EFFECTS OF MARKET GEOGRAPHY AND INSTITUTIONAL QUALITY ON FINANCIAL MARKETS INTEGRATION IN THE EAST AFRICAN COMMUNITY

DUNCAN OCHIENG' ELLY
B.Com, MBA, Nairobi

Thesis submitted in partial fulfillment of the requirements for the Degree of Doctor of Philosophy in Business Administration of the University of Nairobi

November, 2014

DECLARATION

This thesis is my original work and has not been presented for a degree in any other University.

Signed……. Date……

Duncan Ochieng' Elly,

D80/61369/2010

This thesis has been submitted for examination with our approval as the University Supervisors.

Signed……. Date……

Prof. Erasmus S. Kaijage,

Signed……. Date……

Dr. Daniel Abala,

DEDICATION

To the Father, the Son and the Holy Spirit

To all those who have a special place in my heart

To everyone who sacrificed in prayers, time, finances and understanding

To Elly jnr., Jeremy, John and Scoline, thank you for always being there for me especially to share and light up the stressful moments.

To my Brothers (Bonn, Fred, Charles, Jonah, Moses and Shadrack) and sister Faith, you are all special persons in every significant role you played towards this achievement.

To my Dad and Mum (Mr. Elly Akodhe and Mrs. Rose Anyango), your encouragements and patient wait for this excellence made it happen.

God bless all of you.

ACKNOWLEDGEMENTS

It is my sincere appreciation to all those who supported me in this useful phase of academic development. I am grateful to my supervisors, Prof. Erasmus S. Kaijage and Dr. Daniel Abala, for all the support, advice, constructive criticism, guidance and mentorship that they gave me throughout the research process. Thank you for your patience with the candidate in the whole process.

It is my great gratitude to the University of Nairobi management under the pragmatic leadership of Prof. Magoha for granting me an opportunity to pursue my postgraduate studies at the University on a full staff development scholarship and for nurturing an environment conducive for scholarly discourse and excellence. Your generosity is such a golden treasure. These studies would have been delayed without your kind gesture and support.

Profound thanks and appreciation to members of faculty at the University of Nairobi for their support and resourceful input on the research process from inception to this end. I remain indebted to my colleagues in the department of Finance and Accounting at the School of Business and friends at the School of Economics for the constant reminders on the deadlines and the probono consultation sessions.

Lastly, I appreciate the support from Mr. Fred Nyalali (Ndugu) at the Dar es Salaam Stock exchange, Mr. Jonathan Busara (Sebo) at the Uganda Stock exchange (USE) and Irene Mugua, Beryl Ongudi and Maureen Agunga during the data collection phase.

ABBREVIATIONS AND ACRONYMS

ADF: Augmented Dickey-Fuller

ASEAN: Association of Southeast Asian Nations

ATS: Automated trading system

CM: Common market

CMA: Common Monetary Area

CU: Customs union

DSE: Dar es saalam Stock exchange

EA: East Africa

EAC: East African Community

EACB: East African Central Bank

EAMU: East African Monetary Union

ECM: Error Correction Model

EMH: Efficient Markets Hypothesis

EMU: European Monetary Union

EU: European Union

FSD: Financial sector development

FTA: Free Trade Area

GARCH: Generalized Auto – regressive Conditional Heteroscedasticity

GCC: Arab States of the Gulf

GDP: Gross domestic product

G-PPP: Generalized purchasing power parity

ICT: Information and Communication Technology

IMF: International Monetary Fund

ISE: Istanbul Stock Exchange

JSE: Johannesburg Stock Exchange

MU: Monetary Union

NSE: Nairobi Securities Exchange

PP: Phillips-Perron

PPP: Purchasing power parity

RECs: Regional Economic Communities

RIA:	Regional integration arrangement
ROTCE:	Rwanda over – the - Counter Exchange
RSE:	Rwanda Stock Exchange
SACU:	South Africa Customs Union
SADC:	South African Development Cooperation
SAMU:	South Africa Monetary Union
SCU:	Scandinavian Currency Union
SEZs:	Special Economic Zones
UIP:	Uncovered Interest Parity
USE:	Uganda Stock Exchange
VAR:	Vector auto regressive
WTO:	World Trade Organization

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ABSTRACT

The East African Community (EAC) is in the phase of transition from a common market to a monetary union characterized by a single currency. This phase requires integration of financial markets. Studies on financial markets integration in EAC concur on none deepening of integration evidenced by divergences in the financial market segments.

Considering that divergences in market returns are not the desirable outcome of the process, this study sought to establish any effects of market geography and institutional quality on integration of financial markets in the EAC. Specifically, the study sought to: Establish integration relationships between Kenyan and other EAC financial market segments; determine the relationship between market geography and financial markets segments integration; investigate the influence of institutional quality proxied by rule of law and political stability on the relationship between market geography and financial markets segments integration and Probe the Joint effects of market geography and institutional quality attributes on integration of financial markets segments.

Structured as a longitudinal study on three equity, five Treasury bill and five interbank markets, the study applied monthly market return and market geographical data for a 14 year period (2000 to 2013) to test five hypotheses. The main study findings revealed that there are linkages in the money markets and long run integrating relationships amongst the equity markets though perfect and full integration has not been attained. The study establishes that GDP, remoteness, financial sector deepening policy (Fsd) and adjacency are statistically significant geographical variables in explaining financial markets segments integration. Institutional quality as a factor in financial markets integration is confirmed when political stability moderates the influence of geography on integration and rule of law mediates the same relationships.

Given that measures of remoteness and financial deepening policy are related to GDP and distance, the study recommends formulation of policies that promote EAC member country macroeconomic convergence and market efficiency which are supportive of financial markets integration and subsequently, economic integration.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Economic integration is described as elimination of economic frontiers between two or more economies (Pelkmans, 2006). He defines an economic frontier as any demarcation over which actual and potential mobility of goods, services, production factors and communication flows are relatively low. Traditionally, five stages of the integration process have been distinguished; a free trade area (FTA), a customs union (CU), a common market (CM), an economic/ monetary union (EU/MU) and a complete integration. Mc Carthy (2004) postulates that regional integration reaches its pinnacle when monetary and fiscal integration is added to free trade in goods and services creating a monetary union (MU) with a single currency. This is preceded by a common market characterized by mobility of factors of production especially labor and capital.

The decision for geographic regions to economically integrate and adopt a single currency is based on the theory of optimum currency areas (OCA). OCA theory associated with Mundell (1961), McKinnon (1963), and Kenen (1969) define a common currency area in terms of the extent of trade and factor mobility between states. The role of states in integration process is explained by Heather, Porter and Roberge (2004) in the hegemonic stability theory (HST) through an argument that integration is driven and shaped by powerful states rather than by forces endogenous to markets. The role of market forces in financial markets is anchored in the adaptive markets hypothesis (AMH) advanced by Lo (2004) where principles of evolution, competition, adaptation and natural

selection explain financial interactions. Within the AMH framework, behavioral finance proponents counter examples to economic reality like loss aversion, overconfidence, overreaction, mental accounting and other behavioral biases that are consistent with an evolutionary model of individuals adapting to a changing environment.

Creation of regional economic communities (RECs) in Africa dates back to the establishment of the South Africa Customs Union (SACU) in 1910 and the original East African Community (EAC) in 1917. De Lombaerde (2007) note that EAC is one of the oldest regional economic communities (RECs) in Africa. It began in 1917, when Kenya and Uganda formed a customs union. Tanganyika (Currently Tanzania) joined later in 1922. The CU was created to serve the interests of the then colonial administration. However, in 1967, after the independence of the countries, Kenya, Tanzania and Uganda formally established the EAC. Due to political differences of the three member countries, the EAC collapsed in 1977. In 2000, after being disbanded for 25 years, the EAC was re-constituted under the Arusha Treaty.

1.1.1 Financial Markets Integration

Financial market integration is defined by De Brouwer (2005) as 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 that an increase in capital flows and a tendency for prices and returns on traded financial assets in different countries to equalize.

The European Commission, in its financial integration monitor of 2005 defines financial integration as a process, driven by market forces, in which separate national financial markets gradually enter into competition with each other and eventually become one financial market, characterized by converging prices, product supply and converging efficiency or profitability.

Distinction between perfect, direct and indirect financial integration is provided by Oxelheim (1990). Perfect (or total) integration means that expected real interest rates are the same on the markets concerned. Under direct financial integration, the law of one price is held, that is, an investor can expect the same return on investments on different markets. Indirect financial integration, in turn, refers to a situation where the return on an investment in one country is indirectly linked to the return on investments in other countries through other markets like exchange market, or the goods market.

Apart from financial markets efficiency, Bhoi and Dhal (1998), Jena, Murty and Narasimhan (2002) and Anand (2009) underscore the fact that effective integration of financial markets depends on a few characteristics such as: rates being market determined, differences in returns on financial products being based on risk and maturity profiles, rates of return are related to a benchmark (reference) rate, there is flow of resources from one market segment to the other thereby eliminating the arbitrage opportunity and rates of various segments of the financial markets move in tandem.

Financial market integration has been studied from different perspectives. Goldberg and Delgado (2001) distinguish literature on integration in two sets. The first set of studies relate to regime breaks whose existence is verified through unit root tests or cointegration among different financial markets. The second set consists of studies that define integration as the convergence of asset returns where the more markets converge, the more the assets with related risk characteristics would yield similar returns.

Convergence between economies is defined by Soukiazis and Castro (2005) as tendency for levels of per capita income, or levels of productivity to equalize over time which happens only if a catching-up process takes place. Islam (2003) summarizes some of the different ways in which convergence has been understood. These include: convergence within an economy versus across economies, convergence in terms of growth rate versus in terms of income level, unconditional versus conditional convergence, global versus local or club-convergence, income versus total factor productivity convergence, deterministic versus stochastic convergence and beta versus sigma convergence.

The law of one price that characterizes perfect integration has led to the adoption of beta (β) and sigma (σ) convergences as measures of financial integration by Baele, Ferrando, Hordahl, Krylova and Monnet (2004), Vajanne (2007), Babetskii, Komarek and Komarkova (2007), Espinoza, Prasad and Williams (2011), Yabara (2012) and Kaijage and Nzioka (2012). In these studies, β-convergence indicates the speed at which financial markets are integrating and σ-convergence signifies the level of financial markets integration.

1.1.2 Market Geography

Integrating member country characteristics are explained to influence financial markets integration by Lemmen and Eijffinger (1996), Von Furstenberg (1998), Cottarelli and Kourelis (1994), Hubbard and Hubbard (2004) and Xuan Vinh (2005). Xuan Vinh (2005) identify these variables as policy on capital controls, level of development, economic growth, institutional environment, Trade openness, financial market development and tax policy.

The Gravity model of international trade developed independently by Tinbergen (1962) and Poyhonen (1963) is applied to explain the connections between markets. In its basic form, the amount of trade between two countries is assumed to be an increasing function of their sizes as measured by their national incomes and a decreasing function of the cost of transport between them as measured by the distance between their economic centers. Linnemann (1966) extended this work to incorporate population as an additional measure of country size. Other variants of the gravity models applied by Portes and Rey (2001) and Flavin, Hurley and Rousseau (2001) in financial markets proxy country size with market capitalization.

The basic idea behind gravity models is that geography matters. Variables associated with physical geography, such as distances and market size, along with those that emanate from psychological geography like having a common border, having past colonial links and common language explain market links (Flavin, *et al*., 2001).

With advancements in information technology, trade volumes between countries vary irrespective of market sizes and distances. Although distance between countries is expected to have a negative impact on trade in goods, it is not clear that this is necessarily the case for services as Walsh (2006) explain that service products do not have to be physically transported from location to location. Depending on the nature of the service, in some cases it will require movement of physical persons but in others it may be communicated electronically. Consequently, the importance of distance in services trade may be low or even insignificant.

Effects of trade barriers in international trade models have been explored by Anderson and van Wincoop (2003) who propose that estimation of gravity model can be greatly improved by incorporating multilateral resistance measures. Trade between any two regions depends negatively on the trade barriers of each region relative to the average barrier of the two regions with all trade partners. If a country has a relatively high average trade barrier, it will trade more with a country with which it has a low bilateral barrier.

1.1.3 Institutional Quality

The term institution typically refers to a range of structures that affect economic outcome like contract enforcement, property rights, investor protection and the political system. Measures of institutional quality incorporate aspects of economic, political and civil freedom. Institutions are often seen as providing the 'rules of the game', needed to establish baseline conditions for human interaction resulting in greater predictability and less uncertainty and discouraging actions that, if widely practiced, would be economically costly (Nelson and Sampat, 2001).

Building institutional capacity as a key element in successful securities markets development has been explained by Chuppe and Atkin (1992) and Pardy (1992). Pardy (1992) emphasizes the role played by governments in facilitating development of stock markets by laying solid legal and institutional foundations and supervising the market to ensure its efficient, fair and stable operation. Chuppe and Atkin (1992) underscore the importance of regulations such as disclosure requirements for public companies, complemented by good accounting standards, along with credible contract enforcement and restrictions on the intermediaries licensed to participate in trading.

Though Grunfeld and Moxness (2003) have applied trade restrictiveness index (TRI) which measures market regulations and protection for services in 34 different countries while modeling services trade between countries, Kimura and Lee (2004) advocate for use of the composite economic freedom of the world index (EFI) published by the Fraser Institute of Canada since 1996 which measures the consistency of a nation's policies and institutions with economic freedom.

Economic freedom characterizes the degree to which an economy is a market economy with the possibility of entering into voluntary contracts within the framework of a stable and predictable rule of law (Berggren, 2003). Gwartney and Lawson (2003) published the Economic freedom of the world index (EFI) for measuring institutional quality in five key areas as: size of government (measured by government expenditures, taxes and enterprise), legal structure and security of property rights, access to sound money, exchange with foreigners (freedom to trade internationally) and regulation of capital, labour and business.

1.1.4 The East African Community Financial Markets

The creation of RECs is fuelled by the changing nature of the global economy, world trade organization (WTO) initiatives, borderless globalization and fast-paced advances in ICT. De Lombarde (2007) observes that economic integration has become a major priority of governments and the people of many African countries. Anand, Anderson, Guttmann and Lee (2011) indicate that the five EAC member countries cover 1.82 million kilometers to the east and south of Lake Victoria in East Africa and are home to 133.5 million people.

In November 2013, the heads of states of the EAC countries signed a monetary union protocol for the introduction of a single currency in ten years time. The future East African Monetary Union (EAMU) is expected to replace the five individual country currencies with a common currency managed by the prospective East African Central Bank (EACB). A treaty establishing the EAC was signed in 1999, a customs union treaty in 2004 and a common market protocol (CMP) in 2009 (Buigut, 2011). Dobrogonov and Farole (2012) confirm that significant progress has been made in the implementation of regional integration. Most notably, the customs union was launched in 2004 and as of January 2010 all internal tariffs, surcharges, and excise taxes have been removed for intra - regional trade, establishing a single market for goods and services.

While describing EAC capital markets, Yabara (2012) note that all five EAC countries operate government debt markets and corporate bond markets which are at nascent stages. Corporate bonds are issued in EAC countries except for Burundi and are traded at

the securities exchanges. EAC currently has four securities exchanges. Onyuma, Mugo and Karuiya (2012) note that the Nairobi Securities Exchange (NSE) is one of the more active capital markets in Africa with sixty two listed companies as at 1st February, 2014. The second largest exchange in EAC is Dar es Salaam Stock Exchange (DSE). As at 1st February, 2014, there were seventeen firms listed on the DSE, five of which are cross-listed firms from the NSE. The third largest exchange is the Uganda Securities Exchange (USE). On 1st February, 2014, USE had sixteen listed firms of which six are cross listed from the NSE. Lastly, the Rwanda Stock Exchange (RSE) took over the operations of the Rwanda over the Counter Exchange (ROTCE), which began business in bond trading in January, 2008. The bourse currently has five listed firms, two local and three cross-listed.

As explained by Sifunjo (2011), foreign exchange markets are international markets that are geographically dispersed with a 24 hour trading platform where international foreign exchange markets influence the activities in the local foreign exchange markets. Adam, Kessy, Kombe and O'Connell (2012) underscore that the exchange rate policies in the EAC countries dates back from the mid 1990's when the three large EAC countries adopted their current systems of managed floating. The move to managed floating was part of a set of reforms designed to establish unified and market determined exchange rates by eliminating distortionary systems of foreign exchange rationing and developing an interbank market for foreign exchange.

Uganda and Kenya liberalized their exchange controls very substantially in the mid 1990s, dismantling controls on the capital account as well as the current account. Tanzania liberalized fully on the current account but has only recently begun to liberalize its capital controls as part of harmonization efforts within the EAC. It is highly likely though not inevitable that the monetary framework adopted by the union wide central bank will be close in outline to the framework currently operated in the three large countries, with a flexible, market determined exchange rate and a largely open capital account. Burundi and Rwanda appear to be on a gradual path to such a regime (Adam, *et al.*, 2012). The protocol for the establishment of the East African Monetary Union article 12 specify that the exchange rate regime for the single currency area shall be free floating.

1.2 Research Problem

Financial markets integration is observed statistically or on the basis of asset pricing. Bachman, Choi, Jeon, and Kopecky (1996), Yusof and Majid (2006) show that statistically, markets are integrated if they share a long-run equilibrium relationship between their returns. Jorion and Schwartz (1986) use the asset pricing approach to define integration as a situation where investors earn the same risk-adjusted expected return on similar financial instruments in different national markets. This later definition supports Akdogan (1992) proposition that a complete integration of capital markets should imply the absence of arbitrage opportunities.

Within the asset pricing paradigm, integrated financial markets are associated with the propositions by Baele, *et al*., (2004) that participants follow a single set of rules, have identical access to financial instruments, are treated equally and traders can perform transactions freely anywhere within an integrated area. The expected results of integration would therefore be convergence, increasing cross border allocation of investment and greater co-movement of asset prices.

In East Africa, a common market, a monetary union and ultimately a political federation of states is envisaged. The EAC capital market has four established securities exchanges for trading equity and debt instruments. All the five central banks in the community hold auctions to sell treasury bills and treasury bonds on behalf of the respective governments. Such securities are traded over the counter and/ or in local stock exchanges. The interbank market also exists in all the five countries where they facilitate short term borrowing and lending needs of financial institutions.

Studies on financial integration in EAC by Mkenda (2001), Buigut and Valev (2007), Falagiarda (2010), Buigut (2011), Yabara (2012) and Kaijage and Nzioka (2012) use different statistical techniques to test the levels or speed of financial markets integration. These studies focus on testing the levels or speed of financial integration as a single variable without probing the determinants of the established levels and speeds of market integration.

Investigations by Kaijage and Nzioka (2012) using monthly data and Yabara (2012) using weekly and bi-weekly data concur on non-existence of long run cointegration relationships amongst capital markets in EAC. A limitation of the Johansen cointegration technique applied in these statistical studies is their inability to reveal evolving patterns in long run relationships. This methodological challenge leads to a study gap on further investigation of patterns in integration of EAC financial markets or otherwise, lack of it using other statistical techniques like vector auto regression (VAR), Impulse response functions (IRFs), Variance decomposition (VD) and error correction mechanisms (ECMs).

In the European Union (EU), Baele, *et al*. (2004), Vajanne (2007) and Babetskii, Komarek and Komarkova (2007) apply convergence analysis to establish levels and speeds of integration in financial markets. At the cooperation council of the Arab states of the Gulf (GCC), Espinoza, Prasad and Williams (2011) finds evidence of financial integration using convergence approach. Convergence analysis by Kaijage and Nzioka (2012) and Yabara (2012) in EAC suggest that financial integration has not deepened with the Treasury bill and inter-bank market segments showing signs of increasing divergence. Given that divergence is not the intended outcome in regional integration arrangements, possible causes of divergence require an investigation.

Causes of cross-country differences in economic activities advanced by North (1990), Landes (1998) and Sachs (2003) are institutions and geography respectively. In the EAC, member countries exhibit diverse market geography and institutional competencies which

may influence the convergence or divergence evidenced in the financial markets. The reason for none deepening of financial markets integration in EAC is therefore a research gap that requires probing by questioning the geography, institutions and convergence nexus. This study therefore sought to address the research question: what are the effects of market geography and institutional qualities on integration of financial markets in EAC over time? The objectives addressing the research question are as outlined below.

1.3 Research Objectives

The general objective of this study was to investigate the relationship between market geography, institutional quality and integration of financial markets in EAC. The specific objectives were to:

(i) Establish integration relationships between Kenyan and other EAC financial market segments.

(ii) Determine the relationship between market geography and financial markets segments integration in EAC.

(iii) Investigate the influence of rule of law on the relationship between market geography and financial markets segments integration in EAC.

(iv) Establish whether political stability moderates the influence of market geography on financial markets segments integration in EAC.

(v) Probe the joint effect of market geography, institutional quality and political stability on financial markets segments integration in EAC.

1.4 Value of the Study

The theme of financial integration is one that is important practically, theoretically and in policy terms. Practically, the extent of integration between markets is important to investors in pursuit of portfolio diversification. As dictated by portfolio theory, the level of portfolio diversification benefits depends on the extent of linkages between the markets. The determination of diversification strategies by an international investor depends on the nature and magnitude of the relationships existing between different financial markets. It is therefore significant for international investors and their advisors to understand the interrelations among the various EAC markets to diversify risks and to derive optimum returns. Diversification will allow for the same portfolio return with reduced risk if the markets do not move together.

Cointegration of financial markets implies the existence of a common force, such as arbitrage activity, which brings the financial markets in line together in the long run. The practical implication of the fact that financial markets are cointegrated is that the potential for gaining abnormal profits through international diversification is limited. On the contrary, if markets are not cointegrated, there will be no arbitrage activity to bring the markets together and hence there is potential for investors to obtain long run gains through international portfolio diversification.

Theoretically, integration is an important input to international portfolio diversification models and to Mundell-Fleming models of open macro–economy. In line with the gravity models that explain trade patterns between countries, this study models financial markets

integration and its selected determinant geographical and institutional factors in an augmented gravity model. In basic form, gravity models in log linear equation specify that flows from origin country to destination country like migration, commuting, tourism and commodity shipping amongst others can be explained by economic forces at the flow's origin, economic forces at the flow's destination and economic forces either aiding or resisting the flow's movement from origin to destination. The gravity equation relates trade between two countries positively to both of their incomes and negatively to the distance between them. Though based on Newton's law of universal gravitation, Gravity models have no micro economic theory foundation but remain popular due to their simplicity and applicability.

In terms of policy formulation, it is deemed that only relevant policies would lead to perfect integration. Currently, EAC is in a transition of graduating to a monetary union (EAMU) where there is free mobility of factors of production such as capital, labour and technology amongst the member countries. Policy discussions to deliver the envisaged MU can further be informed by knowledge of the geography integration nexus. EAC Policy development and harmonization agencies would benefit from understanding regional market linkages and relationships together with the contributions of such linkages and relationships towards perfect integration.

1.5 Structure of the Thesis

This thesis is structured into seven chapters, starting from the introductory chapter which presents the background of the study, research problem, study objectives and value of the study. Chapter two outlines the context of the study specifically the evolution of the EAC and the financial markets therein. Chapter three provides a review of theoretical and empirical literature on financial markets integration with a focus on approaches to measurement of financial markets integration and the effects of market geography and institutional capacities on economic activities. The theories reviewed include the Optimum currency are theory, hegemonic stability theory, purchasing power parity theory and adaptive markets hypothesis. The review culminates into a summary of identified research gaps and the conceptual framework derived to address the study gaps.

The research design adopted, research philosophy and approaches used in the study with regard to data collection and analysis is presented in chapter four. Chapter five presents the analysis conducted for the study in measuring integration between EAC financial market segments. Integrating market segment geographical attributes and institutional capacities are also incorporated to investigate their influence on the integration process.

This study is based on five hypotheses which are individually tested and discussed in chapter six. Chapter seven concludes the study with a summary of the findings, conclusions and recommendations. Contributions of the study to policy, to practice and to knowledge are presented in chapter seven. The chapter also underscores the limitations of the study and gives suggestions for further research.

CHAPTER TWO

CONTEXT OF THE STUDY

2.1 Introduction

This chapter discusses the contextual background of the study. Section 2.2 presents a description of the historical evolution of the EAC, Section 2.3 describes financial markets in EAC member countries and Section 2.4 highlights the prerequisites for EAMU.

2.2 Historical Evolution of the East African Community

The East African Community (EAC) is the regional intergovernmental organization of the Republics of Burundi, Kenya, Rwanda, Uganda and Tanzania covering a combined area of approximately 1.82 million square Kilometers (EAC, 2010). The five countries held a combined population of approximately 126 million people by 2009 who share cultural, economic and geographic characteristics. Across the geographical borders, they share common climatic conditions, trade and agricultural practices and social set – ups. These characteristics, which are key to human development, provide the partner states with a unique Gross Domestic Product (GDP) of approximately US$73 billion, economic factors have taken centre stage and the urgency for integration cannot be ignored (EAC, 2010).

Documented cooperation among the EAC countries can be traced back to over a century ago. The landmarks then included a customs union operated between Kenya and Uganda as early as 1900, which was later joined by Tanganyika in 1922 (Mkenda, 2001). In the union, the three countries jointly administered customs, excise and income taxes, and

other services such as, medical and industrial research, education, transport and communication, as well as agriculture (EAC, 2010).

Besides the services that were jointly run, a monetary union and a high degree of fiscal integration existed. Labour was also fairly mobile within the region (EAC, 2010). Mkenda (2001) explain that the East African countries also belonged to a monetary union, whose conditions were set up during the colonial period. In 1919, the East African Currency Board was established, and a single currency was in use until 1966. The Currency Board, among other things, was responsible for issuing and redeeming local currency for sterling. The East African countries belonged to the Sterling Exchange System, whereby the external reserves were held in sterling securities. There was a high degree of monetary integration, such that there were no restrictions on the movement of capital between the countries.

A common legislative body and administrative organization for East Africa was established in 1948. It was called the East Africa High Commission (EAHC). The Commission was made up of the three governors of the three territories, and its policy decisions were effected through its Secretariat in Nairobi. There was also a Central Legislative Assembly (CLA), which considered and enacted legislation relating to aspects of the common services. In 1961, Tanganyika attained her independence, and later, Kenya and Uganda gained their independence too. With the attainment of independence, a number of changes were effected in the machinery of co-operation. The High Commission was transformed into the East African Common Services Organisation

(EASCO), which consisted of chief executives of the three governments. The CLA was enlarged, and also, the authority operated through various committees composed of three ministers from each country (Mkenda, 2001).

The operations of the common market, however, continued without any formal enactment, until 1967 when the Treaty was signed. The Treaty founded the East African Community, and as an integral part of it, a common market. The Treaty also established the East African Council, which consisted of the three presidents and five councils, each assigned to the following areas; common market, communications, economics and planning, finance and research, and social affairs (Mkenda, 2001). Robson (1968) explain that by 1967, separate central banks were created in each of the countries. This was done because the countries felt that a monetary union limited their discretion in relation to monetary policy. Hazlewood (1975) observe that though separate central banks had been created in the Treaty that established the EAC, the three states agreed to harmonize their monetary policies to the extent required for the proper functioning of the Common Market and the fulfillment of the aims of the Community.

Some problems emerged in the monetary union soon after the Treaty was signed. Mkenda (2001) notes that the first problem was the nationalization of banks in Tanzania in 1967, in the wake of the Arusha Declaration, and the ensuing exchange controls that were imposed against Kenya and Uganda to restrict capital flight. Also, the free circulation and redemption of Tanzanian notes were suspended in the other states. The second was the heavy outflow of capital from Uganda in 1970 after a nationalization policy was

announced. Exchange controls against Kenya and Tanzania were imposed, and the export and import of the Ugandan currency was banned. The exchange controls triggered retaliatory measures by the others states. The restrictions were directed at capital, and not goods and services. When the exchange controls were in place, the countries pursued divergent policies regarding pegging for their currencies.

As explained by Musonda *et al*. (1997), there are several reasons that may explain the collapse of the original EAC. Firstly, there was a feeling that the benefits of the common market were accruing more to Kenya than to Tanzania and Uganda. The differences in the benefits arose due to the differences in the level of industrialization of the three countries. Mugomba (1978) explains that the other factor that contributed to the collapse of the EAC was the ideological differences between the three countries. The ideological distance between the partner states exacerbated the tensions that were already there in the EAC. While Tanzania pursued a socialist-oriented path of development, Kenya, on the other hand, was committed to the capitalist path of development, becoming increasingly isolated in a region that was predominantly socialist. Uganda, however, had witnessed several ideological shifts.

When the EAC collapsed, the heads of state of the partner countries signed a Mediation Agreement to divide the assets and liabilities of the defunct co- operation. However, a provision in the agreement enabled the partners to revive their co-operation sometime in the future. Following a number of meetings, the leaders signed an agreement to establish the Permanent Tripartite Commission for East African Co-operation, in November 1993.

The operations of the EAC, however, did not commence until the Secretariat was launched in March 1996, at its headquarters in Arusha, Tanzania (Mkenda, 2001).

The history of the new EAC started with the signing of the agreement for the establishment of the permanent tripartite commission for the East African Cooperation in 1993 followed by the launching of the Commission secretariat three years later (EAC, 2010). The initial three partner states of Kenya, Tanzania and Uganda signed the Treaty for the establishment of the EAC on 30th November, 1999, which came into force on 7th July, 2000, following its ratification (EAC, 2010). The main goal of establishing EAC is underpinned by the desire of the EAC partner states to attain sustainable and equitable growth and development that in turn improves the standard of living of the people through increased competitiveness, value – added production, trade and investment (EAC, 2009).

The fourth development strategy published by the EAC in 2011 summarizes the medium term development strategies that operationalize the EAC treaty. The first development strategy covered the period of 1997 to 2000 commonly referred to as the confidence building phase and focused on re-launching of EAC. The second development strategy covered the period 2001 - 2005 and mainly focused on the establishment of the EAC Customs Union and laying the groundwork for the Common Market. The third development strategy (2006 – 2010) prioritized the establishment of the EAC Common Market. The fourth Development Strategy itself covering the period July 2011 to June 2016 mainly focuses on the implementation of the EAC Common Market and the establishment of the EAC Monetary Union.

Significant progress has been made in the implementation of regional integration in EAC within the medium term development strategies. As noted in Dobrogonov and Farole (2012), the EAC aims at deep economic, social, and political integration, starting with a customs union and moving on to a common market, a monetary union, and ultimately a political federation among the five member states. It seeks to achieve these goals by laying down common rules governing, inter alia, trade in goods and services; cross-border investment; mobility of natural/legal persons; infrastructure development and maintenance; environmental and natural resource management; tourism; and regional industrial development, including industrial parks and special economic zones (SEZs).

2.3 Financial Markets in the East African Community

In East Africa, banks and insurance companies have generally taken advantage of the potential of the regional market. Wagh, Lovegrove, Kashangaki and Fuchs (2010) observe that several banks have to some degree adopted a regional business model motivated by a range of factors including client-demand, their own corporate structures, and/or by opportunities perceived along the regional trade corridors. Kenya-based banks are leading regional integration in the EAC banking sector. About eleven multinational and Kenyan owned banks use Kenya as a hub for their operations in the EAC region. There are four indigenous Kenyan banks with branches within the region. In the insurance industry, there are no Tanzanian or Ugandan insurance companies with a regional presence through there are indigenous Kenyan insurance companies with branches within the region.

Participation in EAC stock and bond markets is usually dominated by institutional investors, national pension funds, fund management firms and insurance companies. Wagh, Lovegrove, Kashangaki and Fuchs (2010) describe that several Kenyan stock broking firms have subsidiaries within the EAC region. The integration of the EAC stock exchanges is planned as well. The first move to integrate the exchanges was to develop common automated trading and clearing platforms. This adoption is currently underway, with Uganda adopting the same automated trading system (ATS) that is used by Kenya, and Tanzania and Rwanda expected to follow suit. Prior to implementation of a common trading platform, cross-listing of shares in the EAC is already occurring and has increased private capital flows within the region. The total market capitalization for cross listed shares in the EAC region stands at about US$2.88 billion with 99.84 percent being taken up by the NSE whilst 0.16 percent is shared between DSE and USE.

The EAC securities market is currently formed by four securities exchanges. Onyuma (2012) discusses these four exchanges in noting that the NSE is sub - Saharan Africa's fourth-largest bourse with 58 listed companies and 24 brokerage firms. NSE was a regional security market up to 1972 when it lost its regional character following the nationalization, exchange control and other inter-territorial restrictions introduced in neighbouring Tanzania and Uganda. The NSE successfully installed an automated trading system (ATS) in November 2007 and central securities depositories (CSD) in November 2004. The exchange is also undergoing restructuring of its governance system through demutualization. The second largest exchange in EAC is Dar es Salaam Stock Exchange (DSE). The DSE was incorporated in September 1996 as a private limited company.

Thirdly, the Uganda Securities Exchange (USE), which was launched in June 1997, is run under the jurisdiction of the Capital Markets Authority, which reports to the Central Bank of Uganda. Lastly, the Rwanda Stock Exchange (RSE) is the youngest exchange in EAC, having opened for business on 31st January 2011. The RSE took over from the operations of the Rwanda over the Counter Exchange (ROTCE), which began business in bond trading in January 2008.

In a description of the EAC capital markets, Yabara (2012) explain that all five EAC countries operate government debt markets at different stages of development. Central banks in all the EAC countries hold auctions under different frameworks to sell treasury bills and bonds on behalf of the governments, as instruments for monetary and fiscal policy implementation. These auctions are open to nonresidents except in Tanzania, where non - residents are prohibited from holding government securities. Issued securities are traded over-the-counter and/or in local stock exchanges, although the secondary markets are largely inactive.

In 2010, the size of the EAC debt and equity markets differed across the countries as described by Yabara (2012). Kenya leads the region, with government securities outstanding at 27.3 percent of GDP and with maturities of up to 30 years. Tanzania and Uganda followed with amounts outstanding of 10.3 percent and 8.1 percent of GDP, respectively. These two countries succeeded in extending the maturities of treasury bonds to 10 years in the 2000s. Markets in Burundi and Rwanda were recently instituted. The Central Bank of Burundi started auctioning government securities at end -2006, with

maturities now up to 10 years. Rwanda launched its over-the-counter (OTC) securities market in 2008 and started listing government securities there. A first five-year treasury bond was marketed in Rwanda in 2010, and the OTC market was converted to a stock exchange in January 2011. While the size of the market is relatively large in Burundi, at 8.5 percent of GDP, the market in Rwanda is only 2.2 percent of GDP. In the equity markets, the NSE leads with market capitalization of 46 percent of GDP as of end – 2010, the Dar es Salaam Stock Exchange (DSE) in Tanzania and the Uganda Securities Exchange (USE), had market values of about 15 percent of GDP. The Rwanda Stock Exchange (RSE) had only two companies listed.

The EAC (2013) Protocol on establishment of the East African Monetary specify that the partner states undertake to develop and operate an efficient, stable and integrated financial system. The financial system includes the following sub-sectors; banking, capital and money markets, insurance, retirement benefits, microfinance and other financial services.

2.4 Prerequisites for EAMU

As evident from the experience of the European Monetary Union (EMU), forming a monetary union is a complicated project, and there is a non-negligible risk of failure. It is therefore necessary to ensure that the pre-conditions for forming the EAMU are adequate. This entails making sure that economic, political, and institutional requirements are in place (Durevall, 2011).

The fourth EAC development strategy published in 2011 highlight the political commitment of the EAC member countries to the process. It recognizes the reality that democracy is critical in the achievement of sustainable economic growth and development and the EAC Partner States are working towards greater democratic environment. The EAC partner states have held multi-party elections through transparent and open processes though the greatest hindrance to democratic consolidation in EAC is the perennial conflicts within the horn of Africa and the great lakes region.

On macroeconomic prerequisites for EAMU, Lunegelo and Mbilinyi (2009) summarize the macroeconomic convergence criteria for the EAC member states. The primary criteria include; overall budget deficit to GDP ratio (excluding grants) not exceeding 5%, overall budget deficit to GDP Ratio (including grants) not exceeding 2%, annual average inflation rate of not more than 5% and external reserves of more than 6 months of imports of goods and non-factor services. The secondary criteria include; maintenance of market based interest rates, maintenance of high and sustainable rate of real GDP growth of not less than 7.0%, sustained pursuit of debt sustainability, domestic savings to GDP ratio of at least 20% and maintenance of sustainable level of Current Account Deficit (excluding grants) as a percentage of GDP.

The EAC (2013) investment guidebook indicates that the EAC region has been the second fastest growing economic blocs in the region with an average annual growth of 5.8% from 2001 to 2009, following ASEAN at 6.1%. From the investment guidebook, it is inferred that EAC member countries have diverse economic features; Kenya is the

region's largest economy and is a regional trade, finance, communication and manufacturing hub. Uganda is positioned as the region's food basket and distribution hub, taking advantage of its climate, abundance of arable land, and geography linking Eastern and Central Africa. Tanzania has abundant population, agricultural base and natural resources. Rwanda, famous for its zero-tolerance to corruption, has been ranked as one of the fastest growing economies and is recognized as one of the most reformed economies in the world and one of the most preferred investment destinations. Burundi has been recovering from a civil war but is undertaking significant economic reforms and is currently experiencing rapid growth rates, albeit from a low base.

Rwanda and Uganda have so far eliminated controls on equity and debt securities by both resident and nonresident investors. Kenya, Tanzania and Burundi however still maintain some restrictions especially for nonresident investors as summarized in table 2.1 below.

Table 2.1: Summary of EAC controls on Equity and Debt transactions

Securities	Investors	Burundi	Kenya	Rwanda	Tanzania	Uganda
Equities	**Non Residents**	Purchases may be effected in foreign exchange or in Burundi francs of lawful origin.	- Foreign investors are not allowed to hold 60 percent or more of equities of a listed company. East African investors are treated as local investors. - Local issuance of securities by nonresidents requires approval of the authority.	no controls	- Nonresidents are allowed to participate in the market up to 60 percent of total equities issued by an issuer. -Foreign companies from the EAC may issue securities to the public and be cross-listed at the stock exchange, subject to approval of the authority.	no controls
	Residents	Purchase of foreign securities by residents requires authorities' approval.	Sale or issuance of securities abroad by residents requires authorities' approval.	no controls	- Purchase of foreign securities by residents is permitted, provided such equities are acquired by externally generated funds. Such purchase must be reported. - Sale or issue of securities abroad by residents requires approval of the authority.	no controls

Securities	Investors	Burundi	Kenya	Rwanda	Tanzania	Uganda
Debt	**Non Residents**	Purchases may be made With nonresidents' own foreign exchange funds or in Burundi francs of lawful origin	The same regulations on equity apply.	no controls	- Nonresidents are not permitted to hold government securities. - Purchase of bonds on the stock exchange by a foreign investor is subject to a limit of 60% of total securities issued by an issuer. - Sale or issue of debt securities by nonresidents is not permitted.	no controls
	Residents	Sale or issue of bonds abroad requires authorities' approval.	The same regulations on equity apply.	no controls	- Purchase of securities abroad by residents is allowed only if funded fully by external sources and must be reported. - Sale or purchase of securities abroad by residents requires authorities' approval.	no controls

Extracted from Yabara (2012)

CHAPTER THREE

LITERATURE REVIEW

3.1 Introduction

This chapter undertakes a review of previous studies on regional financial integration both at the local and the global contexts. Section 3.2 outlines the theoretical perspectives upon which measurement of integration of financial markets are based. This is followed in sections 3.3, 3.4, 3.5, 3.6 and 3.7 by a review of the empirical discussions on the study variables and measurements on financial integration together with identifiable conceptual, contextual and methodological study gaps there from. Section 3.7 outlines the proposed conceptual framework for the study as derived from the literature alongside a set of hypotheses derived for the study.

3.2 Theoretical Perspectives

This study is premised on the optimum currency area (OCA) theory supported by other theories discussed herein. OCA is the guiding paradigm given that EAC member countries have ratified a single currency protocol and the implementation process is ongoing. The adaptive markets hypothesis (AMH) based on the argument that the impacts of the competitive forces on financial market participants determine returns are also incorporated.

Though there is lack of consensus on the application of the terms optimal and optimum in the OCA theory, differences in member country economic status and institutional complexities in EAC affect the law of one price in the financial markets as envisaged in

the purchasing power parity theory (PPPT). The role of states in the integration process is explained in the hegemonic stability theory (HST) which focuses on production of international stability (international economic infrastructure) where free trade is dependent on presence of a state that plays the role of a hegemony.

3.2.1 Optimum Currency Area Theory

Studies in economic integration make reference to the optimum currency area (OCA). The originators of OCA notably Mundell (1961), McKinnon (1963), Kenen (1969) define a common currency area in terms of the extent of free trade and factor mobility. Tavlas (1993) and Tjirongo (1995) suggest that literature on OCA address two issues, namely, the advantages and disadvantages of adopting a common currency, and the characteristics that are desirable for countries to consider monetary integration. These characteristics are: degree of labor mobility and/or wage and price, incidence of asymmetric shocks, degree of openness or trade integration, size of an economy, similarity of industry structures between two economies, degree of product diversification and level of fiscal integration.

In answering the question on how the world should be divided into currency areas, Mundell (1961) argues that the stabilization argument for flexible exchange rates is valid only if it is based on regional currency areas. The investigation distinguishes three policy objectives: full employment, price stability and external balance.

As postulated in the OCA theory, countries that are highly integrated with each other, with respect to international trade in goods and services, are more likely to constitute an OCA. However, the studies based on this framework pay little attention to the differences in characteristics among economies in the real world especially considering that international trade pattern and international business-cycle correlation is endogenous and levels of factor mobility are diverse between states. Though there is endogeneity of international trade patterns and business cycle correlation, differences in member country economic status, institutional capacities and reaction to asymmetric shocks and the lack of a consistent approach to membership cost benefit analysis, OCA is one theoretical underpinning upon which financial market integration in a diverse economic set up can be analyzed. The intention of the EAC to establish operate as a monetary union with a single regional currency is considered in this study with a focus on the desirable member characteristics for monetary integration.

3.2.2 Hegemonic Stability Theory

The theory of hegemonic stability is widely employed as an explanation of regime dynamics in international relations. An argument that the theory of hegemonic stability is not a single theory but is composed of two distinct theories namely leadership theory and hegemony theory was advanced by Lake (1993). Leadership theory builds upon the theory of public good and focuses on the production of international stability also referred to as international economic infrastructure. Hegemony theory seeks to explain patterns of international economic openness where free trade is seen as dependent on the presence of a hegemon for whom benefits of supporting international openness would outweigh the costs. Heather, Porter and Roberge (2004) argue that trans-border

integration is driven and shaped by powerful states rather than by forces endogenous to markets.

Criticism on hegemony theory by Snidal (1985) is premised on the provision of public goods by the hegemon regime. In the East African context, no country plays the hegemon state status as all the participants support the development of the regional economic infrastructure. It is notable however in the current study that some countries such as Kenya have relatively more developed economies than the others in the region, a position that may be causing a hegemonic state perception.

3.2.3 Adaptive Markets Hypothesis

The Adaptive Markets Hypothesis (AMH) introduced by Lo (2005) is based on the argument that the impact of the competitive forces on financial institutions and market participants determines the efficiency of markets and the waxing and waning of investment products, businesses, industries and, ultimately, institutional and individual fortunes.

The application of adaptive markets framework guides the analysis of market linkages and financial market return convergence considering that the returns in individual identified market segments are dependent on the environmental factors characterizing the markets. The degree of market efficiency in this framework is related to environmental factors characterizing market ecology such as the number of competitors in the market, the magnitude of profit opportunities available and the adaptability of the market participants.

Application of adaptive markets framework guides the analysis of market integration in EAC in the current study. The study considers that the returns in regional market segments are dependent on environmental factors that also include member market geography and institutions therein.

3.2.4 Market Microstructure Theory

The study of securities market microstructure, deals with the behavior of the participants in the securities markets and the effects of information and institutional rules on the economic performance of those markets. These institutional factors may arise from technology, tradition or regulation (Flood, 1991). Market Microstructure is of significance because of the vast amounts of wealth which pass through the securities markets every day. Micro structural analyses of financial markets give insights into traders' behavior and the effect of various institutional arrangements.

In the words of O'Hara (1995), "Market microstructure theory is the study of the process and outcomes of exchanging assets under explicit rules". This suggests that the organization and regulation of trading in securities markets have important implications for the process of price formation and more generally for all characteristics of these markets.

Interaction between organizational features of a market and the behavior of heterogeneous traders is a crucial issue in the working of actual markets as it affects important variables such as the volume of trade, the degree of liquidity and transaction costs, price volatility and information processing. Heterogeneity may concern risk

aversion, needs for liquidity, assets preferences, beliefs, information as well as learning processes and reaction dynamics (Calamia, 1999). Institutional quality measure of rule of law that is considered in this study affects individual EAC member countries securities markets microstructure.

