Effectiveness of Monetary Policy Transmission Mechanism on Macroeconomic Objectives; A Case of Selected East African Countries (Pooled Mean Group Estimation)

A Thesis Submitted to the Department of Economics

Addis Ababa University

Presented in Partial Fulfillment of the Requirements for the Degree of Master of Science in Economics (Economic Policy Analysis)

By Yabatfenta Getachew

Addis Ababa, Ethiopia

June; 2019

Addis Ababa University

School of Graduate Studies

This is to certify that the thesis prepared by Yabatfenta Getachew, entitled as ***Effectiveness of Monetary policy transmission Mechanisms on Macroeconomic Objectives in case of selected East African Countries***: Evidence from a Panel ARDL model with Pooled Mean Group estimation. The thesis is submitted to department of economics in partial fulfillment of the requirements for the degree of Master of Science in Economics (Economic Policy Analysis) complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

Signed by the Examining Committee:

_____ _____

External Examiner **Signature**

_____ _____

Internal Examiner **Signature**

_____ _____

Advisor **Signature**

_____

Chair of Department or Graduate Programs Coordinator

Declaration

I declare that this thesis is my original work and has not been presented for a degree award in any other university, and that all sources of materials used for the thesis have been duly acknowledged.

Declared by: Yabatfenta Getachew : Signature: _____

Date: _____

Confirmed by Advisor: Dr. Mesele W/areya: Signature: _____

Date: _____

Addis Ababa University

Addis Ababa, Ethiopia

Acknowledgement

First, I would like to thank to Almighty Lord and his mother St. Marry all the time. God has already stated that one can do nothing without the help of him. I did this thesis with his savoir and blessing and St. Marry's day to day protection. Next, I am extremely grateful and give me a great honor to thank my thesis advisor, Dr. Mesele W/arya, for his valuable guidance and lively welcoming face. My very sincere thanks to Yadamnesh Aderaw and Ayehutiru Addisu is for their support and encouragement to do my thesis within the provided period. I would like to extend my gratitude to my families, without their moral support, my achievement was not possible. And also I want to say thank you all to my class mates and college students who have helped me while I was doing my thesis. Last, but not least, I want to thank Addis Ababa University for sponsoring my Master's degree.

Acronyms/Abbreviation

ADF	Augmented Dickey-Fuller
ARDL	Autoregressive Distributed Lag
BNR	National Bank of Rwanda
BOP	Balance of Payment
CBK	Kenya Central Bank
CPI	Consumer Price Index
DC	Domestic Credit
DF	Dickey-Fuller
EAC	East African Countries
ER	Exchange Rate
GDPGR	Growth Domestic Product Growth Rate
GLS	General Least Squaere
GMM	General Methods of Movement
IPS	Im, Pesaran and Shin
KPSS	Kwiatkowski, Phillips, Schmidt, and Shin
M1	Monetary Aggregate
M2	Broad Money Supply
M3	Broad Monetary Aggregate
MG	Mean Group
MTM	Monetary Transmission Mechanism
NBE	National Bank of Ethiopia
PMG	Pooled Mean Group
PP	Phillips-Perron
RIR	Real Interest Rate
SSA	Sub- Saharan Africa
SVAR	Structural Vector Auto-Regressive
VAR	Vector Autoregressive
VECM	Vector Error Correction Model

Table of Contents

List of Figures

List of Tables

Abstract

This paper investigates the effectiveness of monetary policy transmission mechanism on macroeconomic objectives in cases of selected East African Countries using a Dynamic Panel ARDL model with Pooled Mean Group estimation method. It specifically examines the dynamic responses of exchange rate, real interest rate, domestic credit and broad money supply on economic growth rate, consumer price index and balance of payment by employing annual data from 1992 to 2017. To do so, three models (economic growth rate, consumer price index and balance of payment) and different tests (i.e. descriptive analysis, panel unit root test, Pedroni co integration test and pooled mean group estimation) were used. *The empirical evidence for economic growth rate model suggests that exchange rate, real interest rate and broad money supply have a positive and significant long-run impact for economic growth rate, while domestic credit has a negative and significant impact for economic growth rate in both short-run and long run. Exchange rate and broad money supply have no significant impact for economic growth in the short run but real interest rate has positive and significant impact in the short run. Similarly, empirical result for consumer price index model shows that exchange rate and real interest rate have a significant and negative long-run impact for consumer price index whereas domestic credit and broad money supply have a significant and positive long-run impact for consumer price index. The short-run analysis suggests that real interest rate, domestic credit and broad money supply have a negative short-run impact for consumer price index while exchange rate has a positive and insignificant short-run impact. For balance of payment model, exchange rate and domestic credit have positive insignificant short run and significant long-run impact for balance of payment. However, real interest rate and broad money supply have negative short run and long-run impact for the balance of payment with insignificant impact of real interest rate both in short run and long run. Therefore, real interest rate and broad money supply have no significant impact for balance of payment in selected east African countries. The monetary authorities and policy makers should know the relationship between monetary policy transmission mechanisms and macroeconomic objectives with their central bank monetary policy.*

Keywords: Macroeconomic Objectives, Monetary Policy Transmission Mechanism, Panel ARDL, Pooled Mean Group, Selected East African Countries

Chapter One

Introduction

1.1. Background of the Study

During the 1970s and early 1980s, governments in many countries in Sub-Saharan Africa (SSA) pursued macroeconomic policies that were inconsistent with a policy of fixed nominal exchange rates (Ghura & Hadjimichael, 1996). Macroeconomic policies are generally thought of as demand-management policies. It plays a fundamental role in providing as well as maintaining a sustainable and acceptable economic environment, which makes it possible for an economy to achieve faster, stable and sustainable growth. The two leading instruments of macroeconomic policy in economy conduct this fundamental role are Monetary and fiscal policies (Sen and Kaya, 2015).

As a useful tool for macroeconomic stabilization, monetary policy is important for influencing the direction of economic activities not only for developed countries but also for developing ones. Through various monetary transmission channels, monetary authorities can use monetary policy to either expand or contract activities in the real economy depending on the desired macro-economic objectives (i.e., economic growth, price stability, exchange rate stability, balance of payments (BOP) equilibrium, employment, neutrality of money, equal income distribution and credit control (Ekpo and Effiong, 2017). Similarly, Van Hai and Trang (2015) described that monetary policy is considered as an important instrument to influence the economy in order to achieve some targets like price stability. Compared to other macroeconomic policies, the impacts of monetary policy appear to be greater on the economy in general and on financial markets in particular, especially in the short-term, through some variables such as money supply, credit, interest rates, and exchange rate.

As Holtrop (1963) and Usman (2015) described, Monetary policy is the process by which the monetary authority of a country controls the supply of money and it works under the central bank of an economy that controls money supply by setting exchange rate and interest rate for the purpose of promoting economic growth and stability. This economic growth and stability are one of the fundamental objectives of macroeconomic policy for all countries both developed and developing ones. The achievement of macroeconomic goals, namely full employment, the

stability of price level, high and sustainable economic growth and external balance, from immemorial, has been a policy priority of every economy, for any economy. For the achievement of those macroeconomic goals, monetary policy is one of the most important macroeconomic policies that the monetary authority uses to control the supply of money. The achievement of the above goals is through a monetary policy transmission mechanism. As different scholars described (see Mishkin, 1995; Muric, 2010; Zgambo & Chileshe, 2014; Van Hai & Trang, 2015; ÖZCAN, 2016), transmission mechanisms of monetary policy include interest rate channel, exchange rate channel, asset price effects and credit channel. Similarly, Havi and Enu (2014) and Akhtar (2008) described that; government can use monetary policy to achieve macroeconomic objectives. These objectives are sustained economic growth, price stability, low unemployment, the balance of payment equilibrium and sustainable development. However, these objectives are achieved by monetary transmission mechanisms (i.e., a change in interest rate, a change in the money supply and a change in the exchange rate). Because the monetary transmission mechanism or transmission mechanism of monetary policy is the process through which monetary policy decisions are transmitted into changes in the gross domestic product (GDP) and inflation. Therefore, it is necessary for policymakers to investigate and understand how monetary policy mechanisms work in order to implement a proper monetary policy.

1.2. Statements of the Problem

In East African Countries, a number of monetary policy channels have been identified namely; money, interest rate, exchange rate, credit, asset price, and the expectation channels but not every channel is active. For example, their levels of financial development are less advanced compared to those in advanced or emerging economies where each of these channels was reported to be active. In addition, institutional frameworks for the small open economy are weak (Kibwe, 2016). Therefore, those countries typically face macroeconomic challenges related to imperfections in the financial sector. However, to increase or facilitate economic growth and ultimate aggregate output, the financial system is used. An efficient financial system that facilitates capital accumulation is likely to promote economic growth. Therefore, efficiency and stability of the financial system, together with capital accumulation, are outcomes of the monetary policy stance and its effects within an economy i.e.; the key policy tool for managing financial systems is monetary policy. While this conceptual link between monetary policy,

capital accumulation and economic growth seems obvious, the transmission dynamics between financial factors such as monetary policy and the real economy is still plagued with many empirical and ideological issues (Fiador, 2015). This issue of dynamic inconsistency, which is especially important for low-income countries because of the existence of weak institutions and low credibility of central banks, is handled by setting up rules, or targets, for money and credit growth, interest rates, the exchange rate, and inflation are all mechanisms designed to try to overcome the problem (Khan, 2011). Similarly, Van Hai and Trang (2015) argue that policymakers should understand how monetary policy mechanisms work in order to implement a proper monetary policy.

> *Khan (2011) describes, "Dynamic inconsistency refers to the difference between the optimal policies that a central bank announces it would carry out and the policies that the central bank would carry out after the public had made decisions on the basis of its expectations. If the central bank announces that it will target a particular rate of inflation, and the public engages in contracts based on that announcement, the central bank will have an incentive to renege on its promise and try to achieve higher output by producing surprise inflation. However, the public will then know this and will adjust its inflationary expectations upwards, thereby limiting the desired output gain. Dynamic inconsistency can also imply difficulties in bringing down inflation in disinflation plans. After the private sector sets nominal contracts, the government tries to disinflate less than promised to obtain some output growth"(page, 6).*

The study also indicates that, to overcome the dynamic inconsistency problem a number of countries have successfully resorted to pegging the exchange rate. However, it must be emphasized that this mechanism is also not exempted completely from a similar dynamic inconsistency problem.

Lopes (1998) with a title of the transmission mechanism of monetary policy in a stabilizing economy in case of Brazil also defined that, understanding the transmission mechanism of monetary policy in the context of a stabilizing economy is a difficult task (i.e. stabilization produces a structural and behavioral change in the economy). That means, for stabilization, the nature of transmission mechanism is modified or the effectiveness of monetary policy is used.

There are several studies for the effectiveness of the monetary policy on macroeconomic objectives in developed and developing countries including Ethiopia by using vector autoregressive (VAR) model. Other vast empirical studies focused on the monetary transmission for developed economies and developing economies. The studies distinguish different characteristic of monetary transmission mechanism (MTM) in developed countries by focusing on prices (interest rate, exchange rate, and other asset prices) rather than quantities (money, credit, base money, bonds, foreign assets, etc.).

In addition, the studies in developing countries focused on quantities (money, credit, base money, bond, foreign asset etc.) rather than on price (interest rate, exchange rate, and other asset prices) (Davoodi, Dixit, & Pinter, 2013).

Empirical literature on effectiveness of monetary policy transmission mechanism on macroeconomic objectives by using dynamic panel data with Autoregressive Distributed Lag (ARDL) model and a technique of Pooled Mean Group (PMG) estimation method by focusing on price (interest rate, exchange rate, and other asset price) and on quantities (money, credit, base money, bonds, foreign assets, etc.) are scanty.

Therefore, the estimation methodology involved in this study and effectiveness of monetary policy transmission mechanism by focusing on price (the exchange rate and interest rate) and on quantities (money and credit) for macroeconomic objectives in selected East African Countries, differs from many similar studies. Because most of the previous research on this area differ from this study in case of variables, duration of time, selection of countries and also in models. For example Isedu (2013) with the effect of monetary policy on the macroeconomic performance of Nigeria by employing quarterly time series data from 1970Q1 to 2011Q4 use three approaches to suggest the effectiveness of monetary policy for income stabilization, BOP stabilization and CPI stabilization in Nigeria.

The first approach was based on the coefficient of the variables using long run and co-integration vector error correction model (VECM) with a result of all variables are statistically insignificant. The second approach was simulating of the macroeconomic model to demonstrate the effect of monetary policy on macroeconomic performance with an impressive and satisfactory result. Finally, the third approach was Structural Vector Auto-Regressive (SVAR) to trace the effect of monetary policy shocks on domestic output, CPI and BOP position in Nigeria. However, Fiador (2015) with monetary policy and economic performance for three Anglophone West African countries (Gambia, Ghana and Nigeria) employs the bounds testing approach to co-integration and the Autoregressive Distributed Lags (ARDL) between 1975- 2011. The findings show significant differences in the interest rate pass-through of the three countries studied. The study also assesses the impact of monetary policy on foreign exchange market pressure by focusing on some selected countries in SSA with the model of the Generalized Method of Moments (GMM). The study found a negative and significant relationship between monetary policy and exchange market pressure.

To the best of my knowledge, the general aim of the study is to examine the effectiveness of the monetary policy transmission mechanism on macroeconomic objectives for selected East African Countries (EAC).

Specifically, this study aims to see the effect of exchange rate, real interest rate, money supply and domestic credit for stable economic growth, consumer price index and balance of payment in Ethiopia, Kenya, Tanzania, Uganda, Burundi, Rwanda, Madagascar, Zambia and Seychelles by using dynamic panel data with the help of Autoregressive Distributed Lag (ARDL) model. The model uses a technique of Pooled Mean Group (PMG) estimation method from the year 1992 to 2017. This makes the study different from all previous studies, which concentrated on the effectiveness of the monetary policy transmission mechanism on macroeconomic objectives.

1.3. Objectives of the Study

The general objective of this study is to examine the effectiveness of monetary policy transmission mechanism on macroeconomic objectives by using macro panel data from 1992 to 2017 for selected East African Countries (i.e.; Ethiopia, Kenya, Tanzania, Uganda, Burundi, Rwanda, Madagascar, Zambia and Seychelles).

The specific objectives of the study are:

- To characterize the monetary policy transmission mechanisms in selected East African Countries

- To examine the effectiveness of monetary policy transmission mechanisms on selected macroeconomic objectives

1.4. Significance of the Study

This thesis aims to show the effectiveness of the monetary policy transmission mechanism on macroeconomic objectives for selected East African Countries (EAC). The main significance of this paper will be used for policymakers to identify the relationship between monetary policy transmission mechanism (i.e., real exchange rate, real interest rate, the domestic credit and broad money supply) and macroeconomic objectives (i.e., stable economic growth, price stability and balance of payment). It also serves as a reference for the further study of the research in the related areas of the effectiveness of the monetary policy transmission mechanism on macroeconomic objectives.

1.5. Limitation and Scope of the Study

The focus of this paper is for selected East African Countries (Ethiopia, Kenya, Tanzania, Uganda, Burundi, Rwanda, Madagascar, Zambia and Seychelles). This selection is due to lack of data sets for all the country within this sub-region, which is the main limitation for the study and limited the span in terms of time is another limitation of the study. This study will cover a period of twenty-six years using annual data from 1992 to 2017. The paper examines the effectiveness of monetary policy transmission mechanism on macroeconomic objectives such as stable economic growth rate, consumer price index and balance of payment for the above selected east African countries. However, it does not examine the effectiveness of monetary policy transmission mechanism for stability and low level of unemployment due to the limitation of data.

1.6. Organization of the Study

The rest of this paper is organized as follows. Chapter II reviews the related theoretical and empirical literature. Chapter III explains the definition of variables and model specification for the paper, Chapter IV highlights the overviews of the monetary policy transmission mechanisms and the trends of monetary policy transmission mechanism. Chapter V presents empirical results and the effects of monetary policy transmission mechanism on macroeconomic objectives (i.e.; stable economic growth, consumer price index and balance of payment) and the last chapter (i.e.; VI); concluded about the main findings and policy recommendations.

Chapter Two

Literature Review

2.1. Theoretical Review

2.1.1. Views of Different Schools of Thought

Economists' views on how monetary policy affects the economy differ widely. There are a number of schools of thought in economics having different levels of views on monetary policy transmission mechanism and on macroeconomic objectives.

2.1.1.1. Classical Economists View

In the classical monetary transmission mechanism, a change in the money supply does not affect the real variables like output, employment and income. Money is neutral in its effects on the economy because it serves only as a medium of exchange. This analysis is based on a direct and mechanical relationship between money and prices. Therefore, the only lasting effect of money is on the general price level. By depending upon Fisher's Equation of Exchange (MV = PY) as well as Marshall's Cambridge Equation (M = KPY) classical quantity theorists say that, Money supply and price have direct relations, i.e. if the quantity of money is raised, the price level will also rise in the same proportion. Because consumer spending and business spending decisions depend upon relative prices, changes in the money supply do not affect real variables, as mentioned above (i.e. output, employment and income).

The classicists believed that there was always full employment in the economy. At the same time, they recognized the existence of unemployment in the event of downward rigidity of money wages. They believed that, when the monetary authority increases the money supply, liquidity rises with the people who increase the demand for goods and services. This, in turn, raises the price level. The rise in price level reduces the real wage, which provides an incentive for employers to expand employment and output towards the full employment level.

2.1.1.2. Keynesian Economists View

The Keynesians believe that in the short run, under the conditions of unemployment, changes in money supply will produce permanent non-neutral effects, i.e., will permanently change the rate of interest, the level of employment, the rate of capital formation, etc. All this means that money is non-neutral in the short period.

In the Keynesian analysis, the effects of money supply on economic activity are examined in the structural models showing the run of monetary policy in the frame of structural models. In Keynesian structural models, the channels of monetary policy to affect the total product are presented by defining the behaviors of firms and consumers in most sectors of the economy. In structural models, the transmission process of monetary policy is toward total expenditures from the monetary supply.

In the Keynesian analysis, the rate of interest is determined by the demand for and supply of money i.e. the transmission mechanism in the Keynesian theory is indirect via the interest rate. The higher the interest rate gives the lower the demand for money. This negative relationship between the interest rate and the demand for money provides a link between changes in the money supply and the aggregate variables of the economy. Therefore, in the Keynesian transmission mechanism, changes in the money supply affect aggregate expenditure, output, employment and income indirectly through changes in the interest rate. That is, increase in money supply leads to a decrease in interest rate, a decrease of interest rate leads to an increase in investment and income and also, an increase of income leads to increase in output and cause for full employment. The direct effects of variations in the interest rate on the real economy by means of investment are described in the Keynesian approach, in the frame of IS-LM analysis (ÖZCAN, 2016). Similarly, Zgambo, P., & Chileshe, P. M. (2014) due to the assumption of sticky price in Keynesian approach states that, increase in money supply leads to a decrease in real interest rate and change in real interest rate induce economic agent to change their investment and consumption expenditure and thereby changing economic activity.

