EFFECT OF MACROECONOMIC CONVERGENCE ON EXCHANGE RATE VOLATILITY IN QUEST FOR THE EAST AFRICAN MONETARY UNION (2000-2016)

JANE MUTHONI KABORO

A Thesis Submitted to the Graduate School in Partial Fulfillment for the Requirements of the Award of the Master of Arts Degree in Economics of Egerton University

EULIB
064255

EGERTON UNIVERSITY LIBRARY
24 JAN 2019
P.O. BOX 536, EGERTON
ACQUISITION SECTION

EGERTON UNIVERSITY

AUGUST, 2018

EGERTON UNIVERSITY
LIBRARY

2019/109868

DECLARATION AND RECOMMENDATION

DECLARATION

This thesis is my original work and to the best of my knowledge has not been presented for the award of a degree, diploma or certificate in this or any other university.

Signature..... Date..15/08/2018.....

Jane Muthoni Kaboro

AM16/14414/15

RECOMMENDATION

This thesis is submitted for examination with our approval as University supervisors.

Dr. Aquilars Kalio

Department of Economics,

Egerton University

Signature..... Date..17/08/2018.....

Prof. Lawrence Kibet

Department of Economics,

Egerton University

Signature..... Date..16/08/2018.....

Q019/109868

COPYRIGHT

© 2018 Jane Muthoni Kaboro

All rights reserved. No part of this publication shall be produced, stored in a retrieval system or transmitted in other means; electronic, photocopying, recording or otherwise without prior knowledge of the author or that of the university.

2019/109868

DEDICATION

To my mum Mrs. Kaboro and my lovely children: Frida, Faith and Elvis.

ACKNOWLEDGEMENT

I begin by thanking the Lord Almighty for the abundant blessings and guidance He granted upon me throughout my academic career. It is through His will and grace that I have been blessed with the opportunity and capacity to complete this study. I am grateful to Egerton University for giving me the rare opportunity to undertake this study at the institution. Special thanks go to my supervisors, Dr. Aquilars Kalio and Prof. Lawrence Kibet for the wise academic advice and through corrections they gave me throughout my study. I sincerely thank them for their dedicated guidance and valuable time they accorded me which enabled me complete this study, and which uplifted my future academic endeavours. I also extend my heartfelt gratitude to Dr. Symon Kiprop for his continuous guidance and encouragement throughout this research.

I am forever indebted to my family members who have been a source of strength and encouragement throughout my studies. I thank you so much for your dedication to ensuring that I constantly challenge myself to be and become more in academic life. I thank you for your endless support and always being there for me when i needed you most. To all of you, I pray that I continue to make you proud.

Finally, I express my gratitude to all my colleagues and friends for their cooperation and support during my research programme. I thank the entire staff of Economics Department for the continuous support they gave me during the entire period of my studies. I extend my gratitude to all those who deserve to be mentioned here but were not included, may you feel appreciated.

ABSTRACT

Attaining a monetary union is an ambition for most African regional economic communities (RECs). So far, the formation of a monetary union in the East African Community (EAC) has remained elusive. Macroeconomic convergence is critical for EAC members to achieve a level of harmonization required for establishing a stable and sustainable monetary union. The EAC partner States therefore established set targets for macroeconomic convergence, with an aim to eliminate exchange rate variability within the bloc. Where countries are able to eliminate or reduce exchange rate adjustments to maintain external balance, the costs of a monetary union reduces, thus the more suitable it is for such a region to form a monetary union. However, empirical studies undertaken indicate that the rate of convergence of the member states economies to the set targets has been very slow, resulting in high exchange rate variability within the region. It is against this background that this study was carried out to determine the effect of convergence in macroeconomic variables on exchange rate volatility, of five East African community (EAC) countries; Kenya, Uganda, Tanzania, Burundi, and Rwanda. The research was carried out in order establish whether macroeconomic convergence in EAC reduces exchange rate volatility within the region in readiness for a stable and sustainable monetary union. The macroeconomic variables focused by this study were: nominal GDP growth rates, budget deficit/GDP, national savings/GDP, and inflation rate. These are the four variables that the region has identified as being major in influencing their economies. Secondary data obtained from World Bank, EAC member countries National Bureau of Statistics, International Monetary Fund (IMF), and World Development Indicator (WDI) Report of the World Bank was used. The study was guided by the Optimum Currency Area (OCA) theory. A panel data analysis was used over the period 2000-2016. Sigma (standard deviation) was used in the study to establish convergence of variables and volatility of exchange. Levin-Lin-Chu test for panel unit root was employed to test for data stationarity and it was found that real exchange rate, nominal GDP growth rate, and inflation rate were stationary. Budget deficit and national savings were non-stationary, they were differenced once and they became stationary. The study results showed that all the explanatory variables had a significant and a negative effect on exchange rate volatility. This means that convergence in nominal GDP growth rate, budget deficit, savings and inflation rates among the EAC countries reduces exchange rate variability within the region.

TABLE OF CONTENTS

DECLARATION AND RECOMMENDATION ..... **ii**
COPYRIGHT ..... **iii**
DEDICATION ..... **iv**
ACKNOWLEDGEMENT ..... **v**
ABSTRACT ..... **vi**
TABLE OF CONTENTS ..... **vii**
LIST OF TABLES ..... **x**
LIST OF FIGURES ..... **xi**
ABBREVIATIONS AND ACRONYMS ..... **xii**
CHAPTER ONE **1**
INTRODUCTION **1**
1.1 Background to the Study 1
1.1.1 Macroeconomic Convergence and Monetary Integration in Africa 2
1.1.2 Macroeconomic Convergence and Monetary Integration in East African 4
1.1.3 Essence of Exchange Rate Reduction or Elimination in a Monetary Union 10
1.2 Statement of the Problem 11
1.3 Objectives of the Study 11
1.3.1 General Objective 11
1.3.2 Specific Objectives 12
1.4 Research Hypotheses 12
1.5 Significance of the Study 12
1.6 Scope and Limitations of the Study 13
1.7 Definition of Terms 14
CHAPTER TWO **15**
LITERATURE REVIEW AND THEORETICAL FRAMEWORK **15**
2.1 Introduction 15
2.2 Theoretical Literature Review 15
2.2.1 The Optimum Currency Area (OCA) Theory 15
2.2.2 Endogenous Optimum Currency Area Theory 16
2.2.3 Keynesian Theory 16
2.2.4 The Monetarist View on Monetary Policies and Monetary Union 17
2.2.5 Maastricht-type Convergence Criteria 18
2.3 Empirical Literature Review 18

2.4 Theoretical Framework 21
2.5 Conceptual Framework 23
CHAPTER THREE 26
METHODOLOGY 26
3.1 Introduction 26
3.2 Research Design 26
3.4 Data Collection 27
3.5 Data Analysis and Presentation 27
3.5.1 Panel Unit Root Test 28
3.5.2 Panel Cointegration Test 28
3.5.3 Hausman Test 28
3.6 Empirical Model Specification 29
3.7 Justification for Panel Approach 31
3.8 Definition and Justification of Variables, and Sources of Data 31
3.8.1 Exchange Rate Volatility 31
3.8.2 Nominal GDP Growth Rates Convergence 32
3.8.3 Budget Deficit/GDP Convergence 32
3.8.4 Savings/GDP Convergence 32
3.8.5 Inflation Rate Convergence 33
3.9 Post-estimation Diagnostic Tests 33
3.9.1 Test for Cross-Sectional Dependence 33
3.9.2 Test for Autocorrelation 34
3.9.3 Test for Heteroskedasticity 34
CHAPTER FOUR 35
ANALYSIS AND DISCUSSION OF RESULTS 35
4.1 Introduction 35
4.2 Descriptive Analysis 35
4.2.1 Trends in Macroeconomic Performance in EAC against the Regional Mean 35
4.2.2 Descriptive Statistics 39
4.2.3 Correlation Matrix for the Selected Macroeconomic Variables 40
4.3 Pre-diagnostic Tests 42
4.3.1 Panel Unit Root Test 42
4.3.2 Hausman Test 43
4.4 Regression Analysis 44

4.4.1 Effect of Nominal GDP Growth Rate Convergence on Exchange Rate Volatility in EAC 45
4.4.2 Effect of Budget Deficit/GDP Convergence on Exchange Rate Volatility in the EAC 46
4.4.3 Effect of National Savings/GDP Convergence on Exchange Rate Volatility in the EAC 47
4.4.4 Effect of Inflation Rate Convergence on Exchange Rate Volatility in the EAC 47
4.5 Post Estimation Diagnostic Tests 48
4.5.1 Test for Cross-Sectional Dependence 48
4.5.2 Test for Heteroskedasticity 49
4.5.3 Test for Autocorrelation 49
CHAPTER FIVE 50
SUMMARY, CONCLUSION AND RECOMMENDATIONS 50
5.1 Introduction 50
5.2 Summary 50
5.3 Conclusion 51
5.4 Recommendations 52
5.5 Areas for Further Research 54
REFERENCES 55

LIST OF TABLES

Table 1.1: Macroeconomic Convergence Criteria in the EAC 7
Table 4.1: Descriptive Statistics of Selected Macroeconomic Variables, 2000-2016 40
Table 4.2: Correlation Coefficient Results for Variables 41
Table 4.3: Panel Unit Root Test Results using Levin-Lin-Chu 42
Table 4.4: Hausman Test Results 43
Table 4.5 Regression Results of Macroeconomic Convergence and Real Exchange Rate 44

LIST OF FIGURES

Figure 1.1: Trends in Nominal GDP Growth Rates for EAC Countries, 2004-2016 7
Figure 1.2: Budget Deficit/GDP Excluding Grants for EAC Countries, 2006-2016..... 8
Figure 1.3: Gross National Savings/GDP for EAC Countries, 2004-2016..... 8
Figure 1.4: Trends in Inflation Rate at Consumer Prices (%) of EAC Countries..... 9
Figure 1.5: Real Effective Exchange Rate of EAC Countries, 2005-2015..... 9
Figure 2.1: Conceptual Framework 24
Figure 3.1: Map of Study Area 27
Figure 4.1: Nominal GDP Growth Rates Convergence, 2000-2016 35
Figure 4.2 Budget Deficit/GDP Excluding Grants Convergence in EAC, 2000-2016..... 36
Figure 4.3: Gross National Savings/GDP Convergence in EAC, 2000-2016..... 37
Figure 4.4: Inflation Rate Convergence in EAC, 2000-2016 38
Figure 4.5: Real Exchange Rate in EAC, 2000-2016 39

ABBREVIATIONS AND ACRONYMS

ASEAN	–	Association of South-East Asia Nations
CARICOM	-	Caribbean Community
CFA	–	Common Franc Area
CMA	–	Common Market Area
COMESA	-	Common Market for East and Southern Africa
CPI	–	Consumer Price Index
EAC	-	East Africa Community
EAMU	–	East African Monetary Union
ECOWAS	-	Economic Community of West African States
EMU	-	European Monetary Union
GLM	–	Generalized Linear Model
G-PPP	-	Generalized Purchasing Power Parity
IFS	–	International Financial Statistics
IMF	–	International Monetary fund
KNBS	-	Kenya National Bureau of Statistics
LLC	–	Levin-Lin-Chu
OCA	-	Optimum Currency Area
OLS	–	Ordinary Least Squares
RECs	-	Regional Economic Communities
SACU	–	South African Cooperative Union
SADC	-	Southern African Development Community
VAR	–	Vector Auto-regressive
WAEMU	-	West African Economic Monetary Union
WAMZ	–	West African Monetary Zone
WB	-	World Bank
WEO	–	World Economic Outlook

CHAPTER ONE
INTRODUCTION

1.1 Background to the Study

Monetary integration is a process whereby two or more countries come together and subject themselves to a single monetary authority or central bank which is responsible for the issuance of legal tender currency and formulates financial policies on behalf of member countries (Guillaume and Starage, 2000). It involves harmonization of exchange rates among different countries which existed before they integrated. On the other hand, countries that accept the occurrence of monetary integration process or arrangement are said to be in a monetary union.

According to Alper (2015), there are three forms of monetary unions; (1) an informal exchange rate union – consists of separate currencies of the member countries whose parities are fixed but only within margins that can be adjusted; (2) a formal exchange rate union – countries use separate currencies but rates fluctuating within narrow or zero margins, and a strong degree of coordination among the central banks; and (3) a full monetary union – which involves use of a single currency and central bank among member countries. Countries willing to form a monetary union start with informal union, then formal and finally to full monetary union. EAC countries are at the formal stage where they are moving towards maintaining zero or narrow margin in exchange rate volatility.

Advantages of a monetary union for member states include reduced cost of transaction in trade, price transparency and increased efficiency (Mongeli, 2008). However, the major disadvantage for member states who agree to form a monetary union is the loss to a certain degree of sovereignty (De Grauwe, 2010). Hence, forming a monetary union implies that member countries must give up the right to set their own independent policies which they consider as conducive for their domestic alone, and must be bound to agree with a common policy that is suitable for member states (Mongeli, 2008).

As Regional Economic Communities (RECs) in the world strive to deepen their level of integration, an increasing number are considering forming a monetary union. According to Collier (2007), out of the fourteen RECs that existed in 2001, nine have expressed the objective of attaining full economic union (monetary and fiscal integration). In Latin America, the Mercosur countries, the Andean Community, and the Central American

Common Market countries have held informal discussions on their monetary union ambitions. Similar intentions have been voiced within the Caribbean Community (CARICOM) for a Caribbean Single Currency, while the Association of South-East Asia Nations (ASEAN) has conducted a feasibility study on a common ASEAN currency.

European Monetary Union (EMU) has always been a prime example of reference of monetary unions, given its unprecedented scope and success. According to Klein (1998), political support for EMU among leaders of Europe has been very strong which kept the prospects for EMU alive. Countries joining EMU had to strictly adhere to convergence in macroeconomic variables outlined in the Maastricht treaty. Proper mechanisms and adequate resources have been provided for effective planning, coordination, implementation, and monitoring of the union (Gramlich, 2016). Therefore, though EMU has had its own challenges, the above are lessons that RECS in Africa can learn from.

1.1.1 Macroeconomic Convergence and Monetary Integration in Africa

Monetary integration in Africa has been intense over the decades since independence (Tsikata, 2014). Initiatives of monetary integration among the African RECs has been increased by the creation of the Euro zone in January 1999 and the January 2002 introduction of Euro notes and coins to replace the German deutche mark, French franc, Italian lira, and other currencies of the twelve member countries (Zhang, 2012).

According to Robson (1987), poor macroeconomic performance experience in Sub-Saharan African countries have been a major hindrance to a successful monetary integration for the blocs and a subject of great concern over the past three decades. The African countries as a group share some similarities in terms of growth and macroeconomic management. Since the 1980s, they have experienced declining growth, fiscal and trade deficits, and large external debts. While there are several causes of poor macroeconomic performance, main ones include; excessive budget deficits and printing of money to finance fiscal deficits leading to high inflation, low degree of product diversification, deficits in balance of payments and debt crises.

According to Collier (2007), there are two main justifications as to why macroeconomic convergence is needed for any successful monetary union of the blocs. First, domestic fiscal policies can cause negative spillover effects on other members of the union. For example, excessive government deficits in one country may cause inflationary pressures on the

common currency that could negatively impact other countries as well. Second, a moral hazard arises in a monetary union as countries become able to borrow unsustainably with the hope that other members of the union or a regional central bank would bail them out in case of a debt crises.