3.2.5 Purchasing Power Parity (PPP) Theory

The concept of purchasing power parity was explained by Cassel (1918) who distinguishes the relative version of PPP from the absolute PPP. Relative PPP emphasizes arbitrage across time rather than across space and explains that the exchange rate will adjust to offset inflation differentials between countries. Rogoff (1996) show that prices of similar goods ought to be the same in different currencies or exchange rate changes should offset international differences in price movements or inflation rates.

Direct testing to determine the degree of international market integration is carried out by examining the validity of various international parity conditions. Analysis of short time series spans conclude that parity conditions fail to hold. On the contrary, studies that use much longer-run time series or panel data series argue that in the long run, parity conditions do indeed hold.

Though this study uses panel data of returns over the years from the various market segments, the short and long run parity conditions may not suffice in an emerging economy financial markets context because the markets do not operate within the confines of perfect inter-country commodity or return arbitrage.

Although these theories reviewed may be relevant to this study, the study will however be anchored on the OCA theory considering that there are efforts towards introduction of a common currency in the EAC. AMH theory applies on the adaptability of the markets.

3.3 Determinants of Financial Markets Integration

In the European Union, Lemmen and Eijffinger (1996) identify and classify the potential determinants of financial markets integration as; Monetary, Fiscal, Political, Institutional and Structural. The Monetary determinants are inflation, domestic credit and broad money. Fiscal determinants are government deficits to GDP. Political determinants are the proxies for the political leaning of the government and the political instability of the countries. Institutional determinants are the proxies for independence of the central bank and the flexibility of the exchange rate arrangement. Structural determinants are either financial structure or economic structure. Relevant financial structure determinants are the government to GDP and the ratio of broad money over narrow money. Relevant economic structure determinants are ratio of current account balance to GDP, unemployment rate, productivity of the business sector, ratio of gross fixed capital formation to GDP and openness of the economy.

Economic determinants of stock market integration are postulated by Bracker, Docking and Koch (1999). The statistically significant determinants on a regression model are established as; geographical distance between markets, size differential across markets, time trend, dummy variables for different blocks of countries whose trading hours overlap and real interest differential between markets. Portes and Rey (2000) explain that

up to 70% of variations in cross border equity transactions flows are explained by market size, openness, efficiency of transactions and distance.

The effect of international politics on the nature and dynamics of the international economy is argued by Gilpin and Gilpin (2000). Although technological advance and the interplay of market forces provide sufficient causes for increasing integration of the world economy, the supportive policies of powerful states and cooperative relationships among these states constitute the necessary political foundations for a stable and unified world economy. The international rules (regimes) that govern international economic affairs cannot succeed unless they are supported by a strong political base.

3.4 Empirical Review

There is a wide range of studies by Mkenda (2001), Azmani-Saini *et al.* (2002), Hearn and Piesse (2002), Yang *et al.* (2003), Weber (2006), Adjasi and Biekpe (2006), Maneschiold (2006), Buigut and Valev (2007), Carrieri *et al*. (2007), Onay (2007), Simpson (2008), Kishor and Ssozi (2009), Bekaert and Harvey (2011), Khan (2011), De Nicolo (2012), Yabara (2012), Kaijage and Nzioka (2012) and Saleem (2013) that investigate integration relationships in financial markets. The methods used to scrutinize financial markets integration in these studies include beta and sigma convergence, Johansen cointegration, recursive cointegration, granger causality, vector auto regressive (VAR) models, vector error correction mechanism (VECM) and autoregressive conditional heteroskedasticity (ARCH) models.

3.4.1 Convergence in Financial Markets

Researchers such as Quah (1993) and Friedman (1994) have emphasized that convergence is a proposition regarding dispersion of the cross sectional distribution of income and growth rates. According to this view, instead of judging indirectly and perhaps erroneously through the sign of Beta (β), convergence should be judged directly by looking at the dynamics of dispersion of income level and/or growth rate across countries. This gave rise to the concept of Sigma (σ) - convergence, where σ is the standard deviation of cross - sectional distribution of income level or growth rate.

Price based measures of β and σ convergence proposed by Adam, *et al*. (2002) have been applied in empirical studies to measure integration. While explaining convergence, Islam (2003) clarifies that convergence in terms of growth rate requires β - convergence which follows from the assumption of diminishing returns and implies higher marginal productivity of capital in a capital poor country. This is explained that capital deepening continues until the economy reaches a state where capital labour ratio remains constant.

On Beta and Sigma convergence that are applied in this study, Monfort (2008) explain that while β - convergence focuses on detecting possible catching-up processes, σ - convergence simply refers to a reduction of disparities among regions in time, the two concepts are of course closely related. Formally, β - convergence is a necessary condition but not sufficient condition for σ - convergence.

Beta - convergence is a process in which poor regions grow faster than rich ones and therefore catch up on them. This is in line with neo classical growth theory which presumes that factors of production, in particular capital, are subject to diminishing returns. Diminishing return implies that the growth rate of poor economies should be higher and their income and/or GDP per capita levels should catch up with those of rich economies over time. Complexity of measuring integration is explained by Monfort (2008) in the argument that there are several definitions of convergence and although coherent, they correspond to different concepts of convergence and there is no known measure capable of capturing all aspects of the convergence process.

3.4.2 Measurement of Financial Markets Integration

There has been an emergence of various models in studies on financial markets integration. Bekaert and Harvey (1995) measure integration by a regime probability, that is, the likelihood that a market is integrated. The measure, arising from a conditional regime switching model describes expected returns in countries that are segmented from world capital markets in one part of the sample and become integrated later in the sample. Bekaert and Harvey (1997) compute the ratio of equity market capitalization to GDP and the ratio of trade to GDP to measure the levels of market integration. When these ratios are large, the markets are said to be integrated. The former measure is used in the current study as a market geography variable for measuring financial deepening policy of the integrating countries.

An intuitive measure of capital market integration or segmentation that accounts for investment barriers and does not rely on a specific asset pricing model is advanced by Nishiotis (2006) who uses the price differential between closed-end fund price and their net asset values to measure the levels of market integration or segmentation. Using cointegration analysis, the model establishes capital market segmentation that can be compared across countries and through time.

To investigate the integration of eight emerging markets, Carrieri, *et al.* (2007) focus on the impact of substitute assets, such as industry portfolios, country funds (CFs) and American Deposit receipts (ADRs) since theoretical models suggest that the substitute assets allow investors to duplicate returns on available emerging market assets through homemade diversification thereby effectively integrating emerging markets even though explicit barriers to portfolio flows may be in place. Using GARCH approach, the study estimates the degree and variation through time of market integration. An integration index is developed which exploits the model prediction that if markets are fully integrated, only global systematic risk is priced, whereas under complete segmentation, only local market risk is priced. The study establishes that mild segmentation has been a reasonable characterization for emerging markets. While none of the countries appear to be completely segmented, there are wide ranges in the degree of integration. Pricing tests suggest that local risk is still an important factor in explaining time variation of emerging markets returns.

A valuation - based measure of market integration is proposed by Bekaert, *et al*. (2011). In this measure, the degree of a country's integration compared with the world benchmark is measured by the weighted aggregated difference between local and global industry earnings yields. The measure characterizes both the time series and cross country variation in observed segmentation. The study finds that openness of equity markets to foreign investors plays a pivotal role in explaining cross country differences in valuation differences, but so does the institutional environment and local financial market development. Variables reflecting global risk conditions such as the US credit spreads, also account for a significant proportion of segmentation variation.

A proxy measure of relative degree of financial integration is developed by De Nicolo and Juvenal (2012). The measure (ISPEED) is given by the distance of the market excess returns of a country from the mean as a measure of central tendency of the cross – country distribution of market excess returns in a particular sample. This measure captures a ranking of a country's financial integration within a group. The higher the level of financial integration in a region, the smaller should be the cross-sectional average of the distance of countries' excess returns from the region's central tendency.

3.4.3 Granger Causality in Financial Markets

Since 1969 when Granger offered definitions of causality as unidirectional, feedback and independence, research studies by Granger, *et al*. (1998), Sifunjo (1999), Muhammad, *et al*. (2003) and Phylaktis and Ravazzolo (2005) have explored causality relationships between intra country foreign exchange and equity markets. Granger causality techniques are explained by Cheng and Lai (1997) that a variable x_t is said to granger cause y_t if the prediction of the current value of y_t is improved by using past values of x_t.

In some integrated equity markets, granger causality techniques have been applied to investigate equity market relationships. Azmani - Saini, *et al*. (2002) uses weekly share index data spanning January 1988 to August 1999 to investigate whether or not causality is present among the ASEAN–5 equity markets in the long run. The results of the Granger non-causality test reveal that Singapore stock prices were not affected by other countries in the long run except from the Philippines. The results support the view that the Singapore stock market is not inclusive in the region's common trend and thus there exist opportunities for beneficial international portfolio diversification.

In the SACU markets, Hearn and Piesse (2002) tests markets that are integrated for evidence of granger causality through an error correction mechanism. Using monthly aggregate all share indices for the period 1990 to 2000, the study finds that causality in terms of co - dependencies on each other's lagged indices runs from South Africa to both Namibia and Botswana. Thus, South Africa has a leading position with respect to Botswana and Namibia, and therefore prices on the Johannesburg stock exchange (JSE) influence those in the other markets, while the reverse does not hold.

Relationship between Sao Paulo Stock Exchange (BOVESPA) and Istanbul Stock Exchanges were studied by Onay (2007) for a ten year period between 1995 and 2005. Using weekly closing stock price series of IBX and ISE100 indexes denominated in local currencies and converted to natural logarithms, the study applies Granger causality test which reveal a causal flow from IBX index to ISE100 index, suggesting a one-way lead-lag relationship amongst the markets.

At the GCC, Simpson (2008) applies the granger causality test using daily market indices for the period 2000 to 2003. Pair wise granger causality test found that there is no causality between the UAE and Bahrain and the UAE and Oman markets. However, the UAE granger causes Saudi Arabia, Kuwait and Qatar markets. The foregoing studies at the GCC, IBX and ISE, SACU and ASEAN indicate varied causality and non causality relationships which may be dependent on the context of the markets under investigation.

3.4.4 Cointegration Analysis in Financial Markets

Cointegration analysis establishes relationships between non stationary economic variables. Cheung and Lai (1993) illustrate that while non stationary economic series can wander widely through time, economic theory often suggests that specific sets of variables should obey certain long run equilibrium constraints. If individual economic series are stationary only after differencing but a linear combination of their levels is stationary, then the series are said to be cointegrated. Johansen (1988, 1991) proposes a maximum likelihood (ML) method for estimating long run equilibrium relationships or cointegrating vectors and derives likelihood ratio (LR) tests for cointegration.

Equity market integration, measured through the identification of common mutual long run stochastic trends using cointegration techniques, has been the basis of studies by Mkenda (2001), Yang, *et al*. (2003), Weber (2006), Adjasi and Biekpe (2006), Maneschiold (2006), Onay (2007), Khan (2011), Yabara (2012) and Kaijage and Nzioka (2012). The Johansen and recursive cointegration techniques have been applied in studies to measure stability of long run relationships in equity markets. Studies by Khan (2011),

Weber (2006) and Yang, *et al*. (2003) favor recursive cointegration over Johansen cointegration technique because it is able to reveal evolving patterns in long-run relationships.

Generalized Purchasing Power Parity (GPPP) model was employed by Mkenda (2001) to analyze the suitability of the EAC for a monetary union using the optimality indicators namely degree of factor mobility, openness, degree of product diversification, flexibility of prices and wages, similarity in industrial structures, high co-variation in economic activities, similar inflation rates and political factors. Political factors are measured in terms of strong political will by government leaders and strong public support for economic integration. This model postulates that the determinants of real exchange rates (economic fundamentals such as income and the terms of trade) should move together if a region is an OCA. Thus, the real exchange rates of these countries should be cointegrated. The study uses cointegration methods to find if the prospective countries' macroeconomic variables exhibit long-run relationships. The study establishes cointegration between the real exchange rates in the three erstwhile EAC member countries namely Kenya, Uganda and Tanzania for the period 1981 to 1998 which suggest that they are affected by similar stochastic trends.

While applying a recursive cointegration approach to derive any evolving integration patterns, Yang, *et al*. (2003) examines whether long-run integration between the US and other international markets has strengthened over time. Using monthly equity market indices for fifteen markets for the period 1970 to 2001, the study finds that there exists no

long-run relationship between most of these markets and the US though it further confirms integration between smaller markets and the US when no such pattern emerges for larger markets. Since market size is a distinguishing parameter in the relationships observed in this study, the findings leads to the question: what would be the effect of market size on financial markets integration proxied by existence of long run relationships?

Cointegration and error correction modeling applied by Adjasi and Biekpe (2006) show two long run stable co integration relationships, one hinging on a larger market (South Africa) and the other on a smaller market (Ghana). The study adopts a dynamic vector autoregressive regression (VAR) which explores both co -integration and Granger causality possibilities whose essence is to capture the causal dynamics between stock market returns computed from monthly share indices, and at the same time to observe the long run dynamics. VAR models are defined by Geda, Ndung'u and Zerfu (2012) as a multivariate stochastic time series model in which each variant is expressed as a function of lagged values of its own and other variables in the system. The classification of the seven selected financial markets in Africa as large and small based on their average capitalization also raises the fundamental question on the effects of market size on financial market integration.

In the EU, Maneschiold (2006) applies the Johansen cointegration technique to analyze the existence of long-run relationships among Baltic stock markets and international stock markets (including US, Japan, Germany, UK and France). Using daily data, the

study constructs the market return as the logarithm and first difference of each equity index for the individual stock markets and finds that a significant common trend does not exist between the Baltic States and the international markets, or among the Baltic markets themselves except for the Latvian and European markets.

Existence of any long run relationship between the returns of Bovespa and Istanbul stock exchanges which are in distant regions of the world is investigated by Onay (2007) using the Engle Granger causality and Johansen co integration tests. Co movement of the stock markets is analyzed using weekly closing stock price series of IBX and ISE100 indices. The stock price indices are denominated in local currencies so as to obtain cointegration results just based on movements on asset prices by eliminating the effect of exchange rate changes. Cointegration test results present no evidence of pair wise cointegration intimating no long-term relationship between the indices. Considering that the markets under study are in distant locations, the effect of distance on financial markets integration is an aspect that may need to be explained.

Business cycles synchronization in EAC has been investigated by Buigut and Valev (2007) who empirically assess the suitability of the EAC countries for EAMU by testing for symmetry of the underlying structural shocks. Using a two variable VAR model to identify supply and demand shocks for EAC countries, the study identifies and compares macroeconomic shocks to different EAC countries by focusing on shocks to aggregate output growth and inflation. The correlation results indicate that contemporaneous shocks among the EAC countries are mostly asymmetric. Only the contemporaneous supply

shocks for Kenya and Burundi are positive and significantly correlated. However correlations based on the lagged supply shocks show some symmetry related to trade patterns. The correlation results therefore do not show strong support for a currency union at the time of the study but do indicate the importance of more integration.

In a related study, Kishor and Ssozi (2009) use a VAR model to conclude that the EAC is a plausible OCA. By estimating the degree and evolution of business cycle synchronization between the EAC countries, the study finds that the shares of the common shocks in the EAC are low. These conflicting findings may open inquiry on what has changed on the preparedness of the region for EAMU within the two year time span between the studies. One possible explanation would come from the changes in institutional capacities of the member countries over this period of time given the various reforms instituted by partner states in this period.

In the EAC, long run relationships have been analyzed using Johansen cointegration approach by Kaijage and Nzioka (2012) who use monthly secondary data on market indices for NSE, USE and DSE. The study finds absence of long run relationship amongst the equity markets. Yabara (2012) uses weekly and bi-weekly data and finds no cointegration vector in EAC stock prices thereby finding no long run relationship among the EAC stock markets.

Using a bivariate GARCH framework, Saleem (2013) examine the linkage of African stock markets using daily price index data. The stock markets of South Africa, Nigeria, Kenya, Morocco, Egypt and Tunisia are investigated. The study shows direct linkage in terms of returns and volatility between all the six equity markets. South African market is the most integrated market while Kenya's is the least integrated within the African region. The study results suggest that South, East and Western Africa represented by South Africa, Kenya and Nigeria are totally isolated from each other while Egypt, Morocco and Tunisia representing North Africa share common influences both with regard to returns and volatility. Since the study sample excludes other EAC markets, the findings raises questions on how the Kenyan market integrates with the rest of the EAC markets.

Though there is the concurrence on lack of long run relationships for the EAC equity markets in studies by Kaijage and Nzioka (2012) and Yabara (2012), the studies fall short of investigating existence of any evolving patterns on the non cointegration established. Investigations of evolving long run patterns will therefore be one of the contributions of the current study which reviews integration in both equity and money markets hypothesized as: *There are integration relationships between the Kenyan and other EAC financial market segments.*

Size of markets and distance between markets as geographical variables in studies by Onay (2007), Maneschiold (2006), Kaijage and Nzioka (2012), Yabara (2012) and Saleem (2013) may also explain the levels of integration or disintegration evidenced in

the study findings. Further investigations can therefore be modeled with geography as a determining factor when the cointegration level established is reviewed using a recursive technique to derive any evolving patterns.

3.4.5 Degree and Speed of Financial Markets Integration

Taking cognizance of monetary union enlargement activities in EU, Babetskii, *et al*. (2007) tests for existence of integration of financial markets for four new EMU member states using β and σ convergence techniques. The analysis done at the country level and at the sectoral level using weekly stock index averages find that since 2005, stock markets of the Czech Republic, Hungary and Poland started diverging from the euro area stock market and that Hungary and Poland have the lowest degree of stock market integration within the euro area at the end of the period. The study does not suggest the possible reasons for the diverging levels of integration. From the contributions of Sachs (2003), Landes (1998), the current study postulates that market geography and institutions may explain the divergence.

Similarity of industry structure as an OCA indicator for country risks measured by the Herfindahl index is incorporated by Babetskii, *et al*. (2007) to derive return convergence in banking, chemical, electricity and telecommunication industries. Considering that country risk is a geographical attribute, levels of integration and convergence can be further investigated using other market geography attributes other than sector risks.

In conformity with economic growth literature, Kaijage and Nzioka (2012) investigate the extent of financial integration in EAC by examining the degree of return convergence in the stock markets using monthly secondary data on NSE, DSE and USE. The study finds a beta convergence coefficient of 0.61 which imply some level of integration but recommends policy harmonization for further integration. The foregoing analysis is specific to the equity markets where integration is the dependent variable and independent variables are stock indices for the EAC member markets. The current study extends this analysis by deriving both the β - convergence and σ - convergence as the dependent variables over the years and further probes the contributions of specific market geographies and institutional competencies on the integration process.

Recognizing that capital markets in EAC face challenges of low capitalization and liquidity to different degrees, Yabara (2012) find that convergence is taking place to some extent though market integration has not deepened as inferred from σ - convergence. β - Convergence in the stock markets is faster than in treasury bills markets. There is also lack of integration deepening evidenced by divergence in Treasury bill and interbank markets. The study recommends further harmonization of market infrastructure and capacity building of existing regional institutions. Recommendations by Kaijage and Nzioka (2012) on policy harmonization and Yabara (2012) on infrastructure harmonization and capacity development lead to the question: What are the contributions of the market infrastructure and institutional framework to the levels of convergence or divergence in EAC markets?

3.4.6 Market Geography and Financial Markets Integration

The role of country geography in explaining financial flows between countries is articulated by Guerin (2006) who argues that the geographical location of a country may determine its economic and financial integration into the world economy. Lemmen and Eijffinger (1996) test the fundamental determinants of the degree of financial integration and intensity of capital controls in the European Union (EU). The study applies a multiple regression analysis and finds that inflation, government instability and gross capital formation provide explanations for financial integration. Political risks attributed to political stability also influence the differentials from closed interest parity after allowing for realized inflation. Government deficits, current account deficits and productivity in the business sector are also found to explain the intensity of capital controls in the long run.

To investigate why the degree of co movement across different pairs of equity markets varies over time, Bracker, Docking and Koch (1999) regress potential macroeconomic determinants of the extent of same day lead and lag relationships across nine equity markets for a 22 year period. The study results for the same day relationships indicate that geographic distance between markets, size differential across markets, time trend and dummy variables for different blocks of countries whose trading hours are significantly associated. Lead and lag relationships across days display significant association between real interest rate differentials between markets and market size differential.

Variants of the Gravity model have been applied to explain international trade activities that include trade distorting barriers and trade flows by Rose (2002), trade in services by Park (2002), determinants of intra-regional trade by Geda and Kebret (2008), demand for imports of services by Francois, *et al.* (2003), determinants of trade in services by Nicoletti, *et al.* (2003), existence of border effects in closed economies by Okubo (2004), determinants of trade in services by Kimura and Lee (2004) and Lejour and de Paiva Verheijden (2004), export performance by Soderling (2005), determinants of trade flows by Kox and Lejour (2005), and foreign direct investment (FDI) by Blonigen, *et al*. (2007).

One of the first applications of the gravity model to services trade is Francois (2001), where demand for imports of services is modeled as a function of the recipient country's GDP per capita and population. The gravity equation is estimated using OLS and the resulting levels of predicted trade between countries are compared to actual trade flows to calculate tariff equivalents of the barrier to services using a constant elasticity import demand function.

Similar to gravity models found in the trade literature, Flavin, *et al*. (2001) investigates drivers of market returns correlation as a dependent variable when geographical variables of distance, market capitalization, common border, language, colonial links and currency are the independent regressors. The study finds that distance is a key determinant of integration measured as return correlation between cross country equity returns with a negative coefficient. The border exerts a positive and significant impact on the level of

the correlation between the cross country equity returns inferring that stock markets in close proximity move together. The gravity model used in this study is found to have statistically significant explanatory power over cross-country equity return correlation. All of the estimated coefficients are statistically significant at the 5% level with the exception of those on language and colonial links dummies.

Despite encouraging results of the standard model, Flavin *et al.* (2001) develops an asset market model, which is adapted to include additional variables associated with financial markets. The model includes a measure of trading synchronicity (overlapping opening hours), risk (similarities in industrial composition) and effects of corporate governance on inward investment. Informed by contributions from Geda and Kebret (2008), the role played by financial policy as market geography attribute should also be considered in modified asset market gravity models. The findings by Flavin *et al*. (2001) that markets in close proximity move together lead one to pose the question: What is the effect of proximity or adjacency as a geographical variable on the integration process? Considering that market return correlation proxies for market integration in the standard and modified gravity models developed by Flavin *et al*. (2001), the current study hypothesizes that: *There are significant relationships between market geography and integration of financial markets in EAC.*

Application of gravity models in financial markets is also evident in the work of Portes and Rey (2001). The modified gravity model considers the significance of market capitalization, volume of telephone call traffic, number of bank branches and absence of

insider trading, sophistication of financial markets, stock market index variance and correlation of stock market returns as independent regressors that explain gross asset flows between countries. The study findings provide evidence that there is important geographical component in international asset flows and that the international capital markets are not frictionless as they are segmented by informational asymmetries which may explain home bias.

Using data for trade in services and FDI flows from the OECD, Grunfeld and Moxnes (2003) apply a gravity model to the bilateral export of services and FDI flows. The regressors in this study include the level of GDP in the importing and exporting countries, the distance between them, a dummy variable if they are both members of a free trade area (FTA), a measure of corruption in the importing country and a trade restrictiveness index (TRI) to measure the barriers to services trade in the importing country. The TRI is the augmented frequency index based on research by the Australian Productivity Commission. The study findings suggest that trade in services between two countries is positively related to their size and negatively related to the distance between them and barriers to services in place in the importing country (measured by the TRI). Further, the presence of a FTA is not statistically significant in the case of services. This result might be expected as many FTAs do not cover trade in services.

Covariates of growth in international financial integration are also investigated by Lane and Milesi-Ferretti (2003). Variables such as trade openness, GDP per capita, and stock market capitalization are established to be successful in explaining the variation over time in the degree of international financial integration in the EU.

Highlighting that there is a limited amount of research focusing on the determinants of international financial integration theoretically and empirically, Xuan Vinh (2005) empirically investigates the potential drivers of international financial integration and finds that country specific characteristics influence the level of international financial integration. These characteristics are: the policy on capital controls, the degree of economic development, the depth of financial markets, economic growth, the country political and investment environment risk index and the openness of international trade.

The role of real exchange rate volatility in inducing portfolio home bias in equity markets where investors reveal a strong preference for their home countries' equity is explored by Fidora, *et al*. (2006). With a sample of 40 investor countries and 120 destination countries, the study focuses on the importance of real exchange rate volatility in explaining cross-country differences in portfolio home bias and investigates the extent to which exchange rate volatility can account for differences in home bias across financial asset classes (between equities and bonds). The analysis develops a simple portfolio selection model based on an international capital asset pricing model (ICAPM) which incorporates real exchange rate volatility as stochastic deviations from PPP. Given a mean-variance optimization which implies risk aversion of investors, real exchange rate volatility in this model induces a bias towards domestic financial assets because it puts additional risk on holding foreign securities from a domestic (currency) investors' perspective. Typical augmented gravity models have not yet introduced exchange rate volatility as psychological market geography information and further investigation on determinants of financial markets integration should consider the significance of this

variable in a modified gravity model. The current study investigates the influence of exchange rate volatility on market integration.

3.4.7 Institutional Quality and Financial Markets Integration

The ability of a country's institutions to protect private property and provide incentives for investment is advanced by Osili and Paulson (2004) as a key explanation for persistent disparity in financial market development and economic performance across countries.

The link between institutional or legal environment and financial markets development is investigated by Chinn and Ito (2002). The study demonstrates that financial systems with higher degree of legal or institutional development on average benefit more from financial liberalization than those with a lower one. Furthermore, the positive effects of legal or institutional development seem to flow primarily from the degree of shareholder protection and accounting standards.

The effects of changes in the legal environment on equity markets equilibrium is investigated by Lombardo and Pagano (2002). The study documents a positive correlation between the amount of external equity funding and indicators of the general quality of the legal environment (respect for the law and judicial efficiency) as well as specific measures of the protection of shareholder rights vis–a-vis company directors. This positive correlation as resulting from the effect that better legal and judicial institutions have on the severity of agency problems between managers and external shareholders. From the regression analysis, general measures of the quality of the legal

environment appear as important explanatory factors besides betas and idiosyncratic risk. Variables measuring the protection of shareholder rights do not appear to have additional explanatory power. The correlation between respect for the law or judicial efficiency and the risk-adjusted rate of return on equity is found to be positive and statistically significant. The measure for the respect for rule of law or judicial efficiency as applied in this study is not clear. Further work could apply measures of the legal environment and efficiency of the court system like the time it takes to resolve business disputes in the court system.

Using quarterly data on institutional quality indicators and bilateral capital flows for nineteen source countries and fifty one recipient countries for the period 1984 to 2002, Papaioannou (2004) investigate how various types of institutional arrangements impact cross-border bank flows. The standard gravity model applied in the study models bank flows as a function of the distance between the two countries and their size. The augmented gravity model that incorporates a political risk rating is highly successful with inferences that political risk is highly significant as the model explains more than half of the gross bilateral bank flows variability. The study also unbundles the institutional index by considering the effects of specific institutional characteristics on international bank flows. The findings confirm that a corrupt bureaucracy acts like a tax and discourages foreign banking investments, banks are unwilling to invest in countries with inefficient legal systems, corporate governance practices are quite important and government ownership of the banking sector strongly hampers foreign bank investment. Taking cross border foreign bank flows as a proxy for financial markets integration, the findings of this

study leads to the hypothesis: *Rule of law positively influences integration of financial markets in EAC.*

3.4.8 Political Stability and Financial Markets Integration

The link between political instability and asset markets and investments is studied by Robin, Liew and Stevens (1996) who finds that political risk is a determinant of asset returns in emerging markets than in developed markets. Bussiere and Mulder (1999) establish that including political variables in economic models significantly improve the ability of those models to explain economic crises.

Effect of politics on investments in developing countries is studied by Feng (2001) in a framework where political freedom and political instability are different sources of impediments or boosts to private investment. The study findings from linear regression analysis indicate that political freedom promotes private investment. Further, political instability has a negative effect on investment and policy uncertainty measured by variability of government capacity adversely affects private investment. Though the study findings are not specific to investments in financial markets, there is need to investigate the effects of the three political dimensions on financial markets activities which also include financial markets liberalization and financial markets integration.

The impact of Political stability amongst other determinant variables on FDI flows to Africa is investigated by Asiedu (2002). Applying a linear regression model with the ratio of FDI to GDP as the dependent variable, the study posits that political instability deter

FDI in Africa. The study results from 22 countries suggest that corruption and political instability have a negative effect. Though FDI is an international investment flow, it does not illustrate financial integration amongst the donor and host countries thereby raising the question; Does political instability affect the relationship between geography and financial markets integration?

While summarizing past studies, Gwartney, *et al*. (2004) emphasize three different types of explanations for differences in economic activities across countries. One explanation takes the production function approach based on the work of Solow (1956). A second approach by North (1990) and Landes (1998) explains the differences as a function of institutions. As explained by (Fligstein, 1996), institutions refer to shared rules, which can be laws or collective understandings, held in place by custom, explicit agreement, or tacit agreement. These institutions can be called property rights, governance structures, conceptions of control, and rules of exchange and they enable actors in markets to organize themselves, to compete and cooperate, and to exchange. A third approach promoted by Sachs (2003) points to the effects of geography and location. The relationship between integration as an economic activity on one hand and geography, institutions and political stability on another hand is therefore hypothesized as: *The joint effect of market geography, institutional quality and political stability is greater than the sum of the effects of the individual variables on integration of financial markets in EAC.*

3.5 Summary of Literature

Table 3.1 summarizes in a chronological order the studies reviewed and highlights the findings and research gaps. Studies on integration in EAC financial markets indicate none deepening of integration with some divergences or convergences. Though gravity models have been applied in explaining trade, they are yet to be applied in explaining financial markets integration trends. From the review, financial integration is determined by market or country characteristics.

In the context of the EAC financial markets, studies have investigated the levels and speed of financial markets integration and have reached a consensus on none deepening of integration. Reasons for none deepening with a focus on drivers of integration especially specific market characteristics which may be geographical attributes, institutional establishments or political environment are yet to be investigated. It is also noted that concluded studies reject the proposition of existence of long run integration relationships amongst the financial market segments which is inconsistent with expectations of improved relationships supportive of regional integration agenda.

Table 3.1: Summary of Research Gaps

Researcher(s)	Focus of Study	Study Model/ Variables	Findings	Research Gaps	Addressing the gaps in the current Study
Saleem (2013)	Linkage of African stock markets.	GARCH Model	There are direct linkages between the African stock markets in terms of returns and volatility. South African market is most integrated and Kenya is least integrated.	The study context excludes other EAC partner state financial markets and does not explain the contributions of market geography and institutional development levels to the integration levels evidenced.	Study revisits integration to make sense of short run linkages between EAC financial markets in terms of returns and shocks on the returns, long run co integration relationships and patterns, convergence and the effects of geography and institutional capacities on financial markets integration.
Kaijage and Nzioka (2012)	Extent of financial integration in EA using stock market convergence and co integration with data from 2007 to 2012.	Beta Convergence: $\Delta_{Si,t}=\alpha+\beta_{Si,t-1}+\sum_{1=1} y_1\Delta_{Si,t-1}+\varepsilon_{i,t}$ Co Integration: $I = \alpha+\beta i^*$	Level of integration is evidenced by a beta coefficient of 0.6. Absence of long run equilibrium. Integration between USE and NSE is stronger than that between DSE and NSE with a not	Study recommends rigorous econometric analysis of the levels of financial integration that control for other variables. The study particularly calls for sigma convergence analysis. The	The study analyses both the degree and speed of equity market integration using β and σ convergences. It further examines direct linkages between the equity and money markets.

Researcher(s)	Focus of Study	Study Model/ Variables	Findings	Research Gaps	Addressing the gaps in the current Study
Kaijage and Nzioka (2012)			significant difference in Beta convergence between Uganda and Tanzania.	proposed analysis can be enriched by incorporating direct linkages between the financial markets using techniques like VAR, VECM, IRF and VDs.	Specific market geography and institutional quality indices are incorporated to establish their effects on the levels of convergence (integration).
Yabara (2012)	Investigating whether actions taken under the EAC framework have succeeded in advancing financial markets integration.	Beta Convergence Sigma Convergence Johansen Co integration analysis	Cointegration analysis suggests no long run relationship in EAC stock markets. β - Convergence indicate convergence of interest rates and stock returns in treasury bill markets of Kenya, Rwanda and Tanzania and the stock markets of Kenya, Tanzania and Uganda respectively. Sigma convergence analysis suggests that financial integration has not deepened.	Study recommends strengthening the capacity of regional organizations and harmonization of market infrastructure. The study does not explain the sensitivity of the integration process to these identified institutions. Though findings point to no long run co integration relationships, Direct linkages, if any should also be derived.	The study analyses both the degree and speed of equity market integration taking cognizance of the contributions of institutions and geography. Direct linkages are also explored especially regarding returns and shocks on the returns thereon.

Researcher(s)	Focus of Study	Study Model/ Variables	Findings	Research Gaps	Addressing the gaps in the current Study
Buigut (2011)	Convergence and Co – movements of exchange rates, real exchange rates, monetary base and real GDP.	ζ_{max} (r, r+1) = -Tln(1-ζ_{r+1}) Macro-Economic Convergence	Partial Convergence of the independent variables (exchange rates, monetary base and real GDP) implies costs for EAC member countries from an integration process.	The study explores macro – economic convergence. It is silent on degree and speed of financial market return convergence. Macro-economic convergence can also be studied while taking cognizance of the significance of economic geography and institutions that have been put in place.	Study reviews the speed and degree of convergence of returns in financial markets. It attempts to explain the convergence or lack of it with the possible determinants.
Espinoza, *et al*. (2011)	Assessment of the levels of money market integration in GCC for the period 1993–2009.	Interest rate Convergence: Sigma Convergence and Beta Convergence.	There is strong evidence of financial integration. The cross-country standard deviation of interest rates had a negative trend i.e. Convergence to the zero level.	The study does not elucidate the relationship between geography, institutional capacities and n relationships evidenced in the study. Direct linkages in returns and volatility of the returns are not documented.	Effects of equity markets geography & institutional quality on the long run relationships established is explored. Direct linkages on returns and volatility of returns between markets are also investigated.

Researcher(s)	Focus of Study	Study Model/ Variables	Findings	Research Gaps	Addressing the gaps in the current Study
Falagiarda (2010)	Investigating suitability of EAC as an OCA	G-PPP Cointegration: $rer_{12t}=\beta_0+\beta_{13}rer_{13t}+\beta_{14}rer_{14t}+..+\beta_{1n}rer_{1nt}+\varepsilon_t$	EAC may form an OCA as co integrating vectors have been found. It suggests that greater monetary policy co-ordination is needed.	A limitation of GPPP is that relationships between variables reflect combined effects of shocks which are influenced by other variables	The study investigates speed and degree of convergence in markets considering the effects of institutional quality variables and market geography.
Kishor and Ssozi (2009)	Investigating whether 5 EAC countries constitute an OCA.	VAR model, State Space Model, Time Varying parameters model	Shares of the common shocks in the EAC are low but business cycles have become more synchronized since the EAC treaty came into force in 2000.	An investigation on the relationships between financial markets integration, country characteristics and business cycles synchronization in EAC is necessary.	This study modifies the gravity model to explain financial markets integration in EAC by incorporating specific country characteristics.
Babetskii, *et al*. (2007)	Existence of financial integration of four new EMU member states using data for the period 1995 – 2006 at country level and at sector level.	Beta convergence and Sigma convergence techniques.	The beta coefficients are close to 1 for all countries. Since 2005, stock markets of the Czech Republic, Hungary and Poland started diverging from the euro area stock market.	The study falls short of explaining the divergence from euro area using specific country characteristics. These may be institutional or geographical characteristics.	The study starts by establishing the market linkages. The long run relationships established are also explained by other institutional quality variables other than sectoral risks and market geography.

Researcher(s)	Focus of Study	Study Model/ Variables	Findings	Research Gaps	Addressing the gaps in the current Study
Onay (2007)	Investigating the long term financial integration of Bovespa and Istanbul Stock Exchanges	Engle Granger Causality Johansen Cointegration	There is no evidence of pair wise co integration indicating that there is no linear long-term relationship between the IBX and ISE100 indexes. Results of causality test show that IBX index granger cause ISE100 index unidirectional, suggesting a short-run lead - lag relationship amongst the markets	IBX and ISE are in different geographical locations with divergent institutional capacities, there should be attempts to explain the contributions of these variables on the absence of a long run relationship and the presence of short-run lead lag relationship between the markets.	The countries in the sample are in the same region with different geographical contexts and institutional capacity which are incorporated in assessing financial markets integration.
Buigut and Valev (2007)	Assessment of the suitability of the EAC countries for EAMU.	VAR model	Results do not show support for a currency union at the time of the study	Study recommends policy harmonization but does not identify policies to be harmonized before implementation of integration.	The study probes various institutional competencies for the member countries and if it has effect on financial market integration. It applies a VAR system to establish relationships between returns which are treated as endogeneous.

Researcher(s)	Focus of Study	Study Model/ Variables	Findings	Research Gaps	Addressing the gaps in the current Study
Vajanne (2007)	Assessment of integration of retail banking in the euro area.	Beta Convergence and Sigma Convergence	There is evidence of a process of convergence in retail banking credit interest rates for households and non-financial corporations.	Lack of integration should also be attributed to differences in regulation in the banking industry which is within the member country's institutional arrangements and policies.	This study introduces a modified gravity model for financial integration that incorporates market geography and institutional quality of integrating financial markets.
Adjasi and Biekpe (2006)	Examining links between African stock markets	Vector Autoregressive (VAR) models	There are two strands of stable co integration. One hinged on a larger market (South Africa) and another hinged on a smaller market (Ghana)	Market size is one geographical attribute that influences integration. Its effect on the different strands of integration should be examined.	Market size proxied by market capitalization is incorporated in the analysis as a market geography attribute that explain integration of financial markets alongside other variables.
Fidora, *et al*. (2006)	Investigation of importance of real exchange rate volatility in explaining cross-country differences in portfolio home bias	ICAPM	The real exchange rate volatility in the model induces a bias towards domestic financial assets because it puts additional risk on	The augmented gravity model has not introduced exchange rate volatility as psychological market geography that affects the levels of	The economic freedom index (EFI) introduced in the gravity model accounts for regime exchange rate volatilities.

Researcher(s)	Focus of Study	Study Model/ Variables	Findings	Research Gaps	Addressing the gaps in the current Study
Fidora, *et al*. (2006)			holding foreign securities from a domestic (currency) investors' perspective.	home bias.	
Papaioannou (2004)	Investigation of how institutional arrangements impact cross-border bank flows.	Standard Gravity Model Augmented Gravity Model	Distance between trading partners, size, corruption levels, legal systems and corporate governance explain levels of international bank flows.	The study models size of a country in terms of population and distance in terms of road network. Since bank flows are weightless, physical distance may not affect the flows. The psychological distance measure should be modeled as well.	This study models financial integration as a function of market psychological geography aspects where size is in terms of capitalization and distance is in terms of Remoteness between the trading partners.
Yang (2003)	Examining whether long-run integration between the US and many other international stock markets has strengthened over time.	Recursive Cointegration Analysis	The study concludes that there exists no long-run relationship between most of the international markets and the US. It documents evidence of integration between smaller markets and the US.	The study investigates markets in different geographical locations with diverse institutional competencies. Their contribution to established levels of integration should be probed.	Study tests the effects of both institutional capacities and market geography on the observed long term market relationships.

Researcher(s)	Focus of Study	Study Model/ Variables	Findings	Research Gaps	Addressing the gaps in the current Study
Flavin, *et al* (2002)	Investigation on what drives stock market correlation by adopting a standard gravity model and a market model.	Multiple Regression Analysis	Distance is a determinant of equity market return correlation. Adjacency has a positive impact on level of correlation. Other variables are trading synchronicity and risk.	The role played by financial policy of the member countries is not incorporated in the modified model. Its inclusion alongside other institutional quality variables may affect the study findings/ results.	The current study incorporates financial policy amongst the equity market geography variables.
Lombardo and Pagano (2002)	Investigating the effects of changes in the legal environment on equity markets equilibrium	Linear Regression Model	A positive correlation between the amount of external equity funding and indicators of the general quality of the legal environment	Other than the legal environment, other determinants of equity markets equilibrium are not probed in the study.	Study context is based on equity market integration alongside other attributes of institutional quality other than legal environment quality.
Portes and Rey (2001)	Determinants of cross border equity flows.	Augmented Gravity model	There is geographical component in international asset flows and international capital markets are not frictionless. They are segmented by informational asymmetries.	The contribution of institutional capacities that protect interests of shareholders and investors is not explored alongside these findings.	The gravity model is modified further to incorporate the role of institutional quality on asset markets integration.

Researcher(s)	Focus of Study	Study Model/ Variables	Findings	Research Gaps	Addressing the gaps in the current Study
Mkenda (2001)	Analyzing suitability of EAC for a monetary union	G-PPP: Generalized Purchasing Power Parity. $r_{12t}=\beta_0+\beta_{13}r_{13t}+\ldots\ldots+\beta_{1m}r_{1mt}+\varepsilon_t$	The real exchange rates between the EAC countries are cointegrated suggesting that the EAC is an OCA.	Though exchange rate volatility is an institutional quality aspect, the study does not consider how geography and institutional capacities affect OCA membership.	The study tests the significance on institutional quality and market geography on the integration process.
Lemmen, J.J.G. and Eijffinger, S.C.W. (1996)	Fundamental determinants of financial integration in the EU.	Cross section time series regression model. The study uses the wald test by applying a bottom up approach. First, it includes monetary determinants of capital control then adds fiscal policy determinants to test whether explanatory power of the regression improves.	The estimates show that realized inflation, government instability and gross fixed capital formation can provide a reasonable explanation of closed interest differentials in the EU.	The variables excluded from the regression model should be investigated further when the lagged values are incorporated. Some have long term effects on integration.	The study uses a VAR system that incorporates lagged values of the determinants of financial markets integration.

Author (2014)

3.6 The Conceptual Framework

A pair of countries financial markets is said to be integrated when there are short and long run relationships on their returns thereby eliminating arbitrage opportunities. For purposes of this study, X_n denotes a financial market segment of a member country of the EAC paired with a Kenyan financial market segment.

Integration relationships are investigated with Kenya market segments as the benchmark markets. Kenya market segments (equity, treasury bill and interbank) are chosen as the benchmark for pairing with other EAC member countries market segments on account of being the largest economy in terms of GDP with relatively sophisticated financial markets and institutions as compared to the other four EAC member countries. Similar studies in the EU and GCC chose Germany and Saudi Arabian markets respectively as benchmarks for measuring integration on similar grounds.

The integration of financial markets in this study is measured in terms of correlation of returns, beta and sigma convergences, cointegration, direct linkages, causality of forecast error variances and responses to shocks. This relationship is expressed as H_1 in figure 3.1 below. Direct linkages and causality relationships are tested in a VAR system that considers the lagged values of the market yields or returns.

Based on the adaptive markets hypothesis (AMH) and the optimum currency area (OCA) theories, it is discernible from the figure that the independent variable is financial market geography which include attributes as Market capitalization, Gross domestic product,

Distance between financial cities, Remoteness, Exchange rate volatility, Financial deepening policy, Common border, Common culture and Colonial ties. Geography attributes have been applied in gravity models to explain trends in international financial flows. Consistent with the works of Sachs (2003), this study proposes that geography directly affects integration of financial markets in EAC as expressed by H_2.

Barriers to trade in are measured using diverse approaches including ease of doing business, trade restrictiveness and economic freedom. This study contends that a country's institutional framework measured by the worldwide governance indicator (WGI) of rule of law influences integration of financial markets by mediating the effects of market geography as expressed by H_3. Contributions of institutions to international trade, is supported in arguments by Landes (1998) and North (1990).

In formation of a currency area, political factors are important. Jonung and Sjoholm (1998) explain that a strong political will by leaders and public support is required. Political stability indicators are used as a determinant of stock market development in Kenya by Aduda, et al. (2012). This study proposes that political stability has an effect on the integration of financial markets by moderating the contributions of market geography as expressed by H_4. The joint effect of market geography, institutional quality and political stability on integration of financial markets is presented by H_5.

3.6.1 Research Hypotheses

This study will test the following hypotheses:

H_1: There are integration relationships between the Kenyan and other EAC financial market segments.

H_2: There are significant relationships between market geography and integration of financial markets in EAC.

H_3: Rule of law positively mediates the relationship between market geography and integration of financial markets in EAC.

H_4: The influence of market geography on financial markets integration in EAC is moderated by political stability.