2.1.1.3. Monetarist Theory

In monetarist view, Demand (expenditure), price, interest rate, financial and non-financial assets that include money, securities, durable and semi-durable goods, and services are affected by a change in transmission mechanism i.e. change in the money supply. In addition, any change in the money supply causes disequilibrium between the public's actual and desired real cash balances of assets in their portfolios. Increase in money supply leads to increase in cash balance which forces people to spend for financial and non-financial assets like (shares, bonds, goods services) and will affect interest rates in three different ways(i.e. liquidity effect, price expectations effect, and output effect). The short-run liquidity effect brings a reduction in interest rates and both the output and price expectation effects increase the interest rates. Their combined effect will be an increase in interest rates. These will, in turn, discourage investment and reduce output and employment.

In other ways, when the Central bank purchases securities and their prices increase and yields fall, the demand for financial and real assets increases. With the increase in their demand, their prices rise. However, the rise in the prices of real assets leads to some additional effects. When the prices of real assets rise, their production is encouraged which, in turn, raises the demand for resources used in their production. Moreover, there is also an increase in the demand for services as a result of an increase in the prices of real assets. Surplus money balances holders demand more consumer durables, say cars. This will raise the prices of existing cars relative to the prices of new cars. Since the new cars are relatively cheaper, their demand will increase which will raise their output, income and employment in the car industry. With the overall increase in the demand for cars, the demand for their services will also increase.

2.1.1.4. Neo- Keynesian Economists View

The neo-Keynesians monetary transmission mechanism is based on the portfolio adjustment process by considering three effects; i.e. wealth effect, substitution effects, and credit availability effects.

Changes in the money supply affect the economy through wealth effect channels, this increase in money supply through open market leads to increasing consumer's wealth, and consumers increase their spending. They buy more of all assets in their portfolios and thus increase their demand for capital non-durable goods, which ultimately lead to an increase in output, employment and income in the economy.

Under Substitution Effects, suppose the Central bank engages in open market purchases of securities. Due to this fact, the price of securities becomes increase thereby reducing the yield on them. In other words, the holders of securities sell them to the central bank because they get high prices for them. They now hold more money than they desire. As a result, they substitute bonds for their excess money balances. The increase of demand for bonds leads to an increase in their market price and reducing their yield as the interest rate falls.

The credit availability effects relate to the transmission mechanism following the effects of changes in the interest rate on banks and financial institutions. Suppose the central bank purchases government securities and increase the money supply. Consequently, the reserves of banks increase and there is an increase in bank credit. This leads to a fall in interest rates.

2.1.1.5. Monetary policy transmission mechanism in financial market price view

This view stresses the effect on the price of return on financial assets due to change in monetary policy by including bond price, interest rates, and exchange rates and also consider different versions of financial market view by depending on the degree of openness of the economy being studied (Taylor, 2000).

Hildebrand (2006) described that monetary policy affects financial markets through various channels. However, the study focused on the effect of monetary policy instrument, which is typically a short-term interest rate for floating exchange rates on various financial prices by explaining the benefits of central bank transparency. Because central bank intervenes in the financial market to achieve macroeconomic objectives of full employment, maximum

sustainable growth, stable interest rate or exchange rate. Therefore, monetary policy and financial markets are intrinsically linked by different ways by considering expectations (i.e. directly or indirectly). The direct expectation is about the future evolution of the monetary policy instrument, and the indirect expectation is the expected effect of monetary policy on the real economy. However, the link between monetary policy and financial markets is not a one-way street. Therefore, financial markets also affect monetary policy (i.e. market expectations can influence the setting of monetary policy).

According to Muric (2010) studies about monetary policy transmission mechanism in Serbia, transmission mechanism involves into two stages. The first stage involves through the financial system, which explains how the short-term money market rates affect the long-term bond rates and the marginal cost of loan funding through which bank loan rates are affected.

Similarly, Petursson (2001) described that the first stage of the transmission mechanism is a financial system at which monetary policy actions are primarily manifested by changes in short and long term interest rates, asset price, liquidity and exchange rates of the domestic currency. According to this study, a change in central bank policy rate also changes interbank and Treasury bill rate, asset price (i.e. equity price and housing price) and volume of liquidity funds in the economy.

The study by Kigabo, Munyankindi & Amahoro (2018) in Rwanda shows that effectiveness of monetary transmission mechanisms varies across countries depending on the extent of financial intermediation, the structure of the financial system and structural economic conditions. The variables that affect the conditions in the non-financial sector are lending rates, deposit rates, exchange rate and asset prices. The link between these variables and monetary policy instruments under the direct control of a central bank (like short-term interest rates and reserve money) depend on the depth and structure of the financial system. This explains why monetary transmission mechanisms are fundamentally different in low-income countries and in advanced economies (Mishra, Montiel, & Spilimbergo, 2010) and why monetary transmission mechanisms are still weak in emerging and developing economies.

2.2. Empirical Review

There are many empirical studies conducted on the effectiveness of the monetary policy transmission mechanism on macroeconomic objectives. From different macroeconomic objectives, this study focuses only on the three important objectives on economic growth, consumer price index and balance of payment. Different scholars also give different viewpoints about these macroeconomic objectives and monetary policy transmission mechanisms.

2.2.1. Monetary Policy Transmission Mechanism and Economic Growth

Fiscal and monetary policies have an impact on economic growth. The aim of this study in this subtitle considers the effectiveness of the monetary policy transmission mechanism on economic growth. Monetary policy concentrated on creating a stable macroeconomic environment to support sustainable economic growth (Zgambo & Chileshe, 2014).

There are two linkages in the transmission mechanism. The first one is an increase in real balance, which generates portfolio disequilibrium. The second stage of the transmission process occurs when the change in the interest rate affects aggregate demand. Through these two linkages, change in real money stock affects the level of output in the economy (Fisher & Dornbush, 1997).

Different scholars give different result by using different models, different period of times and different countries about the effect of monetary policy transmission mechanism on output level.

Usman (2017) studied the growth effects of fiscal and monetary policies in the case of Pakistan by using Johansson Juselius (1990) approach of co-integration in a VECM setting from 1972 to 2015. The study by depending upon the impact of some monetary policy transmission mechanism for economic growth concluded that monetary policy has a negative response to economic growth in the short run, however, in the long run; monetary policy has a positive impact on economic growth. From some monetary policy transmission mechanisms, the findings of the study indicate that money supply has a significant and positive impact on economic growth in the long run but it negatively responses in the short run. Similarly, the exchange rate has a positive impact on economic growth in the long run but negatively responses in the short run (Usman, 2017).

Using Structural Vector Auto regression (SVAR) model, Sen and Kaya (2015) carried out the relative effectiveness of monetary and fiscal policies on growth by using the quarterly data for Turkey over the period 2001:Q1-2014: Q2. The study showed that both monetary and fiscal policies are effective in growth. However, the relative effectiveness of monetary policy is much stronger than that of fiscal policy. The study used interest rate, inflation rate, openness to trade, and real effective exchange rate as monetary policy variables. From these variables, the study used interest rates as a proxy variable for monetary policy, which is the most effective variable for economic growth. Similarly, Isedu (2013) with the effect of monetary policy on the macroeconomic performance of Nigeria by employing quarterly time series data from 1970Q1 to 2011Q4 conclude that interest rate and money supply have a positive relationship with the output level of Nigeria.

Havi et, al. (2014) examine the relative importance of monetary policy and fiscal policy on economic growth in Ghana by using the method of Ordinary Least Squares estimation technique from a period of 1980 to 2012. The results obtained from the study conclude that monetary policy and fiscal policy have a positive impact on the economic growth of Ghana. However, the relative impact of monetary policy is more powerful than fiscal policy.

Jayaraman & Choong (2009) examine the impact of monetary policy transmission mechanisms especially three policy variables (i.e. monetary aggregate (M1), exchange rate and interest rate) on two monetary goal variables (i.e. output and price level). The study applies variance decomposition and impulse response function for a period from 1970 to 2006 in Fiji and shows that two monetary policy variables (monetary aggregate and exchange rate) are a significant while, the interest rate is not significant. Similarly, the study employs VECM to determine long run and short run causality relationship. The result shows that there are a long run and short run granger causal linkage running from all the three monetary policy variables. The study also concludes that the money channel has a larger impact on output than the interest rate channel.

Aslam and Awan (2018) analyzed the impact of monetary policy on economic growth in Pakistan. The study described that the money supply did not affect economic growth directly but indirectly i.e. through inflation. Because the main cause of inflation is Money supply. Therefore, growth rates are negatively affected by higher inflation.

Dingela and Khobai (2017) did a thesis with a title of dynamic impact of money supply on Economic Growth in South Africa by employing the recently developed Autoregressive Distributed Lag (ARDL) modeling approach. They found that broad money supply has a positive and statistically significant impact on economic growth in both the long run and the short run whereas interest rate has a negative but insignificant impact on economic growth in the short run.

Money supply and interest rate have a long-run positive significant impact for economic growth while exchange rate has a negative significant impact. However, in the short run, there is a negative significant impact of money supply and exchange rate for economic growth but interest rate has no impact in the short run (Galadima and Ngada, 2017). Similarly, the study by Chepkemoi (2014), Chaitipa.P, Chokethaworna.K, Chaiboonsrib.C, and Khounkhalaxc.M (2015) conclude money supply has a positive impact on economic growth.

2.2.2. Monetary Policy Transmission Mechanism and Consumer Price Index

Isedu (2013) defined that the theory of demand for money demonstrates the effect of money supply on consumer price index (CPI) and partially domestic output. In addition, monetarists view that money supply is an important factor affecting consumer's price level and domestic output in the short run and price level in the long run. Increase in domestic output also affected by monetary policy.

The monetary policy supports the objective of increasing the welfare of the public by focusing its efforts on promoting price stability. Because price stability is an overriding objective of monetary policy and this study considers inflation as a proxy variable for consumer price index. Inflation outcome is driven from the output gap or the difference between demand and supply. When the difference between demand and supply is higher (i.e. demand is more than supply), it pushes the general price up. This increased price leads to high inflation and higher inflation causes lower the effectiveness of the market system.

Therefore, Central banks play a major role for controlling inflation relative to output growth, and financial and exchange rate stability by considering different monetary transmission mechanism channels even if difficult to do (Akhtar, 2008).

Sebastain P. M. (2013) with a title the effect of real interest rate, money supply and unemployment to the inflation rate in the Philippines concludes that money supply and real interest rate have a negative effect for inflation. However, the study on the impact of money supply on inflation by depending upon the annual data from 1967 to 2015 in Ghana found that money supply has a positive impact for inflation (Ofori, Danquah & Zhang, 2017).

2.2.3. Monetary Policy Transmission Mechanism and Balance of Payment

Under this study, current account balance is used as a proxy variable for balance of payment. Therefore, Balance of payment is defined as a summary of statement for recording all transaction of residents of a nation with residents of all other nations to give information for the government of international position and to help formulation of monetary, fiscal and trade policy. The international transaction has two parts (i.e. credit transaction and debit transaction). Credit transactions are entered with a positive sign because of receipt of payment from foreigners and debit transactions are entered with a negative sign because of the making of payment to foreigners in the nation's balance of payment. Export of goods and services or capital inflows are entered as a credit. While, import of goods and services or capital outflows are entered as debt in the nation's balance of payment (Salvatore, 2012).

Therefore, the balance of payment is formulated as; BOP= export- Import + Net capital inflow. This shows that import has a negative effect on the balance of payment. According to Keran (1967), Export depends on external factors, imports are depended upon the level and growth in domestic income i.e. an increase in income will lead to an increase in import and a decrease in income will lead to a decrease in import. While net capital movements are influenced by both foreign and domestic factors. Change in money also has a positive relationship with change in income i.e. an increase in money will lead to an increase in income and a decrease in money will lead to a decrease in income. On the other hand, monetary authorities will respond positively with the change of balance of payment i.e. monetary policy and balance of payment have positive relation. The study concludes that, as income rise in one time, it will cause the import to increase and balance of payment becomes deteriorated. Then, the monetary authorities

implement a tight monetary policy that leads to a decrease in income (i.e. an increase in income in a previous period will lead to a decrease in income in the present period). Moreover, a decrease in income leads to a decrease in import and an increase in the balance of payment at which monetary authorities will end tight monetary policy (a decrease in income in the present period will lead to an increase in income in some future period). However, one of the major macroeconomic goals of stabilization policy in any country of the world is to maintain a healthy balance of payment position in order to safeguard the external value of Nation currency.

Isedu (2013) defines that as a monetary authority function, balance of payment flow is one of the mechanisms by which actual money balance are adjusted to their desired levels i.e. if the monetary authorities do not generate money by expansionary policy disequilibrium of the balance of payment is automatically adjusted. Therefore, excess money demand can be controlled by the sale of domestic goods and services and the excess money supply can be reduced by purchasing foreign goods and services.

Shumba Tatenda.K (2013) studied about the impact of money supply on the balance of payments in Zimbabwe by using an Ordinary Least Squares (OLS) technique of multiple regression models using statistical time series data from 1980-2010. The estimated result shows positive impact of money supply for balance of payment.

2.2.4. Empirical studies about the Effectiveness of Monetary Policy Transmission Mechanism

This study takes a critical look at some past empirical studies on the effectiveness of monetary policy transmission mechanisms for macroeconomic objectives.

As monetary policy is a demand-side policy, the government uses it to achieve macroeconomic objectives (i.e. economic growth, price stability, low unemployment, the balance of payment equilibrium and sustainable development). To achieve these objectives, a change in interest rate, a change in the money supply and a change in the exchange rate are important. For example, a decrease in interest rate will cause consumption and investment to increase. A decrease in the exchange rate will cause exports to be rise and imports to befall. These changes will lead to more money coming into the economy, hence, the attainment of economic growth (Havi & Enu, 2014).

According to Kandil, M. (2014) description, a decrease in the interest rate causes an increase in money demand. While the increase in money demand affects the money supply to increase and finally increase in money supply leads to a decrease in the effectiveness of the monetary policy. That means a decrease in interest rate leads to a decrease in the effectiveness of the monetary policy.

Otolorin & Akpan (2017) analyzed an analysis of the effectiveness of the monetary policy transmission mechanism in Nigeria. They used vector auto regression approach (VAR) within a period from 1981 to 2015 by considering the theoretical framework of macroeconomic variables that drives the real sector, financial sector and inflation sector as well as their linkages. The model suggests that, monetary policy plays a significant role in the operation of financial sector and inflation but insignificant impact on real domestic output (RGDP) i.e. channel of monetary transmission mechanisms (interest rate, asset price, exchange rate and credit) have significant impact for financial sector and inflation but insignificant for real sector.

Wai Ching Pool (2010) studies about testing transmission mechanism on economic growth in Malaysia by using bound test approach over a quarterly period of 1980:1 to 2004:4 says that monetary policy affects economy and price through different channel of monetary transmission mechanism with the ultimate goal of sustainable economic growth, low inflation level, stable and predictable. The study found that real GDP, real exchange rate and real share price are co-integrated in the long run. The result shows that interest rate and exchange rate are not a good indicator of monetary policy because interest rate may affect by a change in investment demand and exchange rate can affect by a change in term of trade. Secondly, the asset price channel affects monetary policy and ultimately affects real GDP. In addition, the credit channel affects real GDP but not significantly.

Chapter Three

Methodology of the Study

3.1. Model Specification

For model specification, this study employs the ARDL model with the technique of pooled mean group of Pesaran and Smith (1995).

The ARDL (p, q, q… q) model within a given data on time periods, t=1, 2… T and groups, i=1, 2… N is given as;

$$y_{it} = \sum_{j=1}^{p} \lambda_{it}\, y_{i,t-j} + \sum_{j=0}^{q} \delta_{ij}\, X_{i,t-j} + \mu_i + \varepsilon_{it}$$

Therefore, I use three dependent variables (GDPGR, CPI and BOP) with three models for specified countries, i=1,2,……,9 on time periods, t= 1,2,……,26 as follows by depending on the above model. These are;

Model 1: GDP Model

$$GDPGR_{it} = f\,(GDPGR_{i,t-j}, RIR_{i,t-j}, ER_{i,t-j}, DC_{i,t-j}, M2_{i,t-j});$$

$$GDPGR_{it} = \sum_{j=1}^{p} \beta_{it}\, GDPGR_{i,t-j} + \sum_{j=0}^{q} (\delta_{ij}\, RIR_{i,t-j} + \gamma_{ij} ER_{i,t-j} + \sigma_{ij} DC_{i,t-j} + \theta_{ij} M2_{i,t-j}) + \mu_i + \varepsilon_{it}$$

Whereas; $\boldsymbol{GDPGR_{it}}$ = growth domestic product growth rate of country "i" in period t, $\boldsymbol{GDPGR_{it-j}}$ = 'j' level lagged value of growth domestic product growth rate of country "i" in period t, $\boldsymbol{RIR_{it-j}}$=Real interest rate for country "i" in period t with 'j' level of lagged value, $\boldsymbol{ER_{it} - \mathbf{j}}$ = exchange rate of country "i" in period t with 'j' level of lagged value, $\boldsymbol{DC_{it-j}}$= domestic credit for country "i" in period t with 'j' level lagged value, $\boldsymbol{M2_{it-j}}$ = broad money supply for country "i" in period t with 'j' level lagged value and $\boldsymbol{\varepsilon_{it}}$ *is the error term of each country in period t while,* $\boldsymbol{\mu_i}$ *is the individual effect of the country "i".*

Model 2: CPI Model

$$CPI_{it} = f(CPI_{it-j}, RIR_{i,t-j}, ER_{i,t-j}, DC_{i,t-j}, M2_{i,t-j});$$

$$CPI_{it} = \sum_{j=1}^{p} \beta_{it} CPI_{i,t-j} + \sum_{j=0}^{q} (\delta_{ij} RIR_{i,t-j} + \gamma_{ij} ER_{i,t-j} + \sigma_{ij} DC_{i,t-j} + \theta_{ij} M2_{i,t-j}) + \mu_i + \varepsilon_{it}$$

Whereas; $\boldsymbol{CPI_{it}}$= consumer price index of country "i" in period t (proxy with inflation), $\boldsymbol{CPI_{it-J}}$= 'j' level lagged value of consumer price index of country "i" in period t, $\boldsymbol{RIR_{it-j}}$=Real interest rate for country "i" in period t with 'j' level of lagged value, $\boldsymbol{ER_{it} - \mathbf{j}}$ = exchange rate of country "i" in period t with 'j' level of lagged value, $\boldsymbol{DC_{it-j}}$= domestic credit for country "i" in period t with 'j' level lagged value, $\boldsymbol{M2_{it-j}}$ = broad money supply for country "i" in period t with 'j' level lagged value and $\boldsymbol{\varepsilon_{it}}$ *is the error term of each country in period t while,* $\boldsymbol{\mu_i}$ *is the individual effect of country "i".*

Model 3: BOP model

$$BOP_{it} = f(BOP_{it-j}, RIR_{i,t-j}, ER_{i,t-j}, DC_{i,t-j}, M2_{i,t-j});$$

$$BOP_{it} = \sum_{j=1}^{p} \beta_{it} BOP_{i,t-j} + \sum_{j=0}^{q} (\delta_{ij} RIR_{i,t-j} + \gamma_{ij} ER_{i,t-j} + \sigma_{ij} DC_{i,t-j} + \theta_{ij} M2_{i,t-j}) + \mu_i + \varepsilon_{it}$$

Whereas; $\boldsymbol{BOP_{it}}$ = balance of payment for country "i" in period t (proxy with current account), $\boldsymbol{BOP_{it-j}}$ = 'j' level lagged value of balance of payment of country "i" in period t, $\boldsymbol{RIR_{it-j}}$=Real interest rate for country "i" in period t with 'j' level of lagged value, $\boldsymbol{ER_{it} - \mathbf{j}}$ = exchange rate of country "i" in period t with 'j' level of lagged value, $\boldsymbol{DC_{it-j}}$= domestic credit for country "i" in period t with 'j' level lagged value, $\boldsymbol{M2_{it-j}}$ = broad money supply for country "i" in period t with 'j' level lagged value and $\boldsymbol{\varepsilon_{it}}$ *is the error term of each country in period t while,* $\boldsymbol{\mu_i}$ *is the individual effect of country "i".*

3.2. Definition of Variables

Growth Domestic Product Growth Rate (GDPGR):- Gross domestic product is the total value of everything produced in the country. It does not matter if citizens or foreigners produce it. If they are located within the country's boundaries, their production is included in GDP. Therefore, GDP measures the economic output of a nation. While GDP growth rate measures how fast the economy is growing. It does this by comparing one year of the country's growth domestic product to the previous year.

