional correlation (lower trend) in mid-2011 between Uganda and EAC factor corresponds to high R-square (increasing trend). At this point, while the conditional correlation method infers decoupling and segmentation between Uganda and the EAC factor, the multi-factor R-square methodology mistakenly conclude that there is an increasing financial integration between Uganda and EAC factor, with the R-square approaching the value of 1. Similar opposite results are observed during the end of 2012 and 2014.

Figure 4. comparison of the results of the dynamic conditional correlation and R-square methods



It is clear that the misleading results of the multi-factor R-square method is due to the fact that the R-square focuses on the ‘goodness of fit’ in that high positive or negative correlation between variables implies a high (adjusted) R-square. These results show that the limit imposed by the positivity of R-square does not distinguish clearly periods of high integration and decoupling.

**6. Conclusion**

This paper endeavours to assess the degree of financial integration between three African regional trading blocs, namely COMESA, SADC and EAC to infer the possibility of a successful trade integration between them. Furthermore, the paper assesses the extent of financial integration of each country in these regions and their regional factor. To this end, the paper makes use of stock exchange data and combines the VAR-DCC GARCH model and principal component model. The empirical results show a discrepancy in the level of financial integration of each country and their respective trading and regional blocs. The results imply that the condition for de facto trade integration between the three trading blocs, in order to form inclusive trade integration, is not fulfilled. The contribution of this paper resides mainly in suggesting a new integration measure based on dynamic correlation that is derived from the combination of the VAR-DCC GARCH and principal component models. To test the validity of this new methodology, the paper conducted a robustness test which shows that the suggested methodology provides the same results as the multi-factor R-square measure of integration proposed by Pukthanthong and Roll. Moreover, unlike the Pukthuanthong and Roll measure of integration, our methodology can be used to assess whether countries decouple from the regional factor.

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1. <http://www.bbc.com/news/world-africa-33076917>. Accessed 15 October 2016. [↑](#footnote-ref-1)
2. <http://www.uneca.org/our-work/regional-integration-and-trade>. Accessed 15 October 2016. [↑](#footnote-ref-2)
3. The order of the EGARCH is determined by the log likelihood of the model estimation. [↑](#footnote-ref-3)
4. Results of the estimated mean and variance equation of the VAR-DCC GARCH models can be obtained on request. [↑](#footnote-ref-4)
5. See <http://www.africastrictlybusiness.com/lists/africas-equity-market-capitalization>. Accessed 16 October 2016 [↑](#footnote-ref-5)