H_5: The joint effect of market geography, institutional quality and political stability is greater than the sum of the effects of the individual variables on integration of financial markets in EAC

Figure 3.1: The Conceptual Model

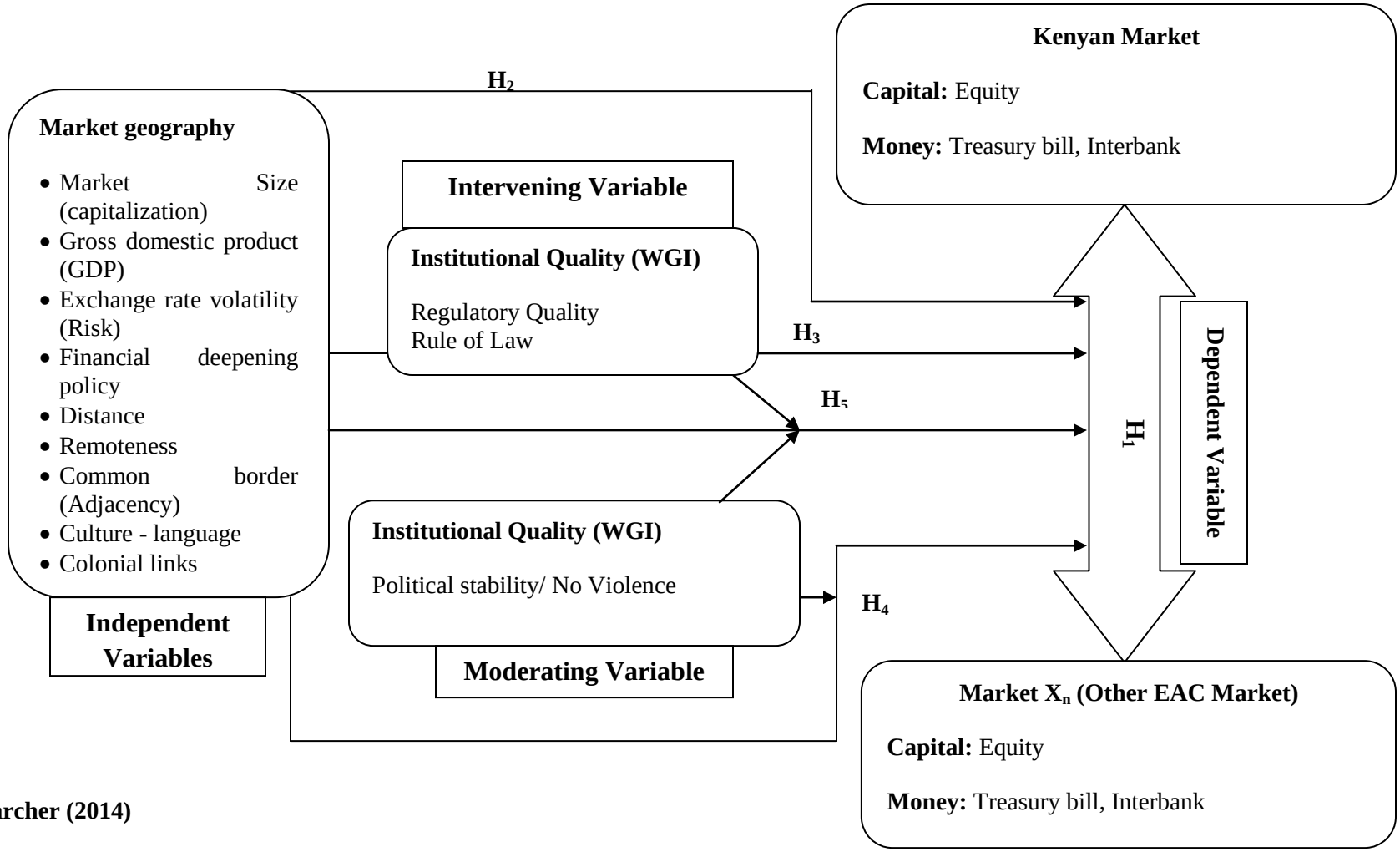

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Table 3.2 below summarizes the five derived research hypotheses for the study and links the respective hypotheses to the research objectives that the current study addresses.

Table 3.2: Summary of hypothesis and Corresponding objectives

No	Objective	Hypothesis
1	Establish integration relationships between Kenyan and other EAC financial market segments.	H_1: There are integration relationships between the Kenyan and other EAC financial market segments.
2	Determine the relationship between market geography and financial markets segments integration in EAC.	H_2: There are significant relationships between market geography and integration of financial markets segments in EAC.
3	Investigate the influence of rule of law on the relationship between market geography and financial markets segments integration in EAC.	H_3: Rule of law positively mediates the relationship between market geography and integration of financial markets segments in EAC
4	Establish whether political stability moderates the influence of market geography on financial markets segments integration in EAC.	H_4: The influence of market geography on financial markets segments integration in EAC is moderated by political stability
5	Probe the joint effect of market geography and institutional quality on financial markets segments integration in EAC.	H_5: The joint effect of market geography, institutional quality and political stability is greater than the sum of the relationships of the individual variables and integration of financial markets segments in EAC

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CHAPTER FOUR

RESEARCH METHODOLOGY

4.1 Introduction

This chapter presents the research methodology applied in this study. It discusses the research philosophy in section 4.2, research design in section 4.3 and the target population in section 4.4. Study variables operationalization is outlined in section 4.5 as the data collection methods and research procedures are discussed in section 4.6. Section 4.7 presents the various data analysis approaches adopted in the study.

4.2 Research Philosophy

To guide the research effort, research strategy is founded on an appropriate research philosophy selected from four options namely: positivism, constructivism or interpretivism, advocacy participatory and pragmatism. Saunders, Lewis and Thornhill (2007) explain that research philosophy can also be categorized into positivism, interpretivism and realism depending on the researcher's philosophical thinking.

The extent to which a research is guided by a research philosophy is dependent on the state of knowledge, theory development in a particular field and researcher's view of the world. Hussey and Hussey (1997) advance that inter-related paradigmatic assumptions regarding the nature of reality, the researcher's role and the research process trigger research.

This study is anchored on a positivism research philosophy. As argued by Hargrove (2004), positivism seeks facts of social phenomena with little regard for the subjective status of individuals. Positivists believe that only phenomena, which are observable and measurable, can be validly regarded as knowledge. They try to maintain an independent and objective stance and argue that reality is precisely determined through reductionist and deterministic measures without consideration of various differences such as cultural, social, ethnic and economic.

The study adopts the positivistic approach because it is based on existing theory and it formulates quantitative hypotheses to be tested with intent of either rejecting or failing to reject the null hypothesis. Positivist paradigm permit use of statistical techniques for data analysis and operationalization of the hypothetical concepts as well as generalization of results when deriving the relationship between market geography, institutional quality, speed and degree of convergence and levels of financial markets integration in EAC.

4.3 Research Design

This study sought to establish the relationships amongst three variables namely market geography, institutional quality and financial market integration using a quantitative paradigm. The study adopts both correlational and longitudinal research designs. Correlational research design suits this kind of study since it allows for testing of expected relationships between and among the variables and making of predictions regarding these relationships. The study model attempts to establish the existence of relationships among the three variables and to describe the statistical association between the variables.

Given that some financial market characteristics change over time and data is collected at more points in time, the longitudinal design is adopted to help detect changes in the relationships and the variables over time. In longitudinal studies, same variables are measured at each point on the time scale.

4.4 Population of the Study

The population of this study consisted 23 financial market segments (Capital and Money markets) operational in EAC. The EAC member country market segments which are 4 equity markets, 4 corporate bond markets, 5 government bond markets, 5 treasury bill markets, 5 interbank markets and 5 foreign exchange markets provide a total of 28 market segments as summarized in appendix one.

4.5 Sampling and Sample Size

This study purposefully sampled three equity markets with share indices namely; NSE, USE and DSE. As summarized in appendix one, all the five interbank and 91 day Treasury bill markets were also selected because of the comparability of the risks and maturities of the instruments traded thereon. Each of the selected 13 EAC member country market segment is the unit of analysis in the study for comparison of their returns with a similar benchmark market segment (Kenyan market) returns.

4.6 Operationalization of Study Variables

The variables in this study namely: market geography, institutional quality and financial market integration are operationalized in accordance with previous studies. The measurement of the dependent, independent and moderating variables is as shown in table 4.1 below.

Table 4.1: Summary of study variables and their measurement

Variable	Measurement
Financial markets Integration	**Correlation Analysis:** Pearson's correlation coefficient on paired country returns. **Cointegration Analysis** which involves: • Verifying whether the price and return data series are non stationary (containing a unit root) using augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests. The tests are applied to levels and first differences where the model includes a constant and a trend. • Selecting the number of lags used in the model. The appropriate lag lengths are chosen according to AIC- Akaike Information Criterion and the critical values are obtained from MacKinnon (1996). **VAR (Vector Autoregressive Regression) Analysis** o Estimate Equation coefficients. o Impulse response analysis (IRA) o Variance Decomposition (VD)

Table 4.1 Cont.	
Variable	**Measurement & Acronyms**
Financial Markets Integration	**Sigma – Convergence – Degree of Integration:** $$\delta_{it} = \left[\sqrt{\frac{1}{N-1}} \sum_{i=1}^{N} \langle \log y_{i,t} - y^{*}{}_{t} \rangle^{2} \right]$$ Where: *N* represents a number of the countries, $y_{i,t}$ represents a return on a portfolio investment in country *i* at time *t*, and *y** identifies an average return in the EAC region at time *t*. Regressing the computed sigma on a time trend tells us whether and at what pace the dispersion is decreasing and thus whether financial integration is deepening over time. Perfect convergence is realized when the sigma stays at zero.
	Beta- Convergence – Speed of Integration: $$\Delta R_{i,t} = \propto_{1} + \beta R_{i,t} + \sum_{i=1}^{l} \gamma l \Delta R_{i,t-l} + \varepsilon_{i,t}$$ Where: *Ri,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 β 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. γl measure lagging effects from ΣRi, in previous periods. In this analysis, the benchmark market is assumed to be Kenya, given its dominant size and development in the region. Thus the analysis focuses on the spreads of returns between Kenya and the other countries. Three-month lags are uniformly taken, with lags beyond the duration not being statistically significant in any of the estimates.

Table 4.1 Cont.	
Variable	**Measurement & Acronyms**
Market Geography	**Size** - Equity Market Capitalization (Average) - *MCap*
	Size - Gross Domestic Product (GDP)
	Distance - Distance between EAC member countries capital cities.
	Remoteness$_i$ = Distance$_{i,j}$/ (GDP$_j$/GDP$_w$) - *Rem* This measures a country's average weighted distance from its trading partners where weights are the partner countries' shares of EAC GDP (denoted by GDP$_w$).
	Exchange rate volatility - Annual Variance (σ^2) on daily exchange rates of EAC member countries - *ExVol*.
	Financial sector deepening policy: Average market size (capitalization) / GDP - *Fsd* Private sector credit/ GDP - *Fsd*
	Common Border (Adjacency) - dummy variable, takes 1 when countries share border and 0 otherwise - *Adj*.
	Culture - dummy variable, takes 1 when countries share official language and 0 otherwise - *Cult*.
	Colonial links - dummy variable, takes 1 when countries share former colonial masters and 0 otherwise - *Colink.*
Institutional Quality	**Rule of Law – World Governance Indicators (WGI) -** *Rulaw*
	Political Stability – World Governance Indicators (WGI) - *PS*

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4.7 Data Collection

The study used quantitative secondary data collected in Microsoft excel sheets for a fourteen year period (2000 to 2013). The secondary data sources are official public institutions with which the researcher created a rapport through official visits first before

starting on the data collection process. Table 4.2 below summarizes the type of data and the institutions from which the data was collected.

Table 4.2: Summary of Data Sources and institutions

Secondary Data	**Institutions (Sources)**
Daily share indices	NSE, DSE, USE and EAC statistics portal
Annual Market Capitalization	
Daily US$ spot rates	Respective Countries central banks CBK, BOT, BOU, CMA-RW, BRB and EAC statistics portal
monthly 91 day treasury bill rates	
monthly interbank rates	
Annual GDP	National statistics organs, World Bank database & IMF database, EAC statistics portal
Annual EAC GDP	
Institutional quality (WGI)	World Bank database
Distance	EAC statistics portal

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Hard copies of data inform of annual and monthly economic reports were photocopied by the researcher and research assistants and thereafter coded into Microsoft excel spreadsheets. Softcopies of data on exchange rates, share indices, interest rates and market capitalization were transmitted through electronic vessels into the Microsoft excel spreadsheets.

Monthly data on market indices and annual market capitalization were retrieved from the databases of the respective securities exchanges. Daily spot rate of domestic currencies against the US dollar were retrieved from the respective partner state central bank databases and the EAC statistics portal. Monthly interest rate data on 91 day Treasury

bills and interbank borrowings for the five EAC member countries were retrieved from the respective country central bank databases and the EAC statistics portal.

Annual GDP for each country were obtained from the respective national statistical organs and EAC statistics portal. The annual institutional quality index for each country were extracted from the world governance indicators (WGI) published by the World Bank. Distances between member country financial centers were extracted from the EAC statistics portal.

4.8 Data Analysis and Presentation

This study analyzes a broad section of countries (five) over time (14 years) to explain the dynamic as well as cross sectional aspects of financial markets integration. Regression analysis (Simple regression, multiple regression, stepwise regression and vector auto regressive models) and Pearson's product moment Correlation analysis were used to establish the nature and magnitude of the relationships between the variables of the study. The analysis was conducted using statistical packages.

4.8.1 Empirical Model

The current study culminates into a modified asset market gravity model as:

Integration = f (market geography, institutional quality)

$$\text{Integration}_{i,t} = (\beta_0 + \beta_{1I}\ \text{Market capitalization}_{i,t} + \beta_{2I}\ \text{GDP} + \beta_{3I}\ \text{Distance}_{i,t} + \beta_{4I}\ \text{Remoteness} + \beta_{5I}\ \text{Financial deepening policy}_{i,t} + \beta_{6I}\ \text{Exchange rate volatility}_{i,t} + \beta_{7I}\ \text{Common national border-Adjacency}_{i,t} + \beta_{8I}\ \text{Common Language}_{i,t}\ (\text{Culture}) + \beta_{9I}\ \text{Colonial links}_{i,t} + \text{Rule of Law}_{i,t} + \text{Political Stability}_{i,t} + \varepsilon_{i,t})$$

4.8.2 Measuring Integration of Financial Markets in EAC

Cointegration tests, Correlation, Vector auto - regression (VAR), Impulse response (IR), Variance decomposition (VD) and Convergence analysis is applied in testing for financial markets integration in EAC.

For this study, each Kenyan financial market segment (Equity, Treasury bill and Interbank) is taken as the benchmark market given its role as the dominant economy with relatively sophisticated financial systems in the region. Integration with other member country financial market segment is computed with Kenyan market segment as the reference market. For the analysis, the monthly Treasury bill market rates, interbank market rates and equity market returns are used for comparison.

Monthly Treasury bill and interbank rates are given but equity market rates of return are computed. Foremost, End of month equity market indices are converted to a common currency, using spot rates between the local currencies and the US dollar. Monthly Market returns are then computed from the share indices as follows:

$$Market\,\mathrm{Re}turn_t = \left(\frac{Index_t - Index_{t-1}}{Index_{t-1}} \right) \qquad \text{.....4.1}$$

Descriptive statistics of specific market segment returns are presented in form of mean, median, standard deviation, skewness and kurtosis. Pearson's correlation coefficients of market returns are derived to describe the nature and magnitude of the relationships between the respective EAC financial market segment returns.

4.8.2.1 Financial Markets Cointegration

If markets are integrated, then their prices exhibit a long term relationship tested by cointegration. Statistically, time series are cointegrated when they share a common stochastic drift. The Johansen co integration procedure tests the co integration rank of returns between Kenya market (benchmark) and other East African markets is adapted from Kaijage and Nzioka (2012) and Baele, *et al*. (2004).

The long run relationship examined in this study here is as:

$$I = \alpha + \beta i^{*}$$

……...4.2

Where:

'I' and 'i' are the market returns in the East African markets of Burundi, Tanzania, Uganda and Rwanda against the Kenyan market as the benchmark.*

The cointegration rank derived tests hypothesis one. To further examine the relationships between the returns, a VAR system is developed to derive equating significant relationships alongside impulse response functions (IRFs) and variance decomposition (VD) to test hypothesis one.

4.8.2.2 Level of Financial Markets Integration

The level of financial market integration is measured monthly and annually by the Sigma Convergence as adapted from Kaijage and Nzioka (2012), Yabara (2012), Espinoza, *et al*. (2011) and Baele, *et al*. (2004). It employs the cross-sectional standard deviation of yields across countries at each time as:

$$\delta_t = \left[\sqrt{\frac{1}{N-1}} \sum_{i=1}^{N} \left\langle y_{i,\,t} - y^*_{\,t} \right\rangle^2 \right] \quad \text{.....4.3}$$

Where:

σ – is sigma convergence (the level of integration),

N – is number of countries,

$y_{i,\,t}$ *- is the market return on investment in country i at time t,*

y^*_t *- is the cross-section mean return at time t (average market return in the region at time t)*

i – Index for separate countries.

The sigma convergence derived tests hypothesis one. Regressing the computed sigma on a time trend tells us whether and at what pace the dispersion is decreasing and thus whether financial integration is deepening over time. Perfect convergence is realized when the sigma stays at zero. Further analysis on the relationships between market geography and institutional quality on the sigma convergence in EAC is done using multiple regression analysis techniques.

4.8.2.3 Speed of Financial Markets Integration

The speed of integration is estimated annually using the following regression in a time series for Beta convergence as adapted from Kaijage and Nzioka (2012), Yabara (2012), Babetskii (2007) and Vajanne (2007):

$$\Delta R_{i,\,t} = \beta_i + \beta_1 R_{i,\,t} + \sum_{l=1}^{L} \gamma_l \Delta R_{i,\,t-1} + \varepsilon_{i,\,t} \quad \text{.....4.4}$$

Where:

β – is Beta Convergence (the speed of integration)

$R_{i,t}$ – is the spread of yields on a relevant portfolio investment between country I and a benchmark market at time t

l - is the lag,

Δ - is the difference operator

β_i - is the country specific constant

$\varepsilon_{i,t}$ – is the error term that accounts for unexplained variations

γ_l - measures lagging effects from ΣRi, in previous periods.

The β - convergence computed tests hypothesis one. An absolute *β* 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. A negative *β* coefficient indicates mean reversion taking place across the markets. Further analysis on the relationships between market geography and institutional quality on the Beta convergence in EAC is done using multiple regression analysis techniques.

4.8.3 Market Geography and Degree (Speed) of Integration

The annual beta and sigma convergence measures computed in 4.3 and 4.4 above are expressed in a stepwise regression model to test hypothesis two:

$$\sigma_{it} = \beta_0+\beta_1 lnMCap_{it} + \beta_2 lnGDp_{it}+ \beta_3 lnDist_{it}+ \beta_4 lnRem_{it}+ \beta_5 lnFsd_{it}+ \beta_6 lnEXVOL_{it}+ \beta_7 lnAdj_{it} + \beta_8 lnCult_{it} + \beta_9 lnColink_{it} \quad \text{.....4.5}$$

$$\beta_{it} = \beta_0+\beta_1 lnMCap_{it} + \beta_2 lnGDp_{it}+ \beta_3 lnDist_{it}+ \beta_4 lnRem_{it}+ \beta_5 lnFsd_{it}+ \beta_6 lnEXVOL_{it}+ \beta_7 lnAdj_{it} + \beta_8 lnCult_{it} + \beta_9 lnColink_{it} \quad \text{.....4.6}$$

Where:

σ_{it} – is the degree of integration during the period

β_{it} – is the speed of integration during the period

β_0 – is the regression constant – intercept

β_1 to β_9 – Are the regression coefficients

4.8.4 Market geography, Institutional Quality and Degree (Speed) of Integration

The annual beta and sigma convergence measures computed in 4.1.3 and 4.1.4 above are expressed in a stepwise regression model to test hypothesis three:

$$\sigma_{it} = \beta_0+\beta_1 lnMCap_{it} + \beta_2 lnGDp_{it}+ \beta_3 lnDist_{it}+ \beta_4 lnRem_{it}+ \beta_5 lnFsd_{it}+ \beta_6 lnExVol_{it}+ \beta_7 lnAdj_{it}+\beta_8 lnCult_{it}+\beta_9 lnColink_{it}+\beta_{10} RegQual_{it}+\beta_{11} Rulaw_{it} \quad 4.7$$

$$\beta_{it} = \beta_0+\beta_1 lnMCap_{it} + \beta_2 lnGDp_{it}+ \beta_3 lnDist_{it}+ \beta_4 lnRem_{it}+ \beta_5 lnFsd_{it}+ \beta_6 lnExVol_{it}+ \beta_7 lnAdj_{it}+\beta_8 lnCult_{it}+\beta_9 lnColink_{it}+\beta_{10} RegQual_{it}+\beta_{11} Rulaw_{it} \quad 4.8$$

Where:

σ_{it} - is the degree of integration during the period

β_{it} – is the speed of integration during the period

β_0 – is the regression constant – intercept

β_1 to β_{11} – Are the regression coefficients

4.8.5 Market Geography, Political Stability and Degree (Speed) of Markets Integration

To test the moderating effect of political stability on the relationship between market geography and financial markets integration as per hypothesis four, Baron and Kenny approach is incorporated in the stepwise regression models as:

$$\sigma_{it}=\beta_0+\beta_1 ln(MCap_{it}PS_{1,it})+\beta_2 ln(GDp_{it}PS_{1,it})+\beta_3 ln(Dist_{it}PS_{1,it})+\beta_4 ln(Rem_{it}PS_{1,it})+\beta_5 ln(Fsd_{it}PS_{1,it})+\beta_6 ln(ExVol_{it}PS_{1,it})+\beta_7 ln(Adj_{it}PS_{1,it})+\beta_8 ln(Cult_{it}PS_{1,it})+ \beta_9 ln(Colink_{it}PS_{1,it}) \quad 4.9$$

$$\beta_{it}=\beta_0+\beta_1 ln(MCap_{it}PS_{1,it})+\beta_2 ln(GDp_{it}PS_{1,it})+\beta_3 ln(Dist_{it}PS_{1,it})+\beta_4 ln(Rem_{it}PS_{1,it})+\beta_5 ln(Fsd_{it}PS_{1,it})+\beta_6 ln(ExVol_{it}PS_{1,it})+\beta_7 ln(Adj_{it}PS_{1,it})+\beta_8 ln(Cult_{it}PS_{1,it})+ \beta_9 ln(Colink_{it}PS_{1,it}) \quad 4.10$$

To test the joint effect in hypothesis five, Stepwise regression techniques are used. A stepwise regression model eliminates not statistically significant explanatory variables

and shows the change on the F statistic on adding a new variable to the model. The models indicated below are used to test hypothesis five:

$$\sigma_{it}=\beta_0+\beta_1 lnMCap_{it}+\beta_2 lnGDp_{it}+\beta_3 lnDist_{it}+\beta_4 lnRem_{it}+\beta_5 lnFsd_{it}+\beta_6 lnExVol_{it}+\beta_7 lnAdj_{it}+ \beta_8 lnCult_{it}+\beta_9 lnColink_{it}+\beta_{10} lnRulaw_{it}+\beta_{11} lnRegQual_{it}+\beta_{12} lnPS_{it} \quad 4.11$$

$$\beta_{it}= \beta_0+\beta_1 lnMCap_{it}+\beta_2 lnGDp_{it}+\beta_3 lnDist_{it}+\beta_4 lnRem_{it}+\beta_5 lnFsd_{it}+\beta_6 lnExVol_{it}+\beta_7 lnAdj_{it}+ \beta_8 lnCult_{it}+\beta_9 lnColink_{it}+\beta_{10} lnRulaw_{it}+\beta_{11} lnRegQual_{it}+\beta_{12} lnPS_{it} \quad 4.12$$

Where:

σ_{it} – is the annual degree of integration

β_{it} – is the annual speed of integration

β – is the regression constant – intercept

β_1 to β_{12} – are the regression coefficients

Table 4.3 below matches the objectives of the study, the hypotheses tested, the statistical tests of the hypotheses and the interpretation thereon.

Table 4.3: Summary of Research Objectives, Hypotheses, Analytical Methods, Statistical tests and Interpretation Criteria

Objectives	Hypotheses	Analytical methods	Interpretation
Establish integration relationships between Kenyan and other EAC financial market segments.	H_1: There are integration relationships between the Kenyan and other EAC financial market segments.	• Correlation Analysis	r = -1: Strong negative relationship r = 1 Strong positive relationship
		• Johansen Cointegration Equation 4.2	I (d): Process whose d^{th} difference is stationary is integrated of order d.
		• Beta Convergence (β) Equation 4.3	• β= 1 (Full integration) • β≠1 (No full integration)
		• Sigma Convergence (σ) Equation 4.4	• σ=0 (Full integration) • σ ≠0 (No full integration)
		• VAR system Analysis: - Estimate equation Coefficients - Impulse Response Functions (IRF) - Variance Decomposition (VD)	• Statistical significance of explanatory coefficients
Determine the relationship between market geography and financial markets segments integration in EAC.	H_2: There are significant relationships between market geography and integration of financial markets segments in EAC.	• Stepwise regression analysis Equation 4.5 Equation 4.6	• Relationship exists between integration and the respective dependent variable when any of $\beta_1 \ldots . \beta_9$ is statistically significant.
Investigate the influence of rule of law on the relationship between market geography and financial markets segments integration in EAC.	H_3: Rule of law positively mediates the relationship between market geography and integration of financial markets segments in EAC	• Stepwise regression analysis Equation 4.7 Equation 4.8	• A relationship exists if β_i is statistically significant. • Statistical significance of explanatory coefficients.

Objectives	Hypotheses	Analytical methods	Interpretation
Establish whether political stability moderates the influence of market geography on financial markets segments integration in EAC.	H_4: The influence of market geography on financial markets segments integration in EAC is moderated by political stability	• Baron and Kenny approach • Stepwise regression analysis Equation 4.9 Equation 4.10	• A relationship exists if β_i is statistically significant. • Statistical significance of explanatory coefficients.
Probe the joint effect of market geography and institutional quality on financial markets segments integration in EAC.	H_5: The joint effect of market geography, rule of law and political stability is greater than the sum of the relationships of the individual variables on integration of financial markets segments in EAC	• Stepwise regression analysis Equation 4.11 Equation 4.12	• A relationship exists if β_i is statistically significant. • Statistical significance of explanatory coefficients.

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CHAPTER FIVE

DATA ANALYSIS AND RESULTS

5.1 Introduction

This study sought to investigate the effect of market geography and institutional quality on integration of financial markets in EAC. To attain this objective, this chapter describes the data analysis techniques adopted and presents the findings thereon. Section 5.2 outlines the descriptive statistics for the study variables, sections 5.3 and 5.4 discusses the measurement of integration of EAC financial markets, Sections 5.5, 5.6, 5.7, 5.8 and 5.9 relates the annual speeds and levels of integration to market geography and institutional quality attributes of EAC member countries.

5.2 Descriptive Statistics on Market Returns

All five EAC member country monthly Treasury bill rates and interbank rates for a fourteen year period (2000 to 2013) together with three equity market share indices for a seven year period (2007 to 2013) yield 1932 observations. DSE introduced a share index after December 2006 thus necessitating the equity markets study period to begin in 2007. For the equity markets, Rwanda and Burundi are excluded because the RSE has no stock index and Burundi does not have a stock market. The stock indices are converted to a standard currency, using spot rates between the local currencies and the US dollar. The share indices in US$ is presented in figure 5.1 below.

The standardized end of month share indices are applied to compute the monthly equity market returns using the formulation:

$$Market\,\mathrm{Re}turn_t = \left(\frac{Index_t - Index_{t-1}}{Index_{t-1}} \right) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 5.1$$

The trend on EAC equity market segment returns obtained from this formulation is presented in figure 5.2 below. Figures 5.3 and 5.4 summarize the trend in the EAC Treasury bill market segment rates and interbank market segment rates.

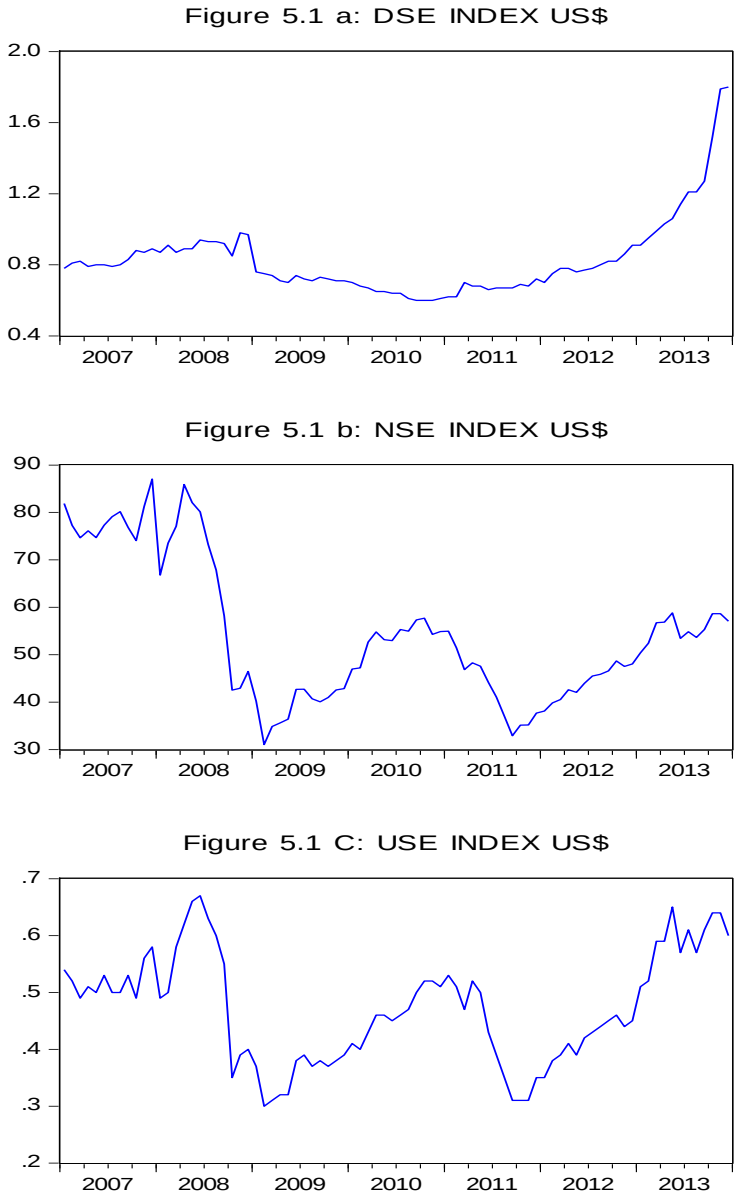


Figure 5.1: EAC Equity Markets Indices in US$

As presented in figure 5.1 above for 2007 to 2013, the EAC equity market segments indices exhibit swings with decline followed by increase in their values over the months. Figure 5.1 (a) shows that the DSE share index increases and declines gradually over time with less volatility and no seasonality. The NSE and USE share indices seem volatile with swings on increase and decrease of the index values. The indices trends and movements also show some seasonality over the months as per figures 5.1 (b and c).

Figure 5.2 a: DSE RETURN

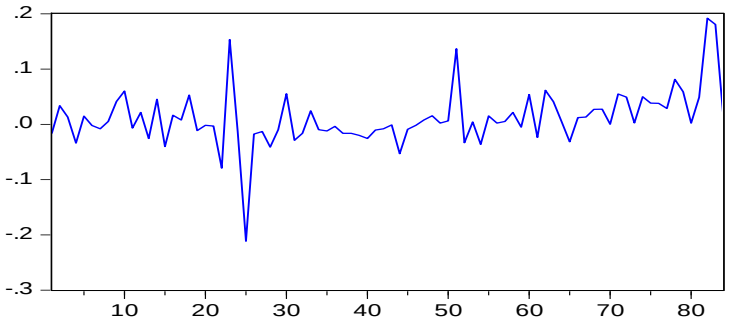


Figure 5.2 b: NSE RETURN

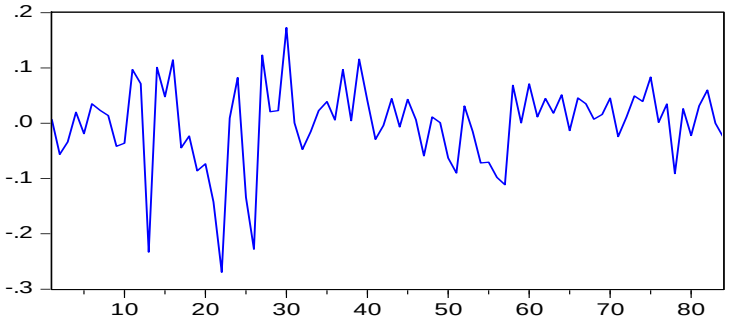


Figure 5.2 c: USE RETURN

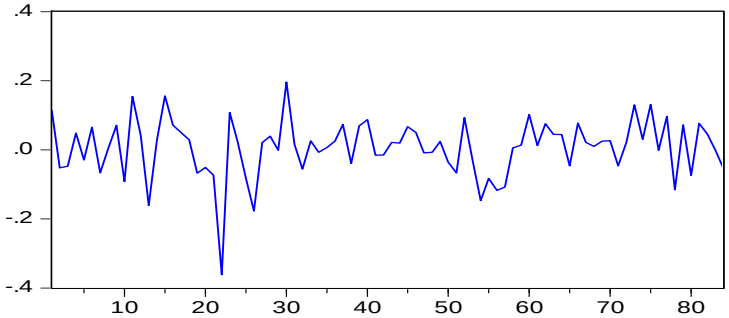


Figure 5.2: EAC Equity Markets Returns

The monthly market returns for 2007 to 2013 from the EAC equity market segments are presented in figure 5.2 above. Across all the three markets, the returns swing between the positive and the negative values over the months which indicate volatility of the market returns. It is inferred from figures 5.2 (a, b and c) that the market returns from DSE, NSE and USE respectively exhibit some forms of seasonality over the months.

Figure 5.3 a: BURUNDI TBILL

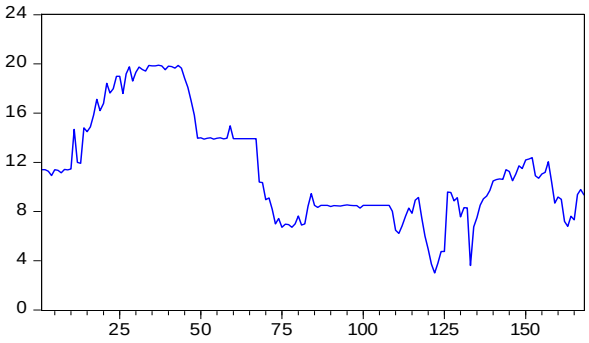


Figure 5.3 b: KENYA TBILL

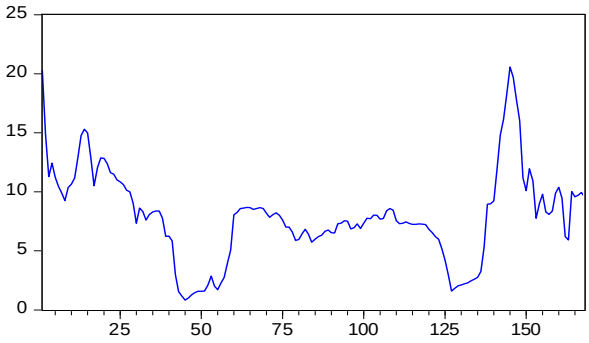


Figure 5.3 c: RWANDA TBILL

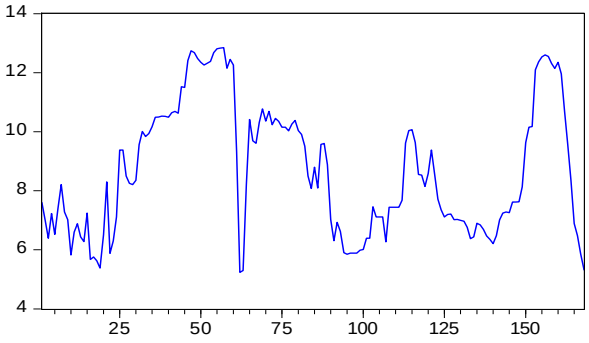


Figure 5.3 d: TANZANIA TBILL

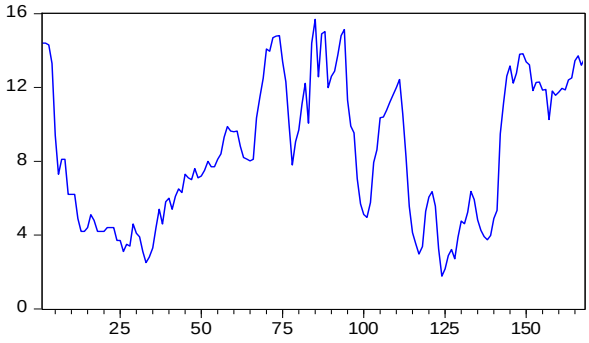


Figure 5.3 e: UGANDA TBILL

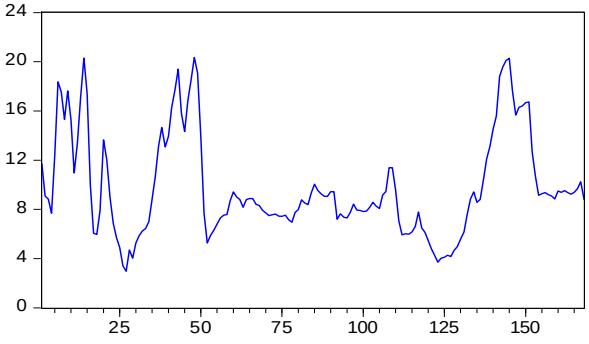


Figure 5.3: Treasury bill Markets Interest Rates

As presented in Figure 5.3 above, all the EAC Treasury bill market returns except for Burundi market exhibit some seasonality and volatility. Figure 5.3 (a) shows that Burundi Treasury bill markets returns trend exhibit long smoothened phases of decline and increases. Figure 5.3 (b) shows that Kenya Treasury bill rates decline or increase gradually though it is characterized by seasonality. As per figures 5.3 (c, d and e) Rwanda, Tanzania and Uganda Treasury bill rates are volatile with instance of sharp increase or decline of the respective country rates with instances of seasonality.

Figure 5.4 a: BURUNDI INTERBANK

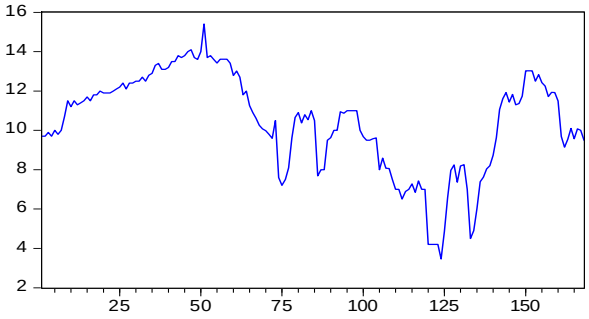


Figure 5.4 b: KENYA INTERBANK

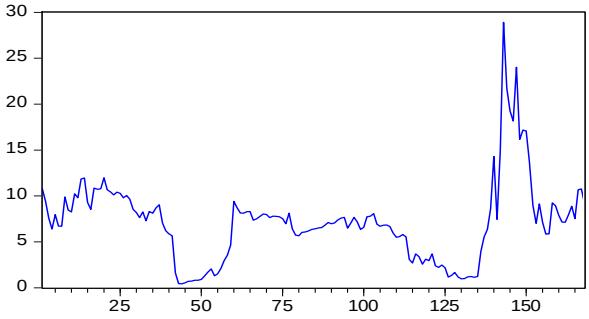


Figure 5.4 c: RWANDA INTERBANK

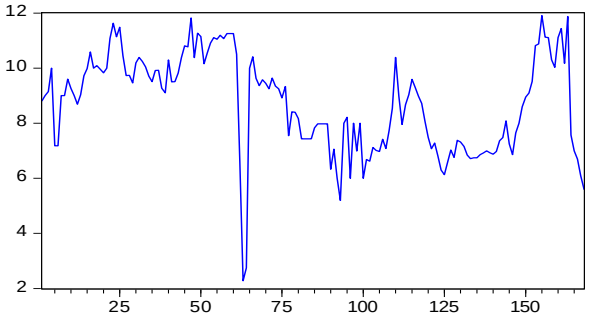


Figure 5.4 d: TANZANIA INTERBANK

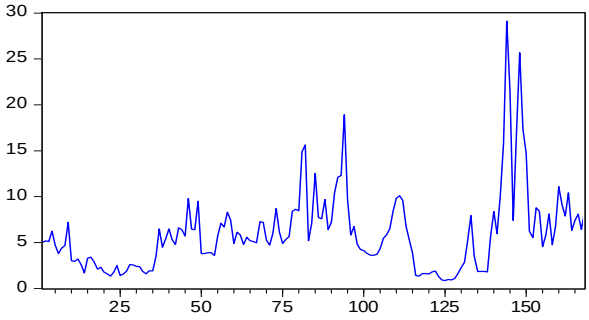


Figure 5.4 e: UGANDA INTERBANK

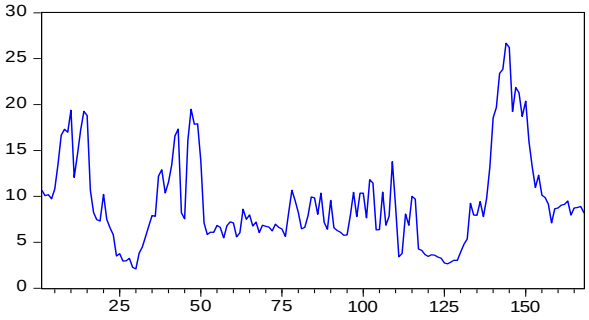


Figure 5.4: EAC Interbank Markets Interest Rates

All the EAC interbank markets returns are presented in figure 5.4 above. The figures show that the EAC interbank markets show seasonality on the rates of the return. As presented in figure 5.4 (b, c, d and e) above, Rwanda, Uganda, Tanzania and Kenya interbank rates are volatile and swings on decline and increase over the months. Figure 5.4 (a) show that Burundi interbank market rates exhibit long period of gradual increase or decline. Though Kenya, Tanzania and Uganda have the rates lower in earlier years, the rates increased and suddenly decreased towards the end of the period. Descriptive statistics of the 1932 monthly returns obtained are summarized in Table 5.1 below.