Consumer price index (CPI):- Consumer price indices (CPIs) are index numbers that measure changes in the prices of goods and services purchased or otherwise acquired by households, which households use directly, or indirectly, to satisfy their own needs and wants. Consumer price indices can be intended to measure either the rate of price inflation as perceived by households or changes in their cost of living (that is, changes in the amounts that the households need to spend in order to maintain their standard of living). Therefore, the proxy variable is inflation for consumer price index.

Balance of payment (BOP):- is a statistical statement that systematically summarizes transactions in goods, services, factor compensation, and assets transactions for a specific time period. Therefore, it is a flow concept, like a company's income statement that summarizes a company's revenue and spending for a particular time period. In addition, it is a statistical record of all the economic transactions between residents of the reporting country and residents of the rest of the world (Pilbeam K., 2006). Therefore, the proxy variable for balance of payment is current account. This is the fact that, current account balance is the sum of net exports of goods and services, net primary income and net secondary income.

Exchange Rate (ER):- exchange rate is the value of one nation's currency versus the currency of another nation or economic zone (Yang & Zeng, 2014). He also defines the real exchange rate as the nominal exchange rate adjusted for the relative purchasing power. It can also be interpreted as the purchasing power of the currency abroad relative to that at home or it is the price of the currency in real terms.

Real Interest Rate (RIR):- A real interest rate is an interest rate that has been adjusted to remove the effects of inflation to reflect the real cost of funds to the borrower and the real yield to the lender or to an investor. The real interest rate of an investment is calculated as the amount by which the nominal interest rate is higher than the inflation rate:

i.e. Real Interest Rate = Nominal Interest Rate - Inflation, from this formula we have understood that, If the inflation is higher than the nominal interest rate, the real interest may also be negative.

Broad Money Supply (M2):- is a measure of the domestic money supply that includes M1 plus Quasi-money (savings and time deposits), overnight repurchase agreements, and personal balances in money market accounts. It includes money that can be used for spending (M1) plus items that can be quickly converted to M1 (NBE's monetary policy framework, 2009).

Domestic Credit (DC):- In this study, domestic credit represents the financial sector credit as a proxy variable. Because, financial sector credit includes all credit to various sectors on a gross basis by including monetary authorities and deposit money banks, as well as other financial corporation's where data are available with the exception of credit to the central government, which is net.

3.3. Data and Source

Subjected to relevance and availability of data, the most important variables that are used for this study includes monetary policy transmission mechanisms (i.e.; real interest rate, exchange rate, money supply (broad money supply) and domestic credit) and three macroeconomic objective variables (i.e.; economic growth rate, consumer price index and balance of payment). As a source of data, this study collects data from the world development indicator. The data set stretches from the year 1992 to 2017.

3.4. Method of Analysis

Studies on the analysis of the effectiveness of monetary policy transmission mechanism on macroeconomic objectives especially on stable economic growth, consumer price index and balance of payment were analyzed by using dynamic approaches of panel data by employing Autoregressive Distributed Lag (ARDL) model with a technique of Pooled Mean Group (PMG).

3.5. The Dynamic Panel Model

Panel data is a statistical tool to perform model using a number of individuals across a defined period. There are two types of panel data i.e. Static Panel and Dynamic Panel. We employed the Dynamic Panel methodology to estimate our model because of addressing heterogeneity of individuals and using several instrumental variables to deal with the endogeneity of the variables that are known as lagged variables. In the model, two conditions are required (i.e. a number of observation n and period of time t). To have adequate degrees of freedom and to avoid over-identification, it is advisable to use a large number of individuals in a short time.

This is used more frequently in studies at the firm level because databases usually have a large number of observations in a short time. However, for countries, regions, sectors etc. database is frequently small in a long time and some serious difficulties arise i.e. the proliferation of instruments (existence of a higher level of instruments) & serial autocorrelation of errors. The proliferation of instruments will cause over identification in the model because of the generation of instrumental variables in differences and levels (Labra & Torrecilla, 2018).

For dynamic panel data with a long period of time and a small number of observations, two procedures are commonly used. The first one is called Mean Group (MG) estimator, which can estimate separate equations for each group and examine the distribution of the estimated coefficients across groups. According to Pesaran and Smith (1999), this estimator provides consistent estimates of the parameters' averages. It also provides efficient long-run estimators for a large sample size. It allows the parameters to be freely independent across groups and does not consider potential homogeneity between groups. The second one is called Pooled Mean Group (PMG) estimator, which considers intercepts, short-run coefficients, and error variances are to be differing freely across groups but constrains the long run coefficient to be the same. That means PMG is an intermediate estimator that allows the short-term parameters to differ between groups

while imposing equality of the long-term coefficients between countries. One advantage of the PMG is that it can allow the short-run dynamic specification to differ from country to country while making the long-run coefficients constrained to be the same (Pesaran, Shin & Smith, 2019). Therefore, PMG estimations are more relevant for this analysis. PMG was applied in order to detect the long and short run association between financial development and economic growth and investigate the possibly heterogeneous dynamic issue across countries by using the appropriate methods of Autoregressive Distributed Lag (ARDL) in dynamic panel models. That means it allows short-run coefficients, including the intercepts, the speed of adjustment to the long run equilibrium values, and error variances to be heterogeneous country by country while the long-run slope coefficients are restricted to be homogeneous across countries. For the validity, consistency and efficiency of this methodology, the assumptions of the pooled mean group i.e. the existence of a long-run relationship among variables (negative coefficient of error correction term), serial uncorrelated of error-correction model and the explanatory variables can be treated as exogenous are important. These conditions are fulfilled by including the ARDL lags for the dependent and independent variables in the error-correction form (Rafindadi & Yusof, 2013; Lee & Wang, 2015).

The maximum lag length of the study is ARDL (4, 3, 3, 3, 3). However, the study uses the base model between the above different variables as ARDL (1, 1, 1, 1, 1) by using the natural logarithm function for smoothing the coefficients of the regression are and to simplify the model equation;

$$lnGDPGR_{it} = \beta_i lnGDPGR_{it-1} + \delta_{1i} lnRIR_{it} + \delta_{2i} lnRIR_{it-1} + \gamma_{1i} lnER_{it} + \gamma_{2i} lnER_{it-1} + \sigma_{1i} lnDC_{it} + \sigma_{2i} lnDC_{it-1} + \theta_{1i} lnM2_{it} + \theta_{2i} lnM2_{it-1} + \mu_i + \varepsilon_{it}$$

$$lnCPI_{it} = \beta_i lnCPI_{it-1} + \delta_{1i} lnRIR_{it} + \delta_{2i} lnRIR_{it-1} + \gamma_{1i} lnER_{it} + \gamma_{2i} lnER_{it-1} + \sigma_{1i} lnDC_{it} + \sigma_{2i} lnDC_{it-1} + \theta_{1i} lnM2_{it} + \theta_{2i} lnM2_{it-1} + \mu_i + \varepsilon_{it}$$

$$lnBOP_{it} = \beta_i lnBOP_{it-1} + \delta_{1i} lnRIR_{it} + \delta_{2i} lnRIR_{it-1} + \gamma_{1i} lnER_{it} + \gamma_{2i} lnER_{it-1} + \sigma_{1i} lnDC_{it} + \sigma_{2i} lnDC_{it-1} + \theta_{1i} lnM2_{it} + \theta_{2i} lnM2_{it-1} + \mu_i + \varepsilon_{it}$$

The short-run model or error correction equations between variables are as follows:

$$\Delta lnGDPGR_{it} = \emptyset(lnGDPGR_{it-1} - \partial_{1i} lnRIR_{it} - \tau_{1i} lnER_{it} - \alpha_{1i} lnDC_{it} - \omega_{1i} lnM2_{it}) - \delta_{1i} \Delta lnRIR_{it} - \gamma_{1i} \Delta lnER_{it} - \sigma_{1i} \Delta lnDC_{it} - \theta_{1i} \Delta lnM2_{it} + \varepsilon_{it}$$

$$\Delta lnCPI_{it} = \emptyset(lnCPI_{it-1} - \partial_{1i} lnRIR_{it} - \tau_{1i} lnER_{it} - \alpha_{1i} lnDC_{it} - \omega_{1i} lnM2_{it}) - \delta_{1i} \Delta lnRIR_{it} - \gamma_{1i} \Delta lnER_{it} - \sigma_{1i} \Delta lnDC_{it} - \theta_{1i} \Delta lnM2_{it} + \varepsilon_{it}$$

$$\Delta lnBOP_{it} = \emptyset(lnBOP_{it-1} - \partial_{1i} lnRIR_{it} - \tau_{1i} lnER_{it} - \alpha_{1i} lnDC_{it} - \omega_{1i} lnM2_{it}) - \delta_{1i} \Delta lnRIR_{it} - \gamma_{1i} \Delta lnER_{it} - \sigma_{1i} \Delta lnDC_{it} - \theta_{1i} \Delta lnM2_{it} + \varepsilon_{it}$$

Chapter Four

Overview of Monetary Policy Transmission Mechanism

The research attempts to present an overview of the selected east African countries' central bank monetary policy with a focus on monetary policy transmission mechanisms and trends of the exchange rate, real interest rate, domestic credit and broad money supply. A use full way to understand monetary policy is to focus on central bank monetary policy actions of selected east African countries and the transmission mechanisms through which those actions work their actions in selected East African countries. Therefore, overview of the monetary policy transmission mechanism can be seen by categorizing into two (i.e. central bank monetary policy of selected east African countries and trends of transmission mechanisms of selected East African countries).

4.1. Central Bank Monetary Policy of Selected East African Countries

There are different channels that affect different variables and different markets by determining the most effective set of policy instruments that central banks face in making their decisions. Because, central banks have a key role in develop local debt markets. The development of local currency bond markets is critical to Africa's financial development and resilience to shocks. The good macroeconomic policy requires mechanisms that ensure appropriate coordination and macroeconomic management. The central bank use monetary policy to achieve the goals of macroeconomic management. The goals of macroeconomic management are sustainable growth, full employment, price stability and a healthy balance of payments. Therefore, Central bank uses monetary policy to achieve these goals by using different channels. However, the monetary policy objective of the central bank is not the same for all central banks.

For example, as described under the NBE's Monetary Policy Framework (2009), monetary policy strategy of a central bank of Ethiopia depends on a number of factors that are unique and contextual to the country. The important factor is the degree of openness of the economy i. e. more opens the economy due to the dominant role of the external sector. Moreover, the Ethiopian monetary policy has three main targets (i.e. the ultimate or final target, the intermediate target and the operating target). The principal objective of the final targets of monetary policy of National Bank of Ethiopia is to maintain price & exchange rate stability and

support the sustainable economic growth of Ethiopia by considering exchange rate stability as the principal policy objective for monetary policy to affect both foreign reserve position and domestic money supply. However, the money supply is considered as an intermediate target i.e. money supply is not directly controlled by the central bank by taking the broader definition of money or M2 as money supply. The operational target is an economic variable that can be used to link instruments of monetary policy to intermediate targets set by the central bank and represents the first impulse in the transmission process of monetary policy. NBE uses the growth of base money/reserve money as an operational target. Reserve money (Base money) is defined as the sum of currency in circulation and deposits of commercial banks at NBE.

Kenya's central bank (CBK) monetary policy is designed to support growth in the production of goods and services to achieve and maintain a low and stable rate of inflation. Therefore, Central Bank of Kenya (CBK) has a responsibility of formulating and implementing monetary policy for achieving and maintaining prices stability (Annual report of CBK, 2016/17). Because, monetary policy is quicker for resolving economic shocks by concerning multiple monetary targets i.e. price stability, promotion of growth, achieving full employment, smoothing the business cycle, preventing financial crises, stabilizing long-term interest rates and the real exchange rate. Therefore, Bank studied the monetary policy transmission mechanism from time to time to update the available evidence. The evidence from different studies suggests that the money, interest rate, exchange rate and credit channels were operational during varied study periods with various strengths (Kamaan & Nyamongo, 2014). For example, the study by Davoodi, Dixit and Pinter (2013) shows that exchange rate and credit channels are important in Kenya.

National Bank of Rwanda (BNR) is an independent central bank with the missions of ensuring and maintaining price stability, achieving and maintaining exchange stability, enhancing and maintaining a stable and competitive financial system without any exclusion and supporting the government's general economic policies (BNR law 55/2007, article 5). To design, manage and implement its monetary policy, understanding of monetary policy transmission mechanisms is essential for the BNR. Therefore, National Bank of Rwanda is operating its monetary policy under a monetary targeting regime by using the broad monetary aggregate (M3) as an intermediate target and reserve money as an operating target to achieve the objective of price stability (Nkikabahizi, 2013).

The Bank of Zambia maintains macroeconomic stability and continues to implement prudent monetary policies to support and promote economic growth with associated of low and stable inflation and lower interest rate to encourage households and businesses to borrow for investment purposes (Monetary Policy Statement of Zambia, 2016).

4.2. Trends of Transmission Mechanisms of Monetary Policy

Due to a shortage of data, the thesis analyzed selected transmission mechanisms (Exchange Rate, Real Interest Rate, Domestic Credit and Broad Money Supply) for selected east African countries (Ethiopia, Kenya, Tanzania, Uganda, Burundi, Rwanda, Madagascar, Zambia and Seychelles). Therefore, we have seen the trend of these monetary policy transmission mechanisms in selected east African countries.

4.2.1. Trends of Exchange Rate (ER)

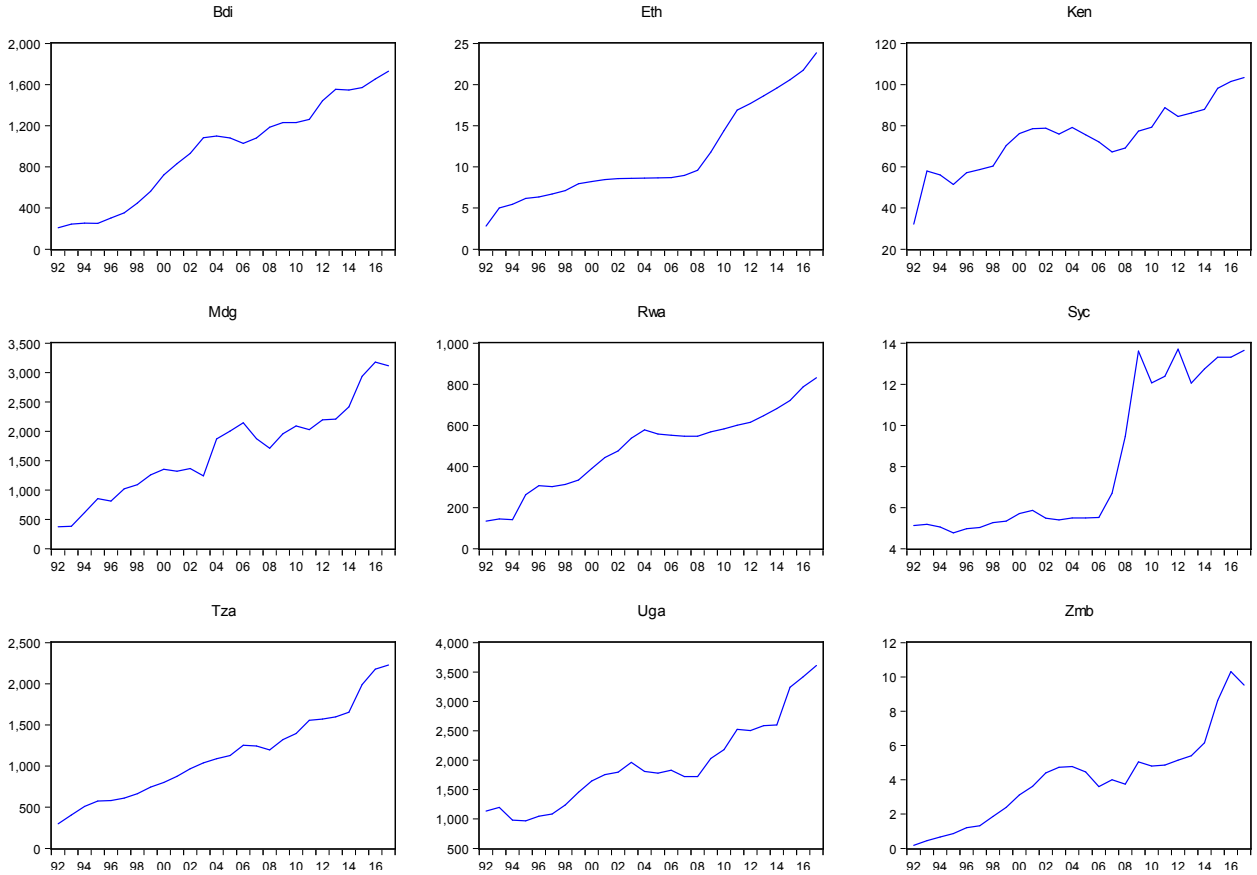
Monetary policy plays an important role in achieving the ultimate economic objectives of sustainable growth, full employment, price stability and a healthy balance of payments. In the pursuit of these goals, the central bank sets intermediate objectives for monetary policy. The intermediate goals are regarded as channels through which monetary policy is transmitted to the macro economy with the aim of influencing the ultimate objectives. Therefore, the exchange rate is one of the intermediate objectives through which monetary policy is transmitted to achieve the ultimate goals of monetary management. Because, the exchange rate channel is one of the primary transmission channels of monetary policy in open economies, especially those with flexible exchange rate regimes. A monetary expansion would tend to reduce the real interest rate and lead to a depreciation of the currency, which would increase exports, reduce imports and finally leads to increase economy i.e. currency depreciation affects the growth of exports and gross domestic product. Therefore, in countries that are open and have flexible exchange rates, the exchange rate channel can be a powerful transmission mechanism for monetary policy. Different countries' central bank reported that the exchange rate channel is among the more important transmission mechanisms for monetary policy (Mohanty, M. S. 2014). The table below describes the individual exchange rate of selected East African Countries from year 1992 to year 2017.