South Africa has been exploring monetary integration in the context of South African Development Community (SADC) to build on the long-standing but more restricted South African Cooperative Union (SACU) and the Common Market Area (CMA) (Talvas, 2008). Though the main focus of SADC is on trade and structural policies, some consideration is also being given to expanding CMA centered on the rand, which formerly included Lesotho, South Africa, and Swaziland to include other SADC countries (Talvas, 2008). Macroeconomic convergence in SADC region is guided following criteria and bench marks that have been specified by a Committee of Central Bank Governors which focus on key essential requirements for macroeconomic convergence. However, there have been significant disparities in macroeconomic performance among SADC member states, coupled with civil conflicts and drought in some parts of the region. Thus, full monetary union among SADC countries may take several years before its establishment (Maruping, 2005).

In West Africa, Economic Community of West African States (ECOWAS) was formed in 1975 with a vision to create a single regional economic space having a single market and single currency to accelerate social economic development and global competitiveness (Olakunle, 2015). Proposed date of the realization of a single currency was 2000, but later revised to 2005, 2009, and then 2020. A set of macroeconomic convergence criteria which member countries are expected to observe prior to the emergence of the monetary union have been set. But the absence of any progress on the mentioned initiatives led to a subset of ECOWAS countries to propose a second monetary zone, in addition to the existing Common Franc Area (CFA) zone in West Africa, known as West African Economic Monetary Union (WAEMU). This was a fast track to the creation of the unified West African Monetary Zone (WAMZ) by 2005. WAMZ would be subsequently merged with WAEMU to achieve the goal of a single West African currency (Sanusi, 2013).

A wider project (which includes Kenya and Uganda but not Tanzania) is a monetary union among the Common Market for East and Southern Africa (COMESA) countries. This regional grouping also partly overlaps with SADC, exhibiting the overlapping regional

commitments that prevail in Africa and often lead to inaction and contention (McCarthy, 2015). As is the case for SADC, differences in macroeconomic stability, fiscal discipline, and financial development among COMESA countries are great, making it unlikely that such a project is achievable as currently envisioned. Moreover, South Africa is not a member, hence COMESA may not benefit from the track record of monetary stability of South African's Reserve Bank (Maruping, 2005).

1.1.2 Macroeconomic Convergence and Monetary Integration in East African

The East African Community (EAC), which was established in 1967, formerly comprised three countries; Kenya, Uganda and Tanzania. According to Kuteesa (2014), the three countries shared a long history like free trade area among themselves, establishment of custom union in 1919, formation of the East African high commission in 1948, and establishment of customs collection centre in 1990. The EAC collapsed in 1977 but was officially revived on 7th July 2000 (Kibua, 2007).

Rwanda and Burundi, which were previously regarded as part of central African bloc, joined the EAC in 2007 mainly for economic and political reasons. Both countries were struggling to emerge from years of civil war since 1993 and they needed to rebuild their shattered economies. They hoped to benefit from an EAC custom union which would ensure free circulation of goods and a reduction of tariffs among the five member countries. The move also allowed the countries to join a planned political federation, including a common market for the region. However, the countries feared the competition they would face especially from the largest economy, Kenya (Kibua, 2007).

Objectives of EAC are to develop policies and programs aimed at widening and deepening cooperation among member states in economic, social, cultural and political fields (EAC, 2005). Member states resolved to establish a custom union among themselves, a common market, and subsequently a monetary union and ultimately a political federation to strengthen and enhance harmonious, equitable and sustained economic development. This collaboration of efforts has so far yielded a custom union launched in 2005 and a common market established in 2010 (Muthui, 2016). Recent negotiations have sought to elevate the REC to a monetary union with the introduction of a single currency by 2015. EAC member states agreed to go through a process of monetary policy harmoniously with a view to achieve macroeconomic convergence. To assess this objective, a number of convergence criteria were

set to guide the member countries and to help move the bloc into a monetary union (EAC, 2005).

However, success of EAC agenda has been hindered especially by the political situations in the member countries. The single-party dominance which is apparently deepening in the parliaments of both Tanzania and Uganda is unattractive to Kenyans (Kibua, 2007). The ethnic politics in Kenya is regarded with some horror in Tanzania. Rwanda's distinct political culture and leadership committed to building a developed state is a great lesson that the other EAC countries can learn from. Diversity of the political systems of the member states will make monetary integration difficult (Kibua, 2007).

Burundi, one of the poorest nations in the world, is struggling to emerge from a 12-year ethnic-based civil war (Kuteesa, 2014). Since independence in 1962, it has been plagued by tension between the dominant Tutsi minorities and the Hutu majority. In 2015, the country was plunged into its worst crises since the end of a civil war in 2005, when Mr. Nkurunziza's ultimately successful bid for re-election to a third term sparked protests by opposition supporters who said the move was unconstitutional (Kuteesa, 2014). This has led to long and intense political instability which significantly affected the country's economic prospects. The country's economy is dominated by subsistence agriculture, and over half of the population lives below the poverty line. This has led to poor performance in macroeconomic variables in the country compared other EAC member countries, though the country is slowly recovering from the recession after 2015 (Muthui, 2016).

The task of forming a monetary union in EAC started early, but proceeded slowly. Thus, in 2001, the EAC Development Strategy for 2006-2010 (EAC, 2005) decided to fast track its establishment and aimed it for 2012. The intention was to sign a protocol to establish the East African Monetary Union (EAMU) in 2012, which was finally signed in 2013, while actual implementation, though planned to be completed by 2015, is now expected to take several years. As evident from the experience of European Monetary Union (EMU), forming a monetary union is a complicated process, and therefore it is necessary to ensure that the pre-conditions for forming the EAMU are adequate (Alper, 2015).

In pursuing this fast tracking process, key legal framework for macroeconomic convergence criteria were adopted by partner states in 2007 as part of preparation of monetary integration.

EGERTON UNIVERSITY
LIBRARY

Thus, the East African countries have set bench mark criteria: sustained growth, price stability, sustainable fiscal and current account deficits and external debts (EAC, 2005). They are set for three different stages and divided into primary and secondary criteria in the first two stages, followed by introduction of a single currency at the last stage as shown in Table 1.1:

Table 1.1: Macroeconomic Convergence Criteria in the EAC

		Stage 1	Stage 2	Stage 3
	Indicator	2007-2010	2011-2014	2015 onwards
Primary criteria	Budget deficit to GDP ratio			monetary union
	Excluding grants	<6%	≤5%	
	Including grants	<3%	≤2%	
	Inflation	≤5%	≤5%	
	External reserves	≥4 months import cover	≥6 months imports cover	
Secondary criteria	Real exchange rates	Stable	Stable	monetary union
	Interest rates	Market based	Market based	
	GDP growth rate	≥7%	≥7%	
	Public debt	Reduced to sustainable levels	Reduced to Sustainable levels	
	Savings to GDP ratio	≥20%	≥20%	
	Current account (excluding grants)	Consistent with debt sustainability.	Consistent with debt sustainability	

Source: Adapted from Opolot and Luvanda (2009).

Meeting the above convergence criteria has so far been elusive. An inspection of the performance of the EAC member countries' performance from 2004-2016, relative to the convergence criteria, reveals significant variations (figures 1.1, 1.2, 1.3, 1.4).

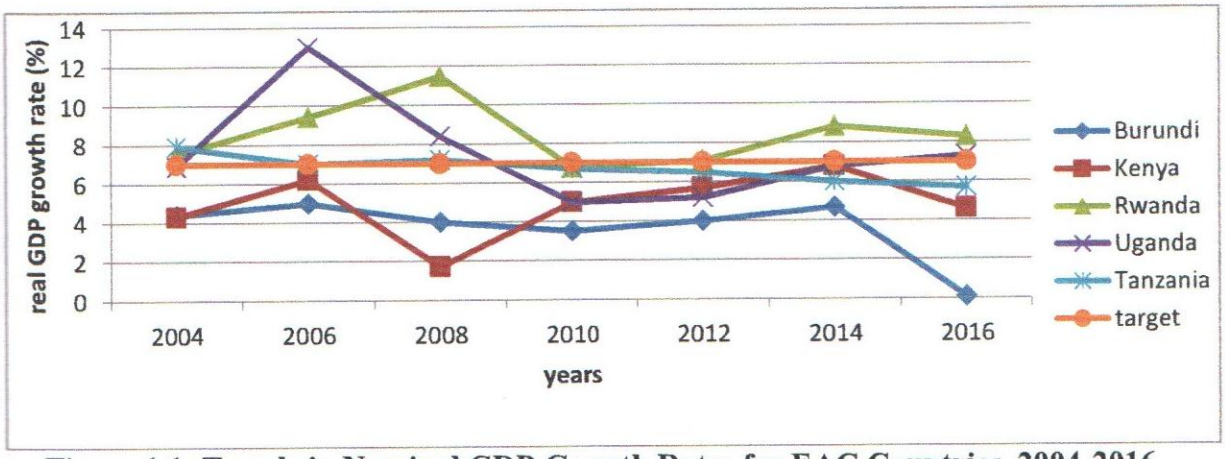


Figure 1.1: Trends in Nominal GDP Growth Rates for EAC Countries, 2004-2016

Source: World Development Indicator (WDI) (2016).

As shown in Figure 1.1, only Rwanda and Uganda has managed above the 7% target of GDP growth rate during the period. Other countries have remained below the target with Burundi and Kenya performing relatively poorer. Burundi attained only 2% growth rate in 2008

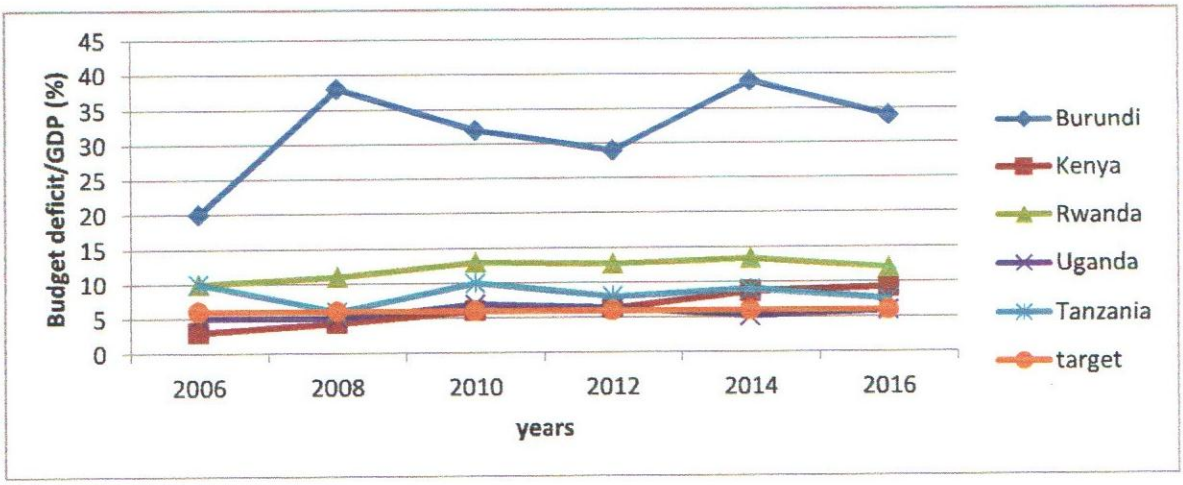


Figure 1.2: Budget Deficit/GDP Excluding Grants for EAC Countries, 2006-2016.

Source: International Financial Statistics (IFS) (2016).

Figure 1.2 above shows performance in budget deficit/GDP of the five EAC countries over the period 2006-2016 against the set target of 5%. Burundi, Rwanda, and Tanzania's performance in budget deficit/GDP has been far above the set target of not exceeding 5%, with Burundi doing so poorly. Kenya and Uganda has been performing well though Kenya went above the target after 2012.

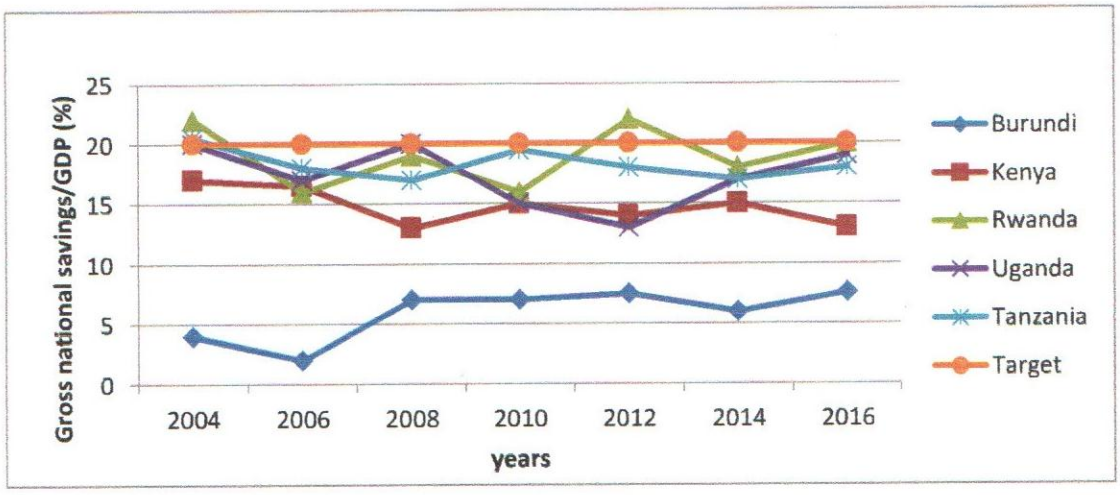


Figure 1.3: Gross National Savings/GDP for EAC Countries, 2004-2016

Source: World Economic Outlook (WEO) (2016).

Figure 1.3 above shows that all countries performed below the set target of more than 20% in national savings/GDP during the entire period except for Rwanda that attained the target in 2004 and 2012.

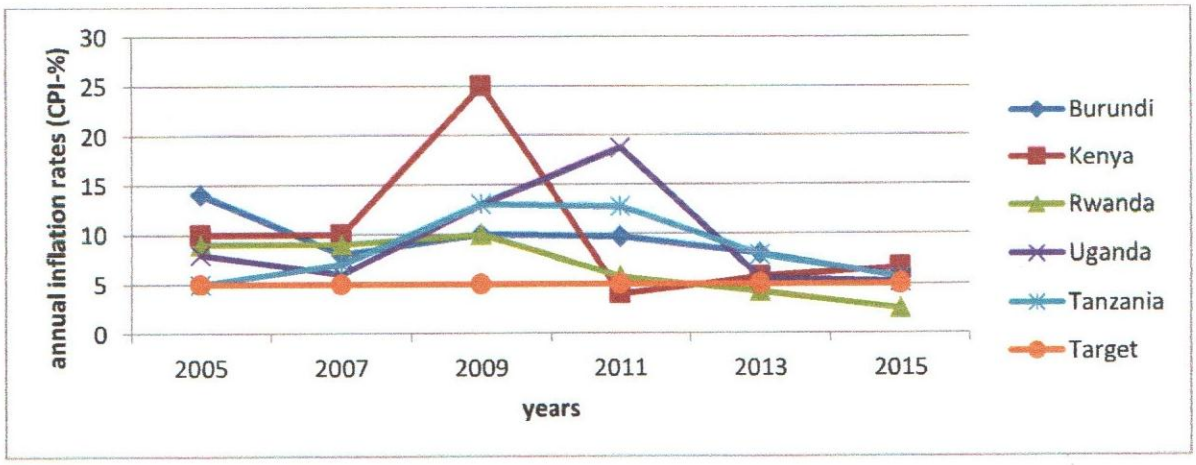


Figure 1.4: Trends in Inflation Rate at Consumer Prices (%) of EAC Countries

Source: World Development Indicator (WDI) (2016).