Table 5.1 a: Descriptive Statistics of Monthly EAC Equity Markets Returns

	N	Minimum	Maximum	Mean	Std. Deviation	Variance	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Percentage Return NSE	84	-26.9500	17.2800	-.122738	7.4962349	56.194	-1.103	.263	2.635	.520
Percentage Return USE	84	-36.1800	19.6000	.619286	8.3205624	69.232	-1.065	.263	3.744	.520
Percentage Return DSE	84	-21.1500	19.2000	1.112976	5.1511425	26.534	.345	.263	6.459	.520

Table 5.1 b: Descriptive Statistics of Monthly EAC Treasury bill Rates

	N	Minimum	Maximum	Mean	Std. Deviation	Variance	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Burundi Tbill rate	168	3.0000	19.8900	11.425357	4.3346588	18.789	.591	.187	-.596	.373
Kenya Tbill rate	168	.8300	20.5600	7.969167	3.8638503	14.929	.576	.187	1.134	.373
Rwanda Tbill rate	168	5.2400	12.8500	8.683018	2.1851473	4.775	.389	.187	-1.039	.373
Uganda Tbill rate	168	2.97	20.35	9.8011	4.15919	17.299	.956	.187	.114	.373
Tanzania Tbill rate	168	1.77	15.69	8.4371	3.82931	14.664	.143	.187	-1.312	.373

Table 5.1 c: Descriptive Statistics of Monthly EAC interbank Rates

	N	Minimum	Maximum	Mean	Std. Deviation	Variance	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Rwanda Interbank rate	168	2.2800	11.9020	8.731446	1.7565499	3.085	-.454	.187	.340	.373
Tanzania Interbank rate	168	.8700	29.1100	6.015595	4.3831792	19.212	2.150	.187	7.060	.373
Kenya Interbank rate	168	.4300	28.9000	7.157262	4.3755887	19.146	1.407	.187	4.774	.373
Uganda Interbank rate	168	2.11	26.68	9.3781	5.08821	25.890	1.214	.187	1.215	.373
Burundi Interbank rate	168	3.46	15.40	10.4070	2.48682	6.184	-.631	.187	-.108	.373

Table 5.1 d: Descriptive Statistics of Annual EAC Market Geography Attributes

Statistics

	N								
	Valid	Missing	Mean	Std. Deviation	Variance	Skewness	Std. Error of Skewness	Kurtosis	Std. Error of Kurtosis
NSE capitalization US$	7	7	1.37784E10	4.130793E9	1.706E19	1.724	.794	3.326	1.587
USE capitalization US$	7	7	4.8832E9	1.78993E9	3.204E18	1.152	.794	1.000	1.587
DSE capitalization US$	7	7	5.3640E9	3.51051E9	1.232E19	.184	.794	-.824	1.587
GDP Kenya	14	0	2.4999E10	1.06194E10	1.128E20	.371	.597	-1.092	1.154
GDP Uganda	14	0	1.1846E10	5.28343E9	2.791E19	.469	.597	-.967	1.154
GDP Tanzania	14	0	1.7752E10	6.78778E9	4.607E19	.558	.597	-.977	1.154
GDP Rwanda	14	0	3.9250E9	2.12702E9	4.524E18	.435	.597	-1.382	1.154
GDP Burundi	14	0	1.4960E9	6.69164E8	4.478E17	.644	.597	-.993	1.154
GDP EAC	14	0	6.0017E10	2.54092E10	6.456E20	.455	.597	-1.054	1.154
Exchange Vol Burundi	14	0	36.0596	38.57458	1487.998	1.093	.597	.116	1.154
Exchange Vol Tanzania	14	0	29.3163	21.66912	469.551	.424	.597	-1.172	1.154
Exchange Vol Uganda	14	0	82.7752	48.89558	2390.778	.626	.597	-.789	1.154
Exchange Vol Kenya	14	0	2.1582	1.77115	3.137	1.801	.597	2.528	1.154
Exchange Vol Rwanda	14	0	17.0091	30.98423	960.022	3.335	.597	11.749	1.154
FSD Policy Burundi	14	0	18.8214	2.43601	5.934	.417	.597	-.295	1.154
FSD Policy Tanzania	14	0	12.2786	4.86703	23.688	-.406	.597	-1.415	1.154
FSD Policy Uganda	14	0	11.4143	4.00651	16.052	.410	.597	-1.292	1.154
FSD Policy Kenya	14	0	29.8214	5.05298	25.533	.922	.597	-.588	1.154
FSD Policy Rwanda	14	0	11.2945	1.14372	1.308	.291	.597	-.709	1.154

Source: Author (2014)

As summarized in Table 5.1 (a) above, the statistics indicate that in the equity markets, DSE has the highest mean return (1.113) followed by USE (0.619) and lastly NSE (-0.123). USE returns have a highest standard deviation at 8.321 followed by NSE at 7.496 and then DSE at 5.151. The returns at the NSE and USE are negatively skewed at -1.103 and -1.065 respectively. DSE returns are positively distributed at 0.345. The returns data are leptokurtic (Highly peaked) with DSE at 6.459, USE at 3.744 and NSE at 2.635.

Table 5.1 (b) shows that Burundi has the highest mean return on treasury bills at 11.425 with a standard deviation of 4.335. Rwanda has a mean return of 8.683 with a standard deviation of 2.185, Kenya has a mean return of 7.969 with a standard deviation of 3.864. Uganda average Treasury bill rate is at 9.801 with a standard deviation of 4.159 while Tanzania has an average rate of 8.437 with a standard deviation of 3.829. The data are positively distributed with a skewness of 0.956, 0.591, 0.576, 0.389 and 0.143 for Uganda, Burundi, Kenya, Rwanda and Tanzania respectively. On the peakedness of the distribution, the Kenyan Treasury bill data is leptokurtic (highly peaked).

The ranking on the mean returns from the interbank markets indicated in table 5.1 (c) has Burundi having the highest return at 10.407 followed by Uganda at 9.378, Rwanda at 8.731, Kenya at 7.157 and then Tanzania at 6.016. All the interbank returns are positively skewed apart from Rwanda and Burundi which are negatively distributed at -0.454 and -0.631 respectively. The Tanzania, Kenya and Uganda interbank rates are leptokurtic (highly peaked).

As inferred from table 5.1 (d) above, the data on financial markets geography and returns have diverse characteristics especially on skewness and kurtosis. To facilitate meaningful analysis and comparisons based on the data, there is essence for standardization of the data. The data are therefore applied in the analysis in their natural log to enable comparisons.

5.2.1 Correlation Analysis on Financial Market Returns

The movements of the returns from the EAC financial market segments are established in a correlation analysis. The Pearson Correlation among the monthly market returns are summarized in tables 5.2, 5.3 and 5.4 below.

Table 5.2: Correlation of returns of three EAC equity markets

	NSE	USE	DSE
NSE	1		
USE	.833**	1	
DSE	.221*	.223*	1

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).
Source: Author (2014)

As presented in table 5.2 above, Positive correlation exists between the monthly returns in the EAC equity markets. At $r = 0.221$, $P < 0.05$ and $r = 0.223$, $P < 0.05$, it is inferred that returns between DSE and NSE on one hand and USE and DSE on another hand weakly move in the same direction. Movements in Returns at USE and NSE exhibit a statistically significant strong relationship with a correlation of $r = 0.833$, $P < 0.05$. In the absence of perfect positive correlation between the equity markets attained by $r = 1$, the

market returns do not perfectly move in the same direction suggesting that the EAC equity markets are not fully integrated and thus there is a possibility for investors to earn arbitrage returns from portfolio diversification in the respective EAC equity markets.

Weak positive and negative correlations are observed for the Treasury bill market rates in EAC as summarized in table 5.3 below. A weak negative relationship is evidenced between the Tanzania and Burundi treasury bill market rates and Rwanda and Kenya treasury bill market rates with correlation of $r = -0.374$, $P < 0.05$ and $r = -0.379$, $P < 0.05$ respectively. These results imply that the rates in these Treasury bill markets tend to weakly move in opposite directions.

Table 5.3: Correlation of Returns of five EAC Treasury bill Markets

	Burundi	Kenya	Rwanda	Uganda	Tanzania
Burundi	1				
Kenya	.081	1			
Rwanda	.257**	-.379**	1		
Uganda	.257**	.329**	.029	1	
Tanzania	-.374**	.218**	.142	.147	1

**. Correlation is significant at the 0.01 level (2-tailed).

Source: Author (2014)

As presented in table 5.3 above, weak positive relationship ranges from a correlation of $r = 0.029$, $P < 0.1$ for Uganda and Rwanda to $r = 0.329$, $P < 0.01$ for Kenya and Uganda. Both the paired Uganda and Burundi, Rwanda and Burundi markets have a weak positive correlation of $r = 0.257$, $P < 0.01$. The Kenya and Burundi market has a weak positive correlation of $r = 0.081$, $P < 0.3$ while the Kenya and Uganda market has a weak positive correlation of $r = 0.329$, $P < 0.01$. The Tanzania and Rwanda, Tanzania and Uganda

Treasury bill markets also evidence weak positive relationships at correlations of r = 0.142, P < 0.1 and r = 0.147, P < 0.1 respectively. Lack of perfect positive correlation between the EAC Treasury bill rates infer that these markets are not fully integrated. It thus implies that there are arbitraging opportunities for money market investors through construction of risk free portfolios across the EAC Treasury bill market segments.

Table 5.4: Correlation between Returns of five EAC Interbank Markets

	Rwanda	Tanzania	Kenya	Uganda	Burundi
Rwanda	1				
Tanzania	-.085	1			
Kenya	-.070	.463**	1		
Uganda	.017	.501**	.518**	1	
Burundi	.532**	.160*	.231**	.306**	1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Source: Author (2014)

Correlation coefficients in the EAC interbank markets as presented in table 5.4 above show that significant positive and negative correlations are existent on the returns. The Kenya and Rwanda, Tanzania and Rwanda markets have a negative weak relationship at correlations of r = -0.070, P <0.4 and r = –0.085, P <0.3 respectively. Uganda and Rwanda, Burundi and Tanzania, Burundi and Kenya and Burundi and Uganda have weak positive relationships at correlations of r = 0.017, P <0.9, r = 0.160, P <0.05, r = 0.231, P <0.05 and r = 0.306, P <0.05 respectively. There are also the strong positive relationships between Uganda and Tanzania, Uganda and Kenya and Burundi and Rwanda interbank markets with correlation of r = 0.501, P < 0.01, r = 0.518, P < 0.01 and r = 0.532, P < 0.01 in their respective order. In fully integrated markets, a perfect correlation of 1 is

anticipated, in the absence of this, profitable opportunities still exist for portfolio diversification across the regional interbank markets.

5.3 Measuring EAC Financial Markets Integration

Markets Integration is tested using cointegration tests, vector auto regression systems, Beta convergence and Sigma convergence analyses.

5.3.1 Cointegration Tests in EAC Financial Markets

Standard regression techniques, such as ordinary least squares (OLS), require that the variables be covariance stationary. A variable is covariance stationary if its mean and its entire auto–co variances are finite and do not change over time. Cointegration analysis provides a framework for estimation, inference, and interpretation when the variables are not covariance stationary. Instead of being covariance stationary, many economic time series including investment returns appear to be "first-difference stationary". This means that the level of a time series is not stationary but its first difference is. First difference stationary processes are also known as integrated processes of order 1, or I (1) processes. Covariance-stationary processes are I (0). In general, a process whose d^{th} difference is stationary is an integrated process of order d, or I (d).

5.3.1.1 Unit Root Tests

Before testing for integration amongst the individual market segment return time series, the time series data is first checked for stationarity. Consequently, all the return series from the selected markets under study were individually tested for stationarity by use of the Augmented Dickey Fuller (ADF) and Phillips - Perron (PP) unit root tests. The aim of

this test is to establish if the time series data has a stationary trend and if not (non-stationary) establish the order of integration, by doing this, chances of obtaining spurious regression and erroneous inferences are minimized.

Table 5.5: Unit Root test of Equity Market Returns

Variable	**At Level**		**First Differencing**	
	ADF statistic	**PP statistic**	**ADF statistic**	**PP statistic**
DSE Returns	-7.642(0.0000)	-7.659(0.0000)	-10.066(0.0000)	-43.237(0.0001)
NSE Returns	-8.016(0.0000)	-7.997(0.0000)	-9.507(0.0000)	-62.209(0.0001)
USE Returns	-8.938(0.0000)	-8.949(0.0000)	-8.533(0.0000)	-34.338(0.0001)

Critical Values	**1%**	**5%**	**10%**	**1%**	**5%**	**10%**
ADF	-3.511	-2.897	-2.586	-3.514	-2.898	-2.586
PP	-3.511	-2.896	-2.585	-3.512	-2.897	-2.586

Source: Author (2014)

From table 5.5 above, all the Monthly equity market returns are stationary at level, that is, they are integrated of order O (I (0)) as they do not posses unit roots at 1%, 5% and 10% levels of significance. This inference is based on the finding that ADF and PP statistics are less than the critical values at 1%, 5%, and 10% levels of significance, respectively without differencing.

The unit roots of EAC Treasury bill rates are presented in table 5.6 below. With ADF and PP tests, at 1% levels of significance, all Treasury bill rates except Kenya are greater than the critical values. On differencing, all the rates are stationary as per the ADF and the PP tests.

Table 5.6: Unit Root test of Treasury bill Market Returns

Variable	At Level		First Differencing	
	ADF statistic	PP statistic	ADF statistic	PP statistic
Burundi	-1.473(0.5450)	-1.489(0.5367)	-3.332(0.0650)	-13.719(0.0000)
Kenya	-3.230(0.0200)	-3.771(0.0039)	-3.399(0.0552)	-9.478(0.0000)
Rwanda	-2.955(0.0415)	-2.506(0.1159)	-9.716(0.0000)	-9.978(0.0000)
Tanzania	-2.250(0.1897)	-2.607(0.0936)	-6.881(0.0000)	-10.009(0.0000)
Uganda	-3.235(0.0197)	-3.016(0.0355)	-5.942(0.0000)	-13.586(0.0000)

Critical Values	1%	5%	10%	1%	5%	10%
ADF	-3.469	-2.879	-2.576	-4.018	-3.438	-3.143
PP	-3.469	-2.879	-2.576	-4.014	-3.437	-3.143

Source: Author (2014)

Table 5.7: Unit Root test of Interbank Market Returns

Variable	At Level		First Differencing	
	ADF statistic	PP statistic	ADF statistic	PP statistic
Burundi	-1.823(0.3682)	-1.937(0.3146)	-11.393(0.0000)	-11.411(0.0000)
Kenya	-3.336(0.0148)	-3.411(0.0119)	-4.938(0.0001)	-14.503(0.0000)
Rwanda	-3.934(0.0023)	-3.780(0.0038)	-12.989(0.0000)	-17.213(0.0000)
Tanzania	-2.939(0.0431)	-4.835(0.0001)	-15.157(0.0000)	-14.671(0.0000)
Uganda	-4.172(0.0010)	-3.225(0.0203)	-11.249(0.0000)	-12.573(0.0000)

Critical Values	1%	5%	10%	1%	5%	10%
ADF	-3.469	-2.879	-2.576	-3.470	-2.879	-2.576
PP	-3.469	-2.879	-2.576	-3.469	-2.879	-2.576

Source: Author (2014)

The unit root tests for the interbank markets are summarized in table 5.7 above. As indicated, the ADF and the PP test statistics for all the markets except Rwanda are greater than the critical values suggesting the only that Rwanda rate series are stationery at level. On differencing, all the other interbank rates are less than the critical values.

5.3.1.2 Cointegration Tests in EAC Financial Markets

Cointegration is considered the appropriate technique to estimate equilibrium or long run parameters in a relationship with unit root variables as classical estimation techniques lead to spurious regression problem. The results from the cointegration tests as summarized in tables 5.8 and 5.9 below indicate that there are possibly three cointegrating vectors in the EAC equity markets. For co integration to exist, the trace statistics should be greater than the critical values at the levels of confidence. The null hypothesis states that if there is no rank, there is no cointegration.

Table 5.8: Johansen Trace statistic test in Equity Markets

Unrestricted Co integration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigen value	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.270352	54.36557	29.79707	0.0000
At most 1 *	0.219829	28.83490	15.49471	0.0003
At most 2 *	0.102142	8.727239	3.841466	0.0031

Trace test indicates 3 co integrating eqn (s) at the 0.05 level
Source: Author (2014)

Table 5.9: Johansen Eigen statistic test in Equity Markets

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.270352	25.53068	21.13162	0.0112
At most 1 *	0.219829	20.10766	14.26460	0.0053
At most 2 *	0.102142	8.727239	3.841466	0.0031

Max-eigen value test indicates 3 cointegrating eqn(s) at the 0.05 level
Source: Author (2014)

The result that the equity markets possibly have three cointegrating vectors (P <0.05) imply that there may be stochastic trends in the equity markets in EAC which are further tested and confirmed through bivariate cointegration tests as presented in table 5.10 below. These results could be attributed to the possibility of some return series being independent or some with very weak relationships.

Table 5.10: Bivariate Engle Granger test in EAC Equity Markets
Automatic lags specification based on Schwarz criterion (maxlag=11)

Dependent	tau-statistic	Prob.*	z-statistic	Prob.*
DSE	-7.630329	0.0000	-68.65462	0.0000
NSE	-12.11437	0.0000	-105.1436	0.0000
USE	-14.09303	0.0000	-115.2873	0.0000

*MacKinnon (1996) p-values.
Intermediate Results:

	DSE	NSE	USE
Rho - 1	-0.827164	-1.266790	-1.389004
Rho S.E.	0.108405	0.104569	0.098560
Residual variance	0.002449	0.001550	0.001685
Long-run residual variance	0.002449	0.001550	0.001685
Number of stochastic trends**	3	3	3

**Number of stochastic trends in asymptotic distribution
Source: Author (2014)

Table 5.11: Johansen Trace statistic test in Treasury bill Markets
Unrestricted Co integration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigen value	Trace Statistic	0.05 Critical Value	Prob.**
None	0.140258	60.68507	69.81889	0.2149
At most 1	0.089447	36.05211	47.85613	0.3937
At most 2	0.059332	20.77842	29.79707	0.3716
At most 3	0.040984	10.80844	15.49471	0.2235
At most 4 *	0.024165	3.987339	3.841466	0.0458

Trace test indicates no cointegration at the 0.05 level
Source: Author (2014)

Table 5.12: Johansen Eigen statistic test in Treasury bill Markets
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.140258	24.63296	33.87687	0.4103
At most 1	0.089447	15.27369	27.58434	0.7263
At most 2	0.059332	9.969973	21.13162	0.7475
At most 3	0.040984	6.821104	14.26460	0.5105
At most 4 *	0.024165	3.987339	3.841466	0.0458

Max-eigenvalue test indicates no cointegration at the 0.05 level
Source: Author (2014)

In the Treasury bill markets, the trace statistics and Eigen values are lower than the critical values for all integration levels at all levels of significance as indicated in tables 5.11 and 5.12 above. The trace statistics and Eigen value statistics therefore indicate existence of no cointegrating vectors in the Treasury bill markets in EAC.

Table 5.13: Johansen Trace statistic test in Interbank Markets
Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.163750	66.75442	69.81889	0.0857
At most 1	0.085070	37.60560	47.85613	0.3195
At most 2	0.069653	23.11358	29.79707	0.2405
At most 3	0.042833	11.34529	15.49471	0.1911
At most 4 *	0.025495	4.209521	3.841466	0.0402

Trace test indicates no cointegration at the 0.05 level
Source: Author (2014)

Table 5.14: Johansen Eigen statistic test in Interbank Markets

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.163750	29.14882	33.87687	0.1654
At most 1	0.085070	14.49203	27.58434	0.7872
At most 2	0.069653	11.76829	21.13162	0.5707
At most 3	0.042833	7.135766	14.26460	0.4732
At most 4 *	0.025495	4.209521	3.841466	0.0402

Max-eigenvalue test indicates no cointegration at the 0.05 level

Source: Author (2014)

As presented in tables 5.13 and 5.14 above, in the interbank markets, there is one cointegrating vector at level four ($P < 0.05$). Eigen and trace statistics tests thus reject the proposition of existence of long run cointegration relationships in the EAC interbank markets.

5.3.2 Vector Auto Regression (VAR)

VAR is a useful model that allows all variables to be endogenous. It is used to estimate equations and to examine how variables respond when another variable is shocked beyond its mean. The VAR system is generated to estimate how the specific EAC financial market segment returns relate on a two month period lag. The estimation results for the respective Equity, Treasury bill and interbank markets are summarized in tables 5.15, 5.16, 5.17 and 5.18 below. Table 5.15 below presents the coefficients and the coefficient labels in the equations indicated in tables 5.16, 5.17 and 5.18.

Table 5.15: Vector auto regression Estimates in Financial Markets

	Equity	Treasury Bill	Interbank
Coefficient Label	**Coefficient**	**Coefficient**	**Coefficient**
C(1)	0.299 (2.538)**	0.843(10.562)*	1.062(13.387)*
C(2)	-0.056 (-0.455)	0.125(1.556)	-0.130(-1.631)
C(3)	-0.178 (-1.239)	-0.017(-0.238)	0.014(0.523)
C(4)	0.306 (1.990)**	0.047(0.697)	-0.012(-0.416)
C(5)	-0.015 (-0.109)	-0.173(-1.726)***	0.065(1.177)
C(6)	-0.173(-1.293)	0.120(1.200)	-0.039(-0.702)
C(7)	0.010(1.642)	-0.113(-1.650)***	-0.041(-2.001)**
C(8)	0.340(1.940)***	0.064(0.935)	0.035(1.753)***
C(9)	-0.304(-1.660)***	0.001(0.013)	0.042(1.778)***
C(10)	0.264(1.230)	0.004(0.088)	-0.018(-0.737)
C(11)	0.308(1.344)	0.939(1.983)**	0.266(0.825)
C(12)	-0.186(-0.895)	0.016(0.197)	0.180(0.774)
C(13)	-0.281(-1.407)	-0.014(-0.172)	-0.184(-0.786)
C(14)	0.002(0.201)	1.264(17.453)*	0.804(9.896)*
C(15)	0.310(1.642)	-0.351(-4.964)*	0.068(0.828)
C(16)	-0.275(-1.396)	-0.047(-0.446)	-0.041(-0.252)
C(17)	0.675(2.924)*	-0.036(-0.345)	-0.035(-0.216)
C(18)	0.247(1.000)	0.121(1.700)***	-0.062(-1.035)
C(19)	-0.545(-2.440)**	-0.108(-1.526)	0.030(0.505)
C(20)	-0.161(-0.751)	0.028(0.575)	0.008(0.120)

* Significant at 1% ** Significant at 5% *** Significant at 10%

Source: Author (2014)

Table 5.15: Vector auto regression Estimates in Financial Markets Cont.

	Equity	Treasury Bill	Interbank
Coefficient Label	**Coefficient**	**Coefficient**	**Coefficient**
C(21)	0.010(1.019)	-0.021(-0.428)	0.054(0.765)
C(22)		1.187(2.407)**	1.221(1.287)
C(23)		0.026(0.432)	0.061(0.531)
C(24)		0.019(0.303)	0.083(0.711)
C(25)		-0.119(-2.237)**	-0.016(-0.394)
C(26)		0.090(1.729)	0.004(0.106)
C(27)		1.135(4.787)*	0.806(10.019)*
C(28)		-0.269(-3.503)*	-0.142(-1.756)
C(29)		-0.010(-0.196)	-0.022(-0.756)
C(30)		0.035(0.670)	-0.025(-0.848)
C(31)		0.032(0.883)	0.016(0.475)
C(32)		-0.030(-0.819)	0.009(0.255)
C(33)		0.633(1.744)	1.553(3.301)*
C(34)		-0.008(-0.093)	0.054(0.176)
C(35)		-0.020(-0.219)	0.084(0.274)
C(36)		0.022(0.277)	0.504(4.746)*
C(37)		0.001(0.018)	-0.430(-3.977)*
C(38)		-0.074(-0.648)	-0.417(-1.966)**
C(39)		0.161(1.419)	0.100(0.468)
C(40)		1.181(15.150)*	0.749(9.571)*

* Significant at 1% ** Significant at 5% *** Significant at 10%

Source: Author (2014)

Table 5.15: Vector auto regression Estimates in Financial Markets Cont.

	Equity	Treasury Bill	Interbank
Coefficient Label	**Coefficient**	**Coefficient**	**Coefficient**
C(41)		-0.274(-3.547)*	-0.102(-1.326)
C(42)		0.076(1.407)	-0.061(-0.667)
C(43)		-0.036(-0.672)	0.147(1.602)
C(44)		-0.229(-0.426)	2.141(1.725)***
C(45)		0.067(0.549)	0.130(0.470)
C(46)		0.006(0.049)	-0.023(-0.083)
C(47)		0.109(1.025)	0.183(1.897)***
C(48)		-0.117(-1.125)	-0.133(-1.359)
C(49)		-0.138(-0.900)	-0.259(-1.349)
C(50)		0.0516(0.337)	0.019(0.100)
C(51)		0.014(0.135)	-0.005(-0.077)
C(52)		0.037(0.352)	0.011(0.162)
C(53)		1.307(17.954)*	0.916(11.114)*
C(54)		-0.456(-6.239)*	-0.083(-0.999)
C(55)		1.013(1.398)	2.159(1.921)**

* Significant at 1% ** Significant at 5% *** Significant at 10%

Source: Author (2014)

In the Equity Markets, the VAR system estimates three equations on the relationships between the current returns at the Dar es Salaam stock exchange (DSE), Nairobi Securities exchange (NSE) and Uganda stock exchange (USE) as presented in table 5.16 below.

Table 5.16: Vector auto regression Estimates in Equity Markets

Equation: DSE = C(1)*DSE(-1) + C(2)*DSE(-2) + C(3)*NSE(-1) + C(4)*NSE(-2)+ C(5)*USE(-1) + C(6)*USE(-2) + C(7)
Equation: NSE = C(8)*DSE(-1) + C(9)*DSE(-2) + C(10)*NSE(-1) + C(11) *NSE(-2) + C(12)*USE(-1) + C(13)*USE(-2) + C(14)
Equation: USE = C(15)*DSE(-1) + C(16)*DSE(-2) + C(17)*NSE(-1) + C(18) *NSE(-2) + C(19)*USE(-1) + C(20)*USE(-2) + C(21)

(-1): Previous month return, (-2): Previous two month return, DSE: Dar es Salaam stock exchange, NSE: Nairobi Securities exchange return, USE: Uganda Securities exchange return.

Source: Author (2014)

As indicated in tables 5.15 and 5.16 above, the statistically significant estimated coefficients for current DSE returns are one period lag returns for DSE itself (β=0.299, P <0.05) and two period lag returns for NSE (β=0.306, P <0.05). For USE returns, the statistically significant coefficients are the one period lag returns for NSE (β=0.675, P <0.05) and USE (β= -0.545, P <0.05). These estimates suggest that the equity markets vary in the forms of their efficiency considering the reliability of using past market returns to predict the future market returns. The findings also suggest linkages between the EAC equity markets hinging on the NSE as lagged NSE returns relate to current USE returns on one hand and current DSE returns on the other hand.

In the Treasury bill Markets, the VAR system estimates five equations on the relationships between the current Treasury bill rates in Burundi, Kenya, Rwanda, Tanzania and Uganda as presented in table 5.17 below.

Table 5.17: Vector auto regression Estimates in Treasury bill Markets

Equation: BURUNDI = C(1)*BURUNDI(-1) + C(2)*BURUNDI(-2) + C(3) *KENYA(-1) + C(4)*KENYA(-2) + C(5)*RWANDA(-1) + C(6)*RWANDA(-2) + C(7)*TANZANIA(-1) + C(8)*TANZANIA(-2) + C(9)*UGANDA(-1) + C(10)*UGANDA(-2) + C(11)
Equation: KENYA = C(12)*BURUNDI(-1) + C(13)*BURUNDI(-2) + C(14) *KENYA(-1) + C(15)*KENYA(-2) + C(16)*RWANDA(-1) + C(17) *RWANDA(-2) + C(18)*TANZANIA(-1) + C(19)*TANZANIA(-2) + C(20) *UGANDA(-1) + C(21)*UGANDA(-2) + C(22)
Equation: RWANDA = C(23)*BURUNDI(-1) + C(24)*BURUNDI(-2) + C(25) *KENYA(-1) + C(26)*KENYA(-2) + C(27)*RWANDA(-1) + C(28) *RWANDA(-2) + C(29)*TANZANIA(-1) + C(30)*TANZANIA(-2) + C(31) *UGANDA(-1) + C(32)*UGANDA(-2) + C(33)
Equation: TANZANIA = C(34)*BURUNDI(-1) + C(35)*BURUNDI(-2) + C(36) *KENYA(-1) + C(37)*KENYA(-2) + C(38)*RWANDA(-1) + C(39) *RWANDA(-2) + C(40)*TANZANIA(-1) + C(41)*TANZANIA(-2) + C(42) *UGANDA(-1) + C(43)*UGANDA(-2) + C(44)
Equation: UGANDA = C(45)*BURUNDI(-1) + C(46)*BURUNDI(-2) + C(47) *KENYA(-1) + C(48)*KENYA(-2) + C(49)*RWANDA(-1) + C(50) *RWANDA(-2) + C(51)*TANZANIA(-1) + C(52)*TANZANIA(-2) + C(53) *UGANDA(-1) + C(54)*UGANDA(-2) + C(55)

(-1): Previous month Tbill rate, (-2): Previous two Tbill rate, Burundi: Burundi Tbill rate, Kenya: Kenya Tbill rate, Rwanda: Rwanda Tbill rate, Tanzania: Tanzania Tbill rate, Uganda: Uganda Tbill rate.

Source: Author (2014)

From table 5.17 above, the statistically significant coefficients for Burundi Treasury bill rates are the one period lag Burundi Treasury bill rate (β=0.843, P <0.05). For Kenya, it is the one and two period lag Kenya Treasury bill rates (β=1.264, P <0.05; β= -0.351, P <0.05). For Rwanda, the coefficients are the one period lag Treasury bill rates in Kenya (β= -0.119, P <0.05), one and two period lag Treasury bill rates in Rwanda (β=1.135, P <0.05; β= -0.269, P <0.05). In Tanzania, the coefficients are the one and two period lag Treasury bill rates for Tanzania (β=1.181, P <0.05; β= -0.274, P <0.05) and in Uganda,

the coefficients are the one and two period lag Treasury bill rates in Uganda (β=1.307, P <0.05; β= -0.456, P <0.05). These findings suggest short term relations between Treasury bill rates within the EAC markets themselves as the lag rates determine the current rates. These estimates also establish short term relationships between the Kenya and the Rwanda Treasury bill rates as the one month lag Kenya Treasury bill rate is statistically significant in estimating the current Rwanda Treasury bill rate.

In the Interbank Markets, the VAR system estimates five equations on the relationships between the current Interbank rates in Burundi, Kenya, Rwanda, Tanzania and Uganda as presented in table 5.18 below.

Table 5.18: Vector auto regression Estimates in Interbank Markets

Equation: BURUNDI = C(1)*BURUNDI(-1) + C(2)*BURUNDI(-2) + C(3)
*KENYA(-1) + C(4)*KENYA(-2) + C(5)*RWANDA(-1) + C(6)*RWANDA(
-2) + C(7)*TANZANIA(-1) + C(8)*TANZANIA(-2) + C(9)*UGANDA(-1) +
C(10)*UGANDA(-2) + C(11)
Equation: KENYA = C(12)*BURUNDI(-1) + C(13)*BURUNDI(-2) + C(14)
*KENYA(-1) + C(15)*KENYA(-2) + C(16)*RWANDA(-1) + C(17)
*RWANDA(-2) + C(18)*TANZANIA(-1) + C(19)*TANZANIA(-2) + C(20)
*UGANDA(-1) + C(21)*UGANDA(-2) + C(22)
Equation: RWANDA = C(23)*BURUNDI(-1) + C(24)*BURUNDI(-2) + C(25)
*KENYA(-1) + C(26)*KENYA(-2) + C(27)*RWANDA(-1) + C(28)
*RWANDA(-2) + C(29)*TANZANIA(-1) + C(30)*TANZANIA(-2) + C(31)
*UGANDA(-1) + C(32)*UGANDA(-2) + C(33)
Equation: TANZANIA = C(34)*BURUNDI(-1) + C(35)*BURUNDI(-2) + C(36)
*KENYA(-1) + C(37)*KENYA(-2) + C(38)*RWANDA(-1) + C(39)
*RWANDA(-2) + C(40)*TANZANIA(-1) + C(41)*TANZANIA(-2) + C(42)
*UGANDA(-1) + C(43)*UGANDA(-2) + C(44)
Equation: UGANDA = C(45)*BURUNDI(-1) + C(46)*BURUNDI(-2) + C(47)
*KENYA(-1) + C(48)*KENYA(-2) + C(49)*RWANDA(-1) + C(50)
*RWANDA(-2) + C(51)*TANZANIA(-1) + C(52)*TANZANIA(-2) + C(53)
*UGANDA(-1) + C(54)*UGANDA(-2) + C(55)

(-1): Previous month interbank rate, (-2): Previous two month interbank rate, Burundi: Burundi interbank rate, Kenya: Kenya interbank rate, Rwanda: Rwanda interbank rate, Tanzania: Tanzania interbank rate, Uganda: Uganda interbank rate.
Source: Author (2014)

As presented above, in the Interbank markets, statistically significant coefficients for Burundi rates are the one period lag rates in Burundi (β=1.062, $p < 0.05$) and one period lag interbank rates in Tanzania (β=-0.041, $p < 0.05$). For Kenya and Rwanda, the coefficients are the one period lag interbank rates in Kenya and Rwanda ($\beta = 0.804$, $p < 0.05$) and ($\beta = 0.806$, $p < 0.05$) respectively. For Tanzania, the significant coefficients are the one period lag interbank rates for Rwanda ($\beta = -0.417$, $p < 0.05$), Kenya ($\beta = 0.504$, $p < 0.05$) and Tanzania ($\beta = 0.749$, $p < 0.05$) and the two period lag interbank rates for Kenya ($\beta = -0.429$, $p < 0.05$). For Uganda, the coefficient is the one period lag interbank rates in Uganda ($\beta = 0.917$, $p < 0.05$). The results suggest that the interbank rates are influenced by the lagged rates in all the respective interbank markets. There is evidence of linkages from the lagged rates of other EAC member countries hinging on Tanzania as Kenya and Rwanda affect Tanzania and Tanzania affects Burundi.

Given the challenge of interpreting the VAR coefficient estimates because of the tendency of the error terms to be contemporaneously correlated and estimated coefficients on successive lags switching signs in successive periods as evidenced in the tables and equations in 5.15, 5.16, 5.17 and 5.18 above, the study pursues the standard practice of examining the dynamic effects of one time shock to one variable on other variables using impulse response functions.

5.3.3 Impulse Response Analysis (IRA)

Through impulse response functions, the study examines the speed of adjustment of monthly equity, Treasury bill and interbank returns in re-establishing the long run equilibrium following a shock. By subjecting the market returns to an impulse response

analysis, market segment returns response to the shocks are compared in terms of magnitude and speed of adjustment. Figures 5.5, 5.6, 5.7 and appendices II, III presents the findings on a 12 month period.

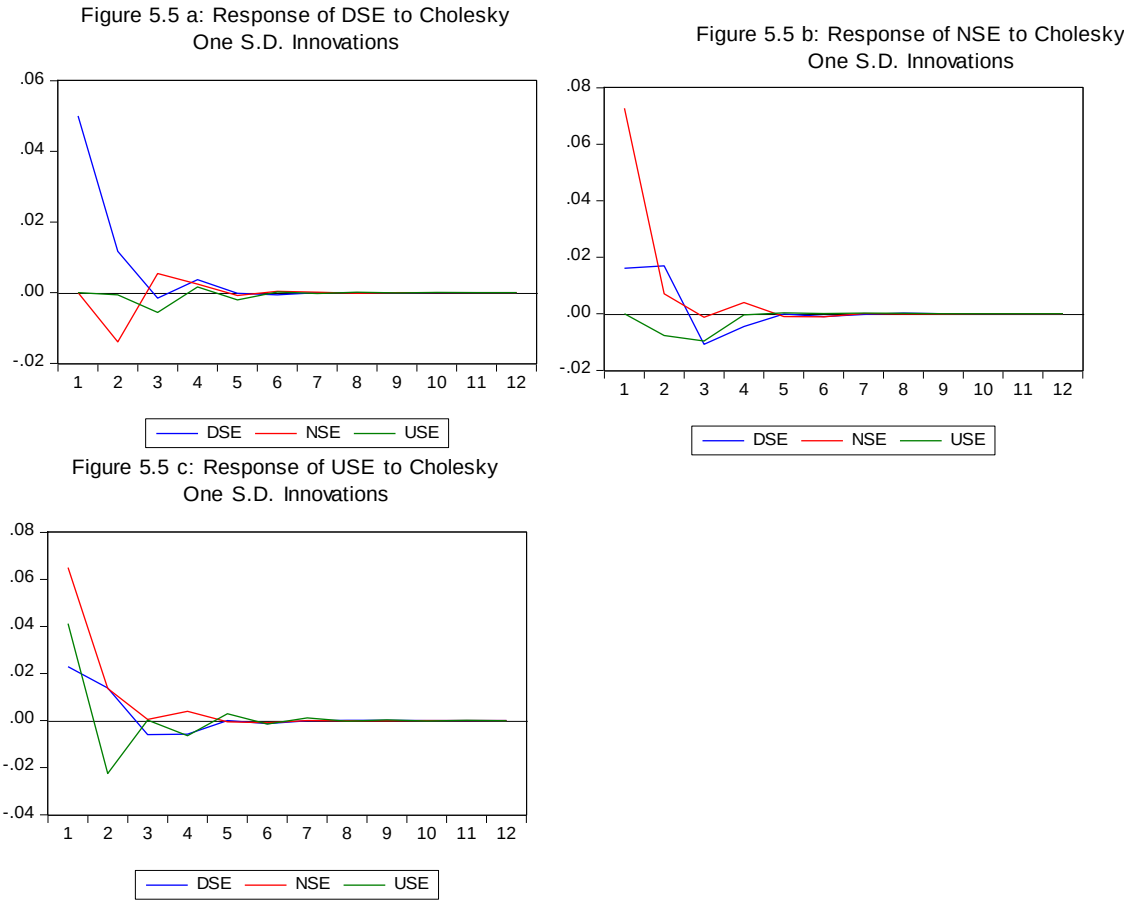


Figure 5.5: Impulse Response in EAC Equity Markets

As observed in figure 5.5 (a) above, a prolonged shock in the DSE market returns attributes to short term change on the USE and NSE market returns. However, all the market returns in a short period revert to the mean market returns. Figure 5.5 (b) shows that a prolonged shock on the NSE attributes to an immediate change on the USE market returns and a lagged short term change on the DSE returns as the overall market returns revert to the mean. As presented in figure 5.5 (c), a prolonged shock on the USE market

returns also attributes to change in DSE and NSE market returns as the market returns revert to their mean after some reasonable time. In general, the figures show that the equity markets in EAC region respond to the shocks amongst themselves. The sensitivity of the impulse responses however vary between the markets as dependent on the linkages between them.

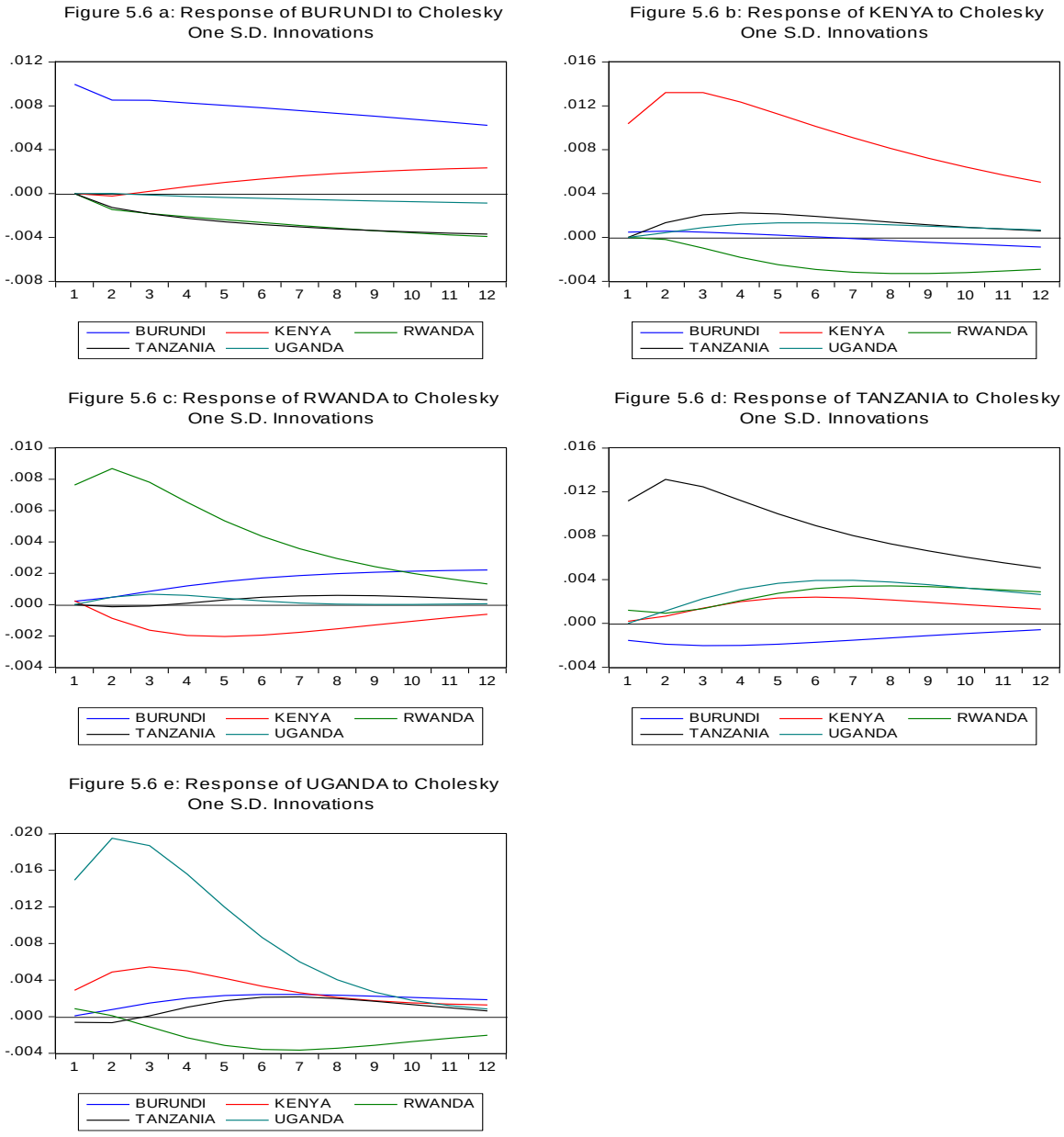


Figure 5.6: Impulse Response in EAC Treasury bill Markets

As evidenced in figure 5.6 (a) above, a prolonged shock on Burundi Treasury bill rate attributes to change on Kenya and Tanzania Treasury bill rates as Rwanda and Uganda Treasury bill rates increase before reverting to the mean Treasury bill rates. Figure 5.6 (b) shows that a shock on the Kenyan Treasury bill rates attributes to change in all the other markets Treasury bill rates. There are lagged responses by Rwanda Treasury bill rates as Uganda and Tanzania Treasury bill rates first increase and subsequently revert to the mean. Burundi Treasury bill rates exhibit divergence. As shown in Figure 5.6 (c), a shock on Rwanda Treasury bill rates attributes to change in Kenya, Uganda and Burundi Treasury bill rates as Kenya and Uganda Treasury bill rates revert to the mean but Burundi Treasury bill rates maintains the decline trend. Tanzania Treasury bill rates foremost increases on the shock and subsequently reverts to the mean. A shock on Tanzania Treasury bill rates has an instant response from Burundi Treasury bill rates which decline to the end with lagged responses from the Kenya, Uganda and Rwanda Treasury bill rates which show an increase and subsequently reverts to the mean as presented in figure 5.6 (d). A shock on the Uganda Treasury bill rate as presented in figure 5.6 (e) has an effect on the Burundi Treasury bill rates as Kenya, Tanzania and Rwanda Treasury bill rates foremost increases and subsequently revert back to their mean.

Figure 5.7 below presents impulse responses in the EAC interbank markets. Figure 5.7 (a) shows that a shock on Burundi interbank rates attributes to change on the rest of the EAC interbank markets rates which first increases and subsequently reverts to the mean apart from Rwanda interbank rates.