Table 1: Exchange Rate (ER) with local currency per US$

Year	Countries								
	Burundi	Ethiopia	Kenya	Madagascar	Rwanda	Seychelles	Tanzania	Uganda	Zambia
1992	208.30267	2.8025	32.216833	372.79333	133.93858	5.1219833	297.70808	1133.8343	0.1722138
1993	242.78	5	58.001333	382.7565	144.23702	5.1815333	405.27402	1195.0168	0.4527627
1994	252.6625	5.465	56.050575	613.46717	140.70385	5.0558583	509.63088	979.44542	0.6693706
1995	249.7575	6.1583333	51.429833	853.12633	262.18226	4.761975	574.76174	968.91667	0.8641192
1996	302.74667	6.351675	57.114867	812.25033	306.82	4.9699833	579.97667	1046.0848	1.2079
1997	352.35083	6.7093417	58.731842	1018.1772	301.52982	5.0263417	612.1225	1083.0087	1.3144975
1998	447.76583	7.1159083	60.3667	1088.2797	312.31409	5.2621917	664.67121	1240.3058	1.8620692
1999	563.5625	7.94225	70.326217	1256.755	333.94193	5.3425833	744.75908	1454.8272	2.3880192
2000	720.67333	8.2172583	76.175542	1353.4962	389.69622	5.7138167	800.40852	1644.4753	3.1108442
2001	830.35333	8.4574917	78.563195	1317.6988	442.99189	5.8575417	876.41167	1755.6588	3.610935
2002	930.74917	8.56775	78.749142	1366.3912	475.36524	5.4800333	966.58278	1797.5505	4.398595
2003	1082.62	8.5996833	75.935569	1238.3277	537.65498	5.4007167	1038.419	1963.7201	4.733271
2004	1100.9	8.6355833	79.173876	1868.8578	577.44897	5.5	1089.3348	1810.3047	4.7788754
2005	1081.5772	8.6664417	75.554109	2003.0258	557.82264	5.5	1128.9342	1780.5403	4.4635033
2006	1028.6836	8.6986158	72.100835	2142.3017	551.71033	5.5196917	1251.9	1831.4519	3.603072
2007	1081.8697	8.96595	67.317638	1873.8767	546.955	6.7010595	1245.0355	1723.4916	4.0025227
2008	1185.6908	9.5997417	69.17532	1708.3708	546.84865	9.4572433	1196.3107	1720.4439	3.7456607
2009	1230.1792	11.7776	77.352012	1956.2058	568.28133	13.60994	1320.3121	2030.4881	5.0461092
2010	1230.7483	14.40959	79.233152	2089.95	583.13091	12.067757	1395.6249	2177.5575	4.7971369
2011	1261.0733	16.899226	88.81077	2025.1175	600.30652	12.381032	1557.4334	2522.802	4.8606655
2012	1442.5056	17.704761	84.529602	2194.9667	614.29514	13.704031	1571.698	2504.5631	5.1472527
2013	1555.0908	18.626629	86.122879	2206.9142	646.63597	12.058317	1597.5558	2586.8896	5.3958871
2014	1546.6867	19.58579	87.922164	2414.8117	681.86172	12.747033	1653.232	2599.7882	6.1528162
2015	1571.8983	20.576849	98.178453	2933.5083	720.97511	13.313925	1991.391	3240.6454	8.632356
2016	1654.6267	21.731547	101.50437	3176.5392	787.25152	13.319117	2177.086	3420.098	10.313053
2017	1729.055	23.866104	103.41092	3116.11	831.53079	13.647842	2228.8576	3611.2245	9.5195014

Data Source: ***World Development Indicators***

Graph 1: Exchange Rate (ER) with local currency per US$



As we observed from the above table (Table 1) and graph (Graph 1), we have concluded that the exchange rate of Ethiopia is continuously increased from year to year with different increasing rate. For example, during year 1992 to year 1993, it increased from 2.8 to 5 and from year 2009 to 2010 it changes from 11.78 to 14.4. In addition, the change from year 2010 to 2011 is great varied (i.e. 14.4 to 16.9). The change in year 1995 to 1997 and year 2000 to 2007 is not significantly varied and the graph looks like a smooth curve. In the year 2011 to 2016, the change in exchange rate is constant (i.e. exchange rate increase with constant rate and the graph shows that vertical increase).

The exchange rate for Uganda is higher than the selected East African countries in the period from 1992 to 2017. This indicates that the local currency of Uganda is lower than the selected East African Countries' currency. But the exchange rate of Uganda in year 1992 and 1993 is higher than the exchange rate from year 1994 to year 1997. The above graph and table also show that the Ugandan exchange rate increases from year to year starting from year 1995 until

year 2003. The exchange rate for Zambia is lower than the selected East African Countries in the period from 1992 to 2017. This also shows that the local currency for Zambia is higher than the local currency of selected East African Countries. The exchange rate of Rwanda is less than the exchange rate of Burundi, Madagascar, Tanzania and Uganda. Nevertheless, in 1995 & 1996 the exchange rate of Rwanda is higher than the exchange rate of Burundi. The exchange rate in Kenya fluctuates from year to year. For example, from 1992 to 1993 exchange rate of Kenya grew from 32.2 to 58.0, which is the higher difference (steep slope of the graph). On the other hand, the exchange rate in Seychelles was steady from 1992 up to 2006 and started fluctuating thereafter. The exchange rate of Madagascar is higher than the selected East African Countries next to Uganda. The rate increases continuously from year of 1992 to year of 2002 except in year of 1996. Next to the year 2002, the exchange rate of Madagascar starts to fluctuate from year to year. Exchange rate of Tanzania also increases from year to year continuously except in 2007 and 2008. The exchange rate is higher but less than that of Madagascar except in a period of 1993.

4.2.2. Trends of Real Interest Rate (RIR)

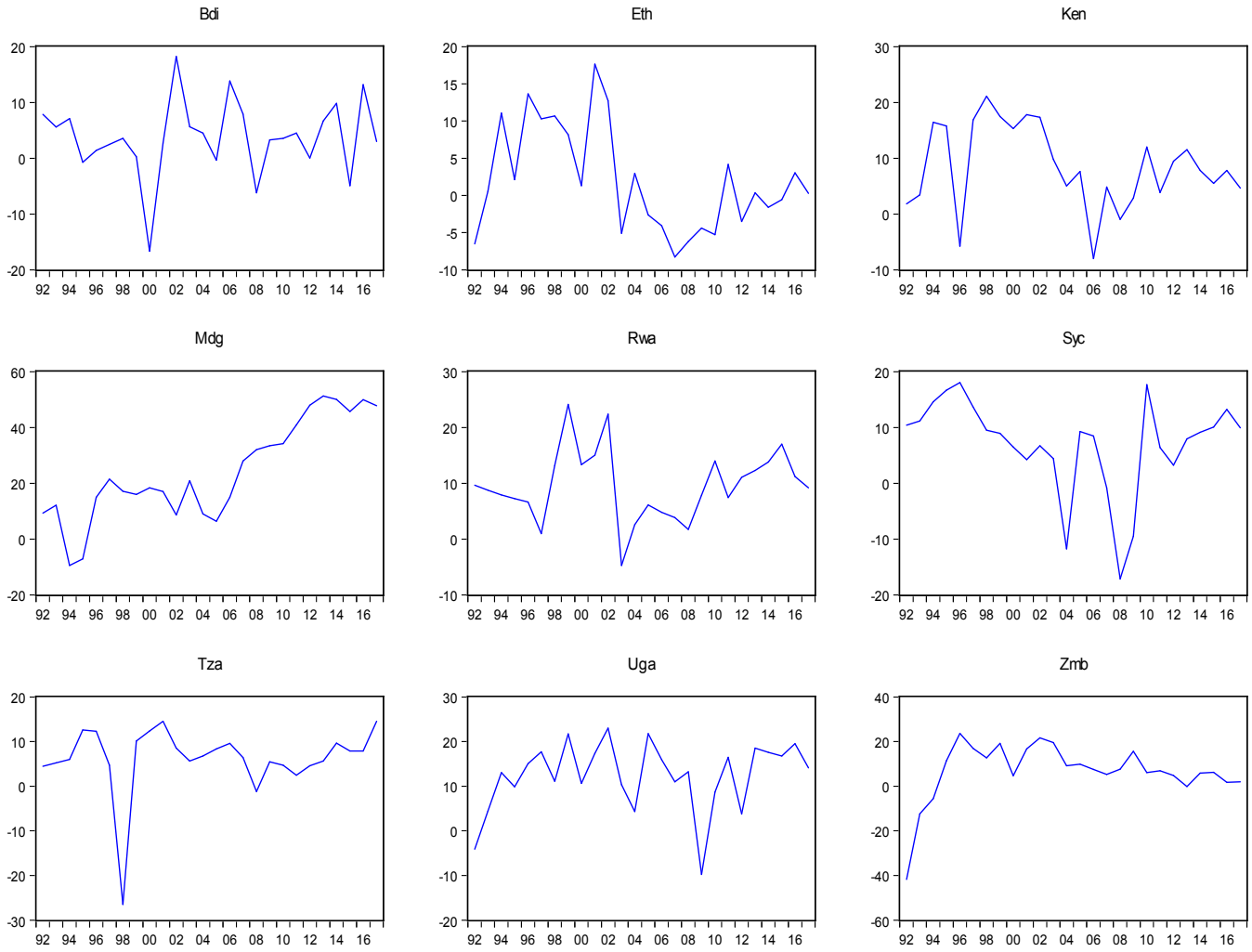
Interest rate means any bank lending rate or any rate at which a lender charge and it has an important role in our everyday lives and can greatly affect our buying power (Kanwal et.al, 2014). When there is lower interest rate this leads to the quantity of money in circulation increases. Trends of east African real interest rate are fluctuated as we have seen in the table and the graph below. This fluctuation is due to the variation of inflation from year to year because real interest rate is the difference between nominal interest rate and inflation, which is nominal interest rate, is almost stable and then its impact for variation of real interest rate is not that much significant. Variation of inflation is due to the change in money supply because the main cause of inflation is money supply in the economies. Aslam. M & Awan,G.A., (2018) described that, money supply does not directly affect economic growth but it indirectly affects through inflation in the economy. The table and the graph below show the trend of real interest rate in the selected east African countries.

Table 2: Real Interest Rate (RIR) with percent

Year	Countries								
	Burundi	Ethiopia	Kenya	Madagascar	Rwanda	Seychelles	Tanzania	Uganda	Zambia
1992	7.8334295	-6.5195889	1.8253292	9.2513871	9.6275471	10.397228	4.4861394	-4.1062928	-41.790244
1993	5.5911204	0.5496147	3.4134724	12.105904	8.7660378	11.153786	5.2530205	4.4578131	-12.455969
1994	7.0908334	11.077559	16.42811	-9.442338	7.9045286	14.615076	5.9693897	13.021919	-5.6344702
1995	-0.7272685	2.1089884	15.801648	-7.1451504	7.2583966	16.669382	12.589576	9.8614131	11.424914
1996	1.4082026	13.644899	-5.7765885	14.987364	6.6122647	18.024427	12.279688	15.034247	23.670486
1997	2.4759381	10.272117	16.879568	21.473635	0.9457562	13.649154	4.7125784	17.726871	16.97663
1998	3.5436737	10.666162	21.096326	17.119038	13.194467	9.5210304	-26.499577	11.100686	12.739309
1999	0.2450482	8.1771875	17.454049	15.982678	24.140093	8.9304055	10.121788	21.686832	19.158795
2000	-16.679198	1.3035686	15.327433	18.316936	13.331745	6.4945477	12.362532	10.621614	4.6647681
2001	2.7329037	17.635483	17.812501	16.997682	15.035293	4.209419	14.541002	17.334496	16.677463
2002	18.252036	12.743948	17.358141	8.6524004	22.378095	6.7311602	8.5470028	22.995593	21.615624
2003	5.6144023	-5.114908	9.7705109	20.907399	-4.7615718	4.4069684	5.6247485	10.329039	19.525341
2004	4.5145212	2.9723771	5.0452576	8.9749317	2.5525086	-11.776678	6.7873453	4.3392439	9.1969336
2005	-0.3337127	-2.6170635	7.6099875	6.385278	6.0882327	9.2678815	8.3272561	21.765552	9.9090852
2006	13.833187	-4.0809089	-8.009867	14.963976	4.7805272	8.4852357	9.6123527	15.909004	7.5178202
2007	7.9151149	-8.2925537	4.8190908	27.984234	3.8434915	-0.8105257	6.3895652	10.980624	5.2408706
2008	-6.1948356	-17.121776	-0.984997	31.99797	1.7239477	-17.15803	-1.2017622	13.24297	7.6137954
2009	3.2745591	4.4146113	2.8370782	33.458294	7.8653549	-9.527437	5.4922304	-9.7494134	15.633633
2010	3.5541572	-5.4548086	12.028233	34.198052	14.001045	17.659312	4.6752616	8.6891912	6.1129422
2011	4.4924895	6.7772871	3.8385116	40.90373	7.4437553	6.405684	2.4639427	16.440081	6.9491962
2012	0.0241139	5.7878426	9.4566161	47.999701	11.048176	3.2510957	4.590681	3.8091836	4.8230372
2013	6.6620446	6.5932738	11.547835	51.2855	12.310329	7.9300858	5.6491962	18.51338	-0.1881384
2014	9.8414075	5.9848652	7.8151158	50.057164	13.788045	9.1487441	9.6541693	17.580957	5.8189688
2015	-4.9490446	-0.5542659	5.5092954	45.713297	16.999025	10.058302	7.9124908	16.758242	6.1782669
2016	13.168971	3.019504	7.7922255	49.980123	11.182948	13.253536	7.8962277	19.538222	1.696021
2017	2.9837285	0.2650283	4.6275908	47.764051	9.1513166	9.9058375	14.523259	14.115438	1.9705882

Data Source: ***World Development Indicators***

Graph 2: Real Interest Rate (RIR)



As we have seen from the table and the graph 2, real interest rate is fluctuating from year to year in each country and there is negative real interest rate in each country at different time. For the negative value of real interest rate inflation play the main role since real interest rate is the difference between nominal interest rate and inflation. Therefore, a higher inflation leads to a negative real interest rate. This higher inflation is may be due to higher money supply.

The table and the graph shows that, the real interest rates for Burundi, Uganda and Zambia reach in a higher value during year of 2002 while Ethiopia, Kenya and Tanzania have higher real interest rate during year 2001. Tanzania has lower real interest rate during the year 1998, which is -26. 5 %.

As a result, the Tanzanian government had taken policy measurements of contraction monetary policy and price stabilization intervention to adjust this fluctuation of real interest rate. When we see the real interest rate of Rwanda, it fluctuates with a slit difference from 1992 to 1996 but after 1998 to 2000, the real interest rate in Rwanda has higher fluctuation. Burundi has the lowest real interest rate in year of 2000 and the highest value in the year of 2002. For Seychelles, the real interest rate is increased continuously from year 1992 to year 1996.

4.2.3. Trends of Domestic Credit (DC)

As we have described under section three in the methodology part, the financial sector is taken as a proxy variable for domestic credit. Because, monetary policy is affected by financial sector credit and they have higher relationship to determine the overall economy.

Law S.M. & Singh.N (2014) concluded that the level of financial development is beneficial to growth only up to a certain threshold; beyond the threshold level, further development of finance tends to adversely affect growth. That means, more finance is not necessarily good for economic growth and highlight that an ‘‘optimal’’ level of financial development is more crucial in facilitating growth.

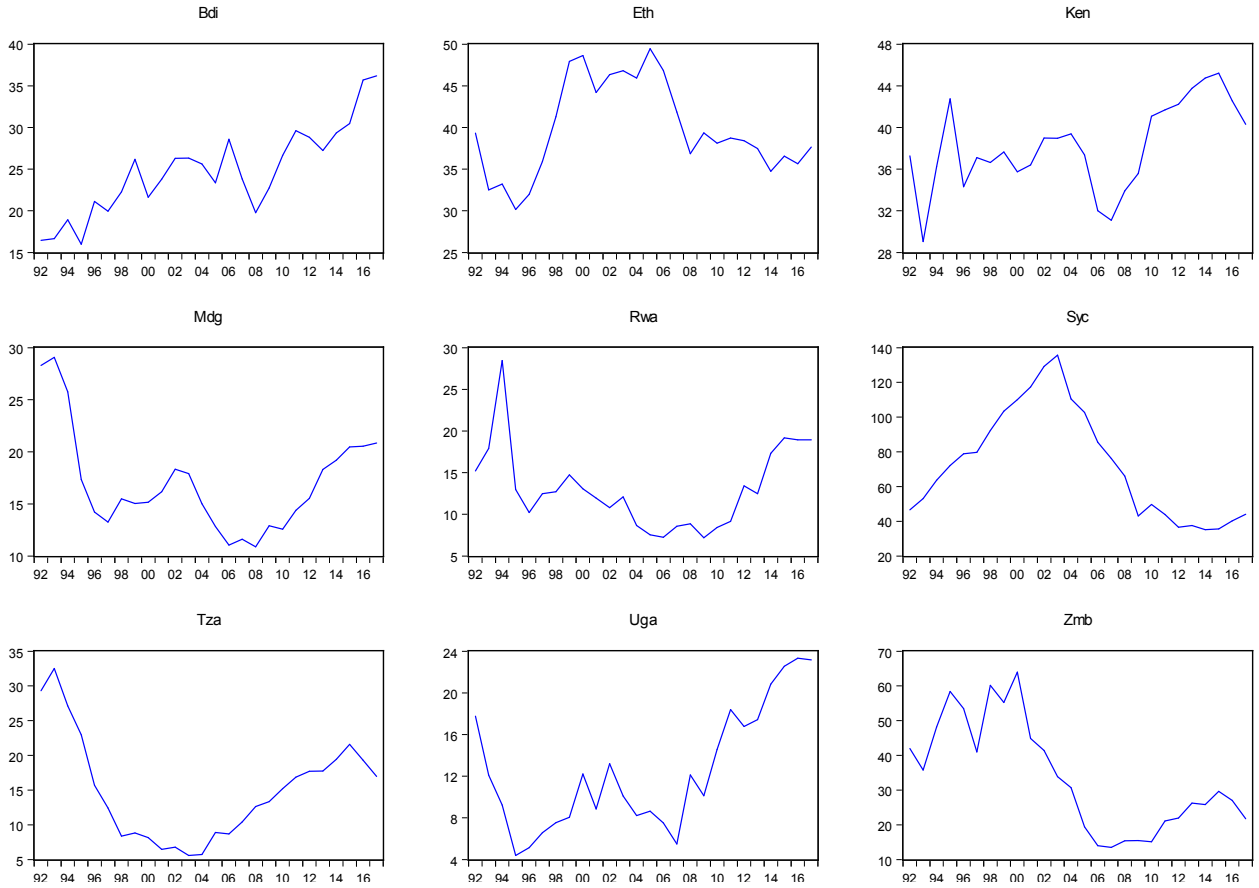
Therefore, the table and the graph below show that the value of financial sectors credit in each countries.