Figure 1.4 above shows that countries recorded variations in inflation rates with Kenya recording the highest in 2009 of 25% against a set target of not exceeding 5%. This is due to the fact that national savings were diverted into financing fiscal deficits and external debt instead of development projects. Fiscal deficits have also been financed by printing money causing high inflation leading to unemployment within the region.

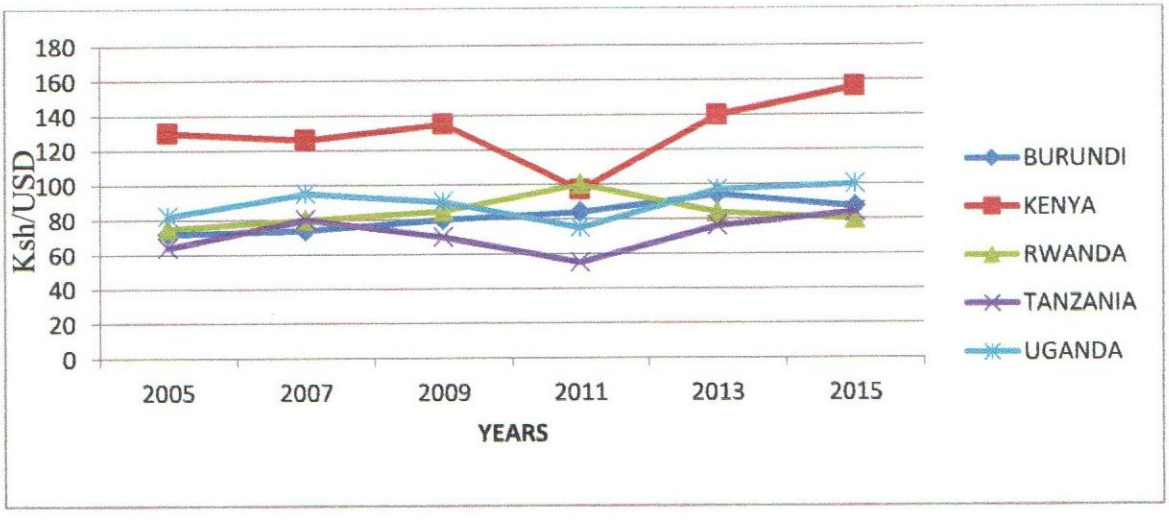


Figure 1.5: Real Effective Exchange Rate of EAC Countries, 2005-2015

Source: IMF (2016)

Real exchange rates have been highly volatile within the region as shown in Figure 1.5. According to Alper (2015), real exchange rate in a given country is influenced by economic fundamentals main ones being the macroeconomic variables. On average, these fundamentals must move together in member countries of a monetary union if they are to reap maximum benefits from the union. Therefore, the situation above may pose a big challenge to the proposed monetary union for the region in terms of its cost, sustainability and stability (Gramlich, 2016).

1.1.3 Essence of Exchange Rate Reduction or Elimination in a Monetary Union

Exchange rate is the price of one currency in terms of another currency. Just like for goods and services, governments can influence it, and even fix it (Emerson *et. al,* 1992). Exchange regime or systems are the framework under which that price is determined. It can be purely floating exchange rate or a central bank determined fixed exchange rate (Mundell, 1961).

A monetary union is an exchange rate regime where two or more countries use the same currency or different currencies but maintain a fixed exchange rate with each other. Their parity relationships are fixed irrevocably, without admitting fluctuations or if so at very low levels. This process is progressively implemented, until reaching full monetary integration (Mundell, 1961). Therefore, a monetary union requires that countries should ensure that exchange rates variation is maintained at very narrow margins and should be minimizing as the region moves into the integration. According to Tsikata (2014), countries willing to fuse into a monetary union should ensure that their economies are similar through macroeconomic convergence. This macroeconomic stability will eliminate exchange rate fluctuations that is necessary in restoring instability in economies hence reduce exchange rate volatility. When countries maintain the volatility at minimal levels, then monetary integration is appropriate.

According to Eichengreen and Bayoumi (1995), although exchange rate plays a very important role in economic performance of individual countries, moving into a monetary union reduces this importance since individual member country cannot act autonomously in exchange adjustments to stabilize their economies in the face of country-specific shocks. Thus, in a monetary union, there ought to be exchange rate stability enjoyed among the member countries in it at the cost of

monetary independence by each country in controlling their own monetary policies (Eichengreen and Bayoumi, 1995).

1.2 Statement of the Problem.

Monetary integration is a key factor in economic growth of the integrating economies. Although it brings with it loss of sovereignty in the use of monetary policies, it leads to increase in trade and investments, financial deepening, and reduces intra-regional trade transactional costs (Mongeli, 2008). EAC countries have set macroeconomic convergence targets with an aim to reduce or eliminate exchange rate variability within the region in preparation for a monetary union. However, convergence towards the set targets remains a challenge in EAC which may have led to exchange rate volatility within the region. This poses a risk to the proposed monetary union in terms of its cost and sustainability. Statistics from World Economic Outlook (2016) shows that between 2009 and 2016, average percentage growth rates of Burundi, Kenya, Rwanda, Tanzania, and Uganda were: 4.3, 5.8, 6.5, 6.7, and 5.0 respectively against a target of not less than 7.0%. CPI inflation rate was: 8.9, 8.8, 5.7, 12.2, and 11.0 respectively against target of not exceeding 5%. Savings/GDP percentage rate were: 6.0, 15.6, 18.1, 18.9 and 18.4 respectively against a target of not less than 20%. Budget deficit/GDP was 9.2, 6.7, 6.6, 7.1, and 5.9 respectively against a target of 5%. Exchange rate within the region has been highly volatile, a situation that can make the proposed monetary union costly and unsustainable. It was against this backdrop that the study sought to establish the effect of convergence in major macroeconomic variables: nominal GDP growth rates, budget deficits/GDP, savings/GDP and inflation rates on exchange rate volatility within EAC, as the region moves into a monetary union. This research was carried out in order to determine whether convergence in the macroeconomic variables reduces exchange rate volatility within the region in preparation for the EAC monetary union. The four variables were picked since the EAC countries identified them as being major variables in influencing their economies (EAC, 2005).

1.3 Objectives of the Study

1.3.1 General Objective

The overall objective of this study was to examine the effect of macroeconomic convergence on exchange rate volatility in the EAC over the period 2000-2016.

1.3.2 Specific Objectives

Specific objectives of the study were:

i. To determine the effect of nominal GDP growth rates convergence on exchange rate volatility in EAC.
ii. To establish the effect of budget deficit/GDP convergence on exchange rate volatility in EAC.
iii. To determine the effect of savings/GDP convergence on exchange rate volatility in EAC.
iv. To assess the effect of inflation rate convergence on exchange rate volatility in EAC.

1.4 Research Hypotheses

i. The nominal GDP growth rate convergence has no significant effect on exchange rate volatility in EAC.
ii. The budget deficit/GDP convergence has no significant effect on exchange rate volatility in EAC.
iii. The savings/GDP convergence has no significant effect on exchange rate volatility in EAC.
iv. The inflation rate convergence has no significant effect on exchange rate volatility in EAC.

1.5 Significance of the Study

This study is important to the academic community interested in empirical studies of monetary integration since it sheds more light on the causal relationship between macroeconomic convergence and exchange rate variability. Most studies have focused on benefits and costs of monetary integration, and its impact on intra-regional trade. Little attention has been given to macroeconomic convergence of the East African states and its effect on exchange rate variability as the region move towards a monetary union, which is a key aspect in its success (Opolot, 2008). The rationale behind macroeconomic convergence is derived from the European experience in establishing EMU where each country willing to join the union had to satisfy some laid down conditions, main ones being macroeconomic convergence in key fiscal variables (Kibua, 2007). This study is also beneficial to managers and policy makers at the EAC secretariat, who need theoretical and empirical foundation for policy decisions, in their ambition

to establish monetary union in East Africa, which so far has remained a challenge. The research will facilitate individual researchers to identify gaps in the current research and carry out research in those areas in future.

1.6 Scope and Limitations of the Study

This study used panel data, covering a period from 2000-2016. This is to allow for the identification of country-specific effects that control for missing or unobserved variables. The period was chosen since integration of EAC countries started after the year 2000. It covered East African regional bloc which has five countries namely; Kenya, Uganda, Tanzania, Burundi and Rwanda, which have already declared interest of being members of the proposed East African monetary union. The bloc was chosen due to the fact that it has scheduled to establish its monetary union earlier than other blocs, thus the experience attained can be a lesson to other blocs. Also, with the entry of poorer nations into the bloc like Burundi, there was need of a research to be carried out to assess whether the harmonization of macroeconomic variables, for instance real GDP growth rate, has been achieved before the bloc enters into a common currency (Kibua, 2007). This study was limited by the fact that some data had some gaps. Unbalanced panel data analysis was therefore employed to address this problem where interpolation and extrapolation of data was used to fill the gaps.

1.7 Definition of Terms

Autocorrelation – It refers to correlation between two values of error terms at different time periods.

Budget Deficit – it is when a country's government spends more than it takes from taxes or other forms of revenue

Convergence – tendency to meet in a point or to a common result.

Exchange Rate Volatility – it is the tendency for foreign currencies to appreciate or depreciate in value thus affecting profitability of foreign exchange trades.

Factor Mobility – ability to move factors of production from one production point into another.

Heteroskedasticity - it is where the variance of error terms differs across observations.

Inflation (CPI) – it is the change in prices of a basket of goods and services that are typically purchased by specific groups of households.

Monetary Integration - it is also known as currency union. It involves two or more states sharing the same currency.

National Savings – it is sum of nation's public and private savings. It is nation's income minus consumption and government expenditures.

Nominal GDP Growth Rate – it is the market value of all finished goods and services produced within a country's borders in a specific time period.

Openness - it is given by the sum of the intra-EAC exports and imports divided by GDP at the current prices.

Panel Data - refers to Multi-dimensional data where multiple cases such as people, firms, and countries are observed at two or more time periods. Panel data will be used in this study to estimate the relationships across the EAC countries of individual country specific variables.

Product Diversification – it is a process of expanding opportunities through additional market potential of an existing product.

Regional Economic Communities (RECs) - these are regional groupings of African states which have developed individually and have differing rules and structures.

CHAPTER TWO

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 Introduction

This chapter reviews some of the related theoretical works and summarizes the results of the actual research that has been done on regional integration: convergence of macroeconomic variables and monetary cooperation. It provides an assessment of the theoretical and empirical literature underpinning regional integration: macroeconomic stability and monetary integration.

2.2 Theoretical Literature Review

2.2.1 The Optimum Currency Area (OCA) Theory

The rationale for any monetary integration is provided by the general framework of the theory of Optimum Currency Area (Mundell, 1961). According to Broz (2005), OCA comprises of a group of countries which have a common currency, or which, though maintaining different national currencies have permanently and rigidly stable exchange rates among themselves and full convertibility of currencies into one another.

The optimum in currency participation is defined by Mckinnon (1963) as a single currency area within which monetary-fiscal policy and flexible external exchange rate can be used to give the best resolution of three objectives: (1), maintenance of full employment; (2), maintenance of balanced international payments; (3), maintenance of a stable internal average price level. According to Emerson *et al.* (1992), the OCA theory, in its macroeconomic aspects, concludes that monetary union can ensure higher macroeconomic efficiency and macroeconomic stability. They argue that, for any monetary arrangements, member states should fulfill the criteria in key macroeconomic stability indicators such as sustained growth, price stability, budget deficits, and debt sustainability.

However, the OCA theory has been criticized for a number of reasons. Robson (1987) noted how several OCA properties are difficult to measure unambiguously. The properties are also difficult to evaluate against each other in that, there is no unifying framework. Tarvas (2008) also observed that there can be a "problem of inconsistency". The theory is also criticized of being static. The limitations of OCA theory are corrected by endogenous theory discussed below.

2.2.2 Endogenous Optimum Currency Area Theory

Frankel and Rose (1998) introduced the notion of endogeneity. The theory states that, a number of optimality features that are absent among a group of countries wishing to set up a monetary union, can be generated by the monetary zone itself once it comes into being. This theory corrects the limitation of the OCA limitation of being static. Frankel and Rose (1998) argued that, in the long run, using a single currency will lead to the formation of Optimum Currency area within the integrated economies. The introduction of a single currency will eliminate transaction costs and exchange rate risks, raise price transparency, and facilitate direct investment and the building of long run relationships, and thus promote trade, growth, economic and financial integration (Fidrmuc, 2001; Mongeli, 2008; Talvas, 2008). According to a research done by Rose (2000) on EMU countries, entering a monetary union triple trade flows between member countries, leads to progressive synchronization of business in the member countries, enhance price transparency, reduce inflation divergences, and increase financial integration through capital markets.

All these characteristics imply that, although EAC countries may not satisfy all the requirements of convergence *ex-ante*, they can satisfy them *ex-post*. For these reasons, the OCA endogeneity hypothesis has become another criterion for joining a common currency area, (Carmignani, 2003). However, it has a limitation in that it lacks the fiscal aspect in absorbing asymmetric shocks.

2.2.3 Keynesian Theory

Keynesian theory was developed by the British economist John Maynard Keynes during the 1930s in an attempt to understand the Great depression. Keynesian macroeconomic perspective focused on the effectiveness of stabilization policies (fiscal, monetary and exchange rate policies) in an open economy (Keynes, 1930). The theory focused on the effects of these policies on the key macro-aggregate variables (GDP, inflation, unemployment, balance of payments, exchange rates and interest rates). With regard to the role of exchange rate policy as an instrument for correcting current account imbalances, the debate was focused on advantages and disadvantages of fixed and flexible exchange rate regimes (Corsetti, 2009). The international monetary system was based on fixed exchange rates, which worked well until the 1970's, when

the system came under attack. According to the Keynesian view, the world is full of rigidities (wages and prices are rigid, labor is immobile), so that exchange rate is a powerful instrument in eliminating disequilibria. For countries that are part of a monetary union, exchange rates do not adopt to the situation of an individual economy but rather to that of the union as a whole (Gramlich, 2016).

2.2.4 The Monetarist View on Monetary Policies and Monetary Union

In the late 1960's, the Keynesian view on fiscal stabilizing policy became increasingly challenged by the monetarism view who argued that fiscal tools were ineffective. According to the monetarists, exchange rate changes are ineffective as instruments of correcting imbalance of shocks between countries, and even if effective, the use of exchange rate policy typically makes countries worse- off (Kenen, 1961). By converging in macroeconomic variables, countries are able to eliminate exchange adjustments to restore equilibrium. Thus, many countries in the world would gain by relinquishing their national currencies, and by joining a monetary union.

According to monetarist Friedman (1967), monetary policy actions may themselves be a source of economic stability. He argued that, macroeconomic stability is best achieved using 'unconditional' policy rule where economies are self-stabilizing. His view on stabilization policy was grounded in the firm belief that the economic system is too limited for effectively addressing short-run fluctuations. However, reliance on self-stabilizing forces alone generates economic fluctuations of politically and economically acceptable magnitudes. From a purely economic viewpoint, the optimal degree of stabilization depends on whether observed macroeconomic fluctuations constitute efficient responses of the economy to shocks or whether these shocks are partly due to economic frictions, to be addressed with the tools of stabilization policies. From a political economy viewpoint, self-stabilization may lead to short-term fluctuations.