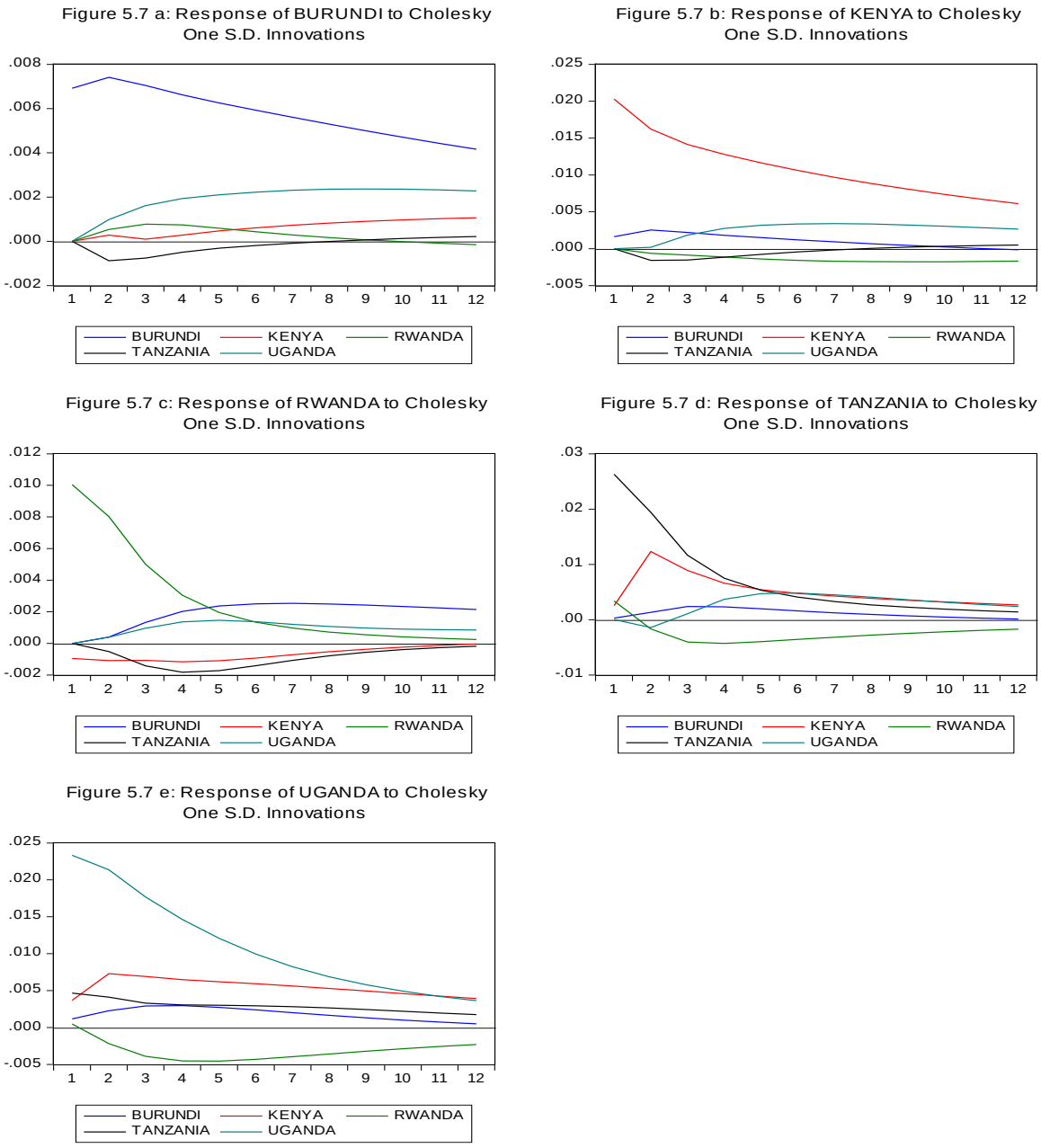


Figure 5.7: Impulse Response of the EAC Interbank Markets

In figure 5.7 (b), a shock on the Kenyan interbank rates attributes to change on the Rwanda interbank rates which reverts to the mean as Burundi, Tanzania and Uganda rates increase to revert back to the mean save for Burundi rates. Figure 5.7 (c) presents that Burundi interbank rates respond to a shock in Rwanda interbank rates by first increasing

and subsequently reverting to the mean, Uganda, Kenya and Tanzania interbank rates declines then reverts to the mean. Figure 5.7 (d) shows that a shock in Tanzania interbank market rate has an immediate effect on all other EAC interbank market rates that decline and subsequently reverts to the mean. Uganda rates decline directly towards the mean. A shock on the Uganda interbank market rate as presented in figure 5.7 (e) has an immediate effect on the Tanzania interbank market rate which declines and then increases. Rwanda interbank rates foremost increases due to the shock and then reverts to the mean. Kenya and Burundi interbank markets rates increase and does not deflect towards mean reversion.

5.3.4 Variance Decomposition (VD)

Forecast error variances shows contributions of each shock to movements in two market segment returns. The study further examines variance decomposition of innovations in the EAC financial markets. Tables 5.19, 5.20 and 5.21 summarize the proportion of volatility of a market segment return for a period of 12 months time horizon attributable to the return itself and the proportion attributable to the volatility of other EAC member market segment returns. The proportion due to the other market segment returns is found by subtracting from 100% the percentage explained by the return itself in each time period as presented in the tables in appendix III.

Figure 5.8 a: Variance Decomposition of DSE

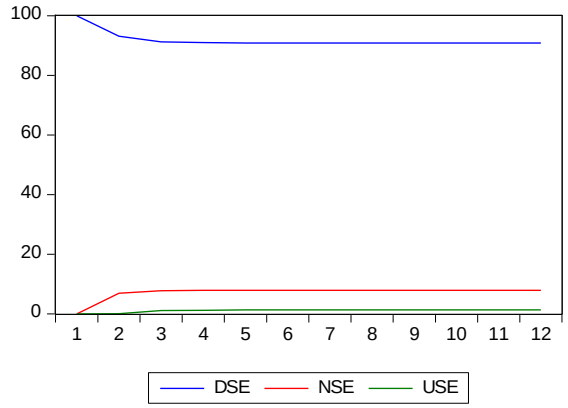


Figure 5.8 b: Variance Decomposition of NSE

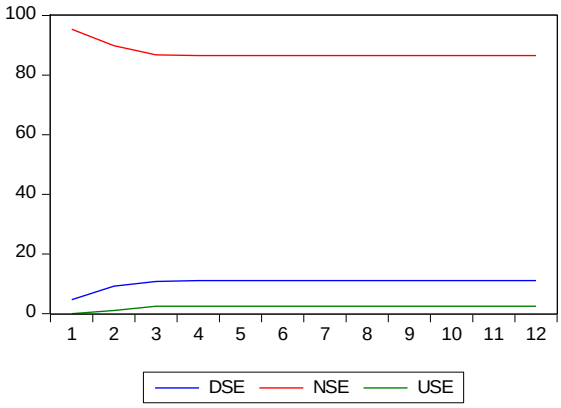


Figure 5.8 c: Variance Decomposition of USE

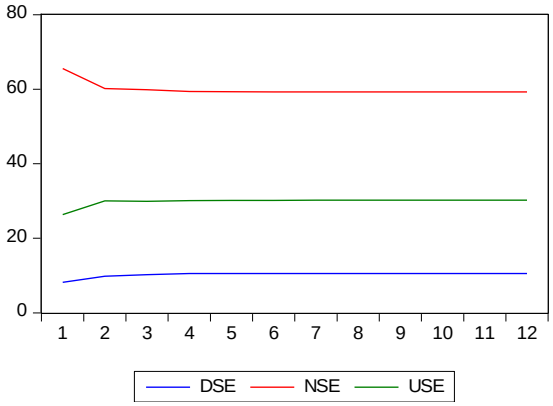


Figure 5.8: Variance Decomposition of EAC Equity Markets Returns

As presented in figure 5.8 above, table 5.19 below and Appendices IV (a) and V (a), on a twelve month horizon, the DSE returns accounts for up to 10.56% of variations in USE returns to up to 11.04% of variations in NSE returns. The NSE returns accounts for up to 7.87% of variations in DSE returns to up to 59.26% of variations in USE returns. USE returns accounts for up to 1.33% of variations in DSE returns to up to 2.44% of variations in NSE returns. The variations in USE returns are strongly influenced by foreign EAC markets returns at up to 69.81% while variations in DSE returns is the least influenced by foreign EAC equity markets returns at up to 9.20%.

Table 5.19: Percentage Variance Decomposition in EAC Equity Markets

Market	DSE	NSE	USE	All other EAC
DSE	90.799	7.874	1.327	9.201
NSE	11.039	86.520	2.441	13.480
USE	10.555	59.255	30.190	69.810

Source: Author Computations (2014)

Variance decomposition findings in the EAC Treasury bill is presented in figure 5.9 and table 5.20 below and appendices IV (b) and V (b).

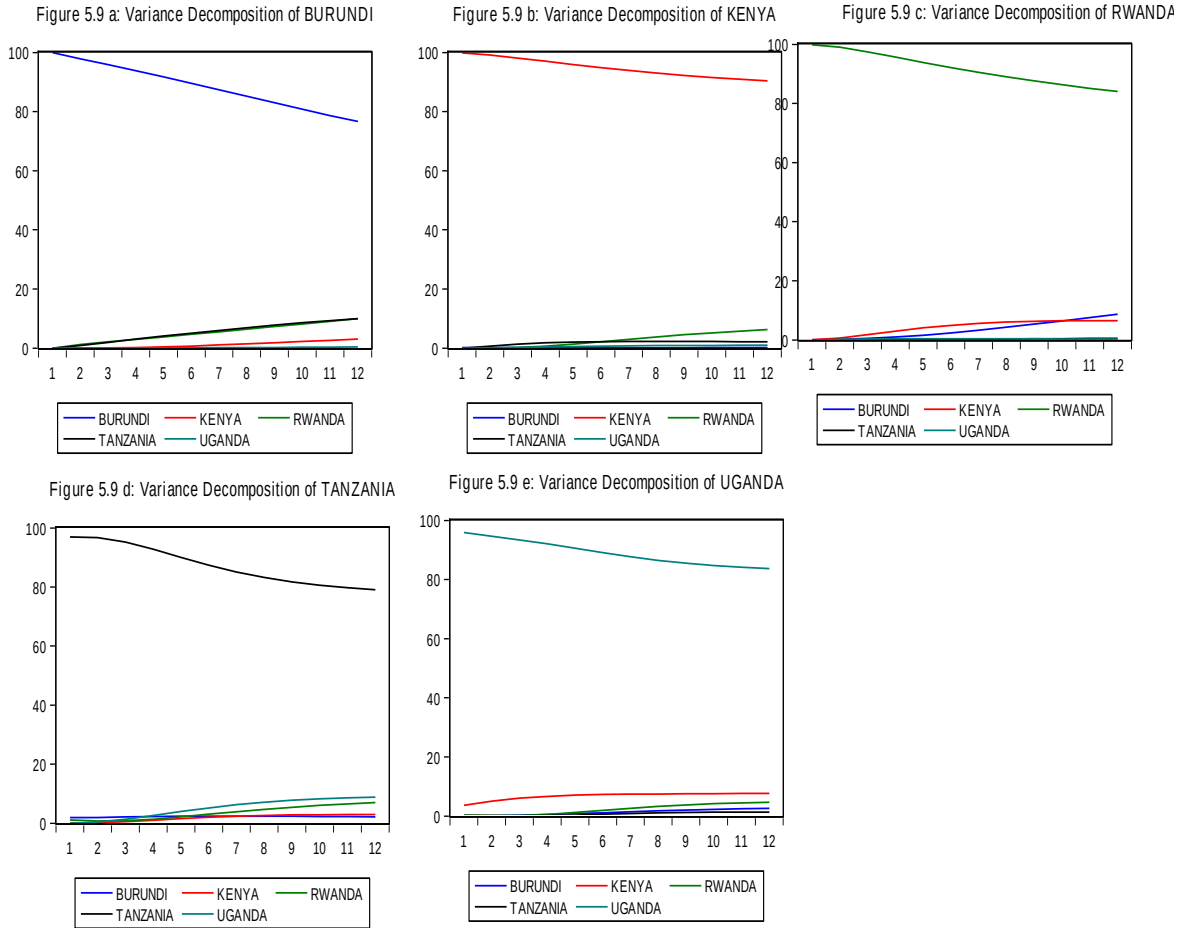


Figure 5.9: Variance Decomposition in EAC Treasury bill Markets

In the Treasury bill markets, variations in Burundi Treasury bill rates are highly influenced by other EAC member markets rates at up to 23.37% and variations in Kenya Treasury bill rates are the least influenced at up to 9.58%. Burundi Treasury bill rates influences on the range of up to 0.23% for variation in Kenya Treasury bill rates to up to 8.71% for variations in Rwanda Treasury bill rates. Kenya Treasury bill rates influences variations in Tanzania Treasury bill rates least at up to 2.97% and variations in Uganda Treasury bill rates more at up to 7.67%. Rwanda Treasury bill rates influences up to 4.66% variations for Uganda Treasury bill rates and up to 10.01% for variations in Burundi Treasury bill rates. Tanzania Treasury bill rates influences variations in Rwanda Treasury bill rates least at up to 0.483% and variations in Burundi Treasury bill rates most at up to 10%. Uganda Treasury bill rate influences variations in Rwanda Treasury bill rates least at up to 0.33% and variations in Tanzania Treasury bill rates most at up to 8.84%.

Table 5.20: Percentage Variance Decomposition in EAC Treasury bill Markets

Market	Burundi	Kenya	Rwanda	Tanzania	Uganda	All other EAC
Burundi	76.628	3.002	10.011	10.000	0.359	23.372
Kenya	0.230	90.417	6.262	2.155	0.937	9.583
Rwanda	8.709	6.472	84.007	0.483	0.329	15.993
Tanzania	2.176	2.974	6.929	79.077	8.843	20.923
Uganda	2.607	7.666	4.664	1.354	83.709	16.291

Source: Author Computations (2014)

Variance decomposition of returns in EAC interbank markets is summarized in Table 5.21, figure 5.10 below and appendices IV (c) and V (c).

As presented in table 5.21, in the EAC Interbank markets, variations in Tanzania market rates are highly influenced by other member markets rates at up to 33.52% and variations in the Kenya interbank market rates are least influenced by other EAC member country market rates at up to 8.04%.

Table 5.21: Percentage Variance Decomposition in EAC Interbank Markets

Market	Burundi	Kenya	Rwanda	Tanzania	Uganda	All other EAC
Burundi	87.502	1.245	0.449	0.386	10.418	12.498
Kenya	1.253	91.965	1.382	0.424	4.976	8.035
Rwanda	17.591	2.635	70.971	4.438	4.364	29.029
Tanzania	1.109	20.071	5.625	66.479	6.717	33.521
Uganda	1.782	13.957	5.284	4.129	74.848	25.152

Source: Author Computations (2014)

Burundi interbank market rates influences on the range of up to 1.11% for variations in Kenya interbank market rates to up to 17.59% for variations in Rwanda interbank market rates. Kenya interbank market rates influences variations in Burundi interbank market rates least at up to 1.25% and variations in Tanzania interbank market rates more at up to 20.07%. Rwanda interbank market rates influences up to 0.45% for variations in Burundi interbank market rates and up to 5.62% for variations in Tanzania interbank market rates. Tanzania influences variations in Burundi interbank market rates least at up to 0.38% and variations in Rwanda interbank market rates most at up to 4.44%. Uganda interbank market rates influences variations in Rwanda interbank market rates least at up to 4.36% and variations in Burundi interbank market rates most at up to 10.42%.

Figure 5.10 a: Variance Decomposition of BURUNDI

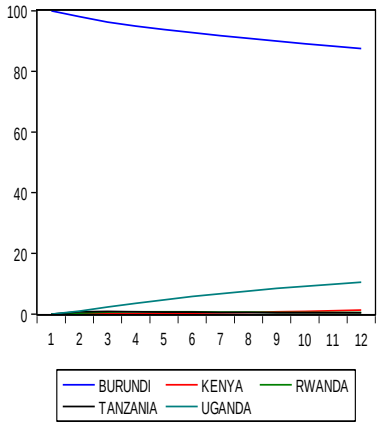


Figure 5.10 b: Variance Decomposition of KENYA

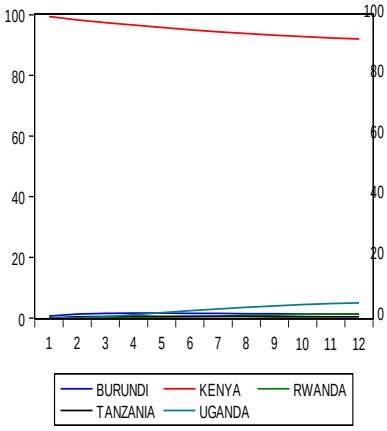


Figure 5.10 c: Variance Decomposition of RWANDA

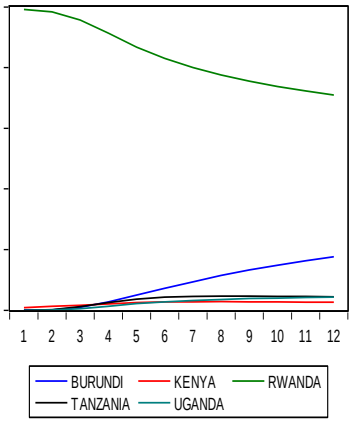


Figure 5.10 d: Variance Decomposition of TANZANIA

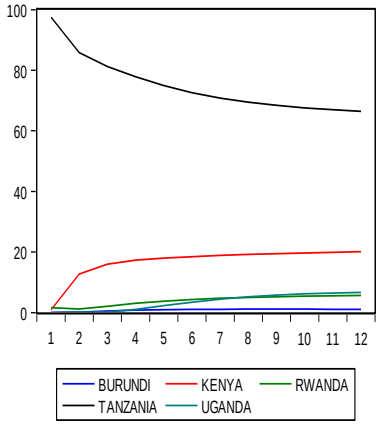


Figure 5.10 e: Variance Decomposition of UGANDA

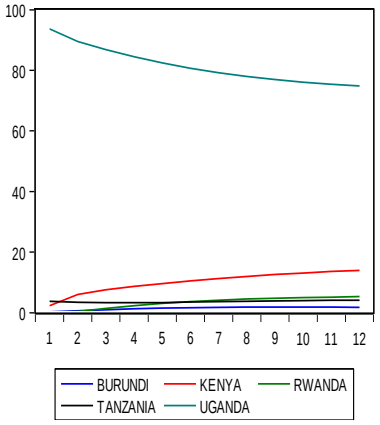


Figure 5.10: Variance Decomposition in EAC Interbank Markets

5.4 Convergence in EAC Financial Markets

Using cross sectional dispersion across the region and individual deviations by the East Africa community member countries equity, Treasury bill and interbank markets from the Kenyan benchmark market, the monthly standard deviation of returns are computed, summarized in appendix VI and presented in graphs 5.11, 5.12 and 5.13 below.

5.4.1 Sigma Convergence in EAC Financial Markets

Monthly cross sectional dispersion across the region and individual deviations by the East Africa community member countries equity markets is presented in figure 5.11 below.

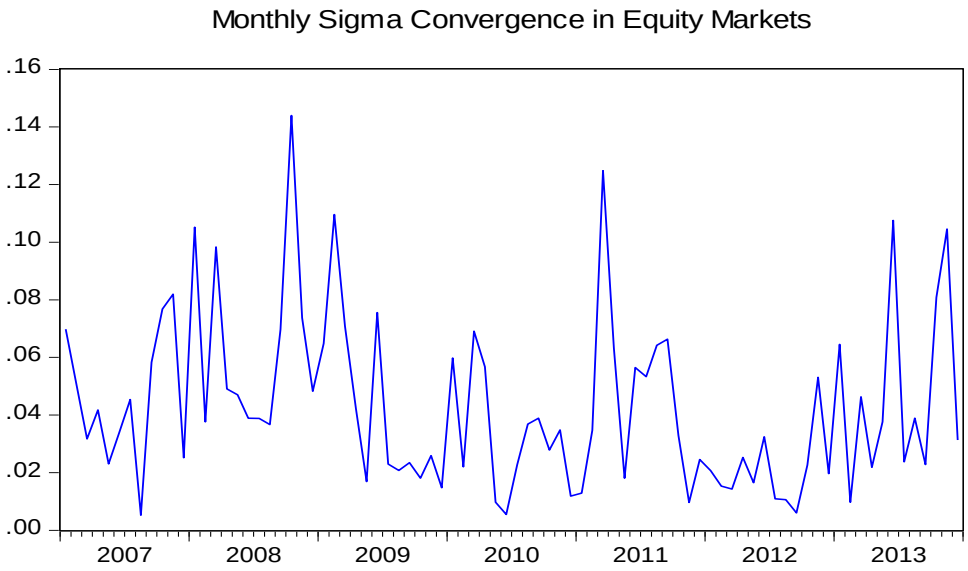


Figure 5.11: Monthly Sigma Convergence for the EAC Equity Markets

As presented in figure 5.11 above, the levels of sigma convergence in the EAC equity markets over the months and years has been swinging between a minimum of 0.005 attained in June 2010 and a maximum of 0.144 attained in October 2008. It is expected that the degree of financial integration increases when the cross sectional standard deviation of the market returns trends downwards. When the cross sectional distribution collapses to a single point and the standard deviation converges to zero, full equity market integration is attained. With the swings evidenced, it is clear that there are seasonal trends towards convergence followed by trends towards divergence in EAC equity markets.

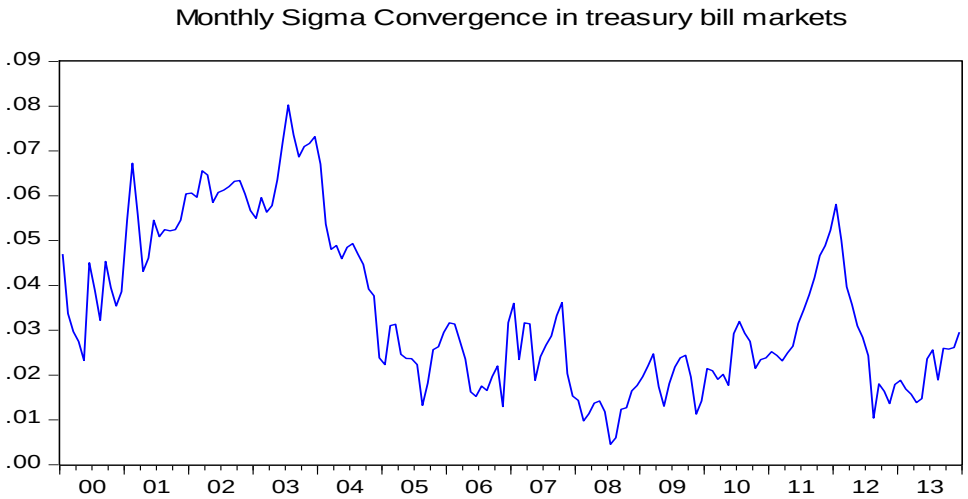


Figure 5.12: Monthly Sigma Convergence for the EAC Treasury bill Markets

As presented in figure 5.12 above, the levels of sigma convergence in the EAC treasury bill markets over the months has ranged between a minimum of 0.005 attained in July 2008 and a maximum of 0.08 attained in July 2003. From the graph, it is evident that the degree of financial integration in EAC Treasury bill markets has swung with increases and decreases over time without attaining a full level of integration. However, there is a remarkable phase of downward trend between December 2003 to November 2006.

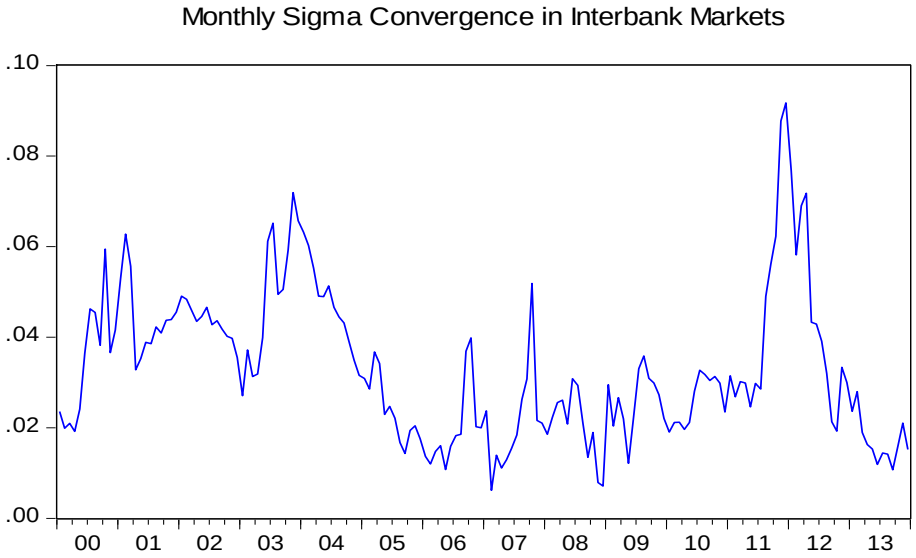


Figure 5.13: Monthly Sigma Convergence for the EAC Interbank Markets

Figure 5.13 above present the levels of sigma convergence in monthly returns for the EAC interbank markets from January 2000 to December 2013. As observed, the levels of cross sectional standard deviation ranges from a minimum of 0.006 in February 2007 to 0.092 in December 2011. Like the other market segments, the interbank markets haven't attained perfect integration. There are notable swings on trends to convergence and divergence with notable phases of downward trends towards convergence.

Annual dispersion of the respective EAC market segment returns from the annual Kenya market returns are computed to generate the annual levels of Sigma Convergence which are summarized in Table 5.22 and presented in figures 5.14 and 5.15 below.

Table 5.22: Annual Sigma Convergences in EAC Markets

Year	Equity markets	Treasury Bill markets	Interbank markets
2000		0.025	0.032
2001		0.048	0.038
2002		0.060	0.042
2003		0.064	0.046
2004		0.043	0.043
2005		0.016	0.020
2006		0.020	0.010
2007	0.006	0.026	0.015
2008	0.026	0.008	0.018
2009	0.013	0.006	0.018
2010	0.020	0.017	0.024
2011	0.025	0.028	0.031
2012	0.001	0.017	0.027
2013	0.023	0.014	0.009

Source: Author Computations (2014)

As indicated in table 5.22 and figure 5.14 below, the equity market segments exhibit divergence and convergence over the years. It is notable that there is a trend for convergence as the levels of dispersion tends towards the zero level with the closest being in 2012.

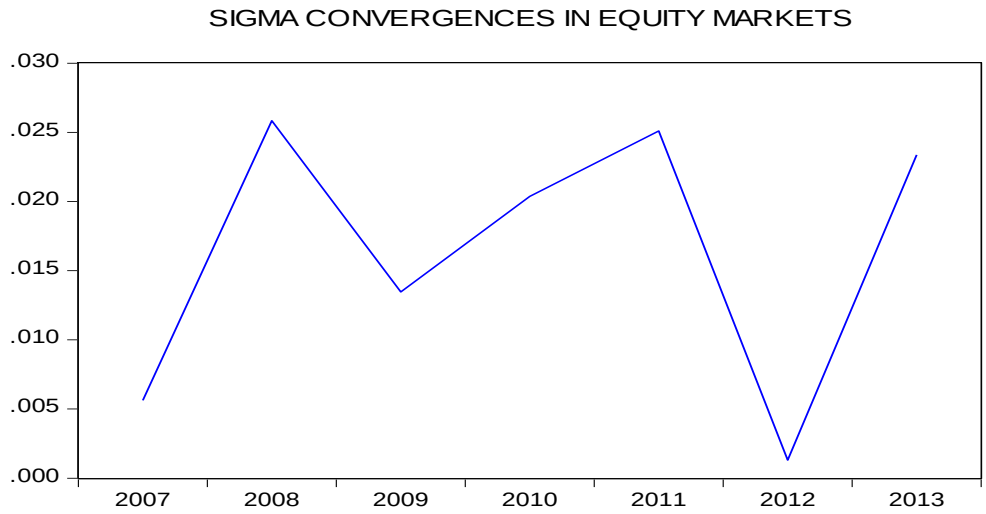


Figure 5.14: Annual Sigma Convergence for the EAC Equity Markets

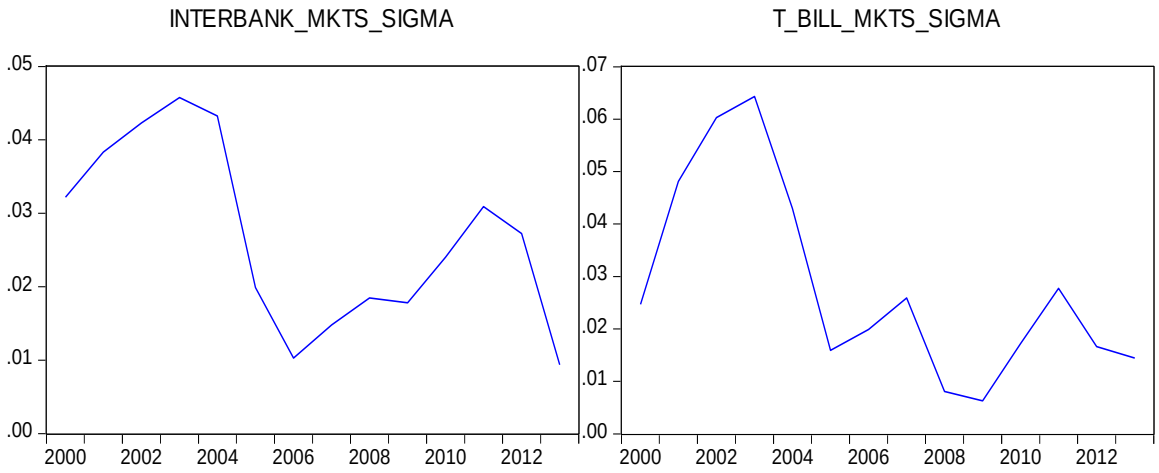


Figure 5.15: Annual Sigma Convergence for the EAC Money Markets

As indicated in table 5.22 and figure 5.15 above, the money market segments exhibit divergence and convergence over the years. It is notable that the Sigma convergences in all markets have not hit zero level implying no perfect integration. However, there is a

trend to convergence when levels of dispersion tend towards the zero level with the closest being in 2009 for the Treasury bill markets and 2013 for the interbank markets.

5.4.2 Beta Convergence in EAC Financial Markets

Annual Beta (β) convergences were computed from the spread of returns on investments against lagged spreads between other EAC member countries markets and Kenya as the benchmark market.

Table 5.23: Annual Equity Market Beta Convergences

Year	NSE.USE (β)	NSE.DSE (β)
2007	-1.395 (-5.572)*	-1.002(-3.087)**
2008	-1.835(-9.401)*	-0.860(-2.627)**
2009	-1.393(-5.153)*	-1.283(-4.349)**
2010	-0.752(-2.425)**	-0.855(-2.699)**
2011	-0.821(-2.568)**	-1.065(-3.324)*
2012	-1.097(-3.729)*	-0.987(-2.969)**
2013	-1.621(-6.082)*	-0.864(0.313)**

*1% level of significance **5% level of significance

Source: Author Computations (2014)

The computed annual Beta Convergences in the Equity markets is summarized in tables 5.23 above. These trends are also graphed in figures 5.16 below.

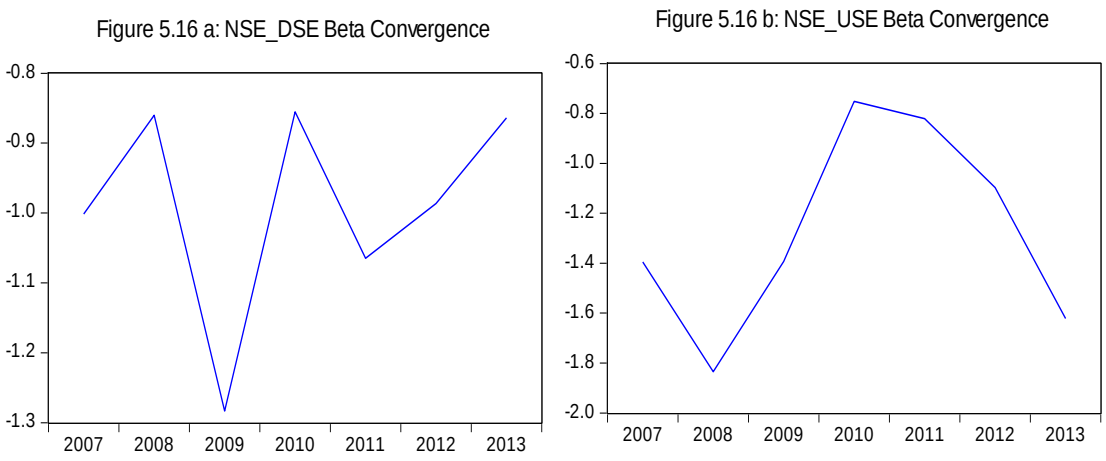


Figure 5.16: EAC Equity Markets Beta Convergence

As presented in figure 5.16 and table 5.23 above, mean reversion takes place across all the EAC equity markets from 2007 to 2013. If financial markets are perfectly integrated the spreads between the returns should be zero. Statistically significant ($p<0.05$) negative β coefficients as presented indicate mean reversion in the equity markets.

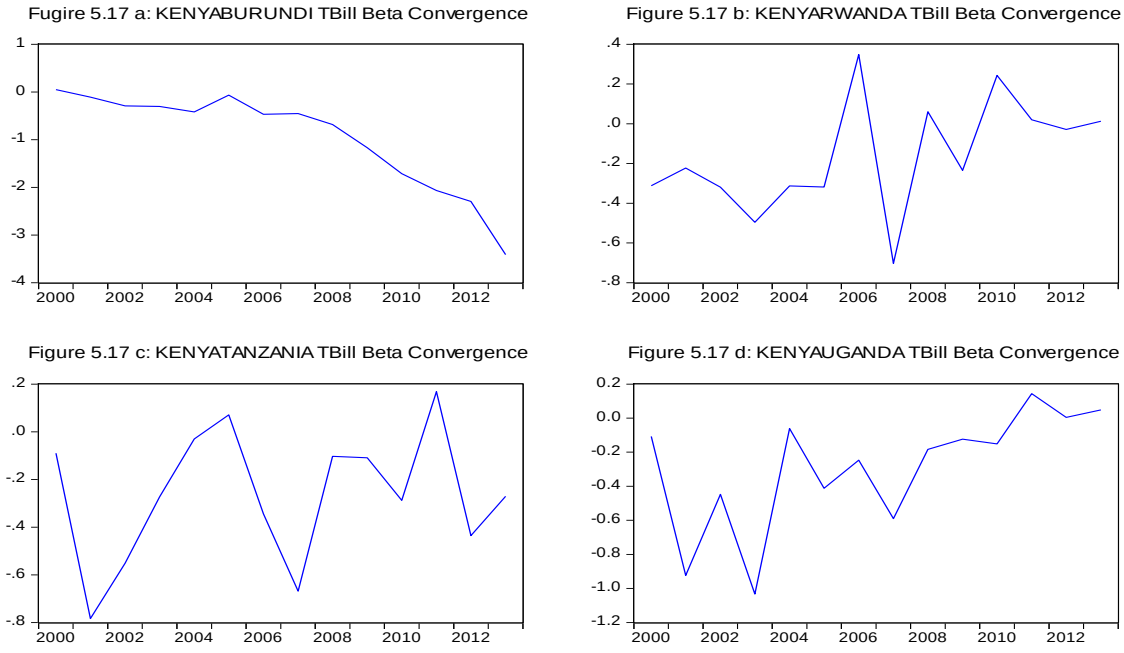


Figure 5.17: EAC Treasury bill Markets Beta Convergence

Figure 5.17 above and table 5.24 below present the values of Beta coefficients which represent the speed of convergence at which the spread is dissolved and investment returns on Treasury bills markets of other EAC partner countries converge with those in the benchmark market (Kenya).

Table 5.24: Annual Treasury Bill Market Beta Convergences

Year	KE.RWA	KE.TZ	KE.BUR	KEUG
2000	-0.312(-1.368)	-0.090(-0.020)	-0.303(-1.313)	-0.107(-0.804)
2001	-0.223(-0.937	-0.783(-2.323)	-0.285(-1.899)***	-0.924(-2.561)**
2002	-0.319(-1.017)	-0.551(-1.721)	-0.869(-3.214)*	-0.447(-2.117)***
2003	-0.496(-2.067)***	-0.273(-1.386)	0.267(2.825)**	-1.034(-3.728)*
2004	-0.314(-2.851)**	-0.031(-0.222)	-0.870(-4.390)*	-0.061(-0.355)
2005	-0.319(-1.395)	0.071(0.556)	-0.117(-0.589)	-0.412(-1.715)
2006	0.349(2.482)**	-0.344(-1.478)	0.219(0.662)	-0.247(-0.954)
2007	-0.703(-2.305)**	-0.669(-1.754)	-0.179(-0.845)	-0.590(-1.862)***
2008	0.060(0.193)	-0.103(-0.581)	-0.428(-1.507)	-0.183(-1.040)
2009	-0.235(-1.855)***	-0.109(-0.979)	-0.374(-1.348)	-0.124(-1.048)
2010	0.243(1.29)	-0.287(-1.466)	-0.151(-0.932)	-0.152(-0.659)
2011	0.019(0.241)	0.168(0.894)	-0.320(-1.306)	0.144(0.741)
2012	-0.029(-0.326)	-0.436(-1.551)	-0.070(-0.462)	0.005(0.040)
2013	0.013(0.156)	-0.271(-1.073)	0.058(0.368))	0.049(0.505)

*1% level of significance **5% level of significance *** 10% level of significance
BUR (Burundi) KE (Kenya) RWA (Rwanda) TZ (Tanzania) UG (Uganda)
Source: Author Computations (2014)

It is observed from figure 5.17 and table 5.24 above that there are a few fluctuations towards the absolute values unlike the predominant instances of mean reversion in the EAC Treasury bill markets. Specifically, Rwanda attains positive coefficients in 2006, 2008, 2010, 2011 and 2013. Burundi attains a positive integration coefficient in 2003 but shows divergence since then. Tanzania has a positive integration coefficient in 2005 and 2011. Uganda attains a positive integration coefficient in the period from 2011 to 2013.

Annual Beta Convergences in the interbank markets are summarized in table 5.25 below and the relationships trend is presented in figure 5.18 below.

Figure 5.18 a: KENYABURUNDI Interbank Beta Convergence

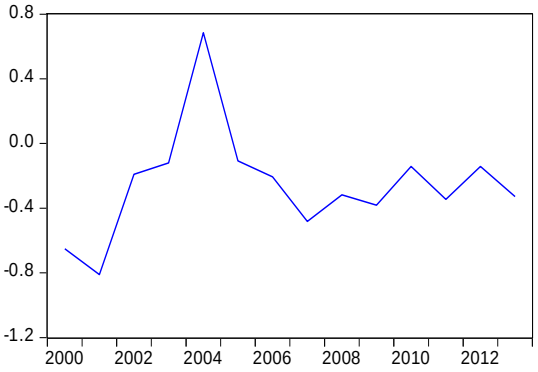


Figure 5.18 b: KENYARWANDA Interbank Beta Convergence

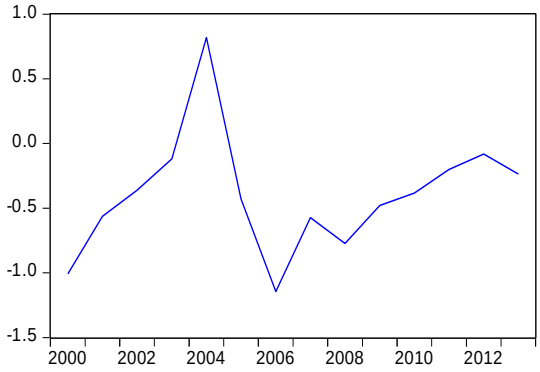


Figure 5.18 c: KENYATANZANIA Interbank Beta Convergence

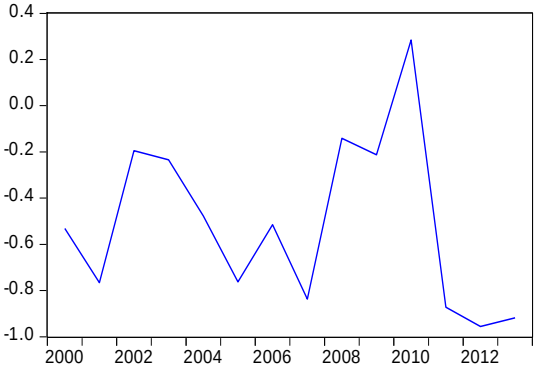


Figure 5.1 d: KENYAUGANDA Interbank Beta Convergence

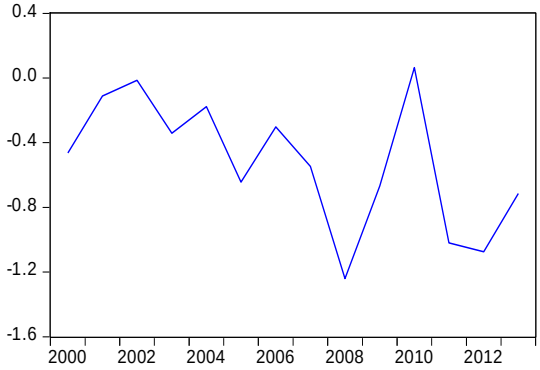


Figure 5.18: EAC Inter Bank Markets Beta Convergence

From figure 5.18 above and table 5.25 below, it is observed that the EAC interbank markets are also dominated by negative Beta coefficients inferring mean reversion of returns in the markets apart from 2004 for Rwanda and Burundi and 2010 for Uganda and Tanzania.

Table 5.25: Annual Inter Bank Market Beta Convergences

Year	KE.RWA	KE.TZ	KE.BUR	KEUG
2000	-1.008(-3.404)*	-0.532(-1.810)***	-0.652(-2.845)**	-0.464(-1.935)***
2001	-0.562(-1.932)***	-0.766(-2.634)**	-0.810(-2.593)**	-0.111(-0.634)
2002	-0.362(-1.532)	-0.194(-0.964)	-0.191(-1.480)	-0.015(-0.123)
2003	-0.118(-1.114)	-0.234(-1.713)	-0.120(-1.229)	-0.341(-1.637)
2004	0.818(2.448)**	-0.478(-1.032)	0.685(2.360)**	-0.178(-1.314)
2005	-0.429(-1.651)	-0.763(-3.074)**	-0.107(-0.538)	-0.643(-2.320)**
2006	-1.145(-3.619)*	-0.515(-1.928)***	-0.206(-0.999)	-0.303(-1.286)
2007	-0.574(-1.923)***	-0.837(-2.537)*	-0.482(-1.971)***	-0.547(-2.198)***
2008	-0.772(-2.459)**	-0.142(-0.642)	-0.317(-1.567)	-1.241(-4.072)*
2009	-0.480(-2.365)**	-0.212(-1.004)	-0.382(-1.518)	-0.667(-2.212)**
2010	-0.383(-1.527)	0.284(1.242)	-0.142(-1.046)	0.064(0.351)
2011	-0.200(-0.91)	-0.873(-2.569)*	-0.346(-1.341)	-1.020(-3.233)*
2012	-0.082(-0.544)	-0.956(-3.373)*	-0.142(-0.831)	-1.075(-3.484)*
2013	-0.235(-1.139)	-0.919(-2.918)**	-0.328(-2.024)***	-0.714(-2.738)**

*1% level of significance **5% level of significance *** 10% level of significance
BUR (Burundi) KE (Kenya) RWA (Rwanda) TZ (Tanzania) UG (Uganda)
Source: Author Computations (2014)

5.4.3 Analysis of Variance on Speed of Integration for Paired EAC Countries

The Beta Convergences for the integrating EAC countries are tested for equality of means to verify if there is a difference on speed of integration amongst the paired countries or the paired financial markets.

Table 5.26: Analysis of Variance on Equity Markets Beta Convergence

ANOVA

Beta Convergence

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.285	1	.285	3.065	.106
Within Groups	1.116	12	.093		
Total	1.401	13			

Source: Author (2014)

The results summarized on Table 5.26 above where p = 0.106 thus suggests that there is no statistically significant difference on the means of the speed of integration amongst the EAC equity markets. This finding infers that on average, the speed of integration is uniform across the region in the equity markets.

Table 5.27: Analysis of Variance on Interbank Markets Beta Convergence

ANOVA

Beta Convergence

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.646	3	.215	1.358	.266
Within Groups	8.247	52	.159		
Total	8.894	55			

Source: Author (2014)

As presented in table 5.27 above, p = 0.266. This suggests that there is no statistically significant difference on the means of speed of integration amongst the EAC interbank markets speed of integration. This finding confirms that on average, the speed of integration in EAC interbank markets is uniform.

In the Treasury bill markets, The ANOVA analysis presented in table 5.28 below shows that there are statistically significant differences on the paired countries mean speed of integration (p = 0.002). The Beta Convergences derived (integration) is on some instances affected by the paired integrating countries while in some other instances, it is not. The statistically significant mean difference pairs suggesting that the mean speeds of integration are different include: Kenya, Rwanda and Kenya, Burundi (p=0.001), Kenya, Burundi and Kenya, Tanzania (p=0.003), Kenya, Burundi and Kenya, Uganda (p=0.004). For the pair of Kenya, Rwanda and Kenya, Uganda (p=0.558), Kenya, Tanzania and

Kenya, Rwanda (p=0.641) and Kenya, Tanzania and Kenya, Uganda (p=0.903) the mean speed of integration is not different.

Table 5.28: Analysis of Variance on Treasury bill Markets Beta Convergence

ANOVA

Beta Convergence

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5.554	3	1.851	5.470	.002
Within Groups	17.599	52	.338		
Total	23.153	55			

Multiple Comparisons

Beta Convergence
LSD

(I) Market Pair	(J) Market Pair	Mean Difference (I-J)	Std. Error	Sig.
KenyaRwanda	Kenya Burundi	.79624317*	.21988516	.001
	KenyaTanzania	.10299976	.21988516	.641
	KenyaUganda	.12979334	.21988516	.558
Kenya Burundi	KenyaRwanda	-.79624317*	.21988516	.001
	KenyaTanzania	-.69324342*	.21988516	.003
	KenyaUganda	-.66644983*	.21988516	.004
KenyaTanzania	KenyaRwanda	-.10299976	.21988516	.641
	Kenya Burundi	.69324342*	.21988516	.003
	KenyaUganda	.02679359	.21988516	.903
KenyaUganda	KenyaRwanda	-.12979334	.21988516	.558
	Kenya Burundi	.66644983*	.21988516	.004
	KenyaTanzania	-.02679359	.21988516	.903

*. The mean difference is significant at the 0.05 level.

Source: Author (2014)

5.4.4 Analysis of Variance on Beta Convergences for Integrating EAC Market segments

Beta Convergences for the Integrating EAC market segments are tested for equality of means to inquire differences on speed of integration based on the market segments.