Table 3: Domestic Credit (DC) percent of GDP

Year	Countries								
	Burundi	Ethiopia	Kenya	Madagascar	Rwanda	Seychelles	Tanzania	Uganda	Zambia
1992	16.445612	39.33418	37.264394	28.299112	15.214984	46.591932	29.316156	17.75071	41.977394
1993	16.664853	32.497003	29.056127	29.074483	17.908372	53.058316	32.504994	12.10401	35.759687
1994	18.917769	33.209059	36.225944	25.760678	28.452955	63.661869	27.104441	9.2323658	48.1951
1995	15.98171	30.141434	42.746081	17.346773	12.978753	72.138341	22.972356	4.3781225	58.398804
1996	21.139529	31.971247	34.307855	14.222972	10.210833	78.904347	15.702102	5.1506057	53.500337
1997	19.943174	35.905172	37.103996	13.249547	12.470106	79.649706	12.423049	6.5654072	40.959115
1998	22.27941	41.301454	36.631186	15.499213	12.707387	92.329304	8.3546782	7.5264496	60.163804
1999	26.171915	47.922953	37.654092	15.042729	14.741945	103.3629	8.8241086	8.0436535	55.246996
2000	21.610828	48.641964	35.746069	15.157486	13.054745	110.05714	8.1566422	12.203205	63.962447
2001	23.811982	44.198345	36.413561	16.168023	11.954729	117.31441	6.4689929	8.860961	44.840432
2002	26.282301	46.331387	38.978653	18.325887	10.795102	129.16366	6.7690309	13.205252	41.398278
2003	26.319681	46.823393	38.973941	17.910931	12.095154	135.7098	5.591615	10.087526	33.890409
2004	25.627364	45.943048	39.37959	15.012206	8.6589926	110.4922	5.7283884	8.2199292	30.675181
2005	23.363145	49.450974	37.360841	12.836104	7.5512644	102.69269	8.8889272	8.6357223	19.435178
2006	28.57625	46.828171	32.002763	11.050339	7.2497219	85.531577	8.6840742	7.5107192	13.973829
2007	23.816502	41.842055	31.093045	11.619429	8.5712128	76.257067	10.410979	5.4924924	13.458356
2008	19.765726	36.862526	33.902523	10.871349	8.863956	66.003737	12.619179	12.121856	15.409173
2009	22.729334	39.352291	35.576963	12.8952	7.1852656	43.05513	13.334983	10.128582	15.483226
2010	26.643342	38.107408	41.080468	12.571018	8.4107821	49.612545	15.215869	14.572845	15.109267
2011	29.611134	38.72985	41.678217	14.375498	9.1589081	43.920785	16.847378	18.388323	21.084549
2012	28.83423	38.418629	42.237003	15.539451	13.416066	36.546804	17.724246	16.769821	21.932876
2013	27.227376	37.484967	43.755052	18.309073	12.470011	37.615746	17.741455	17.441717	26.268995
2014	29.365056	34.728107	44.744342	19.199334	17.310877	35.155638	19.447045	20.841573	25.806568
2015	30.452755	36.573368	45.212361	20.481743	19.165478	35.621204	21.594607	22.546112	29.667352
2016	35.688386	35.650737	42.568542	20.541514	18.930249	40.196682	19.278713	23.325129	27.043632
2017	36.202317	37.651609	40.299762	20.855755	18.953341	44.106321	16.972783	23.159305	21.756904

Data Source: ***World Development Indicators***

Graph 3: Domestic Credit (DC) percent of GDP



From the table and the graph 3 above, we have seen that the domestic credit for Seychelles is higher than the other selected east African countries in the period from 1992 to 2011 and also the Seychelles' domestic credit increases from year to year until 2003. Madagascar has the lowest domestic credit and Tanzanian domestic credit is low from year 1998 to year 2006. Ethiopian domestic credit is in the 3rd level next to Seychelles and Zambia. Its domestic credit during year 1998 to year 2007 is higher than the other year as the graph shows. The Kenyan domestic credit increase continuously from year 2007 to year 2015 but for other years, its domestic credit is fluctuating from year to year.

4.2.4. Trends of Broad Money Supply (M2)

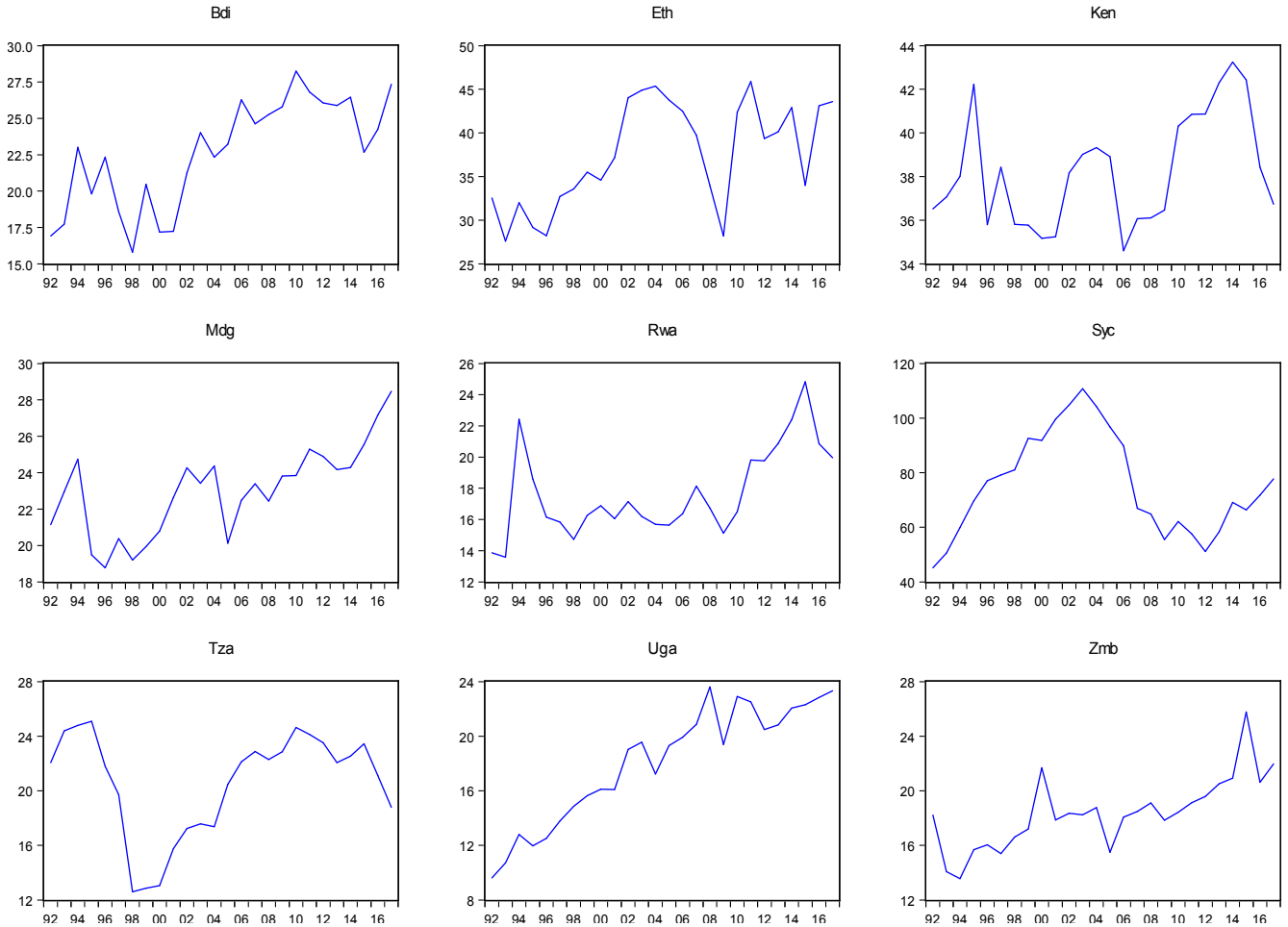
Money supply is defined as total stock of money available in the economy in a given period of time that includes currency in circulation, demand deposits, small time denominations and longtime denominations etc. But broad money supply includes money that can be used for spending (M1) and items that can be quickly converted to M1.

Table 4: Broad Money Supply (M2) in percent of GDP

Year	Countries								
	Burundi	Ethiopia	Kenya	Madagascar	Rwanda	Seychelles	Tanzania	Uganda	Zambia
1992	16.907536	32.539449	36.517796	21.151944	13.861461	45.155772	22.072055	9.6117687	18.21587
1993	17.733129	27.594094	37.065232	22.961393	13.581288	50.537547	24.395433	10.719488	14.071675
1994	23.005207	32.000319	38.016009	24.745476	22.427563	59.937383	24.783719	12.804526	13.563413
1995	19.803614	29.16916	42.232269	19.482744	18.589943	69.678526	25.088727	11.961018	15.690537
1996	22.332307	28.224466	35.791691	18.767738	16.144891	77.090824	21.803982	12.515467	16.038238
1997	18.586377	32.724672	38.422653	20.380663	15.828802	79.169436	19.710366	13.793479	15.406776
1998	15.785882	33.576651	35.807184	19.203746	14.724609	81.030228	12.592048	14.858904	16.618408
1999	20.473737	35.514967	35.770798	19.93182	16.261742	92.590327	12.861062	15.63352	17.19558
2000	17.172855	34.585478	35.164727	20.7863	16.88096	91.789786	13.054892	16.115536	21.686025
2001	17.225782	37.163271	35.240744	22.633465	16.045573	99.629234	15.761487	16.091443	17.860978
2002	21.252341	44.036797	38.15891	24.272719	17.150819	104.83033	17.232372	19.032088	18.347091
2003	24.024346	44.87788	39.023164	23.410834	16.194984	110.76867	17.577383	19.553958	18.230693
2004	22.325412	45.353082	39.327027	24.366448	15.678279	104.24486	17.361196	17.228479	18.77431
2005	23.222864	43.777022	38.906715	20.12979	15.641847	96.76787	20.464403	19.322939	15.497102
2006	26.27487	42.4864	34.601569	22.483319	16.360632	89.83293	22.120025	19.914148	18.061589
2007	24.619613	39.742753	36.06482	23.387789	18.145936	66.966425	22.884232	20.875453	18.483666
2008	25.258885	33.967121	36.105499	22.444197	16.732446	64.898205	22.297843	23.617677	19.101744
2009	25.790462	28.191492	36.458712	23.817565	15.12237	55.500995	22.866691	19.386056	17.837365
2010	28.242729	42.36028	40.30921	23.849963	16.501789	62.153785	24.647924	22.918522	18.429636
2011	26.805904	45.89102	40.854573	25.296359	19.805928	57.560519	24.124198	22.506435	19.121548
2012	26.063643	39.34901	40.862186	24.901195	19.755779	51.116661	23.529954	20.494779	19.576676
2013	25.881936	40.12347	42.303281	24.171246	20.871761	58.323575	22.07096	20.819706	20.51286
2014	26.453755	42.89632	43.2453	24.288318	22.389769	69.077244	22.534368	22.066083	20.927055
2015	22.672683	33.98763	42.435112	25.548698	24.83433	66.372185	23.439826	22.308259	25.772631
2016	24.244642	43.09872	38.427165	27.161831	20.849521	71.777441	21.112382	22.832596	20.623568
2017	27.337032	43.59725	36.733758	28.473675	19.968608	77.712431	18.784938	23.328706	21.963268

Data Source: ***World Development Indicators***

Graph 4: Broad Money Supply (M2) in percent of GDP



From the graph, we have understood that Kenyan and Madagascar broad money supply is highly oscillating than the other. Kenyan broad money supply is higher in 2014 with value around 43 % and also money supply is high in 1995, 2013 and 2015 around 42 %. Tanzanian broad money supply increases continuously from year 1998 to year 2011 with minimum value in 1998 and 1999. The table and the graph show also that the broad money supply for Seychelles is higher than the other selected east African countries in the period from 1992 to 2017.

Chapter Five

Result Analysis

5.1. Descriptive Statistics

The study used annual panel data for the period 1992-2017 from the world development indicators with 234 numbers of observations. The Data was collected for the variables like growth domestic product growth rate (GDPGR), consumer price index (CPI), balance of payment (BoP), real interest rates (RIR), exchange rates (ER), domestic credit (DC) and broad money supply (M2). Table 5 below describes the basic features of the real data for the variables.

Table 5: Data properties of descriptive statistics as a summary of countries, 1992–2017

	GDPGR	CPI	BOP	ER	RIR	DC	M2
Mean	4.628063	11.76601	-8.29E+08	695.2868	8.919019	29.61175	30.15461
Median	5.079689	8.042723	-3.87E+08	323.1280	8.053637	23.58756	22.98330
Maximum	35.22408	183.3120	1.76E+09	3611.225	51.28550	135.7098	110.7687
Minimum	-50.24807	-8.484249	-8.27E+09	0.172214	-41.79024	4.378123	9.611769
Std. Dev.	5.966457	17.94288	1.40E+09	832.3885	11.44544	22.21919	18.97271
Skewness	-3.067702	6.685435	-2.496036	1.203032	0.554536	2.089092	2.149107
Kurtosis	35.08486	59.88069	10.59149	3.775222	7.244558	8.700246	7.705518
Jarque-Bera	10404.04	33288.38	804.8773	62.30362	187.6515	487.0128	396.0114
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	1082.967	2753.245	-1.94E+11	162697.1	2087.050	6929.150	7056.178
Sum Sq. Dev.	8294.476	75013.64	4.57E+20	1.61E+08	30522.53	115030.3	83871.58
Observations	234	234	234	234	234	234	234

From the data presented in Table 5, the mean for GDPGR was 4.63 percent with a standard deviation of 5.96, and with values ranging from a minimum of -50.25 percent to a maximum of 5.07 percent. The mean of the CPI over the study period was 11.77 percent with a standard deviation of 17.9 percent, and with minimum and maximum CPI of -8.5 percent and 183.3 percent respectively. Whereas, mean of BOP over the study period was -8.29E+08 with a standard deviation of 1.40E+09, and minimum and maximum BOP -8.27E+09 and 1.76E+09 respectively.

When we see the mean of independent variables of ER, RIR, DC and M2 over the study period were 695.3, 8.92, 29.6 and 30.2 with a standard deviation of 832.4, 11.4, 22.2 and 18.97 respectively. The minimum values of these variables are, 0.17, -41.8, 4.38 and 9.6 respectively. In addition, theirs' maximum values are 3611.2, 51.3, 135.7 and 110.77 respectively.

5.2. Panel Unit Root Test

One of the major concerns in a time series analysis is data property. Most of a time series macroeconomic variables contain non-stationary process, particularly when considered in level. A series is said to be stationary if the mean and auto covariance of the series do not depend on time. This stationary of a given series is checked by applying a unit root test, which is the formal method to check it in the literature. To this end, there are several methods of testing the presence of unit roots. Some of these tests are; Augmented Dickey-Fuller (ADF), Phillips-Perron (PP), Kwiatkowski, Phillips, Schmidt, and Shin (KPSS), GLS detrended Dickey-Fuller, Elliott, Rothenberg, and Stock Point Optimal (ERS), Levin and Lin (LL), Im, Pesaran and Shin (IPS) Breitung and Ng and Perron (NP) unit root tests. Despite the multiple existences of unit root tests, for this study, the Im, Pesaran and Shin (IPS) test is employed. Some tests are highly restrictive and less powerful (i.e. Levin and Lin (LL) and the others do not allow for heterogeneity in the autoregressive coefficient (i.e. Breitung). While, IPS test are less restrictive and more powerful and allow for heterogeneity both in intercept, slope terms for the cross section units, and solve serial correlation problem (Eggoh, Bangake & Rault, 2011).

Table 6: Panel Unit Root Test Im, Pesaran and Shin (IPS) with p-value in Parentheses

Variables	At A level		At First Difference	
	Intercept	Intercept & Trend	Intercept	Intercept & Trend
lnGDPGR	-7.43613***	-5.66632***	-14.7742***	-13.7826***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
lnBOP	-0.05136	-0.52093	-6.1457***	4.16526***
	(0.4795)	(0.3012)	(0.0000)	(0.0000)
lnCPI	-5.79714***	-3.62606***	-15.6378***	-14.9328***
	(0.0000)	(0.0001)	(0.0000)	(0.0000)
lnER	-2.06227**	-5.17311***	9.91948***	-8.47456***
	(0.0196)	(0.0000)	(0.0000)	(0.0000)
lnRIR	-15.7466***	-15.3728***	-15.4300***	-13.6889***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
lnDC	-1.98038**	-1.05356	-10.622***	-7.59452***
	(0.0238)	(0.146)	(0.0000)	(0.0000)
lnM2	-1.67589**	-3.61808***	-12.5299***	-10.8431***
	(0.0469)	(0.0001)	(0.0000)	(0.0000)

***denotes significance at the 1% level and **denotes significance at the 5% level.

Source: *Own computation based on data*

The above table 6 presents the result of the IPS panel unit root test at the level and first difference with intercept and intercept plus trend forms. As can be seen from the result lnGDPGR, lnCPI and lnRIR are stationary at a level in the 1 % significant level in both intercept and intercept plus time trend form. Again, we found that lnER, lnDC and lnM2 are stationary at a level in 5 % level of significance with intercept in the absence of time trend. However, with time trend form lnER and lnM2 are stationary in the 1 % level of significance. Variable lnBOP is not stationary at a level in both intercept and time trend form. Therefore, this study uses first difference to test stationarity.

The stationarity result clearly shows that the null hypothesis of a panel unit root in the level of the series can be rejected i.e. these variables (lnGDPGR, lnCPI, lnER, lnRIR and lnM2) are stationary at a level with intercept and intercept plus time trend form. In addition, all variables are stationary after first differencing in both intercept and intercept plus time trend form. This shows that the null hypothesis of panel unit root test is rejected.

Generally, all variables except balance of payment and domestic credit are stationary at a level in both intercept and intercept plus time trend form.