Thus, from this theory, the research will borrow heavily on the issue of having an independent central bank among the integrating nations with stable strategies and focus on a single monetary policy with the objective of anchoring inflation expectations at a level consistent with price stability within the region.

2.2.5 Maastricht-type Convergence Criteria

Enders and Hurn (1994) used the G-PPP approach to analyze the suitability of a group of countries to form monetary union. The method uses co integration techniques to find out if the prospective countries' macroeconomic variables exhibit a long run relationship. G-PPP postulated that the real exchange rate and other macroeconomic variables of countries comprising of optimum currency area should move together.

The European nations used these criteria in forming their currency whereby each candidate had to comply with the following rules for macroeconomic sustainability in order to join EMU; price stability, sustained interest rate and exchange rate stability, fiscal deficit, current account deficit/GDP, fiscal deficit/GDP and debt servicing/GDP (Klein, 1998). McKinnon (2004) argued, "it is not in the interest of a country to participate in a common currency regime or monetary union if its own public finances are not sound". If the fiscal and public debts are not sustainable, then a single currency is not advisable. In creating European monetary union, the sustainability of sound and fiscal and monetary policies and price stability was seen as an essential objective. This is because it is difficult to remove adverse shocks from the financial market when fiscal behavior and inflation are unsustainable, unless exchange rates are adjusted (Robson, 1987). According to the terms of the Maastricht Treaty, new applicants to the European Union must wait until certain conditions of sustainability in key macroeconomic indicators are met. The major limitation of Maastricht approach is that, movements in macroeconomic variables reflect the combined effects of shocks and responses (Klein, 1998).

2.3 Empirical Literature Review

Africa's regional financial integration agenda includes a microeconomic convergence program, intended to achieve and maintain macroeconomic stability and laying basis for eventual monetary union. Targets for key macroeconomic variables have been set out by RECs against a timeline. Zhang (2012) conducted a research using cross-sectional time series data over the period from 1991-2011 of eight regional blocs in Africa and established that, while most sub-Saharan African countries had recorded solid macroeconomic performance in recent years reflecting strong economic reforms, the convergence 'targets' have not been generally achieved on a consistent basis. This has led exchange rate variability within the region.

Buigut and Valev (2006) used VAR techniques to investigate the potential of forming monetary unions in East and Southern Africa, over the period 1991-2000. The results showed that, although economic shocks were not highly correlated across the entire region, three sub-regional clusters of countries were identified that they would benefit from a currency union. The study established that economic shocks need to be eliminated within a region before fusion into a monetary union. This is achieved by ensuring that countries converge in their macroeconomic variables.

According to Patroba and Nene (2013), to build a solid and sustainable monetary union, macroeconomic convergence and harmonization of exchange rates are important prerequisites. The successful transition of a bloc from a simple REC to a monetary union presupposes that countries fulfill different convergence criteria. In a research they did on macroeconomic convergence using Standard deviation, over the period 2003-2011, on inflation, fiscal deficits, national debt and the holding of reserves of SACU member countries, the results showed that there was greater convergence in fiscal deficits, inflation and reserves among the member states, but convergence in external debt was low, towards the REC target. The results revealed that inflation continued to converge towards the set criteria of less than 5% over the period under study. The ratio of debt to GDP was low for the whole period, meeting the target of less than 60%. Even Lesotho, which had a high ratio at the beginning of 66.8% in 2003, made substantial efforts to reduce it and fulfill the requirements. The reserve requirements, in terms of months of imports of goods and services, revealed a low level variability suggesting there was convergence. The study established that there was strong correlation between macroeconomic convergence and exchange rate volatility reduction.

According to a research on regional integration and sustainable growth in Sub-Saharan Africa by Kabananiye (2011), in order to make further progress with East African integration, the member states decided to cooperate in monetary and financial matters and ultimately reintroduce East African monetary with a single currency and a central bank. Thus each member country is supposed to consider cooperating and coordinating their fiscal, monetary, exchange rate and commercial policies to avert the possibility of conflicts and improve their positions compared with pursuing the results of unilateral policies. Constant of variation, historical and time-series

data over the period 1980-2007 was used and the results showed that the income per capita in the EAC deviated from zero suggesting divergence. The variability of government budget deficits was found to be stable during the 1970s-1980s, ranging from -2 to 2. From 1990s, the fluctuation ranged from -6 to 8, meaning a large divergence. Real exchange rates in EAC countries were found to be converging to zero in the 1970s, and have been unstable since 1980s, for the current accounts, the results showed no convergence towards zero, in particular, for Tanzania Kenya and Burundi were fluctuating between -10 to 10 in 1993. External debts were found not to converge towards zero; however they fluctuated in a reasonable margin of -1 to 1, except for Uganda where the margin was above 1.

Anand and Guttamann (2011) conducted a study to investigate the need for explicit fiscal convergence criteria to be adopted by the East African Monetary Union (EAMU) as prerequisites and ongoing commitments for a monetary union given that, leaders in the region had already made a political commitment to monetary union. The key question was how best the EAC can move towards that objective. Fiscal policy convergence was thus critically significant and it was an area where the EAC countries still have considerable work to do. Using a cross-sectional time series data between 1992-2008 collected monthly and applying granger causality tests, it was found that other factors outside control of the central banks play a role in determining inflation. Thus, central bank should consider using a core inflation measure, as that could likely be managed using monetary policy more easily. They also recommended that the AEMU adopt a measure of fiscal deficits inclusive of grants, and allow degree of flexibility and leeway in the deficit threshold.

In investigating macroeconomic convergence variables in EAC countries and its effect on exchange rate harmonization within the region, Opolot and Luvanda (2009) used standard deviation, panel unit roots test and co integration analysis, over the period 1980-2009, and the results showed that there was some partial convergence in monetary policy variables, notably interest rates policies and no evidence of convergence in fiscal variables such as public debt, budget deficits, among others. The study established that convergence in monetary and fiscal variables contributes greatly in exchange rate harmonization. Therefore there was need for EAC countries to harmonize their fiscal policies.

Introduction of ECOWAS Monetary Cooperation Program (EMCP) in 1987 was aimed at accelerating the monetary efforts in the sub-region. The EMCP serves as the blue print towards the introduction of a single currency in West Africa. This blue print contained the roadmap and policy framework, and prescribed benchmarks for achieving macroeconomic convergence as well as harmonization of exchange rates among member countries prior to the launch of a single currency. It required the member states comply with a set of primary and secondary convergence criteria to ensure a stable macroeconomic environment. Under the program, there were four primary and six secondary convergence criteria, satisfaction of which could eliminate exchange variability within the region, which was a necessary condition for a successful monetary union. Fwangkwal (2014) used a time series data over the period 1987-2013 and found out that no member country had been able to satisfy all the convergence criteria An analysis of member states performance showed that Senegal and Niger recorded the best performance by achieving 8 out of the 10 targets.

Therefore, from the empirical studies reviewed in this study, it is clear that the benefits of monetary integration are enormous, and most of the regional blocs in Africa, EAC included, are moving towards establishing a monetary union within the member states. It has also been established that macroeconomic convergence, to make exchange rate less volatile, is a key prerequisite for a monetary union. The progress in macroeconomic convergence towards the set criteria needs to be assessed over time as the economies move towards the establishment of a monetary union to ensure its stability once it is established. However, from the empirical studies, there is none that has been done recently to show the progress being made in convergence in East African economies and assess stability in exchange rates within the region. It is on these grounds that this study seeks to assess the progress being made by EAC on convergence of macroeconomic variables and its effect on exchange rate volatility as the regional bloc move towards establishing a monetary union.

2.4 Theoretical Framework

In the literature, macroeconomic convergence and monetary union is related to the Optimum Currency Area (OCA) theory as developed over time by Mundell (1961), Tavlas (2008), Broz (2005) among others. The use of the term macroeconomic convergence became relatively

EGERTON UNIVERSITY LIBRARY

widespread in the 1990s during creation of European Monetary Union (EMU) when the fulfillment of the Maastricht criteria was the main concern of most European policy makers. Macroeconomic convergence is defined with reference to low inflation, sustainable external and current account deficits consistent with sustainable external debt, with an ultimate goal to reduce the costs of monetary union (Gramlich, 2016).

OCA theory seeks to identify the criteria under which a monetary union is appropriate and which countries are suitable for joining a single currency. It tries to indicate under which conditions a monetary union may be appropriate and which countries are suitable for joining it. According to the theory, countries willing to form a currency union have to ensure exchange rate adjustments during asymmetry of shocks is eliminated or reduced to narrow margins before fusion into a common currency. Instead, it has identified four main criteria, namely degree of factor mobility, degree of openness, degree of product diversification, and degree of financial integration. The four factors are necessary in restoring economic stability within an optimal region. Although the theory is primarily concerned with starting positions of the preconditions that would enable a successful monetary union, endogenous OCA theory will also be applied in the research that also incorporates convergence after the formation of a currency union.

The theoretical foundation sets out the pre-conditions or criteria for joining monetary unions. The formation of an Optimum Currency Area is more likely to be beneficial under several conditions. A composite OCA index should take into account the degree of openness, wage-price flexibility, labour and capital mobility and shock symmetry. This is because labour immobility and price rigidities in participating countries and asymmetric shocks are crucial in assessing the costs of monetary union. Capital and labour mobility can counteract the negative effects of asymmetric shocks (Kenen, 1961). According to Tavlas (2008), economies are better off when they participate in a currency union and that benefits could increase with the number of participants. The benefits could be significant when the degree of nominal wage rigidity is low and small when rigidity is high. As wages become more flexible, the economies become closer to being a monetary neutral.

In this study, it is necessary to see the changing patterns in key macroeconomic variables among the EAC member states to assess their effect on the realization of countries in the region joining a monetary union based on the OCA theory. As Mackinnon (2004) argued, it is not in the interest of a country to participate in a common currency regime or monetary union if its own public finances are not sound. The research employed Bayoumi and Eichengreen (1995) OCA Index as a framework of analysis to determine the effect of macroeconomic convergence on the realization of a monetary union in EAC. Real exchange rates between integrating economies are able show the similarity of economies and therefore suitability of a monetary union. The index is constructed as follows:

$$SD(e)_{i,t} = \alpha + \beta_1 GDPSD_{i,t} + \beta_2 BDGSD_{i,t} + \beta_3 SAVSD_{i,t} + B_4 IFSD_{i,t} + \varepsilon_{i,t} \quad \text{.....(2.1)}$$

where,

SD(e) – represent standard deviation of real exchange rate volatility in EAC (Kenyan shilling was used to standardize the other currencies since it is the largest economy in EAC, then US dollar, which has been stable over time was used as a base to calculate volatility and average obtained) .

GDPSD – represent standard deviation of nominal GDP growth rates in EAC.

BDGSD – represent standard deviation of budget deficit/GDP in EAC.

SDSAV – represent standard deviation of savings/GDP in EAC.

SDIF – represent standard deviation of inflation rate in EAC.

ε_{it} – is a stochastic disturbance term.

Standard deviation was used to measure convergence of macroeconomic variables in EAC and also the volatility of exchange rate within the region. The expectation here was that, the estimation of exchange rate volatility should decline over time as a result of convergence in macroeconomic variables and provide a yard stick to measure the suitability of OCA.

2.5 Conceptual Framework

The conceptual framework is a diagrammatic representation of the relationship between the dependent and independent variables. The independent variables are nominal GDP growth rate convergence, budget deficit/GDP convergence, savings/GDP convergence and inflation rates

convergence, towards the set targets, of the integrating economies in the EAC. The intervening variables are variables which may affect the model but are not controlled for and they include: corruption, political instability, government policies of individual member states expectations, and global economic conditions. The study had exchange rate volatility as the only dependent variable.

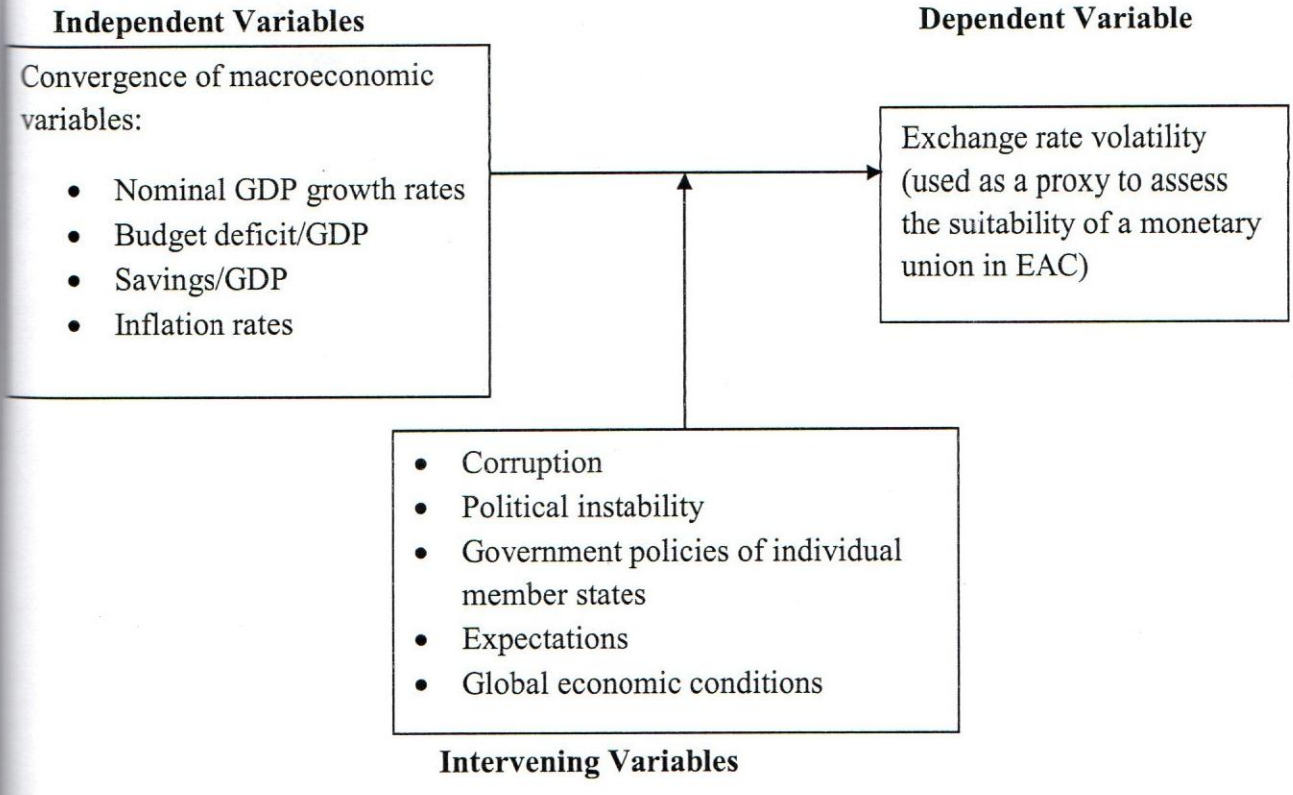


Figure 2.1: Conceptual Framework

Nominal GDP growth rates convergence was expected to have a negative effect on the real exchange rate volatility. GDP represent growth rate of nations and the similarity in growth rates between nations means similar demand conditions hence are likely to face asymmetry of shocks in the same way, thus eliminate use of exchange rate as policy instrument for adjustment. Budget deficit captures the government responsibility financially. National savings is the part of GDP which is not consumed or spent by the government, mostly invested. Similarity of budget deficit and savings to GDP ratio between integrating nations are likely to smooth out the effects of asymmetry of shocks reducing the need of exchange rate movements, hence was expected to have a negative impact on exchange rate volatility. Finally, inflation rates measures the purchasing power of currencies of potential members and their similarities imply the countries conduct their economic policies in the same way and hence have similar economic structures. This will make them face similar economic shocks. This reduces significance of exchange rate policy autonomy for making necessary adjustments, thus was expected to have a negative impact on exchange rate volatility.