Table 5.29: Analysis of Variance on Market segment Beta Convergence

ANOVA

Beta Convergence

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	6.302	2	3.151	11.587	.000
Within Groups	33.449	123	.272		
Total	39.750	125			

Multiple Comparisons

Beta Convergence
LSD

(I) Market Pair	(J) Market Pair	Mean Difference (I-J)	Std. Error	Sig.
equity market	Treasury bill market	-.71151465*	.15582163	.000
	Interbank market	-.71170528*	.15582163	.000
Treasury bill market	equity market	.71151465*	.15582163	.000
	Interbank market	-.00019063	.09855025	.998
Interbank market	equity market	.71170528*	.15582163	.000
	Treasury bill market	.00019063	.09855025	.998

*. The mean difference is significant at the 0.05 level.

Source: Author (2014)

As summarized in table 5.29 above, in the pairs of equity, treasury bill markets and equity, interbank markets, $p < 0.001$, thus implying that there is a difference on the speed of integration between the equity and the money market segments. In the pair of Treasury bill and interbank markets, $p=0.998$, inferring that there is no difference in the mean speed of integration in the EAC money market segments. This finding infers that the

speed of integration in the equity markets is not on average the same as the speed of integration in the Treasury bill and the interbank markets in EAC. This may be explained by the differences in development levels in the various financial market segments.

5.4.5 Analysis of Variance on Sigma Convergences for Integrating EAC Markets

The sigma Convergences for the integrating EAC market segments are tested for equality of means to verify if there is a difference on level of integration based on the type of integrating market segment and presented in table 5.30 below. From the table, $p > 0.05$, it is interpreted that there are no statistically significant differences on the levels of integration amongst the EAC equity and money markets. The mean levels of integration are thus not different across the market segments.

Table 5.30: Analysis of Variance on Market segment Sigma Convergence
ANOVA

Beta Convergence

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.001	2	.000	1.548	.228
Within Groups	.007	32	.000		
Total	.008	34			

Source: Author (2014)

5.5 Market Geography and Financial Markets Integration

The computed annual beta and sigma convergences are regressed against nine annual market geographical variables to explain their relationships with the levels and speed of financial markets integration. The geographical characteristics are market size measured as market capitalization and GDP, Distance measured in kilometers between member country capital cities, Remoteness measured as the product of distance and the proportion

of country GDP to the regional GDP, financial deepening policy (Fsd) measured as the proportion of private sector credit to GDP, exchange rate volatility measured as annual variance of daily US$ spot rate, adjacency assigned a dummy variable incase of countries sharing of borders, Culture assigned a dummy variable incase of countries sharing official language and Colonial links assigned a dummy variable incase of countries having similar colonial history.

5.5.1 Market Geography and Speed of Financial Markets Integration

Table 5.31: Market Geography and Speed of Equity Markets Integration

Variable	**Coefficients**
	Model 1
Fsd Policy	-0.577 (-2.449)
R Square	0.333
Adjusted R Square	0.278
F Statistic	5.999
Significance	0.031

Source: Author (2014)

Table 5.31 above shows the results of stepwise regression analysis. As presented in the table, there is a statistically significant moderate relationship between market geography attributes and speed of equity market integration ($F = 5.999$, $p < 0.05$) as 27.8% variations in speed of equity market integration is explained by variations in market geography (Adjusted R square = 0.278, $p < 0.05$). The statistically significant negative relationship between Fsd policy (β=-0.577, t=-2.449, $p < 0.05$) and speed of equity markets integration is explained that though the EAC member states continue to pursue financial inclusion policies, the efforts are yet to translate to positively support the speed of equity markets integration. Generally, the equity markets are still characterized by mean reversion. Financial sector deepening policies should be supplemented with

policies supportive of efficiency across the equity market segments. The region should also harmonize the member country financial inclusion policies so as to positively support the financial markets integration processes.

Table 5.32: Market Geography and Speed of Treasury bill Markets Integration

Variable	**Coefficients**	
	Model 1	**Model 2**
Gdp	-0.265 (-2.020)	-0.888 (-3.908)
Adjacency	-	0.736 (3.239)
R Square	0.070	0.224
Adjusted R Square	0.053	0.195
R Square Change	0.070(0.002)	0.154(0.002)
F Statistic	4.082	7.645
F Change	4.082(0.048)	10.490(0.048)
Significance	0.048	0.001

Source: Author (2014)

In the Treasury bill markets, stepwise regression models establish that two geography characteristics are statistically significant in explaining the speed of integration. As presented in table 5.32 above, model one indicate that 5.3% of variations in speed of Treasury bill markets integration is explained by variations in GDP (Adjusted R squared = 0.053, $F=4.082$, $p< 0.05$). Model one shows a statistically significant weak negative relationship between GDP ($\beta=-0.265$, $t=-2.020$, $p< 0.05$) and speed on Treasury bill markets integration. Though the model expects a positive relationship between the variables, the finding imply that though the EAC economies continue to enjoy economic growth, the Treasury bill markets have not yet attained desirable levels of efficiency where Treasury bill rates are market determined. On adding adjacency as a second geography attribute, model two shows that 19.5% of variations in speed of Treasury bill markets integration is explained by variations in GDP and Adjacency (Adjusted R Squared = 0.195, $F=7.645$). Model two shows a statistically significant weak negative

relationship between GDP (β=-0.888, t=-3.908, p< 0.05) and speed on Treasury bill markets integration. It further shows a statistically significant weak positive relationship between adjacency (β=0.736, t=3.239, p< 0.05) and speed of Treasury bill markets integration which notes that countries that share common boundaries possibly have similar fiscal policy measures and thus the speed of the markets integration meets the expectations of gravity models of close proximity supporting markets integration. The importance of the adjacency in the model is explained by the R Square change of 0.154 when compared to R Square change for GDP of 0.070.

Since GDP is statistically significant in both models in table 5.32, the findings underscore that disparities in levels of economic development in the region may be a challenge to the integration efforts and there is need to harmonize the EAC member countries economic development policies.

As presented in model one in Table 5.33 below, in the EAC interbank markets, 7.8% variations in speed of integration is explained by variations in GDP (Adjusted R square = 0.078, p >0.05).

Table 5.33: Market Geography and Speed of Interbank Markets Integration

Variable	**Coefficients**
	Model 1
Gdp	-0.309(-2.383)
R Square	0.095
Adjusted R Square	0.078
F Statistic	5.681
Significance	0.021

Source: Author (2014)

The model infers a statistically significant weak negative relationship between GDP (β=-0.309, t =-2.383, p<0.05) and speed of interbank markets integration which is not

consistent with the priori expectations of the model. Similar to the Treasury bill markets, this result is attributed to the reality that though the EAC economies continue to report improved economic performance, the interbank market segments experience mean reversions with divergences and policy should focus on enhancing market efficiency for the rates to be market determined and to support the eventual convergence of the returns. This should also be supported by harmonization of economic development policies.

5.5.2 Level of Integration and Market Geography

The study sought to establish the relationship between level of market integration and geographical variables. Stepwise regression models relating market geography attributes and levels of integration in the money markets establish statistically significant relationships as presented in tables 5.34 and 5.35 below.

Table 5.34: Market Geography and Level of T bill Markets Integration

Variable	**Coefficients**			
	Model 1	**Model 2**	**Model 3**	**Model 4**
Fsd Policy	-0.286(-2.191)	-0.384(-3.049)	-0.059(0.404)	-
Gdp	-	-0.380(-3.020)	-1.676(-5.393)	-1.605(-6.330)
Remoteness	-	-	-1.545(-4.448)	-1.450(-5.721)
R Square	0.082	0.216	0.432	0.431
Adjusted R Square	0.065	0.187	0.400	0.409
R Square Change	0.082(0.033)	0.135(0.004)	0.216(0.000)	-0.002(0.688)
F Change	4.799(0.033)	9.123(0.033)	19.783(0.033)	0.163
F Statistic	4.799	7.322	13.205	20.043
Significance	0.033	0.002	0.000	0.000

Source: Author (2014)

Model one in table 5.34 above indicates that 6.5% variations in the level of Treasury bill markets integration in EAC is explained by variations in Fsd Policy (Adjusted R square = 0.065, F=4.799, $p<0.05$). The finding suggests that there is a statistically significant

negative relationship between Fsd Policy (β = -0.286, t = -2.191, p <0.05) and the level of Treasury bill integration confirming that though the EAC member countries financial sector deepening policies especially financial inclusion continues to improve, the treasury bill markets segments continue to exhibit divergences. One possible cause of such finding is lack of coordination of member country governments' role in Treasury bill markets for fiscal policy initiatives across the region.

Introduction of GDP into model two indicate that 18.7% of variations in levels of Treasury bill markets integration are explained by variations in both GDP and Fsd Policy (Adjusted R square = 0.187, F=7.322, p<0.05). The importance of GDP as an explanatory variable in the model is evidenced by the R square change of 0.135. The statistically significant weak negative relationships between GDP (β = -0.380, t = -3.020, p <0.05) and levels of integration on one hand and Fsd Policy (β = -0.384, t = -3.049, p <0.05) and levels of integration on the other hand confirm the proposition that the increased economic performance and financial inclusion in EAC member countries is yet to translate to integration of the financial markets possibly due to non harmonized fiscal policy amongst the countries and market inefficiencies as the rates of return are not market determined but are influenced by government's economic policies.

Model three in Table 5.34 above shows that 40.0% of variations in levels of Treasury bill markets integration are explained by variations in Fsd Policy, GDP and Remoteness (Adjusted R Squared = 0.400, F=13.205, p<0.05). The importance of remoteness in the model is evident in the R square change of 0.216. The model shows a negative

relationship between Fsd policy (β = 0.059, t = 0.404, p <0.05) and level of integration in the Treasury bill markets. The statistically significant negative relationship between GDP (β=-1.676, t=-5.393, p <0.05) on one hand and remoteness (β=-1.545, t=-4.448, p <0.05) on another hand and the level of Treasury bill markets integration is alluded to lack of policy congruence amongst the EAC countries as economic performance improves but integration diverges in the Treasury bill markets.

Model four in table 5.34 above suggest that 40.9% of variations in levels of Treasury bill markets integration are explained by variations in GDP and Remoteness. The model shows statistically significant negative relationship between GDP (β=-1.605, t=-6.330, p <0.05) and levels of Treasury bill integration and a further negative relationship between Remoteness (β=-1.450, t=-5.721, p <0.05) and levels of Treasury bill markets integration. The gravity model expects GDP to relate positively and remoteness to relate negatively with the levels of markets integration. Removal of Fsd policy in the model leads to a reduction of R square change of -0.002.

Table 5.35: Market Geography and Level of Interbank Markets Integration

Variable	**Coefficients**
	Model 1
Gdp	-0.311(-2.403)
R Square	0.097
Adjusted R Square	0.080
F Statistic	5.776
Significance	0.020

Source: Author (2014)

Model one in table 5.35 above suggests that 8% of variations in levels of interbank markets integration is explained by variations in GDP (Adjusted R squared = 0.08, F=5.776). From the model, a statistically significant weak negative relationship is established between GDP (β=-0.311, t=-2.403, p <0.05) and levels of interbank markets integration. Though the gravity model expects size proxied by GDP to have a positive relationship with levels of integration, the model establishes a negative relationship since the interbank markets returns exhibit mean reversion occasioned by market inefficiency though the economic performance improves across the countries.

From tables 5.31, 5.32, 5.33, 5.34 and 5.35, the study establishes weak and moderate but statistically significant relationships between market geography characteristics and speeds or levels of market segments integration. Moderate but significant relationships of 27.8% are established when relating GDP to the speed of equity markets integration and moderate but significant relationships of 40% when relating GDP, Fsd policy and remoteness to levels of Treasury bill markets integration. Weak but significant relationships of 8% are established when relating GDP to levels of interbank integration, 18.7% when relating GDP and Fsd policy to levels of Treasury bill markets integration, 6.5% when relating Fsd policy to levels of Treasury bill markets integration, 7.8% when relating GDP to speed of Interbank markets integration and 19.5% when relating GDP and Adjacency to speed of Treasury bill markets integration.

The foregoing relationships confirm the proposition by Sachs (2003), Lemmen and Eijffinger (1996), Von Furstenberg (1998), Cottarelli and Kourelis (1994), Hubbard and

Hubbard (2004) and Xuan Vinh (2005) that country or market characteristics influence the economic relationships between trading partners. It further confirms the proposition by Guerin (2006) that geography of a country determines its economic and financial integration in the world economy.

5.6 Market Geography, Institutional Quality and Degree (Speed) of Financial Markets Integration

The study sought to establish the influence of institutional quality on the relationship between market geography and financial markets integration in EAC. As a measure of institutional quality, the World Bank world governance indicator of rule of law was applied.

5.6.1 Market Geography, Institutional Quality and Speed of Treasury bill Markets Integration

Model one in table 5.36 below indicate that 15% of variations in speed of Treasury bill markets integration is explained by variations in rule of law (Adjusted R squared = 0.150, F=10.704). The model indicates a statistically significant weak positive relationship between rule of law (β=0.407, t=3.272, $p<0.05$) and speed of Treasury bills integration. The positive relationship is consistent with the expectation of a positive influence of rule of law as investors prefer markets where there is safety of their portfolio and there are mechanisms for contract enforcement which ensures certainty in returns.

Table 5.36: Market Geography, Rule of law and Speed of Treasury bill Markets Integration

Variable	Coefficients	
	Model 1	**Model 2**
Rule of Law	0.407(3.272)	0.735(4.251)
Remoteness	-	-0.450(-2.601)
R Square	0.165	0.260
Adjusted R Square	0.150	0.232
R Square Change	0.165 (0.002)	0.094 (0.012)
F Statistic	10.704	9.306
F Change	10.704 (0.002)	6.765 (0.012)
Significance	0.002	0.000

Source: Author (2014)

Model two in table 5.35 above indicates that 23.2% of variations in the speed of Treasury bill markets integration are explained by variations in rule of law and variations in remoteness (Adjusted R squared = 0.232, F=9.306). The model establishes a statistically significant weak positive influence of rule of law (β=0.735, t=4.251, $p<0.05$) on the relationship between Remoteness and speed of Treasury bill markets integration which is consistent with the model expectation of a positive influence of rule of law on the integration relationships. The statistically significant weak negative relationship between Remoteness (β=-0.450, t=-2.601, $p<0.05$) and speed of Treasury bills integration evidenced in model two confirms the expectations of gravity models that proximity promotes economic activities but distance is a cost to international economic activities. The positive influence of rule of law on the relationship is confirmed in model one with a greater R square change of 0.165 as compared to R square change of 0.094 in model two.

5.6.2 Market Geography, Institutional Quality and Level of Interbank Markets Integration

In the interbank markets, variations in rule of law explain up to 5.3% of variations in levels of interbank markets integration (Adjusted R squared=0.053, F=4.084). Model one establishes a statistically significant weak positive relationship between rule of law (β=0.265, t=2.021, p<0.05) and levels of integration. The finding confirms the proposition that investors prefer destinations where the safety of their portfolio is guaranteed.

Table 5.37: Market Geography, Rule of law and Level of Interbank Markets Integration

Variable	Coefficients	
	Model 1	**Model 2**
Rule of Law	0.265(2.021)	0.412(3.097)
Fsd Policy	-	-0.387(-2.909)
R Square	0.070	0.053
Adjusted R Square	0.053	0.168
R Square Change	0.070(0.048)	0.128(0.005)
F Statistic	4.084	6.555
F Change	4.084(0.048)	8.461(0.005)
Significance	0.048	0.003

Source: Author (2014)

Model two in table 5.37 establish that 16.8% of variations in levels of interbank integration are explained by variations in rule of law and Fsd Policy (Adjusted R squared = 0.168, F=6.555). The model indicates a statistically significant weak positive influence of rule of law (β=0.412, t=3.097, p<0.05) on the relationship between market geography and levels of integration which supports the proposition of the role of rule of law in creating investor confidence and returns convergence. The statistically significant negative relationship between Fsd Policy (β=-0.387, t=-2.909, p<0.05) and levels of

integration indicate that there is no policy congruence amongst the member states with respect to financial inclusion on one hand and efficiency of the markets on the other hand. In efficient regional markets, returns are expected to be determined by market forces and increased credit to the private sector as a financial inclusion policy should support regional financial markets integration. The results of positive influence of rule of law on integration of financial markets are consistent with the propositions of Osili and Paulson (2004) and Lombardo and Pagano (2008) that ability of a country's institutions to protect private property and provide incentives explains financial markets development.

5.7 Market Geography, Political Stability and Financial Markets Integration

The moderating effect of political stability on the relationship between market Geography and speed or levels of financial markets integration is tested in a stepwise regression model using the Baron and Kenny (1986) approach.

In this approach:

$Y= \beta_0+\beta_1X+\beta_2Z+\beta_3XZ$

Where: X= the independent variable (Statistically significant market geography)

β = Coefficient of variation

Z= moderator (Political stability)

XZ= product of the standardized values for the independent variable (Market Geography) and the moderator (Political stability)

Y= Speed (Level) of Financial Market integration

5.7.1 Market Geography, Political Stability and Speed of Markets Integration

The moderating effect of political stability on the relationship between market geography attributes and speed of integration (Beta convergence) is explored in stepwise regression models. These findings are presented below.

Table 5.38: Market Geography, Political Stability and Speed of Treasury bill Markets Integration

Variable	**Coefficients**
	Model 1
Adjacency and Political Stability	0.428(3.482)
R Square	0.183
Adjusted R Square	0.168
F Statistic	12.125
Significance	0.001

Source: Author (2014)

As presented in table 5.38 above, the product of adjacency and political stability is statistically significant in explaining 16.8% of variations in the speed of integration in the Treasury bill markets (Adjusted R squared = 0.168, $F=12.125$, $p<0.05$). Model one in the table presents a statistically significant weak positive relationship between the product of adjacency and political stability ($\beta=0.428$, $t=3.482$, $p<0.05$) and the speed of Treasury bill markets integration. The model points to the proposition that investments prosper within well-functioning market economies supported by political systems with strong protection of property rights.

In the interbank markets, the moderating effect of political stability on the relationship between market geography attributes and speed of markets integration is summarized in models one and two in table 5.38 below. In model one, 10.9% of variations in speed of

interbank markets integration is explained by variations in market geography and political stability (Adjusted R squared = 0.109, F=7.710). The model presents a negative relationship between the product of GDP and Political Stability (β=-0.353, t=-2.777, p<0.05) and the speed of interbank markets integration. The significance of the product of GDP and political stability in the model is evident in the R Square change of 0.125.

Table 5.39: Market Geography, Political Stability and Speed of Interbank Markets Integration

Variable	**Coefficients**	
	Model 1	**Model 2**
Gdp and Political Stability	-0.353(-2.777)	-0.323(-2.614)
Gdp	-	-0.273(-2.206)
R Square	0.125	0.199
Adjusted R Square	0.109	0.168
R Square Change	0.125 (0.008)	0.074 (0.032)
F Statistic	7.710	6.563
F Change	0.074 (0.008)	4.864 (0.032)
Significance	0.008	0.003

Source: Author (2014)

Model two in table 5.39 above infer that 16.8% of variations in interbank markets integration are explained by variations in GDP and Political stability. The model establish statistically significant negative relationships between the product of GDP and Political Stability (β=-0.323, t=-2.614, p<0.05) and speed of interbank markets integration. There are also negative relationships between GDP (β=-0.273, t=-2.206, p<0.05) and the speed of the interbank markets integration. These findings suggest that advancements in political and economic activities in EAC are yet to positively influence integration the speed of integration in the interbank market segments as expected possibly because of the inefficiencies in the financial systems.

5.7.2 Market Geography, Political Stability and Level of Markets Integration

Stepwise regression model results presented in tables 5.39 and 5.40 below indicates the statistical significance of the moderating effect of political stability on the relationship between level of Treasury bill markets and interbank markets integration and market geography characteristics.

Table 5.40: Market Geography, Political Stability and Level of Treasury bill Markets Integration

Variable	Coefficients		
	Model 1	**Model 2**	**Model 3**
Remoteness and Political Stability	0.336(2.622)	0.339(2.751)	0.504(3.668)
Fsd Policy	-	-0.289(-2.345)	-0.332(-2.776)
Political Stability	-	-	0.327(2.357)
R Square	0.113	0.196	0.274
Adjusted R Square	0.097	0.166	0.232
R Square Change	0.113	0.083	0.077
F Statistic	6.876	6.475	6.539
F Change	6.876	5.501	5.494
Significance	0.011	0.003	0.001

Source: Author (2014)

Model one in table 5.40 indicate that 9.7% variations in levels of Treasury bill markets integration is explained by variations in Remoteness and Political Stability (Adjusted R squared = 0.097, F=6.876). The model shows a statistically significant weak positive relationship between the product of Remoteness and Political Stability (β=0.336, t= 2.622, $p<0.05$). The importance of the moderating relationship is evident in the R square change of 0.113 as presented in the model. Introduction of Fsd Policy to the model shows that 16.6% of variations in levels of Treasury bill markets integration are explained by variations in remoteness, political stability and Fsd policy. Model two evidence statistically significant weak positive relationships between the product of Remoteness

and Political Stability (β=0.339, t= 2.751, p<0.05) and levels of Treasury bill markets integration and a statistically significant weak negative relationship between Fsd policy (β=-0.289, t=-2.345, p<0.05) and levels of Treasury bill markets integration. For the second model, the R square change declines to 0.083. Introduction of political stability into model three establish that 23.2% of variations in levels of Treasury bill markets integration are explained by variations in remoteness, political stability and Fsd policy (Adjusted R squared = 0.232, F=6.539). From the model, there are statistically significant positive relationships between political stability (β=0.327, t= 2.357, p<0.05) and levels of integration in Treasury bill markets and statistically significant positive relationships between the product of Remoteness and Political Stability (β=0.504, t= 3.668, p<0.05) and levels of Treasury bill markets integration. The model shows a weak negative relationship between Fsd policy (β=-0.332, t=-2.776, p<0.05) and levels of Treasury bill markets integration which suggests that the financial inclusion policies pursued in EAC are yet to promote financial markets integration as envisaged in the study models.

Table 5.41: Market Geography, Political Stability and Level of Interbank Markets Integration

Variable	**Coefficients**	
	Model 1	**Model 2**
Gdp and Political Stability	-0.347(-2.721)	-0.317(-2.557)
Gdp	-	-0.276(-2.227)
R Square	0.121	0.196
Adjusted R Square	0.104	0.165
R Square Change	0.121	0.075
F Statistic	7.405	6.453
F Change	7.405	4.957
Significance	0.009	0.003

Source: Author (2014)

Model one on table 5.41 confirm a statistically significant weak moderating influence of political stability on the relationship between interbank markets integration and GDP (β=-0.347, t=-2.721, p<0.05). The model suggests that 10.4% variations in interbank markets integration is explained by variations on political stability and GDP (R square = 0.104, F=7.405). The importance of the moderating variable in the model is evidenced by the R square change of 0.121. The second model indicates that 16.5% variations in interbank markets integration (R square = 0.165, F=6.453, p<0.05) is explained by variations in GDP and political stability. Model two presents a statistically significant weak negative relationship between the product of GDP and political stability (β=-0.317, t=-2.557, p<0.05) and integration of interbank markets and a statistically significant weak negative relationship between GDP (β=-0.276, t=-2.227, p<0.05) and integration of interbank markets.

The negative relationships between the products of political stability and geography characteristics confirm the arguments by Robin, *et al.* (1996) and Feng (2001) that political risk is a determinant of asset market returns and also a determinant of private investment respectively.

5.8 Market Geography, Rule of Law, Political Stability and Financial Markets Integration

Using a stepwise regression model, the study sought the joint effects of market geography and institutional quality (rule of law and political stability) on integration of financial markets in EAC. Regression analysis results are presented in table 5.42, 5.43 and 5.44 below.

Table 5.42: Market Geography, Institutional Quality and Equity Markets Integration in EAC

Type of Integration	Variable	Coefficients
Speed of Integration		**Model One**
	Fsd Policy	-0.577(-2.449)
	R Square	0.333
	Adjusted R Square	0.278
	F Statistic	5.999
	Significance	0.031

Source: Author (2014)

As presented in table 5.42 above, in the equity markets, 27.8% of variations in speed of integration are explained by variations in Fsd policy. Fsd policy is the only statistically significant geographical attribute in the model and it has a negative relationship to the speed of integration. This finding fails to support the proposition that the joint effect of market geography and institutional quality (rule of law and political stability) on integration of equity markets is greater than their individual effects.

As presented in table 5.43 below, statistically significant characteristics in explaining levels of Treasury bill markets integration are Fsd policy, GDP and Remoteness. The statistically significant characteristics in explaining speed of integration are rule of law and remoteness. Since these characteristics exclude political stability, the findings fail to support the proposition that the joint effect of market geography and institutional quality on integration of Treasury bill markets is greater than their individual effects.

Table 5.43: Market Geography, Institutional Quality and Treasury bill Markets Integration in EAC

Type of Integration	Variable	Coefficients			
Level of Integration		**Model 1**	**Model 2**	**Model 3**	**Model 4**
	Fsd Policy	-0.286(-2.191)	-0.384(-3.049)	0.059(0.404)	-
	Gdp	-	-0.380(-3.020)	-1.676(-5.393)	-1.605(-6.330)
	Remoteness	-	-	-1.545(-4.448)	-1.450(-5.721)
	R Square	0.082	0.216	0.432	0.431
	Adjusted R Square	0.065	0.187	0.400	0.409
	R Square Change	0.082(0.033)	0.135(0.004)	0.216(0.000)	-0.002(0.688)
	F Statistic	4.799	7.322	13.205	20.043
	F Change	4.799(0.033)	9.123(0.004)	19.783(0.000)	0.163(0.688)
	Significance	0.033	0.002	0.000	0.000
Speed of Integration	Rule of Law	0.407(3.272)	0.735(4.251)	-	-
	Remoteness	-	-0.450(-2.601)	-	-
	R Square	0.165	0.260	-	-
	Adjusted R Square	0.150	0.232	-	-
	R Square Change	0.070 (0.048)	0.154(0.002)	-	-
	F Statistic	10.704	9.306	-	-
	F Change	4.082(0.048)	10.490(0.002)	-	-
	Significance	0.002	0.000	-	-

Source: Author (2014)

As presented in table 5.44 below, in the interbank markets, GDP is the statistically significant market geography attribute when explaining speed and levels of interbank markets integration. Since the institutional quality measures of rule of law and political stability are not statistically significant on the stepwise regression analysis, the study findings fail to support the proposition that the joint effect of market geography and institutional quality on integration of interbank markets is greater than their individual effects.

Table 5.44: Market Geography, Institutional Quality and Interbank Markets Integration in EAC

Type of Integration	Variable	Coefficients
Speed of Integration		**Model One**
	Gdp	-0.309 (-2.383)
	R Square	0.095
	Adjusted R Square	0.078
	F Statistic	5.681
	Significance	0.021
Level of Integration	Gdp	-0.311(-2.403)
	R Square	0.097
	Adjusted R Square	0.080
	F Statistic	5.681
	Significance	0.021

Source: Author (2014)

CHAPTER SIX

TESTS OF HYPOTHESIS AND INTERPRETATIONS

6.1 Introduction

The study sought to investigate the effects of market geography and institutional quality on the speed and levels of financial markets integration in EAC. The tests were carried out using correlation, cointegration, vector auto regression, convergence analysis and stepwise regression analyses. The tests were done at 5% significance level (α=0.05) as the evaluation presented in sections 6.2, 6.3, 6.4 and 6.5 below focused on the hypothesis derived from the objectives of the study.

6.2 Integration Relationships amongst EAC Financial Markets

The first objective of this study was to establish integration relationships between Kenyan and other EAC financial market segments. This objective informed formulation of hypothesis one as:

H_1: *There are integration relationships between the Kenyan and other EAC financial market segments.*

The study applied Correlation analysis, Cointegration analysis, vector auto regression analysis, impulse response analysis, vector decomposition analysis and convergence analysis to examine the integration relationships amongst the financial market segments.

6.2.1 Correlation Analysis of Returns

Using Spearman's Correlation coefficient, Table 6.1 below presents the correlation between the market segments returns with respect to Kenyan market segment.

Table 6.1: Correlation of Market Segment Returns

Market Segment	Specific Markets	Spearman's Correlation Coefficients
Equity Markets	NSE and USE	0.833**
	NSE and DSE	0.221*
Treasury bill Markets	Kenya and Burundi	0.081
	Kenya and Rwanda	-0.379**
	Kenya and Uganda	0.329**
	Kenya and Tanzania	0.218**
Interbank Markets	Kenya and Burundi	0.231**
	Kenya and Rwanda	-0.070
	Kenya and Uganda	0.518**
	Kenya and Tanzania	0.463**

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Source: Author (2014)

As indicated in table 4.1 above, there are relationships amongst the market segment returns. However, No segment has an absolute correlation of r=1. In the Equity markets, there are strong positive relationships between NSE and USE returns ($r=0.833$, $p<0.01$). In the Interbank markets, there are strong positive relationships between Kenya and Uganda rates ($r=0.518$, $p<0.001$). These relationships suggest that the returns generally from the NSE and USE and Kenya and Uganda interbank market segments strongly move in the same direction.

Weak positive relationships are established between NSE and DSE returns ($r=0.221$, $p<0.005$), Kenya and Uganda Treasury bill rates ($r=0.329$, $p<0.001$), Kenya and Tanzania Treasury bill rates ($r=0.218$, $p<0.001$), Kenya and Burundi Treasury bill rates ($r=0.081$, $p>0.05$), Kenya and Tanzania interbank rates ($r=0.463$, $p<0.001$) and Kenya and Burundi interbank rates ($r=0.31$, $p<0.001$). The relationships infer that the returns from these market segments generally weakly move in the same direction.

The results show weak negative relationships for the Kenya and Rwanda Interbank rates ($r=-0.070$, $p>0.05$) and Kenya and Rwanda Treasury bill rates ($r=-0.379$, $p<0.001$) which indicate that the returns from these market segments generally weakly move in the opposite direction.

6.2.2 Cointegration Tests

At 5% levels of significance, Johansen Cointegration tests as summarized in tables 6.2 and 6.3 below indicate that the equity markets possibly have three cointegrating vectors ($p<0.05$), The money market segments (interbank markets and Treasury bill markets) have no cointegrating vectors. These results therefore confirm the existence of long run integration relationships in the equity markets in EAC.

Table 6.2: Johansen Trace Statistic Tests in Financial Market Segments

	Equity Markets		Treasury bill Markets		Interbank markets	
Maximum Rank	Trace Statistic	5% Critical Value	Trace Statistic	5% Critical Value	Trace Statistic	5% Critical Value
r=0	54.366	29.797	60.685	69.819	66.754	69.819
r≤1	28.835	15.495	36.052	47.856	37.606	47.856
r≤2	8.727	3.841	20.778	29.797	23.113	29.797
r≤3			10.808	15.495	11.345	15.495
r≤4			3.987	3.841	4.210	3.841
Interpretation	Three Cointegrating Vectors		No Cointegrating Vector			

Source: Author (2014)

Table 6.3: Johansen Eigen Statistic Tests in Financial Market Segments

	Equity Markets		Treasury bill Markets		Interbank markets	
Maximum Rank	Eigen Statistic	5% Critical Value	Eigen Statistic	5% Critical Value	Eigen Statistic	5% Critical Value
r=0	25.531	21.132	24.633	33.877	29.149	33.877
r≤1	20.108	14.265	15.274	27.584	14.492	27.584
r≤2	8.727	3.841	9.970	21.132	11.768	21.132
r≤3			6.821	14.265	7.136	14.265
r≤4			3.987	3.841	4.210	3.841
Interpretation	Three Cointegrating Vectors		No Cointegrating Vector			

Source: Author (2014)

6.2.3 Vector Auto Regression (VAR) System Estimates

The study allowed the market returns to be endogenous. A lag of two was selected in a vector auto regression (VAR) system to estimate how the current market returns are explained by themselves and integrating member country market returns. As indicated in table 5.15 in chapter five, there exists linkage relationships hinging from NSE to USE on one hand and NSE to DSE on another hand as one period and two period lag returns for NSE explains returns in USE and DSE respectively. In the Treasury bill markets, there are relationships between Treasury bill rates in Kenya and Rwanda where Treasury bill

rates in Rwanda relates to lagged Treasury bill rates in Kenya. The findings therefore suggest existence of linkages between the Rwanda and Kenya Treasury bill rates. In the interbank markets, linkage relationships are evidenced as Tanzania lagged interbank rates influence Burundi interbank rates and Kenya and Rwanda lagged interbank rates influence Tanzania interbank rates. The findings also imply that the markets are weak form efficient as historical returns or rates can be used to forecast the current returns.

6.2.4 Impulse Response Analysis (IRA)

From the VAR system, impulse responses of the returns in the EAC markets are estimated and graphs presented in figures 5.5, 5.6, 5.7 in chapter five and appendices two (a, b and c) and three (a, b and c). From the graphs, prolonged shocks in member market returns attribute to change in returns in other member market returns. The timing and magnitude of the response is however varied across the markets.

6.2.5 Variance Decomposition (VD)

The study further examined variance decomposition of innovations in the EAC financial markets for a period of 12 months. The proportion of return volatility due to the other market segment returns is found by subtracting from 100% the percentage explained by the return itself in each time period.

As summarized in tables 5.19, 5.20, 5.21, figures 5.8, 5.9, 510 in chapter five and appendices IV and V, in a forecast horizon of twelve months, volatility in USE returns are strongly influenced by volatility in foreign EAC equity markets returns at up to 69.81

percent while volatility in DSE returns is the least influenced by volatility in foreign EAC equity markets returns at up to 9.20 percent. In the money markets, volatility in the Kenya Treasury bill rates and interbank market rates are the least influenced by volatility of other EAC member market rates at up to 9.58 percent and to 8.04 percent respectively. Volatility in Burundi Treasury bill rates are highly influenced by volatility of other EAC member markets Treasury bill rates up to 23.37 percent. Volatility of Tanzania Interbank market rates are highly influenced by volatility of other EAC member interbank market rates at up to 33.52 percent. From these volatility forecast relationships, it is inferred that there are linkage relationships between the forecast financial markets returns.

6.2.6 Sigma Convergence in EAC Financial Markets

Dispersion of market segment returns was computed to test levels of integration in the financial markets on monthly and annual basis. As presented in appendix VI, the levels of sigma convergence in the EAC equity markets over the months has been swinging between a minimum of 0.005 attained in June 2010 and a maximum of 0.144 attained in October 2008. The levels of sigma convergence in the EAC treasury bill markets over the months has ranged between a minimum of 0.005 attained in July 2008 and a maximum of 0.08 attained in July 2003. The levels of sigma convergence in the interbank markets range from a minimum of 0.006 in February 2007 to 0.092 in December 2011. From table 5.22 and figures 5.14 and5.15 in chapter five, it is evident that the computed annual degrees of financial integration in EAC financial markets have swung with increases and decreases over time without attaining the full level of integration which is achieved when the computed standard deviations converge to Zero ($\sigma = 0$). These findings therefore confirm the existence of some levels of integration amongst the EAC financial market

segments but lead the study to reject the proposition of existence of perfect integration in all the EAC financial market segments examined in this study. ANOVA and posthoc tests on the levels of financial market segments integration suggest that there are no statistically significant differences on the mean levels of financial markets integration in EAC.

6.2.7 Beta Convergence in EAC Financial Markets

Annual Beta (β) convergences were computed from the spread of returns on investments against lagged spreads between other EAC member countries and Kenya as the benchmark market. The trends of the Beta Convergences in the equity markets segments as presented in table 5.23 and figure 5.16 in chapter five indicate mean reversion taking place across all EAC equity markets from 2007 to 2013 as all the Beta coefficients are negative. In the Treasury bill markets as indicated in table 5.24 and figure 5.17 in chapter five, there are a few fluctuations towards the absolute values unlike the predominant instances of mean reversion in the markets. Specifically, Rwanda attains a statistically significant positive beta convergence in 2006 while Burundi attains a statistically significant positive beta convergence in 2003. Similarly, the EAC interbank markets are also dominated by negative Beta coefficients inferring mean reversion of returns as presented in table 5.25 and figure 5.18 in chapter five. It is notable that Rwanda attains a statistically significant beta convergence in 2004. Since the test for perfect integration ($\beta = 1$) is not attained in all these markets, the proposition of perfect integration in the EAC equity and money market segments is therefore rejected.

ANOVA and posthoc tests were conducted to examine if speed of integration varies across the paired countries and market segments. The mean speed of integration amongst equity and interbank markets are established as not statistically different. Table 5.28 in chapter five confirms that the speeds of integration in the Treasury bill markets are different across the paired countries as some have statistically significant differences. This finding supports the proposition that there are some market or country specific drivers of the speed of markets integration. The study establishes that speed of integration amongst the money market segments is not statistically different. However, as presented in table 5.29, the speed of integration is statistically different between the equity markets and the money market segments. This further affirms the notion that speed of integration may be affected by market specific characteristics.

Existence of integration relationships amongst the EAC financial markets as established in the correlation, cointegration, convergence and vector auto regression analyses confirms earlier findings by Yabara (2012) and Kaijage and Nzioka (2012) especially on non deepening of integration in the market segments.

6.3 Relationship between Market Geography and Financial Markets Integration

The second objective of this study was to determine the relationship between market geography and financial markets segments integration. From this objective, hypothesis two was formulated as:

H_2: *There are significant relationships between market geography and integration of financial markets segments in EAC.*

The stepwise regression results for the relationships between financial markets integration and market geography variables are summarized in table 6.4 below.

Table 6.4: Relationships between Geography attributes and Integration

Measure	Market Segments	Model	Variable	Coefficients	Adjusted R Square
Speed of Integration	Equity markets	1	Fsd Policy	-0.577(-2.449)*	0.278
	Treasury bill markets	1	Gdp	-0.265(-2.020)*	0.053
		2	Gdp	-0.888(-3.908)*	0.195
			Adjacency	0.736(3.239)	
	Interbank markets	1	Gdp	-0.309(-2.383)*	0.078
Level of Integration	Treasury bill markets	1	Fsd Policy	-0.286(-2.191)*	0.065
		2	Fsd Policy	-0.384(-3.049)*	0.187
			Gdp	-0.380(-3.020)*	
		3	Fsd Policy	-0.059(0.404)*	0.400
			Gdp	-1.676(-5.393)*	
			Remoteness	-1.545(-4.448)*	
		4	Gdp	-1.605(-6.330)*	0.409
			Remoteness	-1.450(-5.721)*	
	Interbank markets	1	Gdp	-0.311(-2.403)*	0.080

* Significant at the 0.05 level

Source: Author (2014)

As summarized in table 6.4 above and inferred from the adjusted R square, there are moderate negative but statistically significant relationships between Fsd policy and speed of equity markets integration and moderate negative but statistically significant relationships between Remoteness and levels of Treasury bill markets integration. The models establish weak negative but statistically significant relationships between Fsd policy and level of Treasury bill markets integration, weak negative but statistically significant relationships between GDP and levels cum speed of Treasury bill and interbank markets integration. The relationship between adjacency and speed of Treasury bill markets integration is positive but is statistically significant. These findings therefore confirm the proposition that there are statistically significant relationships between the

identified market geography characteristics and the levels or speeds of the financial markets integration.

Importance of adjacency and remoteness in the models confirms the proposition on existence of border effects by Okubo (2004) and the argument by Guerin (2006) that geographical location of a country may determine its financial integration. It further confirms the findings by Flavin, *et al*. (2001) that markets in close proximity move together. Importance of GDP in the model is consistent with advancements by Docking and Koch (1999), Francois (2001), Milesi – Ferretti (2003) that market size are successful in explaining the variation of international financial integration over time. The significance of Fsd policy in explaining financial markets integration in the models indicate the role of financial inclusion in financial markets development as explained by Geda and Kebret (2008).

6.4 Market Geography, Institutional Quality and Financial Markets Integration

The third objective of the study was to investigate the influence of rule of law as a proxy of institutional quality on the relationship between market geography and financial markets segments integration in EAC. The hypothesis three tested within this objective was:

H_3: *Rule of law positively mediates the relationship between market geography and integration of financial markets in EAC*

The stepwise regression results for the influence of rule of law on the relationships between financial markets integration and market geography variables are summarized in table 6.5 below.

Table 6.5:Influence of Rule of Law on the relationships between Geography attributes and Integration

Measure	Market Segments	Model	Variable	Coefficients	Adjusted R Square
Speed of Integration	Treasury bill markets	1	Rule of Law	0.407(3.272)*	0.150
		2	Rule of Law	0.735(4.251)*	0.232
			Remoteness	-0.450(-2.601)*	
Level of Integration	Interbank markets	1	Rule of Law	0.265(2.021)*	0.053
		2	Rule of Law	0.412(3.097)*	0.168
			Fsd Policy	-0.387(-2.909)*	

* Significant at the 0.05 level

Source: Author (2014)

As inferred from the adjusted R Square in the summary on table 6.4, there are statistically significant weak positive relationships between rule of law and speed cum levels of integration in the Treasury bill and interbank market segments respectively. The models further indicate statistically weak negative relationships between market geography and financial markets integration. Specifically, a negative relationship between remoteness and speed of Treasury bill markets integration and Fsd Policy and Levels of interbank markets integration.

The foregoing findings support the argument that rule of law as a proxy for institutional quality in this study positively influences the relationship between market geography characteristics and integration of financial markets specifically the money markets. Importance of rule of law in financial markets activities is explained by North (1990), Landes (1998) and Lombardo and Pagano (2002).

6.5 Relationship between Market Geography, Political Stability and Financial Markets Integration in EAC

The fourth objective of the study was to establish whether political stability moderates the influence of market geography on financial markets segments integration in EAC. Based on this objective, the study hypothesized as:

H_4: The influence of market geography on financial markets segments integration in EAC is moderated by political stability.

The stepwise regression results for the moderating influence of political stability on the relationships between market geography and financial markets integration are summarized in table 6.5 below.

The study establishes statistically significant weak positive relationships evidenced from the adjusted R square between the combination of adjacency and political stability and speed of integration of the Treasury bill markets. It also establishes statistically significant weak negative relationships between the product of Gdp and political stability and the speed of integration of interbank markets in EAC.

Table 6.6: Influence of Political Stability on the relationships between Market Geography and Integration

Measure	Market Segments	Model	Variable	Coefficients	Adjusted R Square
Speed of Integration	Treasury bill markets	1	Adjacency and Political stability	0.428(3.482)*	0.168
	Interbank markets	1	Gdp and Political Stability	-0.353(-2.777)*	0.109
		2	Gdp and Political Stability	-0.323(-2.614)*	0.168
			Gdp	-0.273(-2.206)*	
Level of Integration	Treasury bill markets	1	Remoteness and Political Stability	0.336(2.622)*	0.113
		2	Remoteness and Political Stability	0.339(2.751)*	0.166
			Fsd Policy	-0.289(-2.345)*	
		3	Remoteness and Political Stability	0.504(3.668)*	0.232
			Fsd Policy	-0.332(-2.776)*	
			Political Stability	0.327(2.357)*	
	Interbank markets	1	Gdp and Political Stability	-0.347(-2.721)*	0.104
		2	Gdp and Political Stability	-0.317(-2.557)*	0.165
			Gdp	-0.276(-2.227)	

* Significant at the 0.05 level

Source: Author (2014)

As presented in table 6.6 above, the study also establish statistically significant weak positive relationships between the combination of remoteness and political stability and levels of Treasury bill markets integration and statistically weak negative relationships between the combination of Gdp and political stability and the levels of Interbank markets integration.

From the models in table 6.6 above, the study establishes that political stability weakly moderates the relationship between market geography and money markets (Treasury bill and interbank markets) integration in EAC. Though weak, the relationships are statistically significant. The findings are consistent with the argument by Feng (2001) that political freedom and political instability are different sources of impediments or boosts to private investment. As explained by Gilpin and Gilpin (2000), supportive policies of states and cooperative relationships among states constitute the necessary political foundations for a stable and unified world economy.