5.3. Co integration Test

The next step is to test for the existence of long-run co integration among GDPGR, BOP, CPI and the independent variables of ER, RIR, DC and M2 by using panel co integration tests. As described by Orsal D. D. K. (2007), there are mainly two different approaches for the panel co integration tests, residual-based and maximum-likelihood-based. McCoskey & Kao (1998), Kao (1999) and Pedroni (1995, 1997, 1999) introduced Residual-based panel co integration test statistics while, Groen & Kleibergen (2003), Larsson & Lyhagen (1999) and Larsson et al. (2001) introduced maximum-likelihood-based panel co integration test statistics. McCoskey & Kao (1998) derived a panel co integration test for the null of co integration, which is an extension of the LM test; Kao (1999) considered the spurious regression for the panel data and introduced the DF and ADF type tests; Groen & Kleibergen (2003) presented the estimation of homogenous and heterogeneous co integration vectors by using the GMM procedure. On the other hand, Larsson et al. (2001) suggested that the panel co integration test statistic based on cross-sectional independence. But, Pedroni considers the use of seven residual-based panel co integration statistics, four based on pooling the data along the within-dimension (denoted 'panel co integration statistics') and three based on pooling along the between-dimension (denoted 'group mean co integration statistics) (Barbieri, 2008). Despite the multiple existences of co integration tests, for this study, the Pedroni (1999) test is appropriate. Because, Pedroni (1999, 2004) proposes a residual-based test for the null hypothesis of co-integration for dynamic panels with multiple regressors in which the short-run dynamics and the long-run slope coefficients are permitted to be heterogeneous across individuals. These tests allow for heterogeneous slope coefficients, fixed effects and individual-specific deterministic trends, but are only valid if the variables are I(1).

Table 7: Pedroni panel cointegration test for lnGDPGR, lnER, lnRIR, lnDC and lnM2 estimation results

Test Types	Within Dimension			
	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	1.982817	0.0237	-1.728128	0.958
Panel rho-Statistic	-3.650325	0.0001	-2.419349	0.0078
Panel PP-Statistic	-9.586324	0.0000	-10.26388	0.0000
Panel ADF-Statistic	-9.595553	0.0000	-8.801952	0.0000
Test Types	Between Dimension			
	Statistic	Prob.		
Group rho-Statistic	-1.536012	0.0623		
Group PP-Statistic	-15.3582	0.0000		
Group ADF-Statistic	-9.298134	0.0000		

Source: *Own computation based on data*

Estimation of Pedroni in 2004 depends on the critical value of the seven residual-based panel co integration statistics for rejecting the null hypothesis of no co integration between variables. Therefore, the critical value of v-statistic must be greater than 1.64 and the rest of the test value must be smaller than -1.64 to reject the null hypothesis. In another expression, the null hypothesis is rejected if the p-value of the test statistic is less than the significance level (Oganesyan, M. 2017).

All statistic values stated above table 7 are from Pedroni's method (1999). From seven tests conducted, in the constant level, all of them except group rho statistic are significant in the 1 % significant level. That means the values of PP and ADF in both within-dimension and between-dimension and value of panel rho are less than -1.64. In addition, the value of v-statistic in within-dimension is significant since the value of v-statistic is greater than 1.64.

Table 8: Pedroni panel co integration test for lnCPI, lnER, lnRIR, lnDC and lnM2 estimation results

	Within Dimension			
Test Types	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	-1.13805	0.8725	-0.96699	0.8332
Panel rho-Statistic	-1.487726	0.0684	-1.61731	0.0529
Panel PP-Statistic	-11.15725	0.0000	-6.781331	0.0000
Panel ADF-Statistic	-9.066509	0.0000	-6.743234	0.0000
	Between Dimension			
Test Types	Statistic	Prob.		
Group rho-Statistic	-0.235732	0.4068		
Group PP-Statistic	-7.476497	0.0000		
Group ADF-Statistic	-6.816955	0.0000		

Source: *Own computation based on data*

From the above table 8, we have concluded that four out of seven statistical values (pp and ADF in both within the dimension and between dimensions) are significant in the 1 % level of significance. These statistical values reject the null hypothesis of no co integration means that there is co integration or variables like consumer price index, exchange rate, real interest rate, domestic credit and broad money supply have long run relationship. While, the panel v- statistic, panel rho statistic and group rho statistic are not significant since the v-statistic value is less than 1.64 and rho statistic value is greater than -1.64 in both within the dimension and between dimension.

Table 9: Pedroni panel co integration test for lnBOP, lnER, lnRIR, lnDC and lnM2 estimation results

	Within Dimension			
Test Types	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	-2.5933	0.9952	-1.27378	0.8986
Panel rho-Statistic	-3.145828	0.0008	0.393993	0.6532
Panel PP-Statistic	-7.791122	0.0000	-2.318031	0.0102
Panel ADF-Statistic	-7.80191	0.0000	-2.316055	0.0103
	Between Dimension			
Test Types	Statistic	Prob.		
Group rho-Statistic	1.994235	0.9769		
Group PP-Statistic	-1.084168	0.1391		
Group ADF-Statistic	-1.687411	0.0458		

Source: *Own computation based on data*

As the above table 8, table 9 also shows that Pedroni co integration test between the balance of payment, exchange rate, real interest rate, domestic credit and broad money supply. The result shows that the majority of residual test or test statistics are significant. That means, three statistical tests, which are, panel rho, panel pp and panel ADF are significant in the 1 % level of significance while group ADF test statistic is significant in the 5 % level of significance. Therefore, the null hypothesis of no co integration is rejected by the panel PP, panel ADF and panel rho statistics, as well as by group ADF statistics. Finally, by depending upon the above result, we reject the null hypothesis of no co integration and accept the alternative hypothesis of co integration or long-run relationship between variables.

5.4. Pooled Mean Group Estimation

As I have mentioned in the methodology section, the pooled mean group is considered as an intermediate estimator for this paper because it involves both pooling implied by the homogeneity restriction and averaging across groups used to obtain means of the estimated error correction coefficients. Therefore, the pooled mean group estimator allows us to estimate the common long-run coefficient. Under this section, we have seen the three models' empirical result individually.

5.4.1. Empirical Result for Model One

Table 10: Pooled mean group result with ARDL (1, 1, 1, 1, 1) corresponding with lnGDPGR

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Long Run Equation				
LNER	0.042509	0.003874	10.97277	0.0000
LNRIR	0.044121	0.014997	2.941922	0.0037
LNDC	-0.043388	0.006055	-7.166076	0.0000
LNM2	0.029566	0.013174	2.244288	0.0261
Short Run Equation				
COINTEQ01	-0.876315	0.098335	-8.911559	0.0000
D(LNER)	-0.087568	0.055523	-1.577162	0.1166
D(LNRIR)	0.079298	0.036766	2.156857	0.0324
D(LNDC)	-0.132908	0.055736	-2.384583	0.0182
D(LNM2)	-0.559904	0.507761	-1.102692	0.2717
C	3.216769	0.351646	9.147748	0.0000
Mean dependent var	0.003157	S.D. dependent var		0.401850
S.E. of regression	0.196771	Akaike info criterion		-2.342311
Sum squared resid	6.814536	Schwarz criterion		-1.485864

Log likelihood	332.0504	Hannan-Quinn criter.	-1.996992

*Note: p-values and any subsequent tests do not account for model selection.

Source: Eviews Result based on data

The above table 10 shows the result of PMG estimation between economic growth rate, exchange rate, real interest rate, domestic credit and broad money supply in the long run and short run by using ARDL (1, 1, 1, 1, 1). The result shows that all variables except broad money supply are statistically significant in the 1 % level of significance while broad money supply is also statistically significant in the 5 % level of significance in the long run. Variables except domestic credit have a positive relationship with the economic growth rate in the long run.

The above table tells us when the exchange rate will increase with one percent, it leads to economic growth rate to increase with 4.25 %. A one percent increase in the real interest rate will lead to a 4.4 % increase in economic growth rate.

The empirical result of this interest rate is closely related to that of Sen &Kaya (2015), Isedu (2013) and Galadima &Muhanned (2017). In addition, economic growth rate will increase by approximately 3 % due to a one percent increase in broad money supply. This result is closely related with the results found by Usma (2017), Isedu (2013), Sayaraman & Choong (2009), Sidingela & Khobai (2017) and Galadima & Muhammed (2017) that is money supply has positive significant impact for economic growth in the long run for the selected East African countries. Whereas, one percent increase in domestic credit will lead to a 4.3 % decrease in economic growth rate. The negative impact of credit with economic growth may indicate that deficiencies in credit allocation in the country or a weak financial regulation and supervision (Ayadi, Arbak, Naceur and De Groen, 2015). However, Siong Hook Law & Nirvikar Singh (2014) conclude that beyond the threshold level further development of finance or credit tends to adversely affect growth i.e. more finance or credit is not necessarily good for economic growth because it is more crucial in facilitating growth. In addition, negative result of credit indicates that there is no improvement in financial sector efficiency in east African countries.

When we see the short run relationship, domestic credit and real interest rate are statistically significant in the 5 % level of significance while the exchange rate and broad money supply are insignificant in the short run relationship. All variables except real interest rate have a negative relationship with economic growth rate in the short run. For example, a one percent increase in

exchange rate will lead to an 8.75 % decrease in economic growth rate and economic growth rate is decreased by 13.29 % due to a one percent increase in domestic credit. In addition, when broad money supply increased with one percent, it will lead economic growth rate to decrease by approximately 56 %. That means money supply has an insignificant negative impact on economic growth in the short run. This result contradicted with the result of Dingela &Khobai (2017) but closely related to the result of Usman (2017) and Galadima & Ngeda (2017). However, a one percent increase in the real interest rate will lead a 7.9 % increase in economic growth rate.

The table also shows that the error correction coefficient or convergence coefficient is statistically significant in the 1 % level of significance. For IM, Pesaran and Shin test the average adjustment coefficient seems to be less than zero and greater than -0.5. Moreover, the speed of adjustment is negative as expected and the magnitude is small since -0.876. This implies that the model returns immediately to its equilibrium. The fact that the error correction term (convergence coefficient) is statistically significant provides further evidence of the existence of a long-run relationship.

One advantage of the PMG is that it can allow the short-run dynamic specification to differ from country to country.

Table 11: Short run Coefficients with a p-value in parenthesis for Model One

	Countries								
Variables	Burundi	Ethiopia	Kenya	Madagascar	Rwanda	Seychelles	Tanzania	Uganda	Zambia
	-0.558719	-0.887048	-0.73829	-1.159387	-0.916565	-0.481666	-1.412554	-0.706716	-1.025889
COINTEQ01	(0.0004)	(0.0000)	(0.0002)	(0.0001)	(0.0017)	(0.0007)	(0.0000)	(0.0005)	(0.0000)
	0.051581	0.087349	-0.122694	-0.112557	-0.336472	-0.36926	-0.001298	0.04808	-0.03284
D(lnER)	(0.0768)	(0.0246)	(0.0003)	(0.0434)	(0.9484)	(0.0009)	(0.5305)	(0.0156)	(0.0128)
	0.150107	0.065745	-0.010225	-0.015816	0.327066	0.122335	-0.015725	0.030026	0.060169
D(lnRIR)	(0.0000)	(0.0005)	(0.022)	(0.5076)	(0.5902)	(0.0001)	(0.0000)	(0.0022)	(0.0000)
	-0.083255	-0.437258	-0.082123	-0.358894	-0.178671	0.032108	0.060536	-0.04869	-0.09992
D(lnDC)	(0.0160)	(0.0006)	(0.0133)	(0.0013)	(0.7445)	(0.02751)	(0.0000)	(0.0000)	(0.0001)
	-0.08012	-0.099976	0.011202	0.068546	-4.598367	-0.432568	-0.103446	0.071348	0.124246
D(lnM2)	(0.0069)	(0.0013)	(0.7708)	(0.02526)	(0.0225)	(0.0006)	(0.0000)	(0.0245)	(0.0016)
	1.979441	3.422298	2.741853	4.084536	3.311198	1.852591	5.07509	2.525423	3.958489
C	(0.0144)	(0.0026)	(0.0087)	(0.0035)	(0.0935)	(0.0296)	(0.0011)	(0.0213)	(0.0023)

Source: Own computation based on data

As we have seen from the above table 11, the empirical results are for individual countries in the short run coefficients with a p-value in parenthesis. Therefore, we have seen these individual countries by depending upon the general empirical result overview. When we see variable exchange rate, it is statistically significant in Kenya and Seychelles with the 1 % level of significance and it is significant in Ethiopia, Madagascar, Uganda and Zambia with 5 % level of significance. This variable has a positive relationship with economic growth rate in Burundi, Ethiopia and Uganda. When we see the exchange rate effect in Ethiopia in the real market, it is not positive because devaluation of currency in Ethiopia is not important due to price inelastic of Ethiopian economy. The result of this study shows a positive effect of exchange rate for Ethiopian economy due to incorrect data arrangement. This is due to Nevertheless, in Kenya, Madagascar, Rwanda, Seychelles, Tanzania and Zambia it has a negative relationship with economic growth rate.

Real interest rate is statistically significant with the 1 % level of significance in all countries except in Kenya, Madagascar and Rwanda and it is significant in Kenya with a 5 % level of significance. Moreover, the variable has a positive relationship with economic growth rate in all countries except Kenya, Madagascar and Tanzania.

The above result shows also that, domestic credit has a negative short-run effect for economic growth rate in all countries except Seychelles and Tanzania with statistically significant in Ethiopia, Madagascar, Tanzania, Uganda and Zambia with a 1 % level of significance. The effect is highest in Ethiopia than the other countries which are a 43.7 % decrease in economic growth rate of Ethiopia due to a one percent increase in domestic credit.

When we see variable broad money supply, it is statistically significant in Burundi, Ethiopia, Seychelles, Tanzania and Zambia with the 1 % level of significance and it is significant in Madagascar, Rwanda and Uganda with the 5 % level of significance but it is insignificant in Kenya. The variable has a positive and negative short-run relationship with economic growth rate in different countries. For example, it has positive short-run relationship with economic growth rate in Kenya, Madagascar, Uganda and Zambia while, has a negative short-run relationship with economic growth rate in Burundi, Ethiopia, Rwanda, Seychelles and Tanzania.

The error correction coefficient of this short run analysis is negative and statistically significant in the 1 % level of significance in all countries with different magnitude value.

Therefore, the error correction term indicates that there were significant relationships for the above nine East African Countries.

5.4.2. Empirical Result for Model Two

Table 12: Pooled mean group result with ARDL (1, 1, 1, 1, 1) corresponding with lnCPI

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Long Run Equation				
LNER	-0.447644	0.044686	-10.01762	0.0000
LNRIR	-0.452840	0.156502	-2.893510	0.0043
LNDC	0.123941	0.063358	1.956220	0.0520
LNM2	0.942304	0.149555	6.300739	0.0000
Short Run Equation				
COINTEQ01	-0.729127	0.092676	-7.867514	0.0000
D(LNER)	0.793483	0.583049	1.360920	0.1753
D(LNRIR)	-0.693554	0.404173	-1.715982	0.0879
D(LNDC)	-0.101743	0.269290	-0.377817	0.7060
D(LNM2)	-0.856905	0.214555	-3.993878	0.0001
C	2.520586	0.587935	4.287187	0.0000
Mean dependent var	-0.016024	S.D. dependent var		0.915400
S.E. of regression	0.656500	Akaike info criterion		0.641036
Sum squared resid	75.85465	Schwarz criterion		1.497483
Log-likelihood	-17.00119	Hannan-Quinn criteria.		0.986355

*Note: p-values and any subsequent tests do not account for model selection.

Like table 10, the above table 12 shows the result of PMG estimation between consumer price index, exchange rate, real interest rate, domestic credit and broad money supply in the long run and short run by using ARDL (1, 1, 1, 1, 1). Exchange rate and real interest rate have a negative long-run relationship with consumer price index and they are statistically significant in the 1 % level of significance while domestic credit and broad money supply have positive long-run relationship with consumer price index and statistically significant in the 10 % and 1 % level of significance respectively in the long run. The empirical result of money supply is closely related to that of Ofori, Danquah & Zhang (2017). However, a one percent increase in the exchange rate and a one percent increase in real interest rate will lead a 44.8 %, and a 45.4 % decrease in consumer price index respectively. The empirical result of real interest rate is closely related to the result of Sebastain P.M. (2013).

Whereas consumer price index will increase with 12.4 % and 94.2 % due to a one percent increase in domestic credit and a one percent increase in broad money supply respectively. The empirical result of money supply is closely related to that of Ofori, Danquah & Zhang (2017).

When we see the short run relationship, only broad money supply is statistically significant in the 1 % level of significance and real interest rate is significant in the 10 % level of significance while exchange rate and domestic credit are insignificant in the short run. All variables except the exchange rate have a negative relationship with consumer price index in the short run. For example, a one percent increase in real interest rate, domestic credit and broad money supply will lead to a 69.35 %, 10.2 % and 85.7 % decrease in consumer price index respectively. However, a one percent increase in the exchange rate will lead a 79.3 % increase in a consumer price index.

The table also shows that the error correction coefficient or convergence coefficient is statistically significant in the 1 % level of significance. The estimated coefficient value is -0.73. Since the error correction term is negative and highly significant, this implies that the results support the existence of a stable long-run relationship between the variables.

We have seen bellow table 5.8 about the short-run dynamic specification to differ from country to country.

Table 13: Short run Coefficients with a p-value in parenthesis for Model Two

	Countries								
Variables	Burundi	Ethiopia	Kenya	Madagascar	Rwanda	Seychelles	Tanzania	Uganda	Zambia
COINTEQ01	-0.811506	-0.884983	-0.708825	-0.299845	-0.846671	-0.261043	-0.94109	-1.082342	-0.725837
	(0.0001)	(0.0002)	(0.0002)	(0.0129)	(0.0001)	(0.0002)	(0.0001)	(0.0002)	(0.0000)
D(lnER)	0.763567	4.061644	1.373977	0.294209	-2.28088	2.196536	0.097512	-0.334572	0.969351
	(0.1371)	(0.7219)	(0.0299)	(0.5503)	(0.0152)	(0.0247)	(0.6132)	(0.4872)	(0.0007)
D(lnRIR)	-0.33142	-3.437484	0.25486	-1.54822	-0.618796	-1.069603	0.272999	0.309475	-0.073796
	(0.0788)	(0.303)	(0.2341)	(0.0472)	(0.0158)	(0.0022)	(0.0004)	(0.0772)	(0.0016)
D(lnDC)	-0.713345	1.873742	0.083211	-0.367268	-0.829455	0.098676	-0.379802	-0.142389	-0.539053
	(0.1003)	(0.9333)	(0.9389)	(0.4276)	(0.0034)	(0.815)	(0.0034)	(0.0283)	(0.0006)
D(lnM2)	-0.76345	-0.516554	-1.933278	-0.587137	-1.782868	-0.007417	-0.319829	-1.109555	-0.692054
	(0.0764)	(0.9393)	(0.443)	(0.4505)	(0.0028)	(0.9904)	(0.1168)	(0.2932)	(0.0062)
C	3.513507	0.815405	1.85813	1.447052	3.756919	0.057765	4.34129	5.288185	1.60702
	(0.0237)	(0.2665)	(0.0311)	(0.3525)	(0.0275)	(0.2581)	(0.0498)	(0.0686)	(0.0132)

Source: Own computation based on data

Table 13 shows the cross section short-run coefficient between lnCPI, lnER, lnRIR, lnDC and lnM2 for individual countries with a p-value in parenthesis. Therefore, we have seen that the

variable exchange rate has a positive effect for consumer price index in all countries except Rwanda and Uganda and it is statistically insignificant in 1 % level of significance except in Zambia. However, the broad money supply has a negative effect for consumer price index in all countries and it is statistically insignificant except in Rwanda, Zambia and to some extent in Burundi. In addition, the real interest rate has a negative effect for consumer price index in all countries except Kenya, Tanzania and Uganda and it is statistically significant in Seychelles, Tanzania and Zambia with the 1 % level of significance. Moreover, this variable is also significant in Madagascar and Rwanda with the 5 % level of significance. Domestic credit has a positive effect for consumer price index in Ethiopia, Kenya and Seychelles and a negative effect in other countries (Burundi, Madagascar, Rwanda, Tanzania, Uganda and Zambia). The variable is statistically significant only in Rwanda, Tanzania and Zambia with the 1 % level of significance. From the above table, the error correction term is statistically significant with a negative result in all countries which shows that there were significant relationships for the above countries.