CHAPTER THREE
METHODOLOGY

3.1 Introduction

This chapter describes the research design, the model upon which the study was based on, variables in the model, sources of data and methods of analyzing data and the presentation of findings.

3.2 Research Design

The study used historical design as it seeks to determine the effect of convergence in macroeconomic variables to the set targets on exchange rate volatility in EAC over the period 2000-2016. According to Baldwin and McLean (1996), the purpose of historical design is to collect, verify, and synthesize evidence from the past to establish facts that defend or refute a hypothesis. It is well suited for trend analysis. This research design was therefore been chosen since it enables the researcher to capture the trend of convergence in macroeconomic variables of the EAC member countries and the effect it has on exchange rate volatility within the region.

3.3 Study Area

This study covered East African Community (EAC) which is geographically located at (14°N-16°S, 35°W-40°E) on average. Five member states: Kenya, Uganda, Tanzania, Burundi and Rwanda, which have declared interest in joining AEMU were studied. The bloc was chosen since the countries have had a long history of cooperation under different regional integration arrangements thus share characteristics which can be generalized for comparison purposes. Also due to the fact that, it has scheduled its monetary union earlier than the rest of the African blocs, hence experience so acquired can be used by the other blocs in their effort to establish their monetary unions. Also, with the entry of poorer countries like Burundi into the bloc, there is need to assess performance in macroeconomic variables prior to the fusion into a monetary union, especially convergence in growth rate which at the time of entry showed large discrepancies.



Figure 3.1: Map of Study Area

Source: Geography & Map Division, Library of Congress (2010).

3.4 Data Collection

Data employed in this study was quantitative and it was collected secondary sources such as World Development indicator (WDI) (2016), World Economic Outlook (WEO) (2016) and national bureau of statistics of the EAC member countries.

3.5 Data Analysis and Presentation

This study used descriptive analysis to show the relevance of information, then tables and graphs were used to present results of the analysis. Since the data collected was quantitative, inferential statistical estimation was done based on Generalized Linear Model (GLM).

3.5.1 Panel Unit Root Test

Testing for unit roots is a crucial aspect of time series and panel data analysis as the presence of unit roots determine how to proceed for a correct statistical inference. Data series that contain unit roots have no constant mean, no constant variance and have no constant covariance. Unit root tests are mainly a descriptive tool to classify series as stationary and non-stationary. Levin-Lin-Chu (LLC) (2002) developed a unit root test for panel data and suggested the following hypotheses:

H_0: Panels contain a unit root.

H_A: Panels are stationary.

Options allow one to include fixed effects and time trends in the model of data-generating process. Im, Pesaran and Shin (IPS) (2003) propose heterogeneous panel unit root tests based on cross-sectional dependence assumption. Westerlund (2009) showed that local power of Levin-Lin-Chu (2002) test is superior to Im, Pesaran and Shin (2003). Bowman (1999) also emphasized that LLC unit root test is admissible and uniformly powerful against alternative IPS test which is inadmissible. LLC is also known to be suitable for micro-panels of time 10-250 observations. This study hence employed Levin-Lin-Chu test for panel unit root test

3.5.2 Panel Cointegration Test

Cointegration refers to the long-run linear movement of two non-stationary variables integrated of the same order. A set of variables are cointegrated if they individually follow a unit root process, but jointly move together in the long-run. It is possible for two (or more) variables to be I(1), and yet a certain linear combination of those variables to be I(0). If that is the case, the I(1) variables are said to be cointegrated. From the panel unit root test, two variables were found to be non-stationary while the others were stationary. The two were differenced once and they became stationary. Therefore there was no need to proceed for cointegration test.

3.5.3 Hausman Test

Hausman (1978) test specification poses that either Fixed Effect (FE) or Random Effect (RE) model is appropriate depending on the given data and helps to find out the parameters to be estimated in the model. Hausman test was carried out so as to ascertain whether to employ FE or RE. The test establishes whether the error terms are correlated with the regressors or not. The

null hypothesis states that explanatory variables are uncorrelated with variation across the region while the alternative one states that explanatory variables are correlated with variation across the region.

3.6 Empirical Model Specification

The study was guided by the Optimum Currency Area (OCA) theory that explores the criteria as well as the costs and benefits of joining and / or creating a Common Currency Area. The existing literature on macroeconomic convergence and monetary integration does not provide a unique and purely mathematical model. However, the relationships of variables under investigation can be established from the definitions given, (Broz, 2005).

As argued by Optimum Currency Area (OCA) theory, it is anticipated that true monetary integration cannot take place unless economies of participating countries in an integration area deal with economic shocks harmoniously (Mongeli, 2008). Evidence of macroeconomic convergence in the selected indicators is often a sign that policy coordination in the Regional Economic Community (REC) is achieving the desired macroeconomic outcomes. This would provide the necessary foundation for moving the REC through the various phases of integration towards a monetary union.

Mundell (1961) is considered to be the cornerstone in the development of OCA theory. His insight was on the impact of a high degree of factor mobility in that, if labour and capital are allowed to flow freely between two countries say A and B, the exchange rate adjustment (which is not available in a union) would be unnecessary in resolving the economic crises. Instead, resources (labour and capital) would move from the depressed country to the booming country. In this case, where factor mobility is a substitute for exchange rate adjustments, a common currency or monetary union would be ideal for countries A and B. consequently, the costs of A and B of being members of the union would be reduced. Thus a high degree of interdependence among union members is likely to minimize the costs of monetary union membership (De Grauwe, 2010). Similarly high degree of product diversification implies less variability in export earnings and import expenditure, hence more stable balance of payments positions. In a monetary union set up under these circumstances, the benefits to members outweigh the costs of

membership and there is less need to result to an exchange rate adjustment to maintain external balance. Mackinnon (1963) also proposes that a high degree of openness by which a country's size of tradable is relatively high tends to minimize the costs and increase the benefits of monetary union. The more open an economy is, the less effective is the nominal exchange as a policy instrument for adjustments.

In general, the OCA theory identifies four major factors in assessing the suitability of forming a monetary union; degree of factor mobility, degree of openness, degree of product diversification and degree of financial integration, all of which are intended to make the exchange rate between the integrating nations less effective as a policy instrument in adjustments during shocks, making it become less volatile (Mackinnon, 1963). In this study, exchange rate volatility in EAC was used as a measure of trend towards realization of monetary union within the region.

This research employed Bayoumi and Eichengreen (1995) OCA Index as a framework of analysis of the effects of macroeconomic convergence on exchange rate volatility to determine the realization of a successful monetary union in EAC:

$$RERSD_{i,t} = \alpha + \beta_1 GDPSD_{i,t} + \beta_2 BDTSD_{i,t} + \beta_3 SAVSD_{i,t} + \beta_4 IFSD_{i,t} + \varepsilon_{i,t} \quad \text{.....(3.1)}$$

where,

RERSD – represents standard deviation of real exchange rate volatility in EAC (Kenyan shilling was used to standardize the other currencies since it is the largest economy in EAC. Then US dollar, which has been stable over time, was used as a base to calculate volatility, and then average obtained).

GDPSD – represents standard deviation of nominal GDP growth rate in EAC.

BDGSD – represents standard deviation of budget deficit/GDP in EAC.

SAVSD – represents standard deviation of savings/GDP in EAC.

IFSD – represents standard deviation of inflation rate in EAC.

ε_{it} – is a stochastic disturbance term.

The expectation here is that, the estimation of exchange rate volatility should decline over time as a result of convergence in macroeconomic variables and provide a yard stick to measure the suitability of OCA.

3.7 Justification for Panel Approach

From the literature review, most of the studies done on macroeconomic convergence and monetary union applied time-series or cross-sectional data in their analysis. However, in the recent past, panel data econometric techniques have gained popularity in analyzing the relationships between variables. Use of panel framework has significantly influenced the literature on how to measure convergence of macroeconomic variables. The combination of time-series and cross-sectional information leads to tests with improved performance, especially for the data lengths usually encountered in macroeconomic analysis (Hsiao *et al.*, 1995).

Also, use of panel data in estimation of common relationships across countries is appropriate since it allows for the identification of country-specific characteristics (effects) that control for missing or unobserved variables (Judson and Owen, 2016). Such estimations also avoid the problem of multicollinearity due to high correlation of explanatory variables as they vary in two dimensions. According to Plasmans (2005), panel data also reduces and/or even eliminates estimation bias.

3.8 Definition and Justification of Variables, and Sources of Data

3.8.1 Exchange Rate Volatility

Exchange rate is defined as the price of one currency in terms of another currency. Volatility refers to the tendency of foreign currencies to appreciate or depreciate in value. In this study, US dollar was used as a base to calculate volatility of each of the five countries exchange rates since it has been stable over time. Then average for the five countries under study was obtained. Standard deviation of the average differences was used to determine the behavior of volatility of exchange rate in EAC over the whole period under study. The Optimum Currency Area requires group of nations to maintain a low or eliminate exchange rate volatility among each other. Therefore, an individual country within the union cannot unilaterally devalue her currency. The nominal exchange rate of an individual country becomes redundant as a policy instrument. This

cost can be compensated in a monetary union through the reduction of transaction costs and elimination of exchange rate volatility (Mackinnon, 1963). This benefit will be realized only and if the convergence of exchange rate within the union will be possible. Real exchange rates, therefore, are able to show the similarity of economies and hence suitability of monetary union. Data for this variable was obtained from World Development Indicator (WDI) Report.

3.8.2 Nominal GDP Growth Rates Convergence

This represents convergence in nominal GDP growth rates of EAC countries measured by standard deviation. This variable represent the real output growth rates of the economies in the EAC. The nominal growth rate captures the demand conditions in the EAC countries. If countries have a big divergence in their nominal GDP growth rates, forming a monetary union is not a sound decision since such a situation may require a lot of flexibility in the labour markets for smooth functioning and such adjustments may be costly. Countries with similar nominal GDP growth rates will have similar demand conditions and are less likely to face different shocks, hence reduce the significance of exchange rate policy autonomy for making necessary adjustments, and thus would find it easier to share a common currency. Data for this variable was obtained from World Development Indicator (WDI) report of World Bank.

3.8.3 Budget Deficit/GDP Convergence

This represents the convergence in the government budget deficit as a ratio of GDP among EAC countries. It is an indicator of financial health in which government expenditures exceed revenue. A convergence in the balance of budget deficit to GDP ratio is expected to reduce the exchange rate volatility in the region. The intuition behind this is because, the variable attempts to capture the effect of government responsibility. Similarity in government finances will smooth out the effect of asymmetry of shocks, hence reduce the use of exchange rate adjustments to maintain external balance in EAC. Data for this variable was obtained International Financial Statistics (IFS) year book of International Monetary Fund (IMF).

3.8.4 Savings/GDP Convergence

This is the convergence in savings to GDP ratio among EAC countries. This variable represent the part of GDP which is not consumed or spent by the government, in most cases it is invested. Therefore, similarity in national savings to GDP ratio will make the countries face economic

shocks in the same way, thus eliminate use of exchange rate adjustment to smooth out the effect of those shocks hence reduce volatility. Data for this variable was obtained from EAC member countries National Bureau of statistics.

3.8.5 Inflation Rate Convergence

This represents the convergence in inflation rates among EAC nations to be measured by standard deviation. Convergence in inflation rates will change the purchasing power of currencies of potential members. Similarity in inflation rates between nations imply that they are similar in the way they conduct their economic policies, hence are likely to face similar shocks, eliminating use of exchange adjustment as a policy tool. On the other hand differences in inflation rates may signal differences in the way countries conduct their economic policies and hence potential problems of a common currency. Thus the more convergent inflation rates are among economies aspiring to form a monetary union, the more appropriate it will be for them to form the union. Data for this variable was obtained from World Economic Outlook (WEO).

3.9 Post-estimation Diagnostic Tests

Lagging the dependent variable in a dynamic model may cause it to become correlated with the error term. This may lead to the problem of endogeinity of some explanatory variables. Also, according to Khan and Hossain (2010), such model suffers from the problem of serial correlation and Heteroskedasticity. Therefore, tests for the mentioned problems were conducted after estimation. These tests include cross-sectional dependence, autocorrelation, Heteroskedasticity and misspecification.

3.9.1 Test for Cross-Sectional Dependence

Cross-sectional dependence refers to the interdependence between cross-sectional units. According to Anyanwu (2003), cross-sectional dependence is a problem in macro-panels with long time series (over 20-30 years). Cross-sectional dependence may lead to loss of efficiency in least square estimators which may consequently render the results of t-tests and F-tests invalid. In testing for cross-sectional dependence, this study applied the Breuch-Pagan Langrage Multiplier (LM) test for dependence where the null hypothesis is posted that there exists no correlation of residuals across entities (Breuch, 1998).

3.9.2 Test for Autocorrelation

Autocorrelation, also known as serial correlation, is the similarity between observations as a function of the time lag between them. It is a problem that arises when there exist a correlation between error terms of different time periods. This problem complicates the application of statistical tests since it reduces the number of independent observations. Autocorrelation in linear panel data model causes biased standard errors and makes the estimators less efficient, which could lead to misleading confidence intervals and hypothesis tests. To test for this problem in dynamic panel data, Wooldridge (2006) test for autocorrelation was employed where the null hypothesis states that there is no autocorrelation against an alternative hypothesis of presence of autocorrelation in the data.

3.9.3 Test for Heteroskedasticity

Heteroskedasticity occurs when the error terms do not exhibit a constant variance across observations. It is when the standard errors of a variable, monitored over specific amount of time, are non-constant. This problem can be caused by errors of measurements or sub-population differences. Even though Heteroskedasticity does not lead to biased parameter estimates, it can cause errors in regression analysis and other statistical measures in which statistical measures can be incorrectly justified (Khan and Hossain, 2010). This study applied the modified Wald Test for group wise Heteroskedasticity, which is appropriate when the assumption of normality is violated especially in asymptotic terms (Plasmans, 2005). The tests null hypothesis states that $\delta_i^2 = \delta$, for all $i = 1 \ldots Ns$, where N_s is the number of cross-sectional units.

CHAPTER FOUR

ANALYSIS AND DISCUSSION OF RESULTS

4.1 Introduction

This chapter presents the results and discussion of results on the effect of macroeconomic convergence on exchange rate volatility in the East African Community for the period 2000-2016. First, it presents the descriptive analysis of the results composed of plotting of graphs to show trends in performance of macroeconomic variables in EAC, other measures such as mean, variance, standard deviation and kurtosis, and correlation matrix. Secondly, it presents the results of unit root test using Levin-Lin-Chu which was carried out to determine stationarity of variables so as to avoid problem of spurious results. Panel data estimation results using fixed effects are presented. Finally, post diagnostic tests results are presented of cross-sectional dependence, heteroskendasticity, and autocorrelation.