6.6 Joint effect of Market Geography, Rule of Law and Political Stability on Financial Markets Integration

The study also sought to probe the joint effect of market geography and Institutional quality proxied by rule of law and political stability on financial markets segments integration in EAC hypothesized as:

H_5: *The joint effect of market geography, institutional quality and political stability is greater than the sum of the effects of the individual variables on integration of financial markets segments in EAC*

Table 6.7: Market Geography, Rule of Law, Political Stability and Integration of Financial Markets

Measure	Market Segments	Model	Variable	Coefficients	Adjusted R Square
Speed of Integration	Equity Markets	1	Fsd Policy	-0.577(-2.449)	0.278
	Treasury bill markets	1	Rule of Law	0.407(3.272)*	0.150
		2	Rule of Law	0.735(4.251)*	0.232
			Remoteness	-0.450(-2.601)*	
	Interbank markets	1	Gdp	-0.309(-2.383)*	0.078
Level of Integration	Treasury bill markets	1	Fsd Policy	-0.286(-2.191)*	0.065
		2	Fsd Policy	-0.384(-3.049)*	0.187
			Gdp	-0.380(-3.020)*	
		3	Fsd Policy	-0.059(0.404)*	0.400
			Gdp	-1.676(-5.393)*	
			Remoteness	-1.545(-4.448)*	
		4	Gdp	-1.605(-6.330)*	0.409
			Remoteness	-1.450(-5.721)*	
	Interbank markets	1	Gdp	-0.311(-2.403)*	0.080

* Significant at the 0.05 level

Source: Author (2014)

The stepwise regression results for the joint effect of market geography, rule of law and political stability on integration of financial markets as summarized in table 6.6 above establish that the effects of individual explanatory variables are greater and statistically significant than the joint effects. For speed of the market segments integration, the statistically significant explanatory variables are Fsd policy in equity markets, Rule of law and Remoteness in the Treasury bill markets and Gdp for the interbank markets. For levels of interbank markets integration, Gdp is the statistically significant explanatory variable. For the levels of Treasury bill markets integration, Gdp, Remoteness and Fsd Policy are the statistically significant explanatory variables.

6.7 Chapter Summary

The study establishes diverse integration relationships between Kenyan and other EAC financial market segments. In the equity markets, Cointegration tests establish long run relationships as impulse responses show that shocks in returns in one equity market returns attributes to change in returns in the other equity markets. The VAR system infers linkages between NSE to USE and NSE to DSE as volatility in NSE returns for a twelve month forecast period would account for up to 7.87 percent and 59.26 percent of volatility in DSE and USE respectively. In the Treasury bill markets and interbank markets, Cointegration tests find no long run relationships as impulse response indicates that only shocks in the Kenyan Treasury bill markets rates attributes to change in all other EAC Treasury bill market rates. Linkages are noted between the Kenya and Rwanda Treasury bill rates. There are also linkages in the interbank markets as lagged Tanzania rates influence Burundi rates and lagged Kenya and Rwanda rates influence Tanzania rates.

Sigma Convergence findings indicate no perfect integration in all the market segments as Beta convergences are mostly negative implying mean reversion in the markets. These findings confirm the propositions that financial markets integration has not deepened in the EAC but there exists various integration relationships in the financial markets especially between the Kenyan and the other EAC financial market segments.

Comparatively, speed of integration amongst the Treasury bill markets and between equity and money markets varies which underscores the proposition that market

characteristics influence integration. The relationships between geography and financial markets integration find different results based on the type of markets and the measure of integration applied which suggests that financial markets relationships may be conditioned by the geographical environment. The study finds that the weak negative relationships between GDP and both the levels and speed of integration in money markets (Treasury bill and interbank markets) are statistically significant. It also establishes weak but statistically significant negative relationship between Fsd policy and the speed of equity markets integration on one hand and levels of Treasury bill markets integration on the other hand. Remoteness as a country characteristic has a weak but statistically significant negative relationship with Levels of Treasury bill markets integration while common border (Adjacency) has a weak statistically significant positive relationship with the speed of Treasury bill markets integration.

Institutional quality (rule of law) is established to positively mediate the relationship between market geography and integration in the Treasury bill and the interbank markets. This finding though is specific to the money market segments is consistent with the proposition that rule of law positively mediates the relationship between geography and financial markets integration.

Existence of indeterminate relationships between political stability and financial markets integration is established as the measure of institutional quality (political stability), negatively influences speed of integration in Treasury bill markets and the positively influences the level of integration in Treasury bill and interbank markets.

The moderating role of institutional quality on the relationship between geography and integration is supported by the findings that political stability moderates the relationships between adjacency and speeds of Treasury bill markets integration as well as the relationships between Gdp and both the speed and levels of interbank markets integration. Political stability also moderates the relationships between remoteness and levels of interbank markets integration.

Though the study finds that various geography characteristics and the institutional quality attributes of political stability and rule of law explain speed and levels of integration in the financial markets, there is no noted model which supports the proposition of a greater joint effect of market geography, rule of law and political stability over the individual variables effects.

As summarized in table 6.7 below, the study therefore confirms four out of five hypotheses that were proposed to address the various research questions and objectives. The table outlines the objectives, corresponding hypothesis, analytical approaches used and the interpretation thereon. In light of the findings, the revised conceptual model is derived in figure 6.1 below.

Table 6.8: Summary of Research Objectives, Hypothesis and Test Results and Interpretation

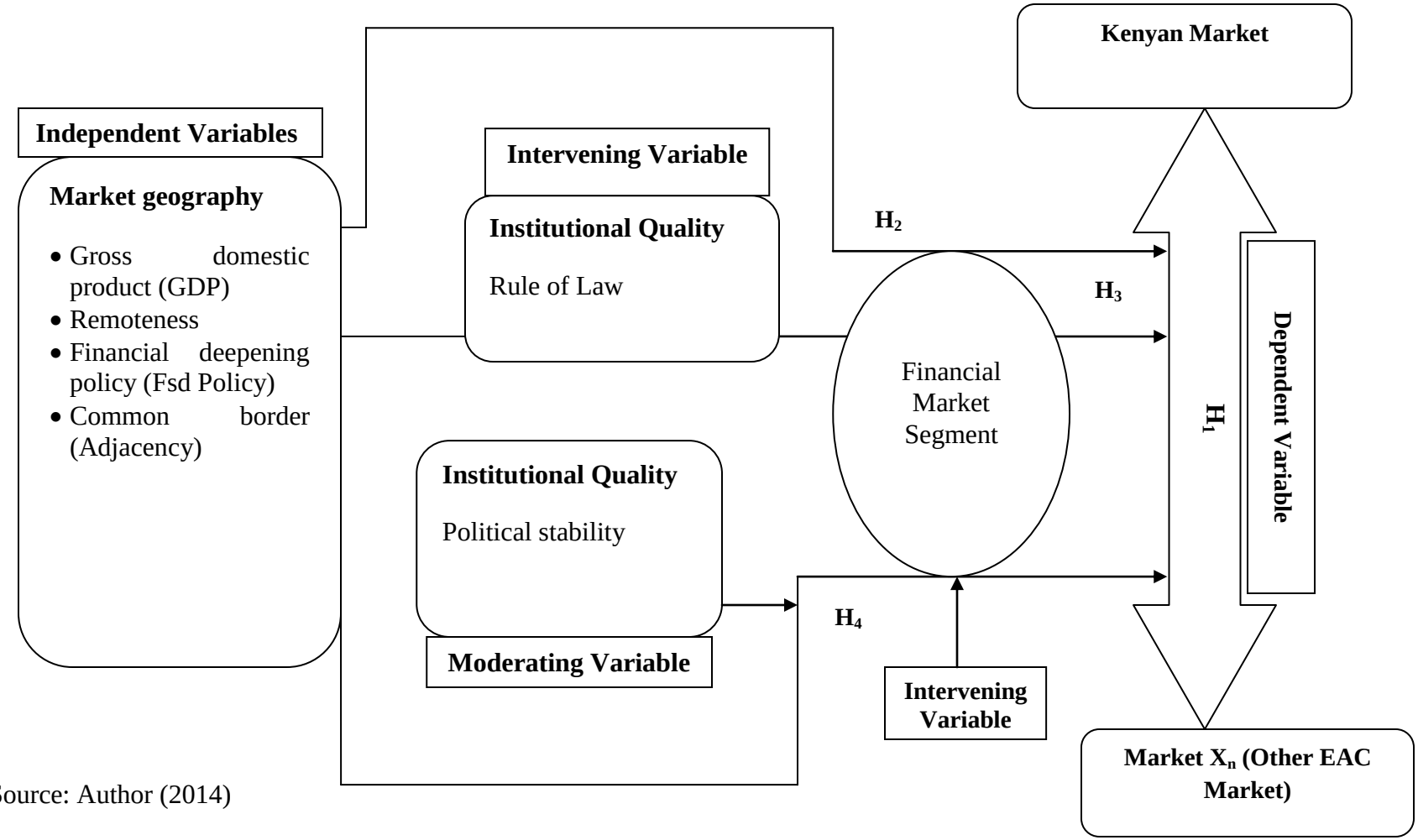
Objectives	Hypotheses	Analytical methods and Results	Interpretation
Establish integration relationships between Kenyan and other EAC financial market segments	H_1: There are integration relationships between the Kenyan and other EAC financial market segments	• VAR system Analysis: - Estimate equation Coefficients Statistical significance of explanatory coefficients **Equity Markets:** DSE returns = DSE1 (β=0.299, P <0.05), NSE 2 (β=0.306, P <0.05). USE returns = NSE1 (β=0.675, P <0.05), USE 1(β= -0.545, P <0.05) **Treasury Bill Markets:** Burundi = Burundi1 (β=0.843, P <0.05). Kenya = Kenya 1 (β=1.264, P <0.05) & Kenya 2 (β= -0.351, P <0.05). Rwanda = Kenya 1 (β= -0.119, P <0.05) & Rwanda 1 (β=1.135, P <0.05) & Rwanda 2 (β= -0.269, P <0.05). Tanzania = Tanzania 1 (β=1.181, P <0.05) Tanzania 2 (β= -0.274, P <0.05). Uganda = Uganda 1 (β=1.307, P <0.05) Uganda 2 (β= -0.456, P <0.05). **Interbank Markets:** Burundi = Burundi1 (β=1.062, p < 0.05) & Tanzania1 (β=-0.041, p < 0.05). Kenya = Kenya1 (β = 0.804, p < 0.05). Rwanda = Rwanda1 (β = 0.806, p < 0.05). Tanzania = Rwanda1 (β = -0.417, p < 0.05), Kenya1 (β = 0.504, p < 0.05), Tanzania1 (β = 0.749, p < 0.05) & Kenya2 (β = -0.429, p < 0.05). Uganda = Uganda1 (β = 0.917, p < 0.05).	- Relationships exist in all financial market segments. ***Hypothesis is supported***
		• Johansen Co integration $\mathbf{I} = \alpha + \beta i^{*}$ - Three stochastic trends in equity markets. - No stochastic trends in money markets	- Long run relationships in equity markets. - No long run relationships in money markets. ***Hypothesis is supported***

		• Beta Convergence (β) $\Delta R_{i,t} = \propto_1 + \beta R_{i,t} + \sum_{l=1}^{L} \gamma_l \Delta R_{i,t-1} + \varepsilon_{i,t}$ - β≠1 - No full integration in all market segment	- No full integration in equity and money markets. ***Hypothesis is supported***
		• Sigma Convergence (σ) $\delta = \left[\sqrt{\frac{1}{N-1}} \sum_{i=1}^{N} \langle (y_{i,t}) - y^{*}{}_{t} \rangle^2 \right]$ σ ≠0 - No full integration in all market segments	- No full integration in equity and money markets. ***Hypothesis is supported***
Determine the relationship between market geography and financial markets segments integration in EAC	H_2: There are significant relationships between market geography and integration of financial markets segments in EAC	• Stepwise regression analysis **Speed of integration:** ***Equity markets*** – Fsd Policy (β=-0.577, t=-2.499, p<0.05), (Adj R Square=0.278). ***Treasury bill markets*** – GDP (β=-0.888, t=-3.908, p<0.05), Adjacency (β=0.736, t=3.239, p<0.05), (Adj R Square=0.195). ***Interbank markets*** - GDP (β=-0.309, t=-2.383, p<0.05), (Adj R Square=0.078). **Level of markets integration:** ***Treasury bill markets*** – Fsd Policy (-0.059, t=0.404, p<0.05), GDP (β=-1.676, t=-5.393, p<0.05), remoteness (β=-1.545, t=-4.448, p<0.05), (Adj R Square=0.400). ***Interbank markets*** - GDP (β=-0.311, t=-2.403, p<0.05), (Adj R Square=0.080).	From the adjusted R square values, Market Geography characteristics are statistically significant in explaining speed and levels of market segments integration. ***Hypothesis is supported***
Investigate the influence of rule of law on the relationship between market geography and financial markets segments integration in EAC	H_3: Rule of law positively mediates the relationship between market geography and integration of financial markets segments in EAC	• Stepwise regression analysis **Speed of Integration:** ***Treasury bill markets*** - Rule of law (β=0.735, t=4.251, p<0.05), Remoteness (β=-0.450, t=-2.601, p<0.05), (Adj R Square=0.232). **Level of markets Integration:** ***Interbank markets*** - Rule of law (β=0.412, t=3.097, p<0.05), and fsd policy (β=-0.387, t=-2.909, p<0.05), (Adj R Square=0.168).	Rule of law positively mediates the relationship between selected market geography characteristics and integration of money markets. ***Hypothesis is supported***

Establish whether political stability moderates the influence of market geography on financial markets segments integration in EAC	H_4: The influence of market geography on financial markets segments integration in EAC is moderated by political stability	• Baron and Kenny approach • Stepwise regression analysis **Speed of markets integration**: ***Treasury bill markets*** - Adjacency and political stability (β=0.428, t=3.482, p<0.05), (Adj R Square=0.168). ***Interbank markets*** - Gdp and political stability (β=-0.323, t=-2.614, p<0.05), (Adj R Square=0.168). **Levels of markets integration**: ***Treasury bill markets*** - remoteness and political stability (β=0.504, t=3.668, p<0.05), (Adj R Square=0.232). ***Interbank markets*** - Gdp and political stability (β=-0.317, t=-2.557, p<0.05), (Adj R Square=0.165).	From the adjusted R square values, Political stability moderates the relationship between market geography characteristics and money markets integration. ***Hypothesis is supported***
Probe the joint effect of market geography and institutional quality on financial markets segments integration in EAC	H_5: The joint effect of market geography, rule of law and political stability is greater than the sum of the relationships of the individual variables on integration of financial markets segments in EAC	• Stepwise regression analysis **Speed of Markets Integration:** ***Equity markets*** **–** Fsd Policy (β=-0.577, t=-2.449, p<0.05), (Adj R Square=0.278). ***Treasury bill markets*** – Rule of law (β=0.735, t=4.251, p<0.05), remoteness (β=-0.450, t=-2.601, p<0.05), Adj R square = 0.232. ***Interbank markets*** – Gdp (β=-0.309, t=-2.383, p<0.05), (Adj R Square=0.078). **Levels of Markets Integration:** ***Treasury bill markets*** –Fsd policy (β=-0.059, t=0.404, p<0.05), Gdp (β=-1.676, t=-5.393, p<0.05), remoteness (β=-1.545, t=-4.448, p<0.05), (Adj R square = 0.400). ***Interbank markets*** – Gdp(β=-0.311, t=-2.403, p<0.05), (Adj R square = 0.080).	From the adjusted R square values, the joint effect of geography, rule of law and political stability (institutional quality) on levels of integration of treasury bill markets is not greater than the individual effects. ***Hypothesis is not supported***

Source: Author (2014)

Figure 6.1: Revised Conceptual Framework



Source: Author (2014)

CHAPTER SEVEN

SUMMARY, DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

7.1 Introduction

This chapter summarizes the study findings and provides conclusions in sections 7.2 and 7.3. It also discusses contributions of the study in section 7.4, limitations of the study in section 7.5 and suggestions for further research in section 7.6.

7.2 Summary of Findings

Taking cognizance of the efforts towards formation of a monetary union in EAC, this study recognized the need to investigate the levels of integration in EAC financial markets and to explore the possible market attributes that explain the levels of integration evidenced in the financial markets.

The core objective of the study was to investigate the effect of market geography and institutional quality on integration of financial markets in EAC. To achieve this objective, four categories of study variables were used. These variables were classified as explanatory, moderating, mediating and dependent variables. The explanatory variable was market geography which consisted of nine attributes namely market capitalization (for equity markets), gross domestic product (GDP), exchange rate volatility (risk), financial deepening policy, distance, remoteness, common border (adjacency), culture (language) and colonial links. The mediating variable was institutional quality of the integrating member countries with respect to regulatory quality and rule of law.

Institutional quality reflecting political stability of the integrating member countries was the moderating variable in the study. The study postulated that variation in market geography, rule of law, regulatory quality and political stability can explain variations in integration in financial markets as the dependent variable. Levels and speed of integration of financial markets was measured using various techniques derived from empirical literature.

The study developed five specific objectives which informed the formulation of five hypotheses. The hypotheses were used to test the effects of financial markets geography and institutional quality on integration of financial market segments in EAC. The hypotheses were in line with the study gaps identified on theoretical and empirical literature review.

From correlation analysis, the study observes a continuum of relationships between the returns ranging from weak negative relationships to strong positive relationships. In the equity markets, there are statistically significant strong positive relationships for the USE and NSE returns. There are also statistically significant moderate correlation relationships between Uganda and Tanzania interbank market returns, Uganda and Kenya interbank market returns and Burundi and Rwanda interbank market returns. Statistically significant weak positive relationships are observed for DSE and NSE returns, USE and DSE returns, Uganda and Burundi treasury bill returns, Rwanda and Burundi treasury bill returns, Kenya and Uganda treasury bill returns, Burundi and Tanzania interbank market returns, Burundi and Kenya interbank market returns and Burundi and Uganda interbank

market returns. Statistically significant weak negative relationship is evidenced between the Tanzania and Burundi Treasury bill markets returns and Rwanda and Kenya markets returns. Cointegration tests conducted in the study confirm the existence of long run relationships in the EAC equity markets and the absence of long run relationships in the EAC money markets.

To explore the relationships between the market segment returns, the study treated the market segment returns as variables explained by foremost the returns themselves and subsequently other member market segment returns. In the equity markets, the findings indicate that the markets are weak form efficient as previous one month or two month period returns are statistically significant in explaining the current period returns. In the equity markets, there are linkages hinging from NSE to USE on one hand and NSE to DSE on another hand. These linkages are identified when the current returns in DSE are explained by one previous month returns for DSE itself and second previous month's returns for NSE. Current USE returns are explained by the one previous month returns for NSE and one previous month returns from the USE. The explanatory rates identified are statistically significant at 5% levels of significance. In the Treasury bill markets, the study establishes short term relations between Treasury bill rates in Kenya and Rwanda as all other Treasury bill rates are explained by their previous one to previous second month rates. The statistically significant coefficients for Rwanda Treasury bill are the one previous month Treasury bill rates in Kenya and Rwanda and second previous month Treasury bill rates in Rwanda. In the interbank markets, the study establishes linkages hinging on Tanzania interbank market rates. On one hand, the statistically significant

coefficients for the Tanzania interbank rates are the previous one month interbank rates for Rwanda, Kenya and Tanzania and the second previous month interbank rates for Kenya. On the other hand, one previous month interbank rates in Tanzania is statistically significant in explaining the current Burundi interbank rates.

Impulse response analysis on the EAC market segments returns indicates that shocks in any of the equity markets attributes to change on the other equity markets as there is mean reversion after the shocks. In the money markets, a shock on the Kenyan Treasury bill rates affects all the other member country Treasury bill rates and interbank rates with the exception of Burundi that shows divergence. The effects of the shocks however depend on the linkages between the markets which are further explained with variance decomposition analysis for a twelve month period.

The variance decomposition on equity markets indicate that USE returns are strongly influenced by other EAC equity markets at up to 69.81 percent while DSE is the least influenced by other EAC equity markets returns at up to 9.20 percent. In the money markets, Kenya Treasury bill rates and interbank market rates are the least influenced by other EAC member market rates at up to 9.58 percent and to 8.04 percent respectively. Burundi Treasury bill rates are highly influenced by other EAC member Treasury bill rates up to 23.37 percent and Tanzania Interbank market rates are highly influenced by other EAC member interbank market rates at up to 33.52 percent. The variance decomposition findings support the proposition that there are linkage relationships between the EAC financial markets.

The levels of financial integration attained by sigma convergences over the months and years evidence that the degree of financial integration in EAC financial markets has swung with increases and decreases over time without attaining a full level of integration attained when standard deviations converges to zero which indicate some levels of integration with an absence of perfect integration. Speed of financial markets integration computed from annual Beta convergences points to mean reversion taking place in all the EAC financial markets over time without attaining a full integration of absolute Beta convergence. These findings are consistent with earlier conclusions of Kaijage and Nzioka (2012) and Yabara (2012). To establish if the speed of integration is market specific or country specific, the study finds that speed of integration varies in the Treasury bill markets segments amongst the countries. Further, the speed of integration in equity markets varies from the speed in the money markets. The mean levels of integration are no varied across the market segments.

The results from the integration analyses indicate long run relationships amongst the EAC equity market segments and linkages between the EAC money market segments. However, the relationships attained are not characteristic of full or perfect integration in the financial market segments as there are instances of mean reversion in the markets and use of past returns to predict future returns which indicate weak form efficiency across the market segments. Market determination of rates is a characteristic of effective integration as found by Anand (2009), Jena, *et al*. (2002) and Bhoi and Dhal (1998). Its absence therefore compromises the speed or levels of financial markets integration.

The study establishes relationships between individual market geography variables and integration subject to two considerations: first consideration being the market segment under analysis and the second consideration being the measure (speed or levels) of integration. The effects of the four identified geographical variables on market integration measures are summarized as: First, Fsd policy explains speed of equity markets integration and levels of Treasury bill markets integration which confirms propositions by Geda and Kebret (2008). Secondly, GDP explains both speed and levels of Treasury bill markets and interbank markets integration which confirms arguments by Docking and Koch (1999), Francois (2001) and Milesi-Ferretti (2003) that market size explain variations in international financial integration. Thirdly, Remoteness explains the levels of Treasury bill markets integration which is consistent with Okubo (2004) and Guerin (2006) explanations that geographical location of a country determines its integration. Fourthly, adjacency explains the speed of interbank markets integration which confirms similar arguments that geographical location is important in explaining integration.

Supporting the arguments for effects of institutional quality on economic activities by North (1990) and Landes (1998), Lombardo and Pagano (2002), the study confirms that rule of law mediates the relationships between market geography and money market segments integration. Further, political stability as a measure of institutional quality also moderates the relationships between market geography and integration in the money market segments. As explained by Osili and Paulson (2004), ability of a country's institutions to protect private property and provide for investments is an explanation for disparity in financial markets development. The role played by rule of law and regulatory

quality in the process of exchange, price discovery and investor behavior is a thematic discussion within the market microstructure theory explained by O'Hara (1995).

The possibility that the joint effect of various market geographical characteristics and markets institutional quality on financial markets integration is greater than the effects of the individual geographical and institutional quality attributes is not confirmed in the current study. The individual variables explain more of the levels and speed of integration in EAC than when used as a combination thus suggesting for independent analysis of the contributions of these variables.

7.3 Conclusions

This study avails a framework for future discussions into theory, practice and policy regarding economic integration with a focus on mechanics of integrating financial markets in developing country contexts. The study finds some converging and diverging integration relationships amongst the financial markets and notably linkages hinging on Kenya equity market segment and Tanzania Interbank market segment.

Though there are no full and perfect integration relationships across the EAC financial markets, there are long run relationships in the equity markets. Beta and sigma convergence measures point to periods towards convergences and periods of divergences which infer mean reversion tendencies in EAC financial markets and weak forms of efficiency characterized by use of past returns to forecast future returns. The mean reversion tendencies are further confirmed in impulse response analysis.

In the EAC equity markets, there are linkages hinging from NSE to USE on one hand and NSE to DSE on another hand as statistically significant determinants of current returns in DSE are one previous month returns for DSE itself and second previous month's returns for NSE. Statistically significant determinants of current USE returns are the one previous month returns for NSE and USE. In the interbank markets, the study establishes linkages hinging on Tanzania interbank market rates. On one hand, statistically significant determinants of Tanzania interbank rates are the previous one month interbank rates for Rwanda, Kenya and Tanzania and the second previous month interbank rates for Kenya. On the other hand, one previous month interbank rates in Tanzania is statistically significant in explaining the current Burundi interbank rates. In the Treasury bill markets, the study establishes short term relations between Treasury bill rates in Kenya and Rwanda as all other Treasury bill rates are explained by their previous first and second month rates.

The study confirms existence of statistically significant negative and positive relationships between selected market geography variables and financial markets integration in EAC. The variables are; Financial sector deepening policy (Fsd) with a negative relationship, remoteness with a negative relationship, Gross domestic product (GDP) with a negative relationship and adjacency with a positive relationship. The relationships and the magnitude of the relationships are varied based on the integrating market segment and the measure of integration under consideration. Further, the study confirms that rule of law as a proxy for institutional quality positively mediates the relationship between market geography and financial markets integration in the EAC

money market segments. Political stability moderates the relationships between the geographical variables and money markets integration specifically adjacency, Gdp and Remoteness. There is however no notable greater joint effects of geography and institutional quality (rule of law and political stability) on integration above the individual effects.

7.4 Contributions of the Study

Despite reporting varied results on the integration relationships amongst the EAC financial market segments and further varied findings on the relationships between market geography, institutional quality levels and markets integration, this study still contributes to both knowledge and managerial policies.

The study adopted a positivist paradigm which permits use of statistical techniques for data analysis and operationalization of the hypothetical concepts as well as generalization of results when deriving the relationship between the variables. Any study guided by empirically testable hypothesis serves the purpose of either validating the theory or falsifying the theory. The current study is just strengthening the theories used in the study since the theories contribute to understanding the link among the variables.

7.4.1 Contributions to Theory

Since one of the tenets of the optimum currency area (OCA) theory is to identify the characteristics desirable for countries to consider monetary integration, the current study develops a framework for applying market characteristics which are either geography or institutions in explaining the success of monetary integration in EAC. The identified explanatory geographical characteristics are: GDP, Financial deepening policy, remoteness, adjacency and exchange rate volatility.

Adaptive markets hypothesis (AMH) advanced by Lo (2005) considers market ecology when assessing markets efficiency. Considering that returns in the respective financial

markets segments is dependent on environmental factors, the current study confirms that the EAC financial markets efficiency is explained by various geography attributes and institutional set ups that include political stability and rule of law.

The behavior of investors and price setting in specific countries securities markets (exchanges) is analyzed within the market microstructure theory. Institutional factors arising from technology, tradition and regulation in specific countries markets, governments or regional integration organs would affect performance of EAC member countries markets. Market Microstructure is of significance because of the vast amounts of wealth which pass through the various securities markets every day. Micro structural analyses of the EAC financial markets gives insights into how the specific attributes affect the integration process.

7.4.2 Contributions to Knowledge

The study has contributed to knowledge in several ways: firstly, it extends the emerging academic literature on economic integration and financial markets integration. It provides a methodological contribution to selected statistical approaches for measuring integration of financial markets by empirically testing the extent of and integration relationships in financial markets.

Secondly, the study provides some level of validity for theoretical models. The models used in the study have been tested and hence can be used in future studies. The theoretical models that have weaknesses can be modified in future studies as informed by the findings of the current study.

Thirdly, the adapted gravity model applied in the study contributes to understanding the link between geography, institutions and economic initiatives while confirming the

findings of previous studies that have found statistically significant relationships between market geography, institutional measures and trade patterns. Gravity models that presume that the closer the trading partner and the larger the size of the trading partner, the more the trade have been applied selectively in explaining trade in tangible goods. With advancements in ICT, there is increased trade in non tangible goods and services. This study thus recommends methodological advancements by applying modified gravity models that incorporate market specific characteristics which explain financial markets relationships and trade in financial services across countries.

7.5 Policy Implications and Recommendations

For EAC to attain perfect economic integration, there should be improvements in relationships and linkages amongst the financial markets that facilitate capital mobility across the countries. Policy formulation should focus on limiting arbitraging opportunities in the EAC financial markets. To minimize arbitraging, institutions should be put in place to promote market efficiency such that securities markets returns are market determined and to eliminate mean reversion tendencies which negate the relationships between the geography characteristics and integration.

As the EAC lays the foundation for the monetary union, policies should be put in place across all the member countries that uphold the rule of law. Investors are keen on their protection especially with contracts enforcement and safety of investments. Since this institutional quality measure is significant in explaining financial markets integration, it should be upheld across all the countries to attract capital flows into the region from other

regional markets. This should also be considered as a requirement for continued membership.

The institutional measure of political stability is also statistically significant when moderating the relationship of geography and integration in the EAC money markets. Efforts should be put in place to improve the regional political environment. Taking cognizance that some EAC member countries have experienced devastating political consequences that have the potential of compromising regional integration progress on recurrence, deterrent measures should be enacted and implemented.

The statistically significant variables in explaining financial markets integration namely; financial sector deepening policy (Fsd) and Remoteness are related through the Gross domestic product (Gdp). Remoteness is a function of GDP and distance and Fsd is a function of private sector credit and GDP. Taking cognizance of this relationship, EAC policy makers should review and revise existing policies. The revision should focus on promoting domestic credit to productive sectors of the economies. The stability of macroeconomic indicators that encourage trade and subsequently overall regional GDP levels should be monitored and aligned to the agenda of regional economic growth through GDP growth.

7.6 Limitations of the Study

The major limitation of the study was the scope of the study. The study was limited to a developing regional integration arrangement (RIA) which is bedeviled with various resource and capacity challenges especially at the implementation phases. Such

challenges may be minimal or nonexistent in developed regional integration arrangements that enjoy adequate capital, human resources and political goodwill.

The study is based on gravity models though some economists believe that there is no macroeconomic foundation for the gravity equation. Despite this challenge, the study findings are not compromised given that the model enjoys empirical success in accurately predicting trade flows between countries in goods and services. Gravity relationships arise in any trade model that has trade costs that vary with distance.

Related to the limitations of gravity models, the study is based on an assumption that the relationship between geography, political stability, institutional quality and financial markets integration is linear. Fixed variables like distance, culture, language and colonial links are redundant in linear regression settings. The study does not therefore consider the possibility that the market and country characteristics may influence markets integration but in a non – linear relationship.

This study could not exhaust all the statistical methods available for studies of this nature. There are various models available for such studies and each model or statistical method has its merit and demerits. Application of other statistical techniques may lead to different findings that may enhance empirical studies in this area. The study relied on variants of regression analysis to establish various effects and relationships.

The study findings are as accurate as the data used and the regression analysis. In the EAC, there are data challenges. Established databases do not have conclusive time series data spanning across various countries over time. This challenge poses difficulties in obtaining data in forms usable for the purposes of this and other studies. The challenge made the researcher to consult various authoritative data sources. Despite the challenge, the quality of the study was not compromised as it makes a contribution to the existing body of knowledge, especially in the area of international financial markets integration and international financial activities.

7.7 Suggestions for Further Research

The key determinants that are found to affect levels and speed of market integration are the current levels of Gross domestic product (GDP), Remoteness, Financial sector deepening policy (Fsd), Adjacency, Rule of law and Political stability. Future investigations should consider the effects of the lagged values of these determinants on integration including the lagged integration values.

Given that all the geographical determinants identified are related through GDP and or distance, further research should be carried out on the effects of macro economic convergence on the overall levels of financial markets integration. In EAC, the efficacy of the macroeconomic convergence criteria put in place should be probed. Since the study finds that institutional quality mediates and moderates money markets integration, further research should be focused on the institutional preparedness of the EAC for financial markets integration.

Within the framework of integration of EAC financial markets, further investigations should focus on how the integration processes affects the specific market microstructure especially the determinants of transaction costs, prices, volumes, quotes and trading behavior. Contributions of Home bias and increased cross listings of financial instruments on integration should be examined.

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APPENDICES

Appendix I: Financial Markets Operational in EAC

Segment/Country	Kenya	Tanzania	Uganda	Rwanda	Burundi
Money	Treasury Bills	Treasury Bills	Treasury Bills	Treasury Bills	Treasury Bills
	Interbank	Interbank	Interbank	Interbank	Interbank
Capital	Treasury Bonds	Treasury Bonds	Treasury Bonds	Treasury Bonds	Treasury Bonds
	Corporate bonds	Corporate bonds	Corporate bonds	Corporate bonds	
	Equity	Equity	Equity	Equity	
Foreign Currency	Foreign exchange	Foreign exchange	Foreign exchange	Foreign exchange	Foreign exchange
Source (s)	www.central bank.go.ke, www.cma.or.ke www.nse.co.ke	www.cmsa-tz.org, www.bot-tz.org	www.bou.or.ug	www.cma.rw	www.brb.bi

Source: Author (2014)

Appendix II: Impulse response in EAC Financial Markets

Panel A: Impulse Response in EAC Equity Markets

	Response of DSE		
Period	DSE	NSE	USE
1	0.049986	0.000000	0.000000
	(0.00390)	(0.00000)	(0.00000)
2	0.011720	-0.013944	-0.000625
	(0.00590)	(0.00573)	(0.00573)
3	-0.001575	0.005382	-0.005613
	(0.00619)	(0.00595)	(0.00546)
4	0.003681	0.002405	0.001615
	(0.00361)	(0.00356)	(0.00217)
5	-0.000193	-0.000815	-0.002030
	(0.00141)	(0.00134)	(0.00169)
6	-0.000629	0.000351	0.000211
	(0.00122)	(0.00100)	(0.00068)
7	1.60E-06	0.000140	-0.000218
	(0.00046)	(0.00042)	(0.00050)
8	-2.10E-06	-0.000156	0.000138
	(0.00027)	(0.00026)	(0.00028)
9	-7.99E-05	1.16E-07	-8.00E-05
	(0.00012)	(0.00012)	(0.00017)
10	2.79E-05	7.79E-06	6.77E-05
	(5.8E-05)	(5.5E-05)	(0.00011)
11	2.09E-06	-1.18E-05	-2.48E-05
	(4.0E-05)	(3.6E-05)	(6.1E-05)
12	4.17E-07	9.54E-07	1.36E-05
	(1.6E-05)	(1.6E-05)	(3.8E-05)

	Response of NSE		
Period	DSE	NSE	USE
1	0.016083	0.072760	0.000000
	(0.00813)	(0.00568)	(0.00000)
2	0.017000	0.007118	-0.007644
	(0.00857)	(0.00844)	(0.00856)
3	-0.010755	-0.001222	-0.009622
	(0.00898)	(0.00860)	(0.00785)
4	-0.004484	0.004000	-0.000355
	(0.00473)	(0.00479)	(0.00336)
5	-3.15E-05	-0.001011	0.000325
	(0.00229)	(0.00212)	(0.00247)
6	-0.000950	-0.001045	6.90E-05
	(0.00171)	(0.00143)	(0.00081)
7	-0.000180	0.000113	0.000265
	(0.00051)	(0.00052)	(0.00053)
8	0.000225	-8.47E-05	0.000168
	(0.00044)	(0.00040)	(0.00026)
9	1.66E-05	-6.36E-05	-1.46E-05
	(0.00017)	(0.00017)	(0.00014)
10	1.09E-05	3.83E-05	1.04E-05
	(9.4E-05)	(9.3E-05)	(8.5E-05)
11	2.15E-05	7.97E-06	-3.96E-06
	(5.6E-05)	(4.6E-05)	(4.3E-05)
12	-1.61E-06	-2.46E-06	-4.79E-06
	(1.9E-05)	(1.9E-05)	(2.4E-05)

Appendix II cont.: Impulse Response in EAC Financial Markets

Panel A: Impulse Response in EAC Equity Markets

Response of USE

Period	DSE	NSE	USE
1	0.022927	0.064968	0.041190
	(0.00868)	(0.00681)	(0.00322)
2	0.013875	0.013693	-0.022456
	(0.00955)	(0.00942)	(0.00937)
3	-0.005916	0.000498	0.000243
	(0.00983)	(0.00945)	(0.00872)
4	-0.005784	0.003955	-0.006463
	(0.00506)	(0.00522)	(0.00445)
5	5.78E-07	-0.000571	0.002913
	(0.00222)	(0.00212)	(0.00300)
6	-0.001268	-0.000935	-0.001487
	(0.00166)	(0.00132)	(0.00203)
7	-0.000100	-2.04E-05	0.001091
	(0.00056)	(0.00053)	(0.00133)
8	7.61E-05	-7.24E-05	-0.000285
	(0.00045)	(0.00042)	(0.00083)
9	8.12E-05	-7.31E-05	0.000261
	(0.00021)	(0.00019)	(0.00054)
10	-1.39E-05	3.05E-05	-0.000127
	(0.00010)	(8.8E-05)	(0.00032)
11	3.65E-05	7.70E-06	7.37E-05
	(6.8E-05)	(4.6E-05)	(0.00020)
12	-7.49E-06	-7.90E-08	-4.61E-05
	(2.7E-05)	(1.8E-05)	(0.00012)

Appendix II cont.: Impulse Response in EAC Financial Markets

Panel B: Impulse Response in EAC Treasury bill Markets

Response of BURUNDI:

Period	BURUNDI	KENYA	RWANDA	TANZANIA	UGANDA
1	0.996723	0.000000	0.000000	0.000000	0.000000
2	0.852859	-0.023274	-0.145522	-0.126242	0.000904
3	0.850678	0.020833	-0.183225	-0.184057	-0.013701
4	0.827365	0.063675	-0.211744	-0.225643	-0.025645
5	0.805094	0.101657	-0.237770	-0.257185	-0.035404
6	0.781476	0.133683	-0.264242	-0.282985	-0.043902
7	0.756958	0.160410	-0.290438	-0.304552	-0.051868
8	0.731550	0.182480	-0.315420	-0.322708	-0.059544
9	0.705336	0.200459	-0.338451	-0.337974	-0.066908
10	0.678421	0.214835	-0.359064	-0.350723	-0.073842
11	0.650934	0.226031	-0.377007	-0.361223	-0.080227
12	0.623016	0.234417	-0.392184	-0.369671	-0.085982

Response of KENYA:

Period	BURUNDI	KENYA	RWANDA	TANZANIA	UGANDA
1	0.047695	1.037166	0.000000	0.000000	0.000000
2	0.057185	1.320482	-0.018450	0.133699	0.042544
3	0.047954	1.321910	-0.096915	0.205732	0.089178
4	0.035230	1.234244	-0.181668	0.223896	0.119605
5	0.020619	1.124191	-0.248262	0.213885	0.132608
6	0.004864	1.013333	-0.292542	0.191881	0.133082
7	-0.011490	0.908405	-0.317710	0.165933	0.126076
8	-0.027920	0.811393	-0.328262	0.139847	0.115235
9	-0.043993	0.722665	-0.328128	0.115439	0.102841
10	-0.059381	0.641971	-0.320364	0.093576	0.090223
11	-0.073852	0.568813	-0.307267	0.074623	0.078108
12	-0.087257	0.502604	-0.290539	0.058663	0.066872

Response of RWANDA:

Period	BURUNDI	KENYA	RWANDA	TANZANIA	UGANDA
1	0.020886	0.024026	0.763970	0.000000	0.000000
2	0.046251	-0.087346	0.869083	-0.013503	0.048153
3	0.084367	-0.163462	0.780934	-0.009360	0.066591
4	0.119092	-0.197275	0.653523	0.008634	0.058921
5	0.147415	-0.203690	0.534668	0.029764	0.040700
6	0.169214	-0.194465	0.435770	0.046550	0.022778
7	0.185587	-0.176629	0.356554	0.056227	0.009917
8	0.197761	-0.154373	0.293413	0.059018	0.002888
9	0.206769	-0.130337	0.242354	0.056400	0.000542
10	0.213367	-0.106228	0.200003	0.050063	0.001163
11	0.218076	-0.083127	0.163854	0.041443	0.003176
12	0.221238	-0.061664	0.132193	0.031595	0.005424

Response of TANZANIA:

Period	BURUNDI	KENYA	RWANDA	TANZANIA	UGANDA
1	-0.154142	0.018607	0.120123	1.115988	0.000000
2	-0.190238	0.064986	0.092211	1.312715	0.113706
3	-0.202546	0.139146	0.133598	1.245850	0.225819
4	-0.200364	0.199019	0.208478	1.121135	0.311680
5	-0.189502	0.231216	0.275179	0.997928	0.366285
6	-0.173018	0.239388	0.318608	0.890965	0.391521
7	-0.153448	0.231370	0.339174	0.801218	0.393036
8	-0.132721	0.214196	0.342661	0.725757	0.377899
9	-0.112145	0.192956	0.335210	0.661104	0.352806
10	-0.092492	0.170938	0.321590	0.604346	0.323111
11	-0.074145	0.150066	0.304961	0.553396	0.292540
12	-0.057234	0.131314	0.287186	0.506896	0.263356

Response of UGANDA:

Period	BURUNDI	KENYA	RWANDA	TANZANIA	UGANDA
1	0.008427	0.289513	0.087939	-0.062544	1.493014
2	0.077935	0.488542	0.011413	-0.065932	1.951872
3	0.148229	0.543030	-0.111542	0.009829	1.870911
4	0.199876	0.500953	-0.230080	0.103034	1.560767
5	0.230232	0.418820	-0.315645	0.174308	1.196532
6	0.242758	0.333446	-0.359272	0.211125	0.864898
7	0.242656	0.262089	-0.365740	0.216363	0.599156
8	0.234835	0.209398	-0.346108	0.198905	0.403292
9	0.223101	0.173656	-0.312123	0.168285	0.267577
10	0.210019	0.150833	-0.273291	0.132282	0.177851
11	0.197089	0.136740	-0.235968	0.096250	0.120422
12	0.185034	0.127949	-0.203620	0.063317	0.084154

Appendix II cont.: Impulse Response in EAC Financial Markets Cont.