5.4.3. Empirical Result for Model Three

Table 14: Pooled mean group result with ARDL (1, 1, 1, 1, 1) corresponding with lnBOP

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Long Run Equation				
LNER	0.121474	0.035679	3.404667	0.0008
LNRIR	-0.007662	0.072301	-0.105974	0.9157
LNDC	0.344627	0.055733	6.183530	e0.0000
LNM2	-0.673419	0.142781	-4.716448	0.0000
Short Run Equation				
COINTEQ01	-0.241898	0.106372	-2.274079	0.0242
D(LNER)	0.614406	0.538368	1.141238	0.2553
D(LNRIR)	-0.319899	0.329729	-0.970189	0.3333
D(LNDC)	0.970157	1.044413	0.928902	0.3542
D(LNM2)	-1.096540	1.067290	-1.027406	0.3056
C	5.487421	2.396290	2.289966	0.0232
Mean dependent var	-0.011967	S.D. dependent var		1.998035
S.E. of regression	1.572744	Akaike info criterion		-2.120596
Sum squared resid	435.3403	Schwarz criterion		-1.264149
Log-likelihood	306.1098	Hannan-Quinn criteria.		-1.775277

*Note: p-values and any subsequent tests do not account for model selection

Source: Eviews Result based on data

Table 14 shows the result of PMG estimation between balance of payment, exchange rate, real interest rate, domestic credit and broad money supply in the long run and short run by using ARDL (1, 1, 1, 1, 1). All variables except real interest rate are significant in the 1 % level of significance. From the significant variables, exchange rate and domestic credit have a positive effect on balance of payment whereas; the broad money supply has a negative effect. This negative significant effect of money supply for the balance of payment contradicts with the result of Shumba Tatenda.K (2013). The negative effect of real interest rate is very low that is a one percent increase in real interest rate will lead to a 0.76 % decrease in the balance of payment. However, the effect of domestic credit and broad money supply for balance of payment is higher i.e. a one percent increase in domestic credit will lead to 34.5 % increase in balance of payment whereas a one percent increase in broad money supply will lead to 67.3 % decrease in balance of payment.

The above table 14 shows that all variables are statistically insignificant in the short run relation. The table also shows that the error correction coefficient or convergence coefficient is statistically significant in the 5 % level of significance with a negative sign and effective magnitude. This implies that the model returns immediately to its equilibrium. The fact that the error correction term (convergence coefficient) is statistically significant provides further evidence of the existence of a long-run relationship. PMG is additionally used to show the cross section short-run coefficient by allowing the short-run dynamic specification to differ from country to country.

Table 15: Short run Coefficients with a p-value in parenthesis for Model Three

	Countries								
Variables	Burundi	Ethiopia	Kenya	Madagascar	Rwanda	Seychelles	Tanzania	Uganda	Zambia
COINTEQ01	-0.000938	-0.871862	-0.128997	-0.686169	-0.233497	-0.029852	-0.176339	-0.079329	0.029902
	(0.0145)	(0.0002)	(0.0032)	(0.0001)	(0.0000)	(0.0000)	(0.0002)	(0.0000)	(0.0313)
D(lnER)	0.018269	4.896725	0.390886	-0.03042	-0.153744	-0.016315	0.323818	0.058107	0.042324
	(0.0000)	(0.9478)	(0.1447)	(0.011)	(0.0001)	(0.0001)	(0.1658)	(0.0165)	(0.0863)
D(lnRIR)	0.012085	-2.954682	0.11725	0.023761	-0.004733	0.001059	0.009235	-0.061246	-0.021823
	(0.0000)	(0.876)	(0.2614)	(0.0132)	(0.0628)	(0.0005)	(0.4762)	(0.0004)	(0.0012)
D(lnDC)	-0.017033	9.314421	0.263509	-0.162179	-0.139111	-0.001089	-0.333444	-0.04894	-0.144718
	(0.0000)	(0.9459)	(0.6871)	(0.0002)	(0.0000)	(0.0517)	(0.005)	(0.0000)	(0.0003)
D(lnM2)	-0.003241	-9.560574	-1.101845	0.345916	0.096356	-0.013768	0.294392	0.046273	0.027627
	(0.0006)	(0.8118)	(0.5013)	(0.0001)	(0.0001)	(0.0001)	(0.1376)	(0.132)	(0.1904)
C	0.019216	19.38749	2.942316	15.82232	5.406535	0.717635	4.000889	1.81394	-0.72355
	(0.8565)	(0.4092)	(0.7394)	(0.2518)	(0.153)	(0.1378)	(0.3725)	(0.1638)	(0.8788)

Source: Own computation based on data

From table 15, we have understood that all variables are statistically insignificant in Ethiopia and Kenya while statistically significant in Burundi with a 1 % level of significance. The exchange rate has a positive effect on the balance of payment in the short run for all countries with the exception of Madagascar, Rwanda and Burundi. Real interest rate negatively affects the balance of payment in Ethiopia, Rwanda, Uganda and Zambia in the short run and positively affect in the remaining countries. Domestic credit has a negative effect on the balance of payment in all countries except in Ethiopia and Kenya which is completely different from the overall short-run effect i.e. positive effect. As table 11 and 13, table 15 shows that, the error correction term is statistically significant with a negative result in all countries except Zambia. It implies that there were significant relationships for the above countries.

Chapter Six

Summary of Findings and Policy Recommendations

6.1. Summary of Finding

The purpose of this thesis was to estimate the effectiveness of monetary policy transmission mechanism on macroeconomic objectives in selected East African Countries of Burundi, Ethiopia, Kenya, Madagascar, Rwanda, Seychelles, Tanzania, Uganda and Zambia by using dynamic Panel ARDL model with Pooled Mean Group estimation method. The method allows us to identify the impact of monetary policy transmission mechanism on macroeconomic objectives in the long-run and in the short-run as a whole and each individual country. It is clear that monetary policy plays a fundamental role in providing as well as maintaining a sustainable macroeconomic objective (i.e. sustained economic growth, price stability, low unemployment, the balance of payment equilibrium and sustainable development). For the achievement of macroeconomic objectives, monetary policy uses different monetary policy transmission mechanisms, which are interest rate channel, exchange rate channel, asset price effects, credit channel and broad money supply as different scholars describe. Due to a shortage of data, this thesis used selected macroeconomic objectives (Economic growth, Consumer price index and balance of payment) and monetary policy transmission mechanism (exchange rate, real interest rate, domestic credit and broad money supply). Therefore, to know the relationship between the above objectives and channels a number of tests are employed in this thesis which is, IM, Pesaran and Shin Panel unit root test, Pedroni co integration test and also Poole mean Group estimation. As a result of IM, Pesaran and Shin Panel Unit Root test, lnGDPGR, lnCPI and lnRIR are stationary (not unit root problem) at a level in the 1 % level of significant in both intercept and intercept plus time trend form. While, lnER, lnDC and lnM2 are stationary at a level in 5 % level of significance with intercept in the absence of time trend. But, all variables are stationary after first differencing in both intercept and intercept plus time trend form. This shows that the null hypothesis of panel unit root test is rejected. The Pedroni co integration test for model one shows that all statistical tests except group rho statistic are significant in the 1 % level of significance.

That means the P-values of all statistical tests are less than 0.05 in both within-dimension and between-dimension. In addition, for model two and model three most statistical tests are significant. These three models' result shows that the statistical values reject the null hypothesis of no co integration means that there is co integration or variables have a long run relationship. Whereas, The empirical evidence for model one suggests that exchange rate, real interest rate and broad money supply have a positive and significant long-run impact for economic growth rate, while domestic credit has a negative and significant impact for economic growth rate in both short-run and long run. Exchange rate and broad money supply have no significant impact for economic growth in the short run but real interest rate has positive and significant impact in the short run. Similarly, empirical result for model two shows that exchange rate and real interest rate have a significant and negative long-run impact for consumer price index whereas domestic credit and broad money supply have a significant and positive long-run impact for consumer price index. The short-run analysis suggests that real interest rate, domestic credit and broad money supply have a negative short-run impact for consumer price index while exchange rate has a positive and insignificant short-run impact. For the third model,, exchange rate and domestic credit have positive insignificant short run and significant long-run impact for balance of payment. However, real interest rate and broad money supply have negative short run and long-run impact for the balance of payment with the insignificant impact of real interest rate both in short run and long run meaning that even if real interest rate increases, there would be no significant effects on the balance of payment.

When we see the short run effect for each individual selected East African Countries, exchange rate has no that much significant impact for economic growth rate in Burundi, Rwanda and Tanzania. However, it has negative and significant impact for economic growth rate for selected East African Countries except Ethiopia and Uganda. Real interest rate has no significant impact for economic growth rate in Madagascar and Rwanda but has positive and significant impact for economic growth rate in most selected EAC except in Kenya and Tanzania, which is negative impact. In addition, domestic credit and broad money supply have negative and significant impact for economic growth rate in most of selected East African countries but have no significant impact for economic growth rate of Rwanda and Kenya respectively. As the overall effect shows in model two, all independent variables have no significant impact for consumer price index in the short run.

Similarly, the effect of these independent variables (ER, RIR, DC and M2) for consumer index is also not significant for most of individual countries. In addition, all independent variables have no significant overall impact for balance of payment in the short run. As individual form, all independent variables have no significant impact for balance of payment in Ethiopia and Kenya but they have statistical significant impact for balance of payment in Burundi. Broad money supply has positive and significant impact for balance of payment in Madagascar and Rwanda whereas exchange rate has negative and significant impact in Madagascar, Rwanda and Seychelles. Similarly, domestic credit has significant and negative impact for balance of payment in all individual countries except in Burundi, Ethiopia and Kenya.

6.2. Policy Recommendations

The goals of the central bank of east African countries are to maintain sustainable economic growth, equilibrium balance of payment, price stability and low unemployment level. To achieve these goals the central bank must consider different channels, which affect these goals. Therefore, these macroeconomic objectives stability can be ensured through monetary and fiscal coordination in order to ensure proper management of macroeconomic dynamics of interest and exchange rates, inflation and output. For this study, we have considered the monetary policy to manipulate macroeconomic objectives. For example, as a mandate of price stability government should use an effective monetary policy to reduce the rate of inflation as a contractionary monetary policy.

The empirical result shows that, exchange rate, real interest rate and broad money supply have a positive and significant long-run impact, while domestic credit has negative and significant impact for economic growth rate.

Therefore, the government should consider real interest rate; exchange rate and broad money supply in the future plane to manipulate economic growth by encouraging the expansion of monetary policy and by discouraging higher flow of financial credit. The monetary authority should also develop a strategy to reintroduce underground money back into the economy. Focusing on the money supply is also important for controlling inflation in the short period of time. Because it is affected negatively by, exchange rate and real interest rate in the long run.

However, in short run consumer price index is more affected negatively by real interest rate, domestic credit and broad money supply.

When we see the individual effect, the policy implication is different from country to country. Therefore, the policy is determined by their central bank monetary policy. Changes in the real interest rates induce economic agents to change their investment and consumption expenditure and thereby changing economic activity. For Ethiopia to have a sustainable and improved economic growth there is need to encourage exchange rate sustainability and expansionary monetary policy. Because, the principal objective of the final targets of monetary policy of National Bank of Ethiopia is to maintain price & exchange rate stability by considering exchange rate stability as the principal policy objective for monetary policy to affect both foreign reserve position and domestic money supply. Whereas, Kenyan government support growth by considering a low and stable rate of inflation. Therefore, Central Bank of Kenya (CBK) has a responsibility of formulating and implementing monetary policy for achieving and maintaining prices stability (Annual report of CBK, 2016/17).

Generally, the government considers monetary policy transmission mechanisms and their relations with macroeconomic objectives to fulfill the goals and planes.

Reference

Akhtar, S. (2008). The effectiveness of monetary policy in Pakistan. *Institute of Business Management. Karachi*.

Aslam, M., & Awan, A. G. (2018). Impact of Monetary policy on Economic Growth: Evidence from Pakistan. *Global Journal of Management, Social Sciences and Humanities*, *4*(1), 89-109.

Ayadi, R., Arbak, E., Naceur, S. B., & De Groen, W. P. (2015). Financial development, bank efficiency, and economic growth across the Mediterranean. In *Economic and social development of the Southern and Eastern Mediterranean countries* (pp. 219-233). Springer, Cham.

Barbieri, L. (2008). Panel cointegration tests: a survey. *Rivista internazionale di scienze sociali*, *116*(1), 3-36.

Begg, D., Fisher, S., & Dornbush, R. (1997). Makroekonomia (Macroeconomic). *Warszawa: PWE*.

Cage, R., Greenlees, J., & Jackman, P. (2003, May). Introducing the chained consumer price index. In *International Working Group on Price Indices (Ottawa Group): Proceedings of the Seventh Meeting* (pp. 213-246). Paris: INSEE.

Chepkemoi, K. W., (2014). The Effect of Money Supply on the Gross Domestic Product in Kenya. *Unpublished MBA Thesis*.

Davoodi, M. H. R., Dixit, M. S., & Pinter, G. (2013). *Monetary transmission mechanism in the East African Community: An empirical investigation* (No. 13-39). International Monetary Fund.

Dingela, S., & Khobai, H. (2017). Dynamic Impact of Money Supply on Economic Growth in South Africa. An ARDL Approach.

Eggoh, J. C., Bangaké, C., & Rault, C. (2011). Energy consumption and economic growth revisited in African countries. *Energy Policy*, *39*(11), 7408-7421.

Ekpo, A. H., & Effiong, E. L. (2017). Openness and the Effects of Monetary Policy in Africa.

Fiador, V. O. L. (2016). *Monetary policy and economic performance-evidence from selected African countries* (Doctoral dissertation, University of Cape Town).

Galadima, M. D., & Ngada, M. H. Impact of Money Supply on Economic Growth in Nigeria (1981–2015).

Ghura, D., & Hadjimichael, M. T. (1996). Growth in Sub-Saharan Africa. *Staff Papers*, *43*(3), 605-634.

Havi, E. D. K., & Enu, P. (2014). The Effect of Fiscal Policy and Monetary Policy on Ghana's Economic Growth: Which Policy Is More Potent?. *International Journal of Empirical Finance*, *3*(2), 61-75.

Hildebrand, P. M. (2006). Monetary policy and financial markets. *Financial Markets and Portfolio Management*, *20*(1), 7-18.

Holtrop, M. W. (1963). *Monetary policy in an open economy: its objectives, instruments, limitations, and dilemmas*. International Finance Section, Department of Economics, Princeton University.

Isedu, M. (2013). *Effects of monetary policy on macro economic performance: the case of Nigeria* (Doctoral dissertation, University of Greenwich).

Jayaraman, T. K., & Choong, C. K. (2009). How does monetary policy transmission mechanism work in Fiji?. *International Review of Economics*, *56*(2), 145-161.

Kamaan, C. K., & Nyamongo, E. M. (2014). The effect of monetary policy on economic growth in Kenya. *International Journal of Business and Commerce*, *3*(8), 11-24.

Kandil, M. (2014). On the effects of monetary policy shocks in developing countries. *Borsa Istanbul Review*, *14*(2), 104-118.

Keran, M. W. (1967). Monetary policy, balance of payments, and business cycles-the foreign experience. *Federal Reserve Bank of St. Louis Review*, (Nov), 7-20.

Khan, M. S. (2011). The design and effects of monetary policy in Sub-Saharan African countries. *Journal of African Economies*, *20*(suppl_2), ii16-ii35.

Kibwe, Z. W. (2016). *The Efficacy of Monetary and Fiscal Policies in East Africa: An Empirical Investigation* (Doctoral dissertation, National Graduate Institute for Policy Studies).

Kigabo, R. T., Munyankindi, P., & Amahoro, A. (2008). Monetary transmission mechanism in Rwanda. *BNR Economic Review*, *2*, 34-66.

Labra, R., & Torrecillas, C. (2018). Estimating dynamic Panel data. A practical approach to perform long panels. *Revista Colombiana de Estadística*, *41*(1), 31-52.

Law, S. H., & Singh, N. (2014). Does too much finance harm economic growth?. *Journal of Banking & Finance*, *41*, 36-44.

Lee, Y. M., & Wang, K. M. (2015). Dynamic heterogeneous panel analysis of the correlation between stock prices and exchange rates. *Economic research-Ekonomska istraživanja*, *28*(1), 749-772.

Lopes, F. (1998). The transmission mechanism of monetary policy in a stabilizing economy: Notes on the case of Brazil. *The Transmission of Monetary Policy in Emerging Market Economies*, (3), 65.

Mishkin, F. S. (1995). Symposium on the monetary transmission mechanism. *Journal of Economic Perspectives*, *9*(4), 3-10.

Mishra, P., Montiel, P. J., & Spilimbergo, A. (2010). Monetary transmission in low income countries. *IMF Working Papers*, 1-42.

Mohanty, M. S. (2014). The transmission of unconventional monetary policy to the emerging markets-An overview. *BIS Paper*, (78a).

Muric, M. (2010). The Transmission Mechanism of Monetary Policy and Channels OF Monetary Transmission in Serbia.

Nkikabahizi, F. (2013). Monetary policy and economic growth in Rwanda.

Ofori, C. F., Danquah, B. A., & Zhang, X. (2017). The Impact of Money Supply on Inflation, A Case of Ghana. *Imperial Journal of Interdisciplinary Research (IIJR)*, *3*(1), 2312-2318.

Oganesyan, M. (2017). Carbon emissions, energy consumption and economic growth in the BRICS.

Örsal, D. D. K. (2007). *Comparison of panel cointegration tests* (No. 2007, 029). SFB 649 discussion paper.