4.2 Descriptive Analysis

4.2.1 Trends in Macroeconomic Performance in EAC against the Regional Mean

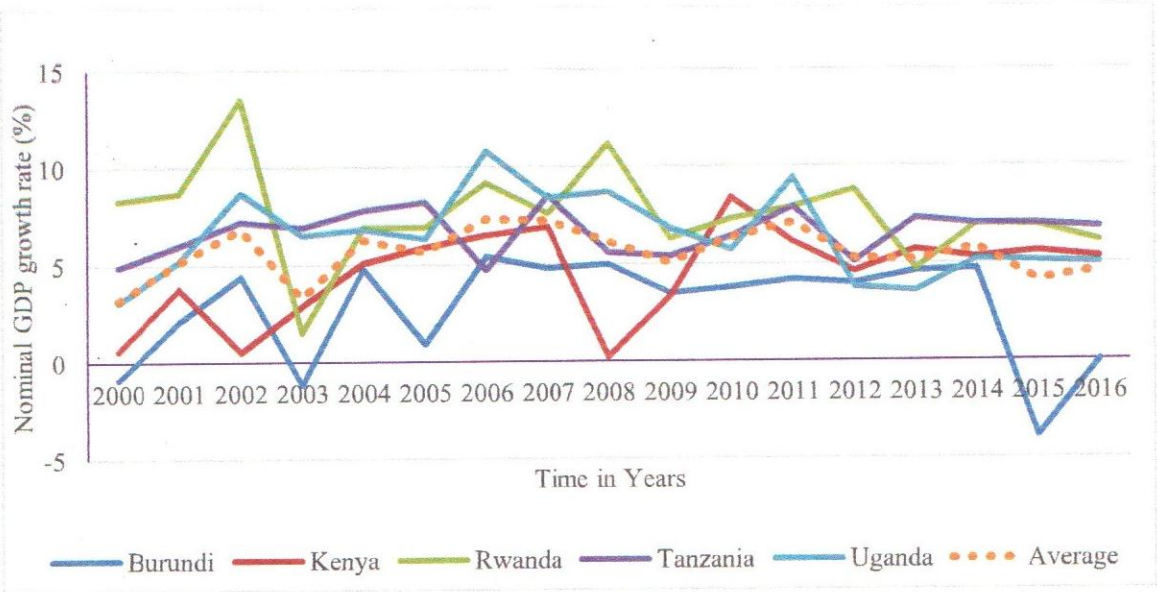


Figure 4.1: Nominal GDP Growth Rates Convergence, 2000-2016

Source: World Development Indicator (WDI) (2016)

Figure 4.1 shows how the EAC countries are converging or diverging toward or away from the regional mean of nominal GDP growth rates over the period 2000-2016. Overall observation indicates that the founder members of EAC, Kenya, Uganda and Tanzania have been converging over the period, though Kenya deviated in 2008 due to the negative impact of 2007 general elections which generated into tribal violence. Agricultural production was greatly affected negatively where the displaced people left their farms as they left their home to look for safety elsewhere. The country however has been able to catch up with the rest of countries after 2008. Rwanda and Burundi, which entered into the bloc in 2007, have been converging towards the mean though Burundi deviated in 2015. Since independence in 1962, the country has been plagued by tension between the dominant Tutsi minorities and the Hutu majority. In 2015, it was plunged into its worst crises when Nkurunziza was elected as president for a third term. This sparked protests by opposition supporters which significantly affected the country's economy negatively (Kuteesa, 2014). This may have led to the decline in the nominal GDP growth rate in the country over that period.

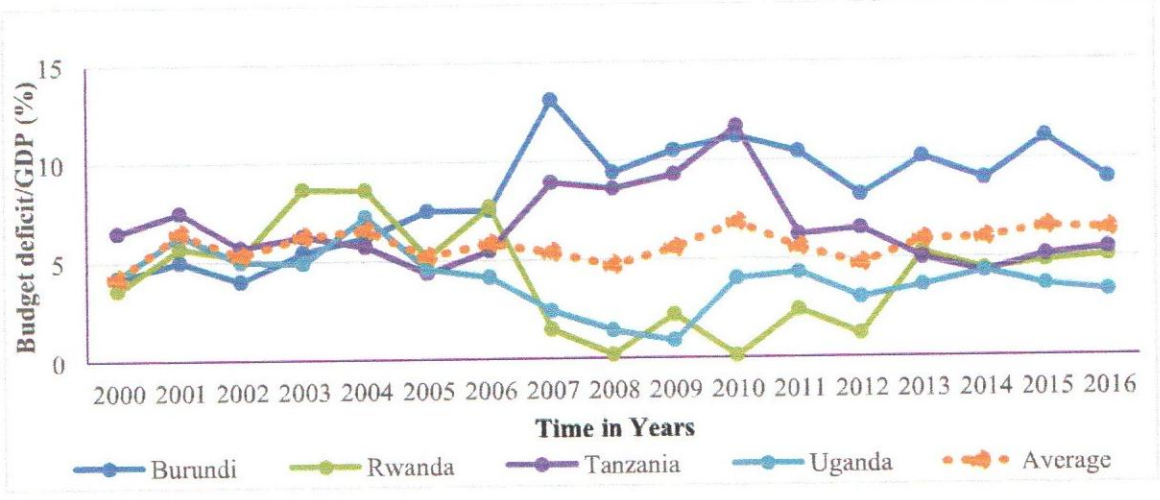


Figure 4.2 Budget Deficit/GDP Excluding Grants Convergence in EAC, 2000-2016

Source: International Financial Statistics (IFS) (2016)

Figure 4.2 shows the convergence of budget deficits of the EAC countries towards the regional mean. Budget deficit represents the excess of a country's total expenditure from total revenue. The graph shows some evidence of convergence in the variable of the five countries for the

period 2000-2007. Three countries, Kenya Rwanda and Uganda have been able to maintain the target set by the community of below 5% for the entire period. This could have been brought about by increased mobilization of domestic recourses thus increased revenue. A mixture of structural tax reforms and high commodity prices may have resulted to increase in revenue in those countries. Tanzania experienced a spell drought during 2008-2009 which may have led to reduced domestic production thus high budget deficit over the period (Lucas, 2003). Burundi's political instability over the entire period affected greatly the country's agricultural production which is the main source of revenue. After 2012, the five countries have been moving towards regional mean though slowly.

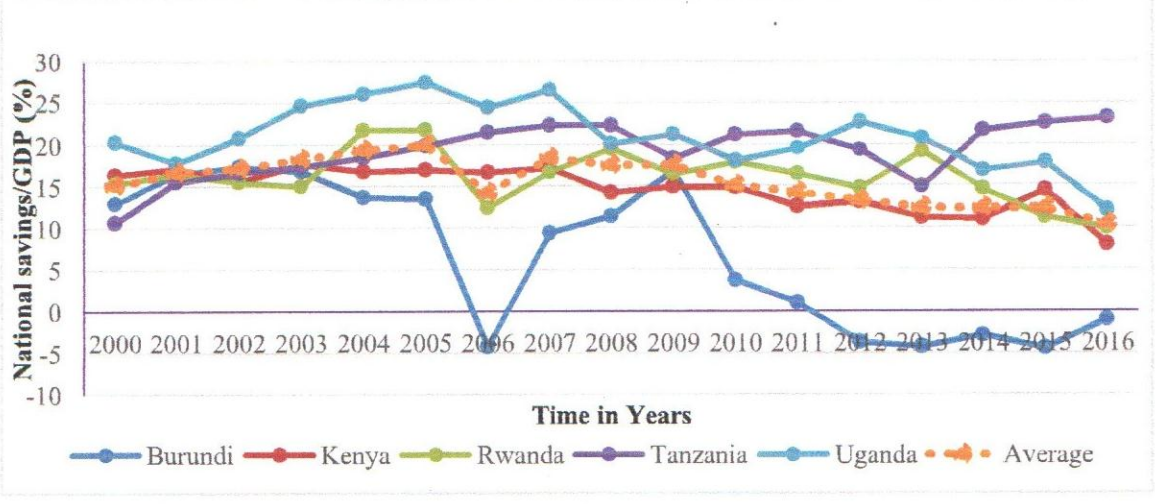


Figure 4.3: Gross National Savings/GDP Convergence in EAC, 2000-2016

Source: National Bureau of Statistics of the Five Countries (2016)

Figure 4.3 shows trend performances in national savings of EAC countries for the period 2000-2016. The overall observation indicates convergence in the variable towards the regional mean for the five countries over the period apart from Burundi from the year 2008. However, the countries remained below the 20% target apart from Uganda that has been performing relatively well. The East African countries need to encourage the mobilization of human and financial resources, attract foreign direct investments, improve on trade and tourism, develop infrastructure, among others. This will increase the revenue of these countries thus have substantial amounts to save. Burundi could have been adversely affected by the Tension between the dominant Tutsi minorities and the Hutu majority which greatly reduced agricultural

production which is the country's major source of income thus low national savings (Muthui, 2016).

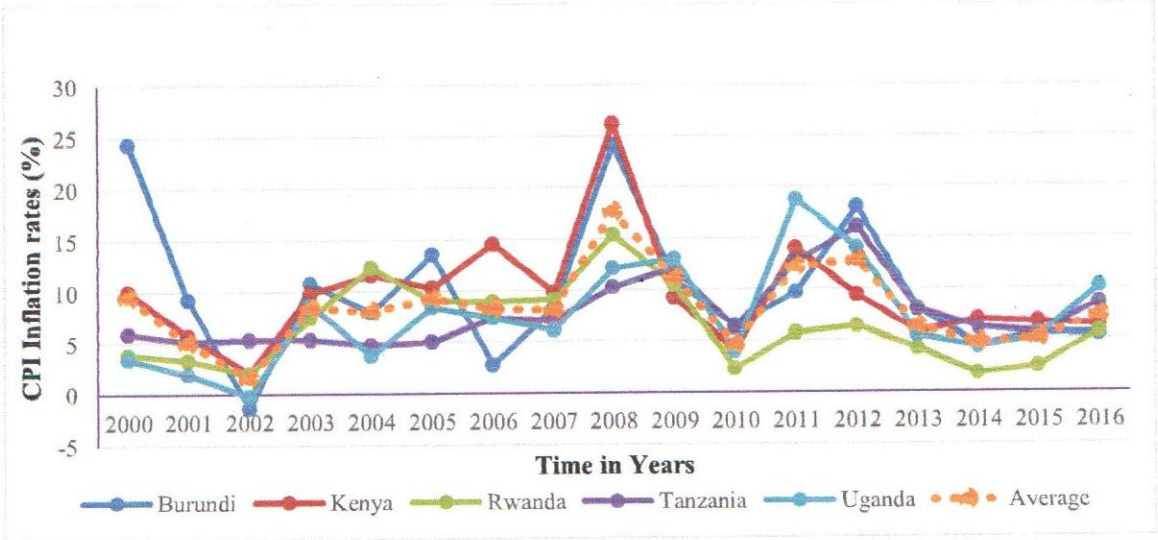


Figure 4.4: Inflation Rate Convergence in EAC, 2000-2016

Source: World Economic Outlook (WEO) (2016)

Figure 4.4 shows the convergence in inflation rates in EAC over the period 2000-2016. The countries have been converging in that variable until the year 2007 where there is evidence of divergence. Surging oil and food prices due to global financial crises may have pushed up inflation rates in many of those countries. After 2009, the EAC countries through a recovery period where they were able to attain the inflation targets set. Although inflation target is paramount in the convergence discourse, the fact is that unemployment and poverty alleviation goals may not be easily achieved without breaking the inflation barrier (Muthui, 2016). This could have explained why most countries have not been able to meet the target of 5%.

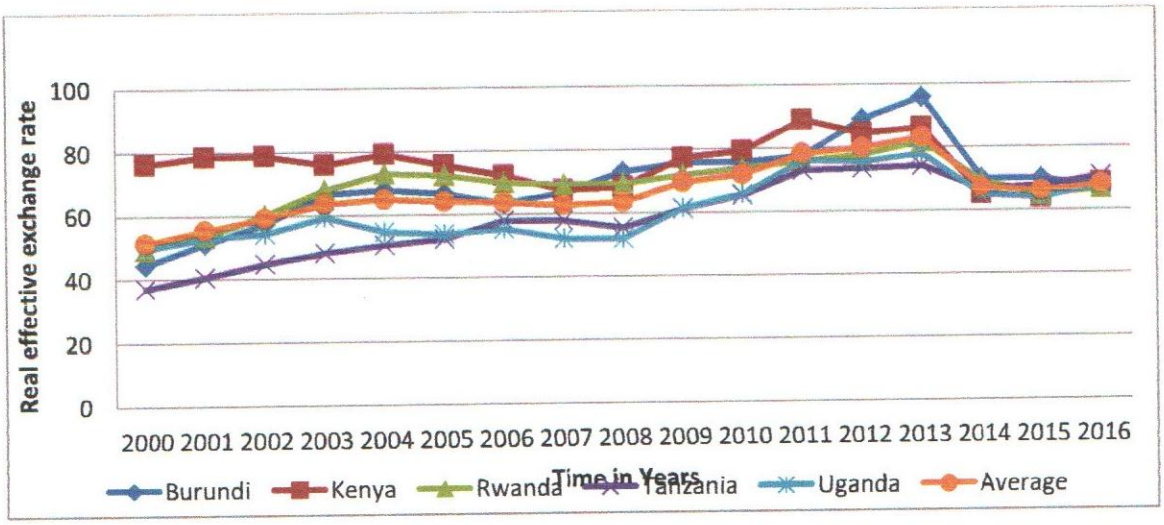


Figure 4.5: Real Exchange Rate in EAC, 2000-2016

Source: International Monetary Fund (IMF) (2016)

Figure 4.5 shows performance in real exchange rate in the EAC for the period 2000-2016. Volatility in exchange rates requires to be minimizing or eliminating before fusion into a monetary union if the countries in the region are to reap maximum benefit from the union. General observation from the graph shows some evidence of harmonization of real exchange rates within the region for the entire period which provides a good base for the proposed monetary union for the region. However, the EAC countries need to ensure that the exchange rate volatility is actually reduced to zero margins and the trend maintained as the region moves into a monetary union.

4.2.2 Descriptive Statistics

Table 4.1 presents the descriptive statistics of both the dependent and independent variables for the period 2000-2016. The means of the independent variables, nominal GDP growth rate, budget deficit/GDP, savings/GDP and inflation rates were 5.571%, 5.729%, 15.53%, and 8.206% respectively for the entire period. This can be used to determine how the region is performing in comparison to the set targets of 7%, 5%, 20%, and 5%, respectively that the EAC countries have set before fusion into a monetary union. The results therefore indicate that the region is moving relatively closer to the set target in budget deficit and nominal GDP growth rate which is desirable for a monetary union. On the other hand, the countries are far from attaining the target in the other two variables, national savings and inflation rate.

Table 4.1: Descriptive Statistics of Selected Macroeconomic Variables, 2000-2016

Average	Nominal GDP Growth Rate (%)	Budget Deficit/GDP (%)	National Savings/GDP (%)	Inflation Rate (%)	Real Exchange Rate
N	17	17	17	17	17
Mean	5.571	5.729	15.530	8.206	66.608
Std. Dev	0.774	0.752	0.814	1.557	0.901
Variance	0.599	0.566	0.662	2.424	0.812
Skewness	-0.421	-0.463	-0.150	0.722	0.386
Kurtosis	-0.512	-0.519	-1.108	1.215	0.229
Minimum	3.200	4.180	10.376	1.520	51.310
Maximum	7.320	6.840	19.920	17.620	83.174

Table 4.1 also shows the standard deviation of variables which can be used to determine the convergence or variability of the variables within the region. For the countries to establish a stable and sustainable monetary union, they need to eliminate or reduce volatility in exchange rate which can be achieved by converging in macroeconomic variables. The results show that three variables, nominal GDP growth rate, budget deficit/GDP and savings/GDP have standard deviations of 0.774, 0.752 and 0.814 meaning the EAC countries are relatively converging in those variables which is desirable for a common currency. On the other hand, the standard deviation of inflation rate was 1.557 meaning convergence in that variable is relatively low. This could be due to the fact that majorly unemployment and poverty alleviation may not be easily achieved without altering inflation rates. Also, the global financial crisis in 2008 led to increased oil and food prices which led to inflationary pressures in so many countries.