Panel C: Impulse Response in EAC Interbank Markets

Response of BURUNDI:

Period	BURUNDI	KENYA	RWANDA	TANZANIA	UGANDA
1	0.692048	0.000000	0.000000	0.000000	0.000000
2	0.740919	0.028255	0.053476	-0.087447	0.098153
3	0.704294	0.009406	0.077606	-0.075945	0.161478
4	0.662081	0.028216	0.074007	-0.049425	0.193240
5	0.625773	0.046900	0.059323	-0.031253	0.210361
6	0.592454	0.061112	0.043427	-0.018774	0.222500
7	0.560510	0.072565	0.029225	-0.008843	0.230804
8	0.529580	0.082197	0.017082	-0.000413	0.235371
9	0.499651	0.090272	0.006820	0.006745	0.236731
10	0.470765	0.096897	-0.001791	0.012717	0.235554
11	0.442960	0.102172	-0.008956	0.017602	0.232432
12	0.416262	0.106212	-0.014865	0.021515	0.227831

Response of KENYA:

Period	BURUNDI	KENYA	RWANDA	TANZANIA	UGANDA
1	0.161810	2.028724	0.000000	0.000000	0.000000
2	0.254409	1.622233	-0.061692	-0.158924	0.019514
3	0.221157	1.413058	-0.086987	-0.154896	0.184113
4	0.182853	1.278357	-0.113882	-0.114830	0.274135
5	0.150027	1.164609	-0.138811	-0.076657	0.317135
6	0.120445	1.061777	-0.157448	-0.044326	0.336029
7	0.092978	0.968496	-0.169465	-0.017405	0.340109
8	0.067465	0.883735	-0.175969	0.004411	0.334200
9	0.043955	0.806428	-0.178152	0.021472	0.321624
10	0.022485	0.735690	-0.177009	0.034301	0.304770
11	0.003050	0.670823	-0.173340	0.043513	0.285326
12	-0.014385	0.611266	-0.167794	0.049727	0.264477

Response of RWANDA:

Period	BURUNDI	KENYA	RWANDA	TANZANIA	UGANDA
1	-0.001690	-0.095133	1.004360	0.000000	0.000000
2	0.039851	-0.108551	0.802826	-0.051297	0.038199
3	0.132743	-0.107869	0.500892	-0.142032	0.095384
4	0.201449	-0.116699	0.304814	-0.182515	0.135675
5	0.236625	-0.110477	0.195658	-0.172841	0.146232
6	0.250504	-0.092792	0.133995	-0.141547	0.136663
7	0.252971	-0.072163	0.096444	-0.107779	0.120919
8	0.249381	-0.053086	0.071704	-0.078977	0.106901
9	0.242481	-0.036863	0.054325	-0.056526	0.096937
10	0.233746	-0.023450	0.041484	-0.039653	0.090698
11	0.224022	-0.012429	0.031609	-0.027128	0.087101
12	0.213813	-0.003353	0.023782	-0.017831	0.085107

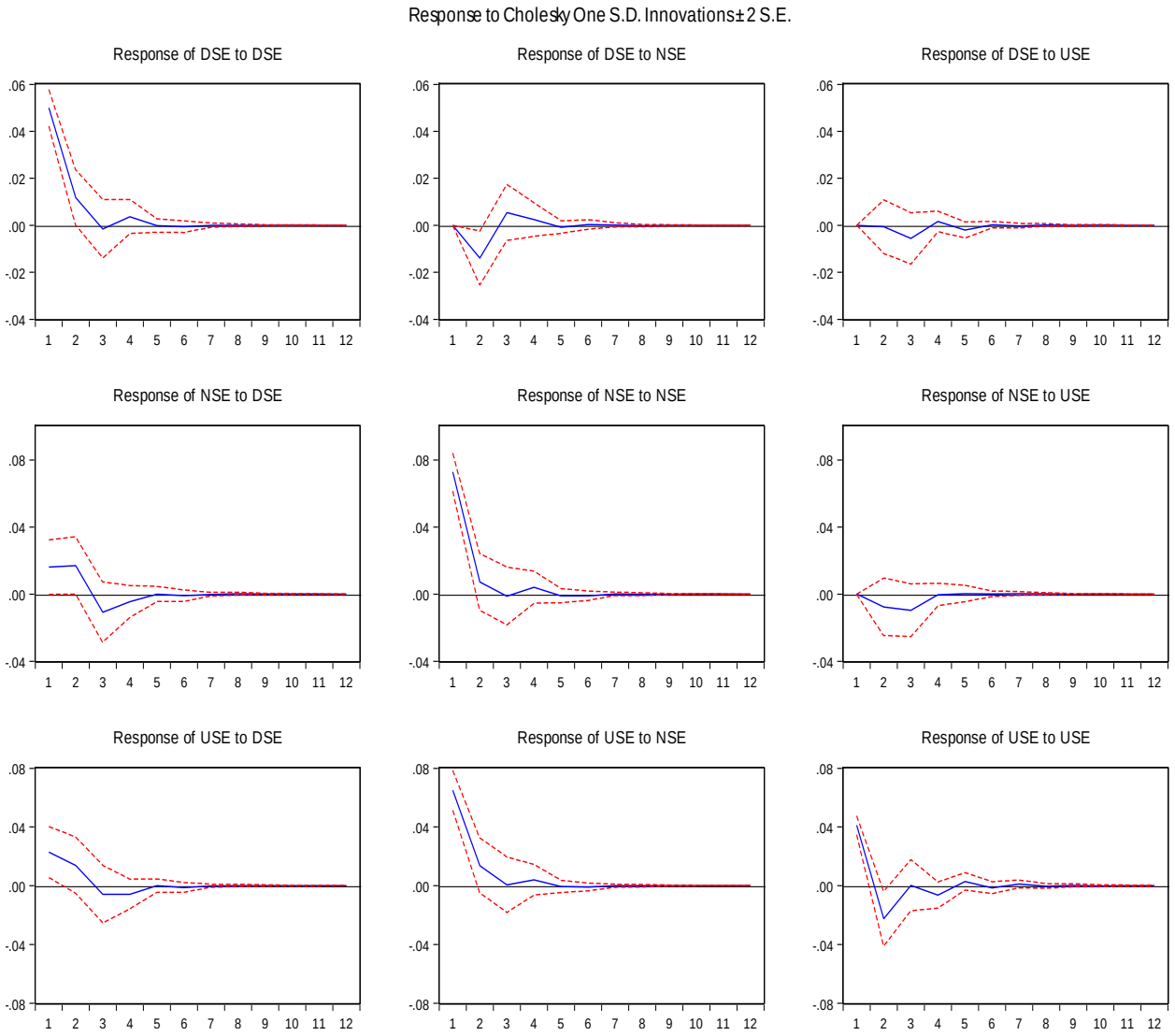
Response of TANZANIA:

Period	BURUNDI	KENYA	RWANDA	TANZANIA	UGANDA
1	0.025663	0.253128	0.338073	2.627934	0.000000
2	0.131537	1.230108	-0.168853	1.940715	-0.141582
3	0.238971	0.889102	-0.403791	1.165306	0.107354
4	0.231795	0.658417	-0.431211	0.748080	0.367808
5	0.195102	0.542282	-0.398781	0.533094	0.472309
6	0.156988	0.474162	-0.356763	0.408353	0.481055
7	0.122857	0.425043	-0.316318	0.326550	0.449990
8	0.093088	0.385124	-0.279446	0.268252	0.405780
9	0.067349	0.350699	-0.246483	0.224307	0.359341
10	0.045245	0.320025	-0.217348	0.189801	0.315040
11	0.026380	0.292173	-0.191759	0.161886	0.274528
12	0.010372	0.266619	-0.169346	0.138823	0.238255

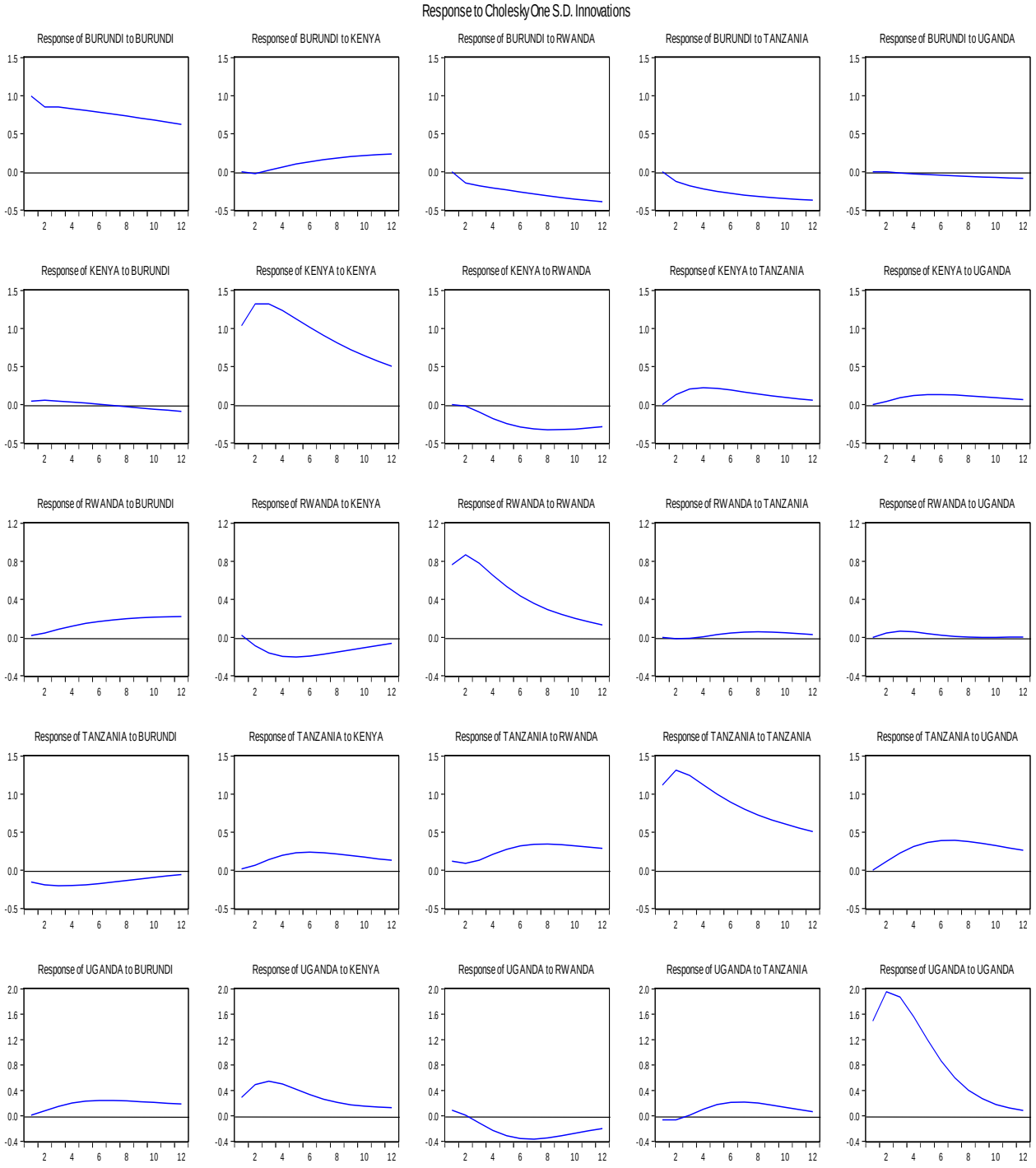
Response of UGANDA:

Period	BURUNDI	KENYA	RWANDA	TANZANIA	UGANDA
1	0.116334	0.367367	0.048193	0.465545	2.333490
2	0.226271	0.730032	-0.218169	0.411963	2.136573
3	0.291946	0.690330	-0.392070	0.330575	1.769178
4	0.295986	0.649046	-0.453700	0.304869	1.465555
5	0.272245	0.620354	-0.455734	0.300294	1.207414
6	0.237855	0.592898	-0.431243	0.294786	0.994130
7	0.200690	0.562509	-0.396449	0.282468	0.823070
8	0.164446	0.529267	-0.359026	0.264146	0.687400
9	0.130820	0.494393	-0.322551	0.242241	0.579419
10	0.100498	0.459114	-0.288591	0.218973	0.492472
11	0.073638	0.424372	-0.257709	0.195926	0.421402
12	0.050134	0.390803	-0.229973	0.174073	0.362413

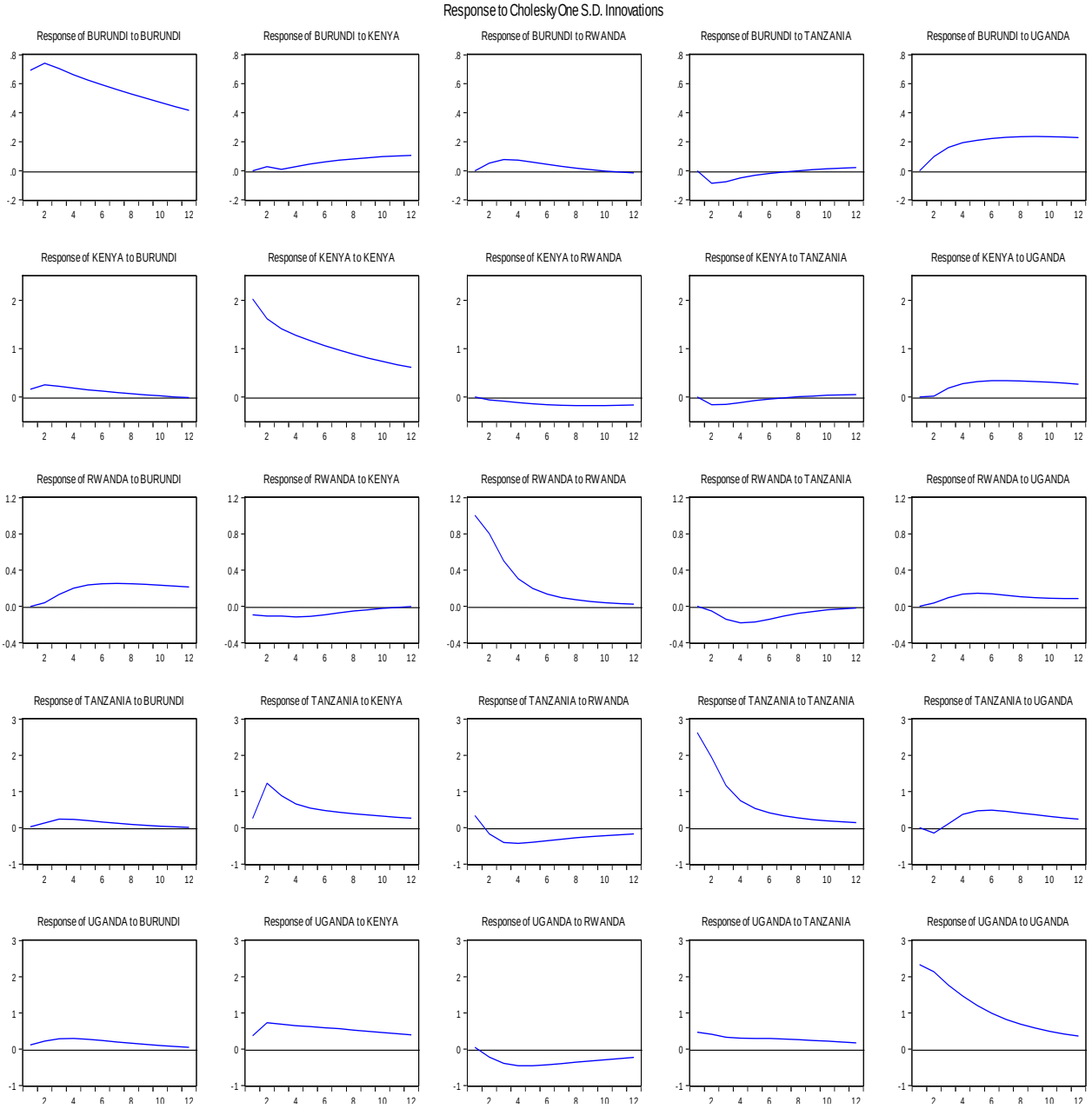
Appendix III a: Figures on Impulse Response in EAC Financial Markets



Appendix III b: Figures on Impulse Response in EAC Financial Markets cont.



Appendix III c: Figures on Impulse Response in EAC Financial Markets cont.



Appendix IV: Variance Decomposition in EAC Financial Markets

Panel A: Variance Decomposition in EAC Equity Markets

Period	S.E.	DSE	NSE	USE	Period	S.E.	DSE	NSE	USE
1	0.049986	100.0000	0.000000	0.000000	1	0.074517	4.658120	95.34188	0.000000
2	0.053205	93.11791	6.868297	0.013792	2	0.077141	9.202883	89.81516	0.981953
3	0.053793	91.17782	7.719739	1.102439	3	0.078489	10.76706	86.78147	2.451475
4	0.053997	90.95642	7.859952	1.183625	4	0.078720	11.02860	86.53223	2.439173
5	0.054041	90.80759	7.869704	1.322711	5	0.078727	11.02660	86.53296	2.440436
6	0.054047	90.80362	7.872394	1.323986	6	0.078740	11.03761	86.52267	2.439726
7	0.054047	90.80154	7.872883	1.325580	7	0.078740	11.03793	86.52126	2.440811
8	0.054048	90.80019	7.873596	1.326212	8	0.078741	11.03859	86.52018	2.441231
9	0.054048	90.80001	7.873561	1.326425	9	0.078741	11.03859	86.52018	2.441233
10	0.054048	90.79987	7.873549	1.326579	10	0.078741	11.03859	86.52018	2.441234
11	0.054048	90.79985	7.873551	1.326600	11	0.078741	11.03859	86.52017	2.441234
12	0.054048	90.79984	7.873551	1.326606	12	0.078741	11.03859	86.52017	2.441234

Appendix IV cont.: Variance Decomposition in EAC Financial Markets

Panel A: Variance Decomposition in EAC Equity Markets

Period	S.E.	DSE	NSE	USE
1	0.080269	8.157989	65.50989	26.33212
2	0.085600	9.800753	60.16297	30.03628
3	0.085806	10.22913	59.87783	29.89304
4	0.086334	10.55327	59.35769	30.08904
5	0.086385	10.54081	59.29198	30.16721
6	0.086412	10.55571	59.26643	30.17787
7	0.086419	10.55414	59.25690	30.18896
8	0.086420	10.55409	59.25624	30.18967
9	0.086420	10.55406	59.25568	30.19026
10	0.086420	10.55404	59.25555	30.19040
11	0.086420	10.55405	59.25550	30.19045
12	0.086420	10.55405	59.25548	30.19047

Appendix IV cont.: Variance Decomposition in EAC Financial Markets

Panel B: Variance Decomposition in EAC Treasury bill Markets

Variance Decomposition of BURUNDI:

Period	S.E.	BURUNDI	KENYA	RWANDA	TANZANIA	UGANDA
1	0.996723	100.0000	0.000000	0.000000	0.000000	0.000000
2	1.326078	97.85860	0.030805	1.204252	0.906296	4.65E-05
3	1.596936	95.85421	0.038260	2.146804	1.953329	0.007392
4	1.826253	93.81780	0.150820	2.985832	3.020174	0.025371
5	2.029198	91.73180	0.373135	3.791441	4.052635	0.050992
6	2.213154	89.58447	0.678544	4.612898	5.041874	0.082216
7	2.382554	87.39227	1.038778	5.466266	5.984352	0.118334
8	2.540119	85.18087	1.429992	6.351096	6.878978	0.159059
9	2.687590	82.97698	1.833690	7.259101	7.726172	0.204060
10	2.826117	80.80444	2.236203	8.179133	8.527410	0.252814
11	2.956483	78.68295	2.627842	9.099815	9.284751	0.304646
12	3.079245	76.62785	3.002034	10.01086	10.00045	0.358810

Variance Decomposition of KENYA:

Period	S.E.	BURUNDI	KENYA	RWANDA	TANZANIA	UGANDA
1	1.038262	0.211024	99.78898	0.000000	0.000000	0.000000
2	1.686700	0.194905	99.10119	0.011965	0.628319	0.063621
3	2.157399	0.168541	98.11916	0.209112	1.293431	0.209754
4	2.505276	0.144760	97.03301	0.680901	1.757859	0.383467
5	2.768683	0.124072	95.93495	1.361538	2.036070	0.543374
6	2.971966	0.107947	94.88548	2.150569	2.183906	0.672099
7	3.130860	0.098615	93.91728	2.967581	2.248751	0.767769
8	3.256074	0.098529	93.04267	3.760103	2.263589	0.835105
9	3.355259	0.109981	92.26203	4.497468	2.250112	0.880408
10	3.434086	0.134890	91.56972	5.163659	2.222249	0.909479
11	3.496861	0.174694	90.95754	5.752034	2.188719	0.927011
12	3.546912	0.230319	90.41655	6.261819	2.154739	0.936579

Variance Decomposition of RWANDA:

Period	S.E.	BURUNDI	KENYA	RWANDA	TANZANIA	UGANDA
1	0.764633	0.074615	0.098729	99.82666	0.000000	0.000000
2	1.162858	0.190456	0.606882	99.01770	0.013484	0.171474
3	1.414375	0.484553	1.745912	97.41847	0.013494	0.337576
4	1.576133	0.961121	2.972539	95.64088	0.013867	0.411591
5	1.683992	1.608249	4.067009	93.86239	0.043387	0.418968
6	1.759221	2.398836	4.948527	92.14220	0.109770	0.400666
7	1.814081	3.302541	5.601758	90.51661	0.199298	0.379788
8	1.855643	4.292036	6.045711	89.00742	0.291622	0.363208
9	1.888139	5.344797	6.315904	87.61758	0.370895	0.350822
10	1.914259	6.442310	6.452666	86.33443	0.429239	0.341350
11	1.935829	7.568611	6.494072	85.13770	0.465560	0.334055
12	1.954145	8.709147	6.472477	84.00677	0.483014	0.328592

Variance Decomposition of TANZANIA:

Period	S.E.	BURUNDI	KENYA	RWANDA	TANZANIA	UGANDA
1	1.133122	1.850505	0.026966	1.123820	96.99871	0.000000
2	1.751865	1.953401	0.148890	0.747217	96.72922	0.421271
3	2.179542	2.125618	0.503768	0.858467	95.16651	1.345633
4	2.495537	2.266018	1.020271	1.352723	92.77469	2.586301
5	2.742777	2.353264	1.555267	2.126423	90.04056	3.924484
6	2.942565	2.390283	2.013082	3.019833	87.39679	5.180009
7	3.105999	2.389425	2.361697	3.902852	85.09555	6.250480
8	3.240011	2.363649	2.607418	4.705176	83.21927	7.104484
9	3.349833	2.323284	2.771052	5.403079	81.74705	7.755534
10	3.439798	2.275648	2.874950	5.998203	80.61370	8.237502
11	3.513553	2.225644	2.937938	6.502368	79.74552	8.588527
12	3.574122	2.176492	2.974190	6.929486	79.07699	8.842838

Variance Decomposition of UGANDA:

Period	S.E.	BURUNDI	KENYA	RWANDA	TANZANIA	UGANDA
1	1.524671	0.003055	3.605638	0.332666	0.168275	95.89037
2	2.526589	0.096259	5.051826	0.123182	0.129374	94.59936
3	3.195833	0.275293	6.044757	0.198808	0.081808	93.39933
4	3.606078	0.523439	6.677482	0.563233	0.145891	92.08996
5	3.846287	0.818401	7.055175	1.168543	0.333613	90.62427
6	3.985692	1.133122	7.270189	1.900760	0.591273	89.10466
7	4.068523	1.443174	7.392153	2.632266	0.850252	87.68216
8	4.119936	1.732277	7.467132	3.272714	1.062247	86.46563
9	4.153449	1.992961	7.521925	3.784834	1.209337	85.49094
10	4.176340	2.224061	7.570132	4.171669	1.296441	84.73770
11	4.192708	2.427701	7.617504	4.455911	1.339039	84.15985
12	4.204993	2.607168	7.665647	4.664396	1.353899	83.70889

Appendix IV cont.: Variance Decomposition in EAC Financial Markets

Panel C: Variance Decomposition in EAC Interbank Markets

Variance Decomposition of BURUNDI:

Period	S.E.	BURUNDI	KENYA	RWANDA	TANZANIA	UGANDA
1	0.692048	100.0000	0.000000	0.000000	0.000000	0.000000
2	1.024124	98.00359	0.076115	0.272651	0.729091	0.918553
3	1.258099	96.27923	0.056026	0.561175	0.847512	2.256053
4	1.437784	94.92312	0.081412	0.694620	0.767085	3.533765
5	1.584223	93.78835	0.154699	0.712363	0.670744	4.673844
6	1.707701	92.75174	0.261200	0.677739	0.589339	5.719980
7	1.813803	91.76733	0.391593	0.626727	0.524783	6.689565
8	1.905987	90.82541	0.540611	0.575602	0.475253	7.583124
9	1.986635	89.92643	0.704084	0.530996	0.438602	8.399891
10	2.057518	89.07220	0.878192	0.495115	0.412723	9.141772
11	2.120011	88.26398	1.059448	0.468141	0.395643	9.812791
12	2.175222	87.50228	1.244768	0.449347	0.385596	10.41801

Variance Decomposition of KENYA:

Period	S.E.	BURUNDI	KENYA	RWANDA	TANZANIA	UGANDA
1	2.035167	0.632138	99.36786	0.000000	0.000000	0.000000
2	2.620632	1.323679	98.24760	0.055417	0.367763	0.005545
3	2.996467	1.557187	97.38587	0.126661	0.548510	0.381770
4	3.278376	1.611986	96.56246	0.226483	0.580918	1.018151
5	3.500327	1.597746	95.77479	0.355937	0.557545	1.713987
6	3.678837	1.553643	95.03568	0.505401	0.519267	2.386006
7	3.824286	1.496820	94.35765	0.664051	0.482591	2.998888
8	3.943777	1.436755	93.74780	0.823510	0.453915	3.538021
9	4.042435	1.379304	93.20738	0.978024	0.434851	4.000444
10	4.124126	1.328175	92.73359	1.123877	0.424712	4.389642
11	4.191871	1.285646	92.32143	1.258839	0.421870	4.712211
12	4.248083	1.252993	91.96483	1.381761	0.424482	4.975934

Variance Decomposition of RWANDA:

Period	S.E.	BURUNDI	KENYA	RWANDA	TANZANIA	UGANDA
1	1.008857	0.000281	0.889208	99.11051	0.000000	0.000000
2	1.296065	0.094711	1.240258	98.42152	0.156648	0.086867
3	1.410391	0.965799	1.632280	95.72479	1.146405	0.530726
4	1.479201	2.732753	2.106364	91.27242	2.564675	1.323788
5	1.531591	4.935896	2.485027	86.76698	3.665745	2.146358
6	1.572832	7.217123	2.704481	83.00220	4.285939	2.790259
7	1.605784	9.405757	2.796579	79.99136	4.562343	3.243959
8	1.632899	11.42841	2.810166	77.54970	4.646012	3.565710
9	1.655916	13.25718	2.782143	75.51644	4.634274	3.809963
10	1.675936	14.88756	2.735647	73.78425	4.580194	4.012351
11	1.693642	16.32750	2.684132	72.28440	4.510585	4.193381
12	1.709467	17.59100	2.635052	70.97164	4.438340	4.363965

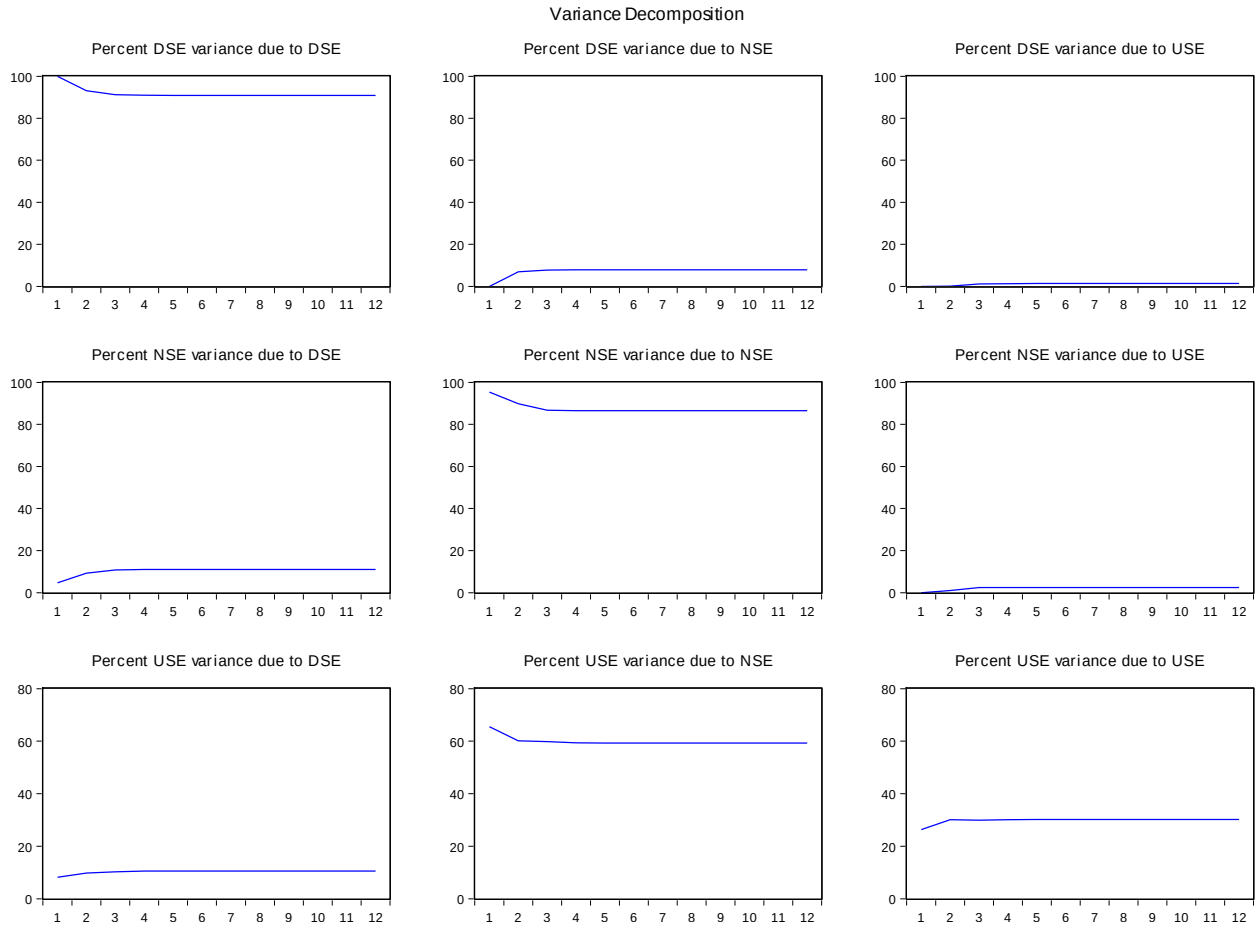
Variance Decomposition of TANZANIA:

Period	S.E.	BURUNDI	KENYA	RWANDA	TANZANIA	UGANDA
1	2.661778	0.009295	0.904348	1.613163	97.47319	0.000000
2	3.525686	0.144488	12.68850	1.148831	85.85692	0.161260
3	3.848452	0.506852	15.98683	2.065090	81.22807	0.213161
4	4.022272	0.796089	17.31449	3.039770	77.81833	1.031317
5	4.144527	0.971419	18.02007	3.788888	74.94957	2.270052
6	4.236983	1.066770	18.49460	4.334334	72.64316	3.461132
7	4.307779	1.113332	18.86525	4.732227	70.84970	4.439490
8	4.362184	1.131273	19.17707	5.025305	69.47160	5.194753
9	4.404131	1.133211	19.44759	5.243258	68.41395	5.761992
10	4.436592	1.127089	19.68437	5.406813	67.59951	6.182219
11	4.461811	1.117880	19.89129	5.530576	66.96915	6.491104
12	4.481480	1.108625	20.07101	5.624927	66.47854	6.716896

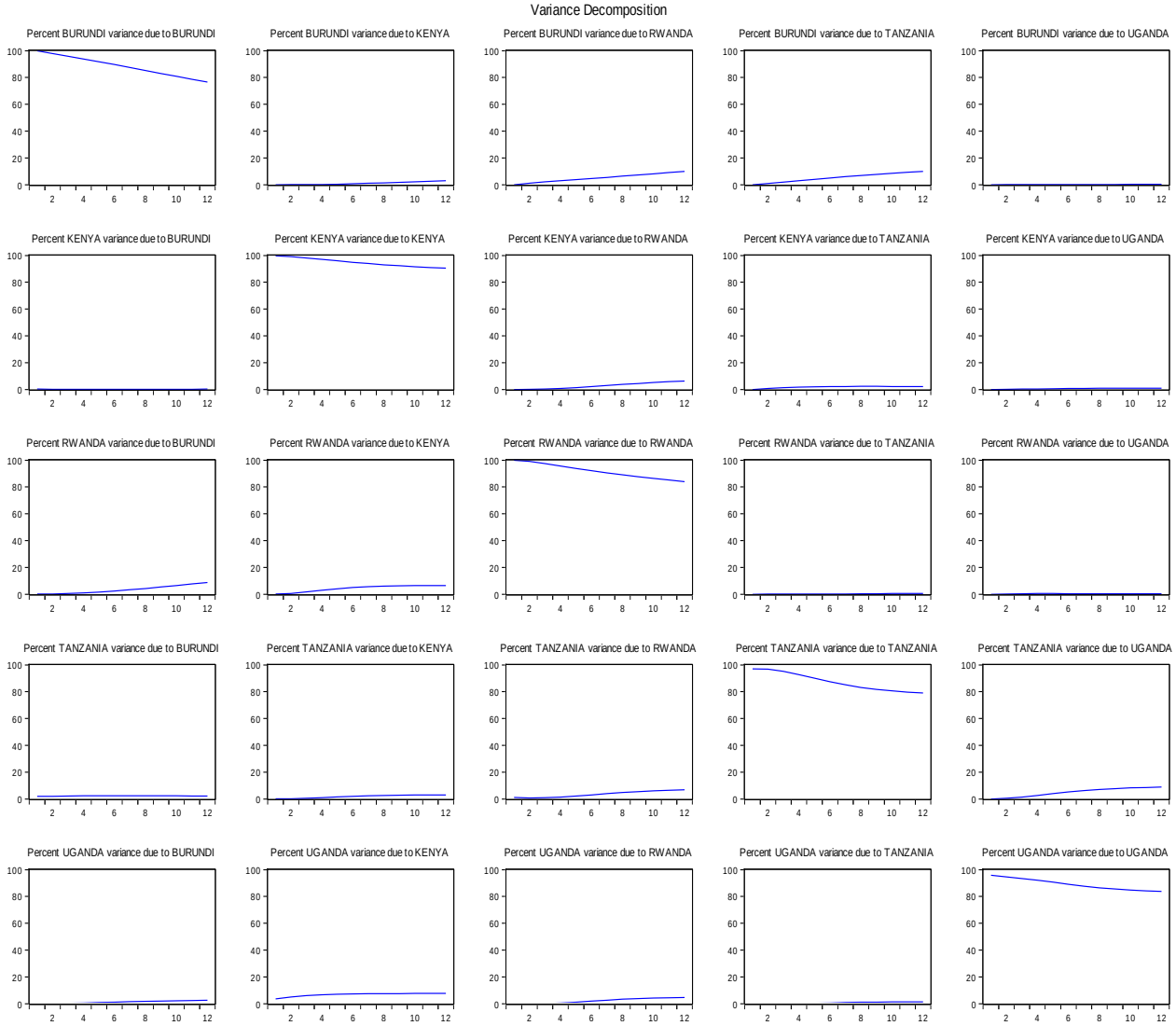
Variance Decomposition of UGANDA:

Period	S.E.	BURUNDI	KENYA	RWANDA	TANZANIA	UGANDA
1	2.410958	0.232826	2.321773	0.039957	3.728580	93.67686
2	3.343519	0.579043	5.974578	0.446550	3.456847	89.54298
3	3.890232	0.990917	7.562235	1.345585	3.275594	86.82567
4	4.253165	1.313321	8.655462	2.263661	3.254225	84.51333
5	4.506006	1.535106	9.606743	3.039665	3.343398	82.47509
6	4.687574	1.675958	10.47673	3.655096	3.484881	80.70733
7	4.821250	1.757584	11.26508	4.131391	3.637570	79.20838
8	4.921667	1.798235	11.96653	4.496666	3.778696	77.95987
9	4.998279	1.812035	12.58087	4.776320	3.898631	76.93214
10	5.057414	1.809395	13.11249	4.990894	3.995459	76.09176
11	5.103463	1.797709	13.56838	5.156229	4.071067	75.40661
12	5.139563	1.782059	13.95662	5.284266	4.128792	74.84826

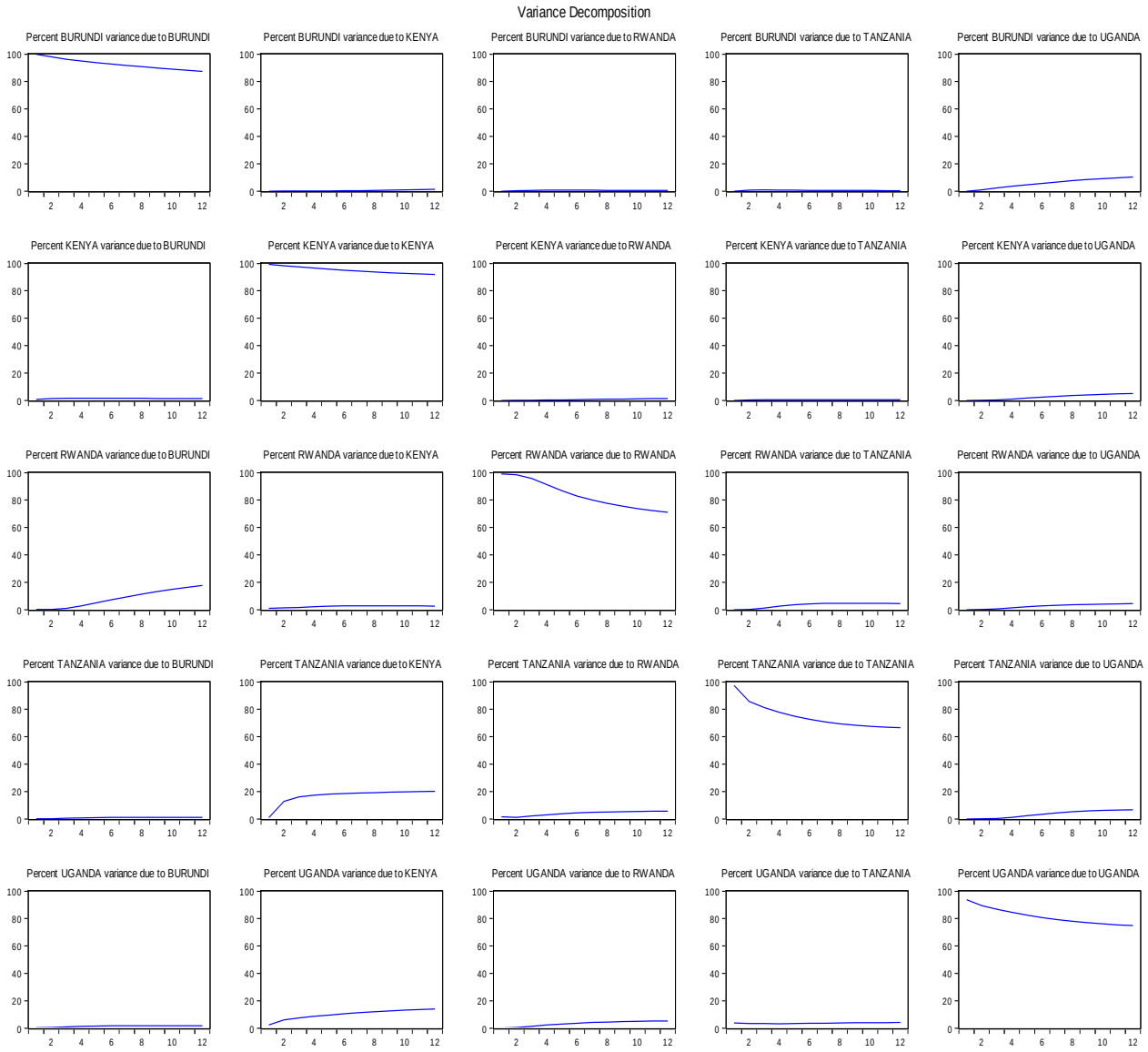
Appendix Va: Figures on Variance Decomposition in EAC Financial Markets



Appendix Vb: Figures on Variance Decomposition in EAC Financial Markets cont.



Appendix Vc: Figures on Variance Decomposition in EAC Financial Markets cont.



Appendix VI: Table on Monthly Sigma Convergence for EAC Financial Markets

Panel A: Monthly Sigma Convergence for the EAC equity Markets

[1]	0.069829503	0.050742673	0.031723890	0.041745198	0.023061444	0.033955911
[7]	0.045361702	0.005234887	0.058321341	0.076787180	0.081894142	0.025212421
[13]	0.105183522	0.037670833	0.098308489	0.049062480	0.047031638	0.038857224
[19]	0.038791294	0.036714725	0.069751673	0.143977207	0.073712706	0.048313397
[25]	0.064838128	0.109592215	0.070838057	0.042202793	0.016934734	0.075565947
[31]	0.022979170	0.020789178	0.023421065	0.018106440	0.025857012	0.014776915
[37]	0.059803174	0.021995581	0.069072720	0.056706423	0.009703701	0.005449186
[43]	0.022758655	0.036847627	0.038886150	0.027834468	0.034762560	0.011896539
[49]	0.012908484	0.034718588	0.124819433	0.063190148	0.018086072	0.056508744
[55]	0.053289702	0.064196201	0.066326811	0.032875764	0.009632672	0.024521563
[61]	0.020671319	0.015348460	0.014322398	0.025285516	0.016538932	0.032395303
[67]	0.010947559	0.010635871	0.006062741	0.022694507	0.053086669	0.019679366
[73]	0.064477592	0.009751114	0.046301811	0.021878869	0.037609882	0.107510309
[79]	0.023774991	0.038871792	0.022849042	0.080859311	0.104555171	0.031340871

Panel B: Monthly Sigma Convergence for the EAC Treasury bill Markets

[1]	0.047017398	0.033720390	0.029707962	0.027481916	0.023266618	0.045055634
[7]	0.038863935	0.032211888	0.045355978	0.039493591	0.035409081	0.038628377
[13]	0.054635426	0.067276221	0.055744268	0.043138556	0.046110170	0.054522202
[19]	0.050917112	0.052464221	0.052172378	0.052431355	0.054594766	0.060421305
[25]	0.060597811	0.059689716	0.065596697	0.064661153	0.058531056	0.060745107
[31]	0.061282232	0.062083787	0.063223892	0.063429942	0.060380143	0.056710601
[37]	0.054981570	0.059583840	0.056348343	0.057825301	0.063534637	0.071909662
[43]	0.080249496	0.073619209	0.068685332	0.071001444	0.071708278	0.073224857
[49]	0.067098764	0.053697989	0.048082250	0.048901218	0.045963415	0.048524614
[55]	0.049355751	0.046939586	0.044695012	0.039193990	0.037675423	0.023835257
[61]	0.022324435	0.031048525	0.031328720	0.024627831	0.023711460	0.023675240
[67]	0.022352114	0.013259226	0.018205287	0.025644919	0.026332451	0.029516063
[73]	0.031663441	0.031375801	0.027534033	0.023593870	0.016268067	0.015245049
[79]	0.017553814	0.016575338	0.019690493	0.022023227	0.012957449	0.031708456
[85]	0.036015709	0.023506318	0.031663400	0.031436843	0.018823344	0.024121982
[91]	0.026697622	0.028713664	0.033237186	0.036160563	0.020326646	0.015340648
[97]	0.014349318	0.009803312	0.011385605	0.013727428	0.014233846	0.011815713
[103]	0.004531708	0.006003855	0.012365055	0.012729388	0.016481508	0.017692273
[109]	0.019649527	0.022056090	0.024721995	0.017418754	0.013071269	0.018103041
[115]	0.021812364	0.023837815	0.024420252	0.019585147	0.011273553	0.014213342
[121]	0.021456636	0.020968684	0.019042513	0.020176844	0.017739870	0.029233990
[127]	0.031938068	0.029323326	0.027530679	0.021481855	0.023446337	0.023855710
[133]	0.025221169	0.024372983	0.023175769	0.024946915	0.026470064	0.031509818
[139]	0.034598138	0.037883124	0.041697307	0.046633118	0.048845785	0.052302568
[145]	0.058077701	0.050082386	0.039675016	0.035729161	0.030966394	0.028424499
[151]	0.024349511	0.010382973	0.018047206	0.016371584	0.013628387	0.017901175
[157]	0.018821511	0.016878857	0.015743005	0.013851136	0.014731941	0.023632279
[163]	0.025636183	0.018930495	0.025988341	0.025784344	0.026140833	0.029554697

Panel C: Monthly Sigma Convergence for the EAC Interbank Markets

[1]	0.023583956	0.019876192	0.020960725	0.019214187	0.024148250	0.036473031
[7]	0.046274269	0.045442689	0.038242254	0.059470396	0.036617591	0.041554699
[13]	0.052954065	0.062757414	0.055672453	0.032823056	0.035269420	0.038839477
[19]	0.038555635	0.042264784	0.040924052	0.043751537	0.043887549	0.045528650
[25]	0.049054123	0.048372027	0.045911948	0.043471508	0.044600863	0.046605761
[31]	0.042762542	0.043630700	0.041783813	0.040174084	0.039764909	0.035504549
[37]	0.027089334	0.037204207	0.031314342	0.031873155	0.039872961	0.061179940
[43]	0.065193803	0.049474367	0.050539806	0.059216915	0.071943485	0.065742984
[49]	0.063194422	0.060260460	0.055256013	0.049040728	0.048946675	0.051330137
[55]	0.046602768	0.044467887	0.043137188	0.038975030	0.034915369	0.031581213
[61]	0.030857373	0.028556902	0.036725509	0.034176337	0.022941817	0.024737320
[67]	0.022095656	0.016748492	0.014300944	0.019415638	0.020446198	0.017547849
[73]	0.013687403	0.011983614	0.014755745	0.016023046	0.010774646	0.015895125
[79]	0.018267129	0.018559553	0.036896002	0.039841034	0.020253839	0.019979615
[85]	0.023745210	0.006195724	0.013909817	0.011126859	0.012935494	0.015444902
[91]	0.018422731	0.026252105	0.030798263	0.051849638	0.021589650	0.021001595
[97]	0.018534562	0.022317549	0.025572387	0.026077730	0.020818621	0.030812287
[103]	0.029360739	0.021085587	0.013485474	0.018928893	0.007913154	0.007110345
[109]	0.029506830	0.020359961	0.026641471	0.021933707	0.012159235	0.022137231
[115]	0.033061655	0.035877918	0.030936419	0.029870671	0.027268425	0.022077885
[121]	0.019032787	0.021166734	0.021197445	0.019618556	0.021181956	0.028071361
[127]	0.032717579	0.031755189	0.030446543	0.031308673	0.029832415	0.023501745
[133]	0.031492745	0.026821766	0.030180031	0.029876956	0.024598880	0.029781505
[139]	0.028551060	0.049019797	0.056093266	0.062275576	0.087752701	0.091765936
[145]	0.076745078	0.058167089	0.069006663	0.071764984	0.043302767	0.042905588
[151]	0.039086119	0.032006398	0.021319285	0.019232731	0.033331748	0.030006641
[157]	0.023609765	0.027977155	0.018941629	0.016275108	0.015321590	0.011890587
[163]	0.014414738	0.014186512	0.010734397	0.015804468	0.021034920	0.015183692

Note:

- Monthly sigma convergences are derived from dispersion of market returns from the average regional return.

- Months move across these tables from left to right (from January to June, then July to December) each year

- One year in the study period tales two rows in each table

- In Panel A, (1) is January, 2007, (13) is January, 2008..... (73) is January, 2013

- In Panel A, (7) is July, 2007, (19) is July, 2008..... (79), is July, 2013

- In Panel B and C, (1) is January, 2000, (13) is January, 2001.....(157) is January, 2013.

- In panel B and C, (7) is July, 2000, (19) is July, 2001..... (163) is July, 2013