4.2.3 Correlation Matrix for the Selected Macroeconomic Variables

The correlation matrix presents the correlation coefficients between the real exchange rate and the explanatory variables in the study. A correlation coefficient is used to measure the degree of linear association of any two variables. It ranges between -1 and 1. A value of zero indicates absence of correlation while a value of -1 and 1 indicate a perfect negative and positive correlation respectively.

Table 4.2: Correlation Coefficient Results for Variables

	Real Exchange Rate	Real Growth Rate (%)	Budget Deficit (%)	National Savings (%)	Inflation Rate (%)
Real Exchange Rate	1				
Nominal Growth Rate (%)	-.2704*	1			
Budget Deficit (%)	.1884***	-.304***	1		
National Savings (%)	-.6600***	.382***	-.454***	1	
Inflation Rate (%)	.4410**	-.203**	-.053**	.004**	1

*****Means that the Correlation is significant at the 0.01 level (2-tailed).**
**** Means that the Correlation is significant at the 0.05 level (2-tailed).**
*** Means that the Correlation is significant at the 0.1 level (2-tailed).**

Table 4.2 presents correlation matrix results with diagonal matrix indicating values being unity (1) which implies that a variable is perfectly correlated with itself. The results from the table show a fairly weak negative relation between real exchange rate and nominal GDP growth rate of -2.704 and it is significant at 10% level. This suggests that if EAC countries increase their nominal GDP growth rate, then their economies will grow which will make the value of their currencies to improve thus reduce the real exchange rate. There is a fairly strong negative relation between real exchange rate and national savings of -0.66 and is significant at 1% level. This means that a country that increases its savings, it improves the value of its currency compared to other foreign currencies thus reducing the exchange rate between its currency and those other currencies

The table shows that there exist a weak positive relation between real exchange rate and budget deficit of 0.1884 and is significant at 1% level. This suggests that higher budget deficits will increase real exchange rate. Higher budget deficit denotes a situation where a country spends more than it collects as revenue. This may result to excessive borrowing from other countries, a situation that can lead to its currency being weaker compared to other stable nations. This makes the exchange rate of its currency with other currencies go up. The table also shows fairly weak

relation between inflation rate and real exchange rate of 0.4410 and is significant at 5% level. This suggests that higher inflation rates increases real exchange rate. Higher inflation rates in a country makes the prices of the commodities in that country expensive compared to other nations. This means currencies in that country will buy less compared with what the same currencies can buy in other countries. This means that its currency will weaken compared to other foreign currencies thus increasing its exchange rate.

4.3 Pre-diagnostic Tests

4.3.1 Panel Unit Root Test

Conducting a panel unit root test is necessary prior to model estimation in order to determine the order of integration of variables. This is because failure to do so may lead to generation of spurious regression results and inconsistent estimates which make inferences to be meaningless. Therefore the study employed Levin-Lin-Chu method to test stationarity of the panel data. The LLC test was chosen since it is suitable for micro-panels of time 10-250 observations. The test's null hypothesis is that each time series contains a unit root while the alternative one is that each time series is stationary. The results are shown in Table 4.3 below

Table 4.3: Panel Unit Root Test Results using Levin-Lin-Chu

Variables	LLC test at level	LLC P-Value at Level	LLC test First Difference	LLC P-Value First Difference	Order of integration
Real Exchange Rate	-4.5762	0.0025			I(0)
	-2.8062				
Nominal GDP	-6.4124	0.0055			I(0)
Growth Rate (%)	-2.5407				
Budget Deficit/GDP	-3.8015	0.1179	-7.2064	0.0022	I(1)
(%)	-1.1858		-2.8412		
National	-2.7579	0.6031	-8.5476	0.0000	I(1)
Savings/GDP (%)	0.2615		-4.5316		
Inflation Rate (%)	-6.558	0.0001			I(0)
	-3.7556				

Significance level 5%

The results from Table 4.3 show that real exchange rate, nominal GDP growth rate (%), and inflation rate (%) were all stationary while budget deficit/GDP (%) and national savings/GDP (%) were non-stationary at 5% level. The latter two variables became stationary after they were differenced once, meaning that the variables are integrated of order 1 {I(1)}

4.3.2 Hausman Test

Hausman (1978) proposed a test to decide whether to use Random Effect (FE) or Fixed Effect (FE) model. If the country specific effects are correlated with the regressors, then the RE estimator is inefficient and inconsistent while the FE is consistent. Hausman test was therefore carried out and the results are presented in Table 4.5. The null hypothesis is that the preferred model is RE against the alternative FE.

Table 4.4: Hausman Test Results

Variables	Coefficients (b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	Fixed	**random**	**Difference**	**Standard Error**
Real Exchange Rate	0.2347684	0.1126433	0.5600234	0.2398561
Nominal Growth Rate (%)	0.1884917	0.0501801	0.1383116	0.2502429
Budget Deficit (%)	0.4101899	-0.2528821	0.6630719	0.2664969
National Savings (%)	-0.3736899	-0.5910311	0.2173412	0.1574104
Inflation Rate (%)	0.471114	0.4992491	-0.0281351	0.0659941
Chi^2 (4) = 17.98			**Prob>chi^2 = 0.0012**	

From the Hausman test results, the p-value 0.0012 is less than 0.05 and therefore the null hypothesis is rejected and the conclusion is that Fixed effect model is appropriate.

4.4 Regression Analysis

The regression results are presented in Table 4.5. The results were tested for the following econometric problems: cross-sectional dependence, autocorrelation, and Heteroskedasticity.

Table 4.5 Regression Results of Macroeconomic Convergence and Real Exchange Rate

Variables	Coefficient	Std. Error	T	P-Value
GDPSD	-0.567811	0.256325	-2.2200	0.0497
BDTSD	-0.765411	0.335679	-2.2800	0.0409
SAVSD	-0.776851	0.205643	-3.7800	0.0010
IFSD	-0.054098	0.226456	-0.2400	0.0501
Const	1.891830	0.393028	4.8100	0.0000
F(4, 12) = 10.13			**Prob> F = 0.0008**	
R-squared = 0.8123			**Adj R-squared = 0.7321**	

Breuch-Pagan LM test results for cross-sectional dependence: **chi^2 (10) = 66.7**

Pr = 0.611

Modified Wald test results for group wise Heteroskedasticity: **chi^2 (5) = 5.95**

Pr = 0.311

Wooldridge test results for autocorrelation: **F(1,4) = 102.477**

Pr = 0.5360

Where,

GDPSD - standard deviation of nominal GDP growth rates in EAC

BDTSD – standard deviation of budget deficit/GDP in EAC

SAVSD – standard deviation of national savings/GDP in EAC

IFSD – standard deviation of inflation rate in EAC

From the regression results, the F = 10.13 (0.0008) is less than 0.01 implying that all the explanatory variables are significant at 1% level, meaning that they all contribute to exchange rate volatility. Adjusted R-squared is 0.7321 which means that independent variables explain approximately 73% of the exchange rate volatility while 27% is explained by other factors.

4.4.1 Effect of Nominal GDP Growth Rate Convergence on Exchange Rate Volatility in EAC

Standard deviation in this study was used to measure convergence of variables within the five EAC countries. Therefore, GDPSD in the regression table represents the convergence in nominal GDP growth rate among the five EAC countries. From the regression results in Table 4.5, convergence in nominal GDP growth rate among the EAC member countries has a negative and significant effect on exchange rate volatility in the EAC at 5% level. This means that convergence in nominal GDP growth rates among the EAC countries will reduce the exchange rate volatility within the region. Also the Table 4.5 shows that, GDPSD has a coefficient of -0.5678. This implies that, if convergence in nominal GDP growth rate among the EAC countries is increased by 1%, real exchange rate volatility within the EAC region reduces by 0.5678%. This is in consistent with the results of Kibua (2007) which showed that, similarity in growth rates between nations implies that they have similar demand conditions and hence are likely to face shocks in the same way. This then reduces the need to result to exchange rate adjustments in order to maintain external balance thus reducing the volatility.

According to Opolot and Luvanda (2009), EAC countries need to attract meaningful and sustainable foreign direct investment in order to unlock growth potential of the region. The research concluded that countries should also work towards increasing investment opportunities in agriculture, manufacturing, information and technology, and infrastructural developments. This will provide momentum toward attaining a long-term growth and stability, employment creation, as well as enhance competitiveness at regional and global markets.

According to Muthui (2016), the EAC countries whose economies lag behind in terms of economic growth should utilize fully the available natural resources and vast tracks of arable land to enhance their growth rates. In doing so, these countries will catch up with the rest of the countries within the region thus make it possible for the region to harmonize their growth. The research recommended that trade among member states should be promoted more vigorously through eliminating the existing trade barriers within the region. This will enable the EAC countries meet the convergence target they have set of more than 7% nominal GDP growth rate.

4.4.2 Effect of Budget Deficit/GDP Convergence on Exchange Rate Volatility in the EAC

The results of the estimated model show that coefficient of standard deviation of budget deficit/GDP is -0.7654 and is significant at 5% level. This means that if convergence in budget deficit/GDP among the EAC nations is increased by 1%, then exchange rate volatility in the EAC reduces by 0.7654%. This result is consistent with those of Patroba and Nene (2013) who established that similarity in budget deficit between countries reduces exchange volatility within them. This is because, when countries within a region maintain their budget deficits at the same level and within the set targets, then the issue of moral hazard is avoided where some countries can borrow excess fully from other countries with a view of being bailed out by the rest. This helps to maintain economic stability within the region thus no need to fluctuate exchange within the region.

Budget deficit is an indicator of financial health in which government expenditure exceed revenue. There has been a gradual improvement in the budget deficit for most of the EAC members as they mobilize more domestic revenue, and more grants especially to low-income earners like Burundi. A mixture of structural tax reforms and high commodity prices has led to an increase in revenue, which consequently reduces budget deficits. The results of Anand and Guttamann (2011) showed that if the EAC countries are able to harmonize their budget deficits within the set targets, then they are likely to smooth out effects of asymmetry of shocks thus reducing exchange rate volatility within the region. However, Anyanwu (2003) noted that budget deficits are healthy where governments are able to invest in income generating projects and repay public debts.

According to Mkenda (2001) strategy, programs that lower and enhance the management of the budget deficits in a sustainable way are vital in enhancing convergence. The research advocated that, reductions in deficits would entail locating and strengthening revenue generating mechanisms to counter fiscal spending. This can be best achieved by countries generating sufficient amounts of revenue to exceed expenditure.

4.4.3 Effect of National Savings/GDP Convergence on Exchange Rate Volatility in the EAC

Results from the estimated model show that standard deviation of national savings/GDP has a coefficient of -0.7769 and is significant at 1% level. This means that if convergence in national savings/GDP among the EAC countries increases by 1%, then exchange rate volatility within the region reduces by 0.7769%. This conforms to the priori expectations that convergence in savings of countries within a region aspiring to move into a monetary union reduces exchange rate volatility, which makes the common currency stable and sustainable in the long-run. According to Talvas (2008), similarity in national savings among nations aspiring to have a common currency, the countries are likely to face economic shocks in the same way. This will make them not resort to exchange rate adjustments to maintain external balance thus reducing volatility.

Results of Mkenda (2001) showed that, harmonization of savings within the set targets in EAC region will greatly stabilize their economies and smoothen out asymmetry of shocks, thus reduce exchange volatility. According to Tsikata (2014), domestic human resources are not efficiently utilized because of limited opportunities in employment. The region continues to lose professionals who migrate to developed nations where jobs are relatively available. This leads to capital flows which reduce revenues for these countries thus low savings.

The results of Kabananiye (2011) showed that low levels of international trade within the EAC region contributed to low savings within the region. The research advocated for the need of the member countries to enhance policies that will help boost international trade within the region. They need to work in harmony in promoting exports within the region as a whole and enhance competitiveness at the global market. Increased public sector investment should be increased which may in turn help to boost private sector investment. This will result to increase in tax collection thus increased government revenue and more savings. This will enable the EAC members meet and maintain the 20% target.

4.4.4 Effect of Inflation Rate Convergence on Exchange Rate Volatility in the EAC

Inflation is the most basic and visible indicator of imbalance between demand and supply of resources in an economy. High and rising inflation demonstrates an imbalance in resource utilization in the economy and serves as an indicator of macroeconomic instability (Rose, 2000).

Results from Table 4.6 shows that inflation rate convergence has a coefficient of -0.0541 and is significant at 5% level. This means that if convergence in inflation rate increases by 1% among the EAC countries, then exchange rate volatility reduces by 0.0541%. The prior expectation was that increase in convergence of inflation rates among the EAC nations reduces volatility in exchange rates within the region, hence the results confirms it.

The results however are in contradiction with those of Oyejide *et al.,* (2016) which indicated that inflation rates convergence has a positive impact on exchange rate volatility, meaning it increases volatility in exchange rate. This could probably be explained by the fact unemployment and poverty alleviation goals may not be easily achieved without breaking the inflation target barrier. Also according to Zhang (2012), although high inflation is harmful to growth, but also trying to anchor it at too low levels may lead to an unnecessary loss of output. In this study, effect of this variable on exchange rate volatility is relatively low compared to other explanatory variables. This could be explained by the fact that, high inflation is sometimes necessary to improve an economy as explained by the above mentioned researchers.

However, differences in inflation rates may signal differences in the way countries conduct their monetary economic policies and hence potential problems for a common currency as the countries will result to exchange movements as they are likely to face asymmetry of shocks (Anyanwu, 2003). In EAC, most countries have made a considerable headway in establishing price stability although surging oil and food prices pushed up inflation rates in many countries in 2008. High inflation has occurred in some countries like Kenya where central banks were obliged to finance public debts.

4.5 Post Estimation Diagnostic Tests

4.5.1 Test for Cross-Sectional Dependence

Cross-sectional dependence can lead to efficiency loss for least square estimators. This test was done using the Breusch - Pagan LM test of independence and results presented in Table 4.5. As the results indicate, the p-value is 0.1161 which is greater than 0.05. Null hypothesis was therefore not rejected and the conclusion was that there is no cross-sectional dependence in the study results.

4.5.2 Test for Heteroskedasticity

Test for Heteroskedasticity was carried out in the study to establish whether the error terms exhibit constant variance across observations or not. Modified Wald test for group wise Heteroskedasticity was employed and the results presented in Table 4.5.From the results, the p-value is 0.3111 which is greater than 0.05. The null hypothesis was therefore not rejected and the conclusion made that there is no Heteroskedasticity.

4.5.3 Test for Autocorrelation

Test for autocorrelation was carried out in order to establish whether the error terms of different time periods are correlated. Presence of serial correlation reduces the number of independent observations and causes the standard errors of the coefficients to be smaller than they actually are. Wooldridge (2006) test for autocorrelation was carried out and the results presented in Table 4.5. From the results, P-value was 0.5360 which is greater than 0.05. The null hypothesis was therefore not rejected and conclusion was that the data does not have first-order autocorrelation.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

In this chapter, summary of findings contained in the preceding chapters is presented. Based on the findings, a number of conclusions are drawn and recommendations made. Areas for further research are also suggested.

5.2 Summary

This study has empirically examined the effect of convergence in major macroeconomic variables in East African Community (EAC) on exchange rate volatility using a panel data over the period 2000-2016. This study was carried out in order to establish whether convergence in macroeconomic variables helps to reduce exchange volatility in EAC, a condition that is required before a region fuses into monetary union.

In the specific objectives, four major macroeconomic variables were picked and the effect of convergence of each variable has on exchange rate volatility was established. The four variables were picked since the EAC countries identified them as being major in influencing their economies. Also, the EAC countries have set targets on the same variables which can be used in this study to assess performance in macroeconomic convergence. These four were; nominal GDP growth, budget deficit/GDP, national savings/GDP, and inflation.

Standard deviation was used to measure convergence of explanatory variables and also to assess volatility of exchange rate in the EAC. The OCA theory was used to guide the study. The theory identifies the optimality of a region to form a monetary union through macroeconomic convergence in order to eliminate or reduce exchange rate volatility. Secondary data obtained from World Economic Indicator report of World Bank, International Financial Statistics of IMF, the member countries National Bureau of Statistics, and World Economic Outlook was used.

The panel data was tested for stationarity using Levin-Lin-Chu (2002) test in order to avoid spurious regression results that occurs due to working with data that is non-stationary. The Breusch-Pagan LM test for cross-sectional dependence was carried out to test on the correlation

between error terms of panel units. Heteroskendasticity test was carried out to establish whether the error terms exhibit constant variance across observations or not. Modified Wald test for group wise heteroskendasticity was employed to establish whether error terms exhibit a constant variance across observations. Wooldridge (2006) test for autocorrelation was employed to establish whether the error terms of different time periods are correlated or not. The Hausman test was also carried out to select the preferred model between the fixed effect and random effect model. Finally, model estimation was carried out using fixed effect model.

5.3 Conclusion

This study was carried out in order to investigate the effect of macroeconomic convergence among the EAC countries on exchange rate volatility within the region. Four macroeconomic variables were focused on which have been identified by the EAC countries as major in influencing their economies. The four variables were: nominal GDP growth rate, budget deficit/GDP, national savings/GDP, and inflation rate. Convergence of each of the above variables on exchange rate volatility was established. Panel data was used over the period 2000-2016.

The results showed that convergence in nominal GDP growth rates among the EAC countries had a significant and negative effect on exchange rate volatility. This implies that convergence in nominal GDP growth rates among the EAC countries will significantly reduce exchange rate volatility within the region, a condition that is required before a region fuses into a monetary union. This variable was found to be stationary when the LLC test was employed.

The results also showed that convergence in budget deficit/GDP variable among the EAC nations had a negative and significant effect on exchange rate volatility. This means that convergence in the variable among the EAC countries will significantly reduce exchange volatility within the region. This is a necessary condition that needs to be achieved before the region moves into monetary union. This variable was non-stationary when LLC test was employed but became stationary after being differenced once.

The effect of national savings/GDP convergence among the EAC nations was found to have a significant and negative effect on exchange rate volatility within the EAC region. This implies that convergence in this variable among the EAC countries will significantly reduce exchange volatility within the region that requires to be minimizing as the region moves into a monetary union. This variable was found to be non-stationary when LLC test for stationarity was employed but became stationary after being differenced once.

Finally, the effect of inflation rates convergence among the EAC countries was found to have a negative and significant effect on exchange rate volatility within the EAC region. This implies that convergence in the variable among the EAC countries will reduce exchange rate volatility. However, even though convergence in this variable was found to reduce the exchange volatility, the impact of reduction is not as much as the other three variables. The variable was found to be stationary when LLC test was employed.

Thus, as shown from the results of the study above, macroeconomic stability of the selected variables within the EAC region is crucial in reducing exchange volatility within the region. This is a requisite for a stable and sustainable monetary union that requires exchange rate volatility to be minimizing to very narrow margins and finally be reduced to zero before a region fuses into a monetary union.

5.4 Recommendations

Having conducted the study and established that macroeconomic convergence of the selected variables has a significant and negative effect on exchange rate volatility in the EAC, policy makers in the region should continue with strengthening of the macroeconomic convergence criteria as set out in the EAC Development Strategy (EAC, 2005). This will help greatly to harmonize exchange rates within the region in readiness for a successful monetary union. Although the results of the research show that a positive progress has been made in achieving the targets of macroeconomic convergence as out by the EAC countries, measures need to be put in place to ensure that they are actually achieved and exchange rate reduced to almost zero margins before establishing a common currency within the region.

The study results showed that nominal GDP convergence has significant and negative effect on exchange rate volatility. The EAC countries should therefore ensure that there is cooperation and coordination of policies that affect their economic growth. They also need to identify key economic drivers in their economies in order to unlock growth potential of the region. Such areas include investing in information and technology, foreign direct investment, manufacturing, human resource investments, production of export goods that are able to compete globally, among others. This will lead to attaining long term growth and stability among the EAC region before fusion into a monetary union.

The results also established that budget deficit convergence among the EAC region significantly reduces the exchange rate volatility within the region. This therefore calls for the need of the EAC countries to locate and strengthen revenue generating mechanisms to counter fiscal spending. They need to mobilize more domestic revenue and grants especially to low-income earners like Burundi that showed dismal performance in the selected variables of this study. They also need undertake tax reforms and high commodity prices that will help them to raise their revenues, hence reducing budget deficit to the required levels.

Having established that national savings convergence between EAC countries significantly reduces exchange rate volatility within the region, EAC countries need to work in harmony in promoting exports within the region that are able to compete at the global markets. The countries should also work towards mobilizing and improving management of human and financial resources within the region. They should also enhance policies that help in boosting international trade within the region. This will enable the EAC countries raise their revenues hence have substantial amount to save thus attain the required targets they have set.

The results also showed that convergence in inflation rate convergence among the EAC countries reduces exchange rate volatility within the region. There is need to establish a common central bank empowered to manage the unified monetary and fiscal policies, and be given the authority that would enable it to avoid the pitfalls of subservient national central banks like being put under pressure by national governments to finance debts. This common central bank needs to focus on price stability as its primary objective and thus causing national fiscal compliance with

this as a goal by all states. If this is achieved, inflation rates will be maintained at the required targets. The central monetary authority should be guided by clear and realistic parameters that are equally enforceable amongst all members.

5.5 Areas for Further Research

The study focused on the effects of macroeconomic convergence on exchange volatility in the EAC. The macroeconomic variables focused were all economic in nature. Further research should go beyond economic aspects and also investigate the role of political conditionality and leadership in designing and implementing the policies as set out at the EAC secretariat in joining up the countries for a monetary union. The study also focused on the EAC economic bloc, there is need to widen the study to cover a wider region like Sub-Saharan Africa. Comparative study can also be undertaken to compare performance between different blocs like SADC, ECOWAS and COMESA. Also, further research need to focus on establishing the rate of convergence of the macroeconomic variables.

REFERENCES

Alper, E. (2015). Toward a Monetary Union in East African Community. *IMF Working Paper,* 6(4), 11-17.

Anand, S. & R. Guttamann (2011). Moving Towards a Monetary Union and Forecast-Based Monetary Policy in East Africa, *Journal of Economic Statistics,* 23(1), 6-7.

Angle, R.F & P. Granger (1987). Autoregressive Conditional Heteroskendasticity with Estimates of Variance. *Econometric Journal of Society,* 2(3), 1-15.

Anyanwu, J.C. (2003). Estimating the Macroeconomic Effects of Monetary Unions, the Case of Trade and Output. *African Development Review,* 15(1),2-3.

Asonuma, T., X. Debrun & P.R. Manson (2012). Welfare Effects of Monetary Integration: The Common Monetary Area. *IMF Working Paper*, 6(1), 2-6.

Baldwin, E.M. & W. C. McLean (1996). Purpose of Historical Design. *American Economic Journal,* 1(2), 2-3.

Bayoumi, T. & W. Eichengreen (1995). Exchange Rate Volatility and Intervention. *Journal of International Economics,* 7(2), 191-209.

Broz, T. (2005). The Theory of Optimum Currency Areas, *Journal of Economic Review,* 4(1), 1-3.

Buigut, S. & P. Valev (2006). Is the Proposed East African Monetary Union an Optimum Currency Area? *Journal of African Economies*, 5(3), 11-15.

Carmignani, F. (2001). Endogenous Optimal Currency Areas: The Case of Central African Economic and Monetary Community. *Journal of African Economies,* 19(4), 25-31.

Collier, P. (2007). Implication for Africa: Trade Reform and Regional Integration in Africa. *Journal of African Affairs,* 90(1), 360-370.

Corsetti, G. (2009). A Modern Reconsideration of the Theory of Optimum Currency Areas. *CEPR Discussion Paper* 6712.

De Grauwe, P. (2010). *Economics of Monetary Union.* Oxford University Press, Oxford.

EAC (2005).The East African Development Strategy, 2006-2010: Deepening and Accelerating Integration. Arusha General Secretariat.

East African Community (2005). Progress and Implications for Proposed Monetary Union. *Bank of Uganda Staff Papers no. 4*, Bank of Uganda.

Emerson, M.D, A. Gros & J. Halianer (1992).*One Market, One Money: An Evaluation of the Potential Benefits and Costs of Forming a Monetary Union* Oxford University Press, Oxford.

Fidrmuc, J. (2001). The Endogeinity of Optimum Currency Area Criteria, Intra-Trade and EMU Enlargement. *Discussion Paper no.8,* Bank of Finland.

Frankel, J.A. & A.K. Rose (1998). The Endogeinity of the Optimum Currency Area Criteria. *Economic Journal,* 208(4), 1009-1025.

Friedman, M. (1967). Monetary Policy Actions. *American Economic Review,* 5(3), 1-5.

Fwangkwal R. (2014). Monetary Integration in West Africa. *African Journal,* (6)1, 3-24.

Gramlich, E.M. (2016). The Usefulness of Monetary and Fiscal Policy in Economy. *Journal of Money Credit and Banking,* 3(1), 506-532.

Guillaume, D.M. & D. Starage (2000).Improving Policy Credibility: is there a Case for Africa Monetary Union? *World Development Review,* 28(8), 1-7.

Hausman, J.A (1978). Specification Tests in Econometrics. *Econometrics Journal,* 46(1), 1251-1278.

Hsiao, C., D.C. Mountain & K.H. Illman (1995). Aggregate vs. Disaggregate Data Analysis. *Journal of Business and Economic Statistics,* 20(5), 576-601.

Im, K.S., M.H. Pesaran & Y. Shin (2003).Testing Unit Roots in Heterogeneous Panels. *Journal of Econometrics,* 115(1), 53-78.

IMF (2016). The East African Community (EAC): Managing the Macroeconomic Convergence Progress Ahead of Monetary Union. Washington D.C., IMF.

Judson, O. & D. Owen (2016). Inference in Panel Data Analysis. *Journal of International Econometrics,* 5(2), 3-23.

Kabananiye, A. (2011). Regional Integration and Sustainable Growth in Sub-Saharan Africa: a Case Study of East African Community. *Journal of African Economies*, 5(1), 88-198.

Kenen, P.B. (1961). *The Theory of Optimum Currency Area.* Chicago University Press, Chicago.

Keynes J.M (1930). Theory of Money. *American Journal,* 4(3), 2-13.

Khan, A. & E. Hossan (2010). Dynamic Model Estimation in Econometrics. *Journal of International Econometrics,* 9(6), 1-25.

Kibua, T. (2007). East African Integration. *Political Economic Journal,* 3(1), 4-8.

Klein, M.W. (1998). European Monetary Union. *New England Economic Review,* 4,1-20

Kuteesa, A. (2014). East African Regional Integration. *Journal of Economic Policy Research,* 4(2), 23-30.

Levin, A., C.F Lin & C.S Chu (2002). Unit Root Test in Panel Data. *Journal of Econometrics,* 108(1), 1-24.

Lucas, G.F (2003). Regional Integration in African Continent. *African Journal,* 2(3), 1-4.

Maruping, M. (2005). Challenges for Regional Integration in Sub-saharan Africa. *African Economic Journal,* 5(1), 23-43.

McCarthy, C.L. (2015). Macroeconomic Convergence in SADC. *African Economic Journal,* 7(5), 1-12.

McKinnon, R.I. (1963). Optimum Currency Areas. *American Economic Review,* 53(4), 717-725.

McKinnon, R.I. (2004). Optimum Currency Areas and Key Currencies: Mundell 1 Versus Mundell 2. *Journal of Common Market Studies,* 42(4), 23-28.

Mkenda, B.K. (2001). Is East Africa an Optimum Currency Area? *African Journal,* 4(3) 1-5.

Mongeli, F.P. (2008). New View on Optimum Currency Area Theory: What is EMU Telling us? *Journal of European Economic Surveys,* 38(1), 23-43.

Mundell, R.A. (1961). A Theory of Optimum Currency Areas. *American Economic Review,* 60(1), 4-18.

Muthui, J.N. (2016). A G-PPP Analysis of the EAC Monetary Integration Process. *International Journal of Business & Science,* 4(5), 12-35.

National Bureau of Statistics (2016). EAC Member Countries Bureau of Statistics.

Olakunle, J.S. (2015). A Study of the Economic Community of West African States. *Journal of International Economics,* 5(2), 13-38.

Opolot, J. & E. Luvanda (2009). Macroeconomic Convergence in the East African Community: Progress and Implication for the Proposed Monetary Union. *Bank of Uganda Working Paper,* 4(1), 1-3, Bank of Uganda.

Oyejide, T. A., I. Elbadawi & P. Collier (2016). Regional Integration and Trade Liberization in Sub-Saharan Africa. *African Journal,* 8(3), 16-24.

Patroba, N. & M. Nene (2013). Is SACU Ready for a Monetary Union? *Journal of African Economies,*3(2), 12-14.

Pedroni, P. (1999). *Critical Values for Cointegration Tests in Heterogeneous Panels with Multiple Regressors*. Oxford, University Press, Oxford.

Plasmans, E. (2005). Panel Data Econometrics. *Journal of Econometrics,* 3(1), 1-14.

Robson, P. (1987). *Economic Integration in Africa.*4th Ed., Routledge Press, London.

Rose, A.K. (2000). One Money, One Market: Effect of Common Currencies on Trade. *Economic Policy,* 30(1), 7-46.

Salai-i-Martin, X. (2016). Classical Approach to Convergence Analysis. *Economic Journal,* 106(1), 1019-1036.

Sanusi, J.O. (2003). Ongoing Efforts Towards a Monetary Union in West African Sub-region. *African Economic Review,* 6(1), 1-4.

Talvas, G. (2008). The Benefits of Monetary Union in Southern Africa. *Journal of African Economic Surveys,* 23(2), 1-20.

Tsikata, Y. (2014). Regional Integration in African. *African Economic Journal,* 6(2), 1-2.

Unders, W. & S. Hurn (1994). Theory and Tests of Generalised Purchasing Power Parity. *Review of International Economics,* 2(1), 179-190.

Westerlund, J. (2009). Myths and Facts about Panel Unit Root Tests. *Journal of Econometrics.* 4(1), 1-6.

World Development Indicator (WDI) (2016). Statistics of Progressive Development in Africa. World Bank

World Economic Outlook (2016). Report of World Bank.

Woodridge, J.M. (2006). *Introductory Econometrics*. Oxford, University Press.

Zhang, J. (2012). Supporting Macroeconomic in Africa's RECs. *African Journal,* 3(5), 15-32.

EGERTON UNIVERSITY
LIBRARY