Otolorin, G. E., & Akpan, P. E. (2017). Effectiveness of Monetary Policy Transmission Channels in a Recessed Economy.

ÖZCAN, C. C. (2016). Parasal Aktarim Mekanizmasi Kanallari: Turkiye Üzerine Biranaliz. *Sosyal Ekonomik Araştırmalar Dergisi*, *16*(32), 188-213.

Pedroni, P. (1999). Critical values for cointegration tests in heterogeneous panels with multiple regressors. *Oxford Bulletin of Economics and statistics*, *61*(S1), 653-670.

Pesaran, M. H., & Smith, R. (1995). Estimating long-run relationships from dynamic heterogeneous panels. *Journal of Econometrics*, *68*(1), 79-113.

Pesaran, M. H., Shin, Y., & Smith, R. P. (1999). Pooled mean group estimation of dynamic heterogeneous panels. *Journal of the American Statistical Association*, *94*(446), 621-634.

Pétursson, T. G. (2001). The transmission mechanism of monetary policy. *Monetary Bulletin*, *4*, 62-77.

Rafindadi, A. A., & Yusof, Z. (2013). Is financial development a factor to the leading growth profile of the South African economy? Measuring and uncovering the hidden secret. *International Journal of Economics and Empirical Research (IJEER)*, *1*(9), 99-112.

Salvatore, D. (2012). *Introduction to international economics*. Wiley.

Şen, H., & Kaya, A. (2015). The relative effectiveness of Monetary and Fiscal Policies on growth: what does long-run SVAR model tell us?

Taylor, J. B. (2000). Alternative views of the money transmission mechanism: what difference do they make for monetary policy? *Oxford Review of Economic Policy*, *16*(4), 60-73.

Usman, M. (2017). Growth Effects of Fiscal and Monetary Policies in Pakistan. *Pakistan Development Review*, *56*(4), 529-553.

Van Hai, B., & Trang, T. T. M. (2015). *The transmission mechanism of monetary policy in Vietnam: A VAR approach* (No. 15/2015). Graduate Institute of International and Development Studies Working Paper.

Yang, Z., Tu, A. H., & Zeng, Y. (2014). Dynamic linkages between Asian stock prices and exchange rates: new evidence from causality in quantiles. *Applied Economics*, *46*(11), 1184-1201.

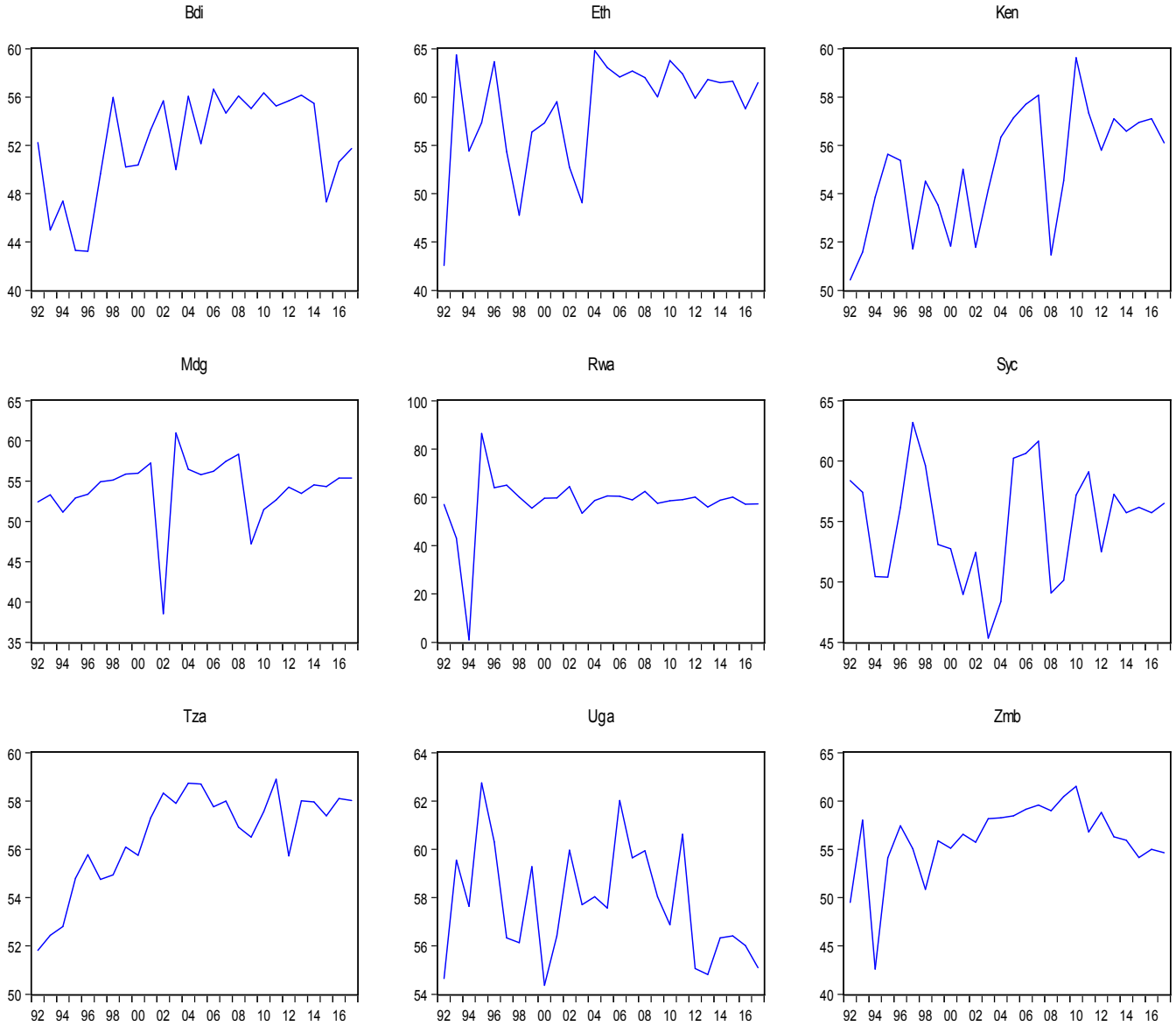
Zgambo, P., & Chileshe, P. M. (2014). Empirical Analysis of the Effectiveness of Monetary Policy in Zambia.

Zgambo, P., & Chileshe, P. M. (2014). The empirical analysis of the effectiveness of monetary policy in Zambia.

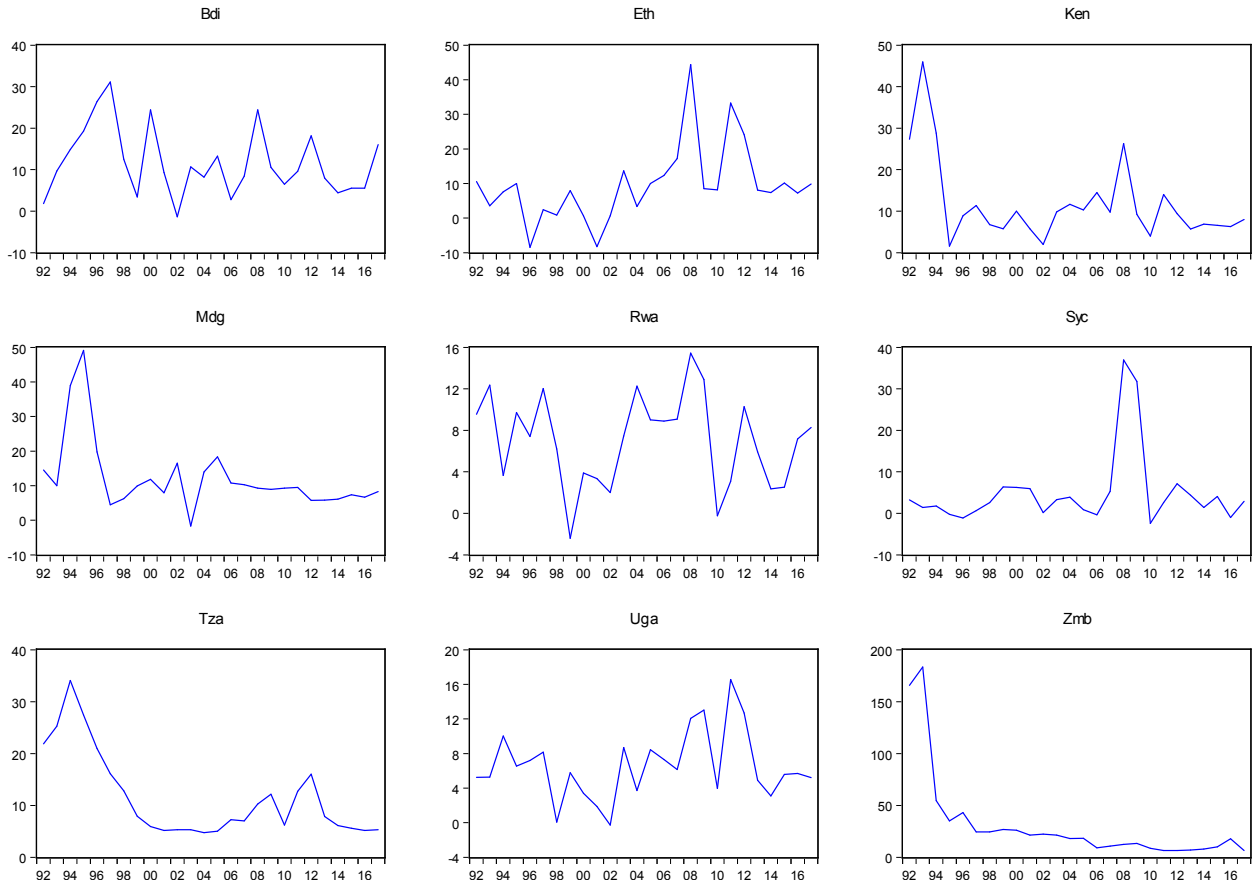
Appendix

Appendix 1: Trends of Macroeconomic Objectives

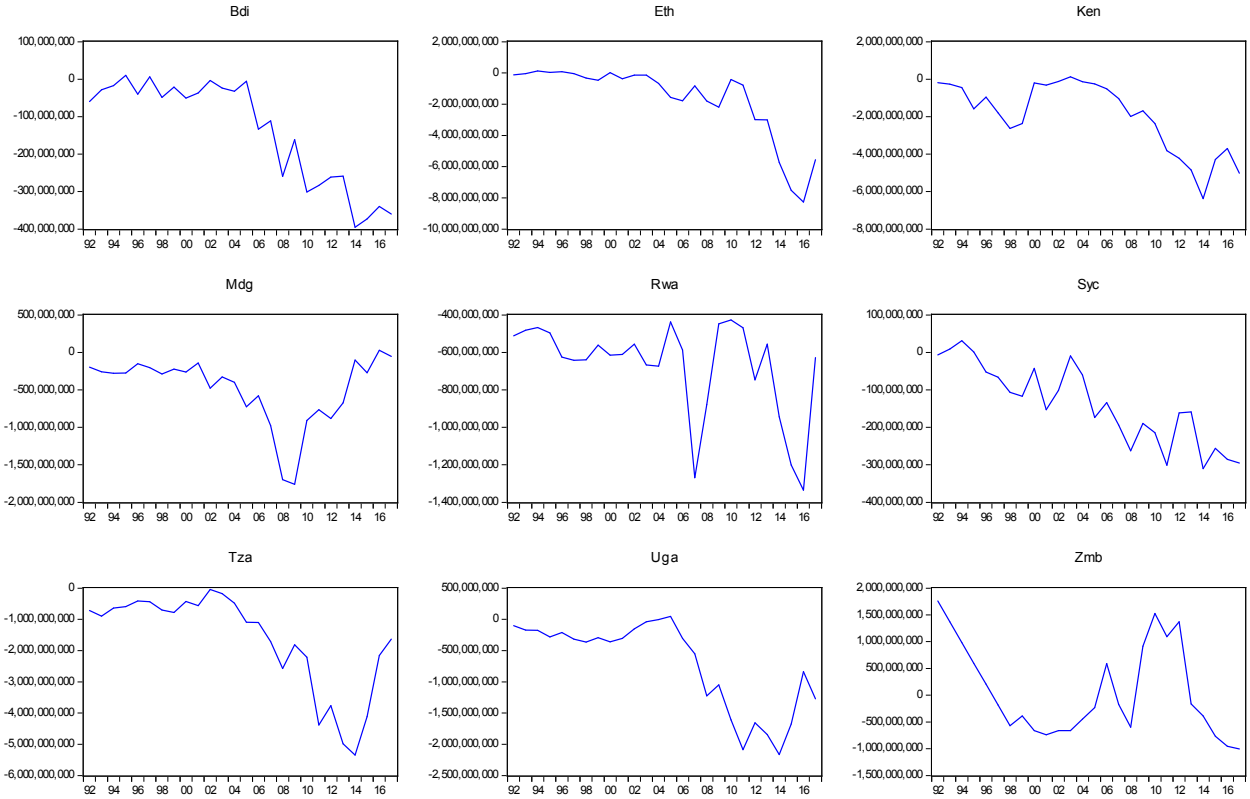
1. Growth Domestic Product Growth Rate (GDPGR)



2. Consumer Price Index (CPI)



3. Balance of Payment (BOP) in US$



Appendix2: Unit Root Test

lnGDPGR with intercept

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-7.43613	0.0000

** Probabilities are computed assuming asympotic normality

lnGDPGR with trend

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-5.66632	0.0000

** Probabilities are computed assuming asympotic normality

D(lnGDPGR) with intercept

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-15.4300	0.0000

** Probabilities are computed assuming asympotic normality

D(lnGDPGR) wth trend

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-13.6889	0.0000

** Probabilities are computed assuming asympotic normality

LnBOP with intercept

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-0.05136	0.4795

** Probabilities are computed assuming asympotic normality

lnBOP with trend

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-0.52093	0.3012

** Probabilities are computed assuming asympotic normality

D(lnBOP) with intercept

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-6.14570	0.0000

** Probabilities are computed assuming asympotic normality

D(lnBOP) with trend

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-4.16526	0.0000

** Probabilities are computed assuming asympotic normality

lnCPI with intercept

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-5.79714	0.0000

** Probabilities are computed assuming asympotic normality

LnCPI with trend

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-3.62606	0.0001

** Probabilities are computed assuming asympotic normality

D(lnCPI) with intercept

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-15.6378	0.0000

** Probabilities are computed assuming asympotic normality

D(lnCPI) with trend

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-14.9328	0.0000

** Probabilities are computed assuming asympotic normality

lnER with intercept

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-2.06227	0.0196

** Probabilities are computed assuming asympotic normality

lnER with trend

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-5.17311	0.0000

** Probabilities are computed assuming asympotic normality

D(lnER) with intercept

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-9.91948	0.0000

** Probabilities are computed assuming asympotic normality

D(lnER) with trend

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-8.47456	0.0000

** Probabilities are computed assuming asympotic normality

lnRIR with intercept

Method		Statistic	Prob.**
Im, Pesaran and Shin W-stat		-15.7466	0.0000
Im, Pesaran and Shin t-bar		-6.24106	
T-bar critical values ***:	1% level	-2.23333	
	5% level	-2.02000	
	10% level	-1.90333	

** Probabilities are computed assuming asympotic normality
*** Critical values from original paper

lnRIR with trend

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-15.3728	0.0000

** Probabilities are computed assuming asympotic normality

D(lnRIR) with intercept

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-15.4300	0.0000

** Probabilities are computed assuming asympotic normality

D(lnRIR) with trend

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-13.6889	0.0000

** Probabilities are computed assuming asympotic normality

lnDC with intercept

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-1.98038	0.0238

** Probabilities are computed assuming asympotic normality

lnDC with trend

Method		Statistic	Prob.**
Im, Pesaran and Shin W-stat		-1.05356	0.1460

** Probabilities are computed assuming asympotic normality

D(lnDC) with intercept

Method		Statistic	Prob.**
Im, Pesaran and Shin W-stat		-10.6220	0.0000
Im, Pesaran and Shin t-bar		-4.72152	
T-bar critical values ***:	1% level	-2.23667	
	5% level	-2.02067	
	10% level	-1.90533	

** Probabilities are computed assuming asympotic normality
*** Critical values from original paper

D(lnDC) with trend

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-7.59452	0.0000

** Probabilities are computed assuming asympotic normality

lnM2 with intercept

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-1.67589	0.0469

** Probabilities are computed assuming asympotic normality

lnM2 with trend

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-3.61808	0.0001

** Probabilities are computed assuming asympotic normality

D(lnM2) with intercept

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-12.5299	0.0000

** Probabilities are computed assuming asympotic normality

D(lnM2) with trend

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-10.8431	0.0000

** Probabilities are computed assuming asympotic normality

Appendix 3: Co integration Test

1. Co integration between lnGDPGR, lnER, lnRIR, lnDC &lnM2

Alternative hypothesis: common AR coefs. (within-dimension)

	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	1.982817	0.0237	-1.728128	0.9580
Panel rho-Statistic	-3.650325	0.0001	-2.419349	0.0078
Panel PP-Statistic	-9.586324	0.0000	-10.26388	0.0000
Panel ADF-Statistic	-9.595553	0.0000	-8.801952	0.0000

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	-1.536012	0.0623
Group PP-Statistic	-15.35820	0.0000
Group ADF-Statistic	-9.298134	0.0000

2. Co integration between lnCPI, lnER, lnRIR, lnDC &lnM2

Alternative hypothesis: common AR coefs. (within-dimension)

	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	-1.138050	0.8725	-0.966990	0.8332
Panel rho-Statistic	-1.487726	0.0684	-1.617310	0.0529
Panel PP-Statistic	-11.15725	0.0000	-6.781331	0.0000
Panel ADF-Statistic	-9.066509	0.0000	-6.743234	0.0000

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	-0.235732	0.4068
Group PP-Statistic	-7.476497	0.0000
Group ADF-Statistic	-6.816955	0.0000

3. Co integration between lBOP, lnER, lnRIR, lnDC &lnM2

Alternative hypothesis: common AR coefs. (within-dimension)

	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	-2.593300	0.9952	-1.273780	0.8986
Panel rho-Statistic	-3.145828	0.0008	0.393993	0.6532
Panel PP-Statistic	-7.791122	0.0000	-2.318031	0.0102
Panel ADF-Statistic	-7.801910	0.0000	-2.316055	0.0103

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	1.994235	0.9769
Group PP-Statistic	-1.084168	0.1391
Group ADF-Statistic	-1.687411	0.0458

Appendix 4: Pooled Mean Group Estimation Result

Dependent Variable: D(LNGDPGR)
Method: ARDL
Date: 05/29/19 Time: 17:43
Sample: 1993 2017
Included observations: 225
Maximum dependent lags: 1 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (1 lag, automatic): LNER LNRIR LNDC LNM2
Fixed regressors: C
Number of models evaluated: 1
Selected Model: ARDL(1, 1, 1, 1, 1)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Long Run Equation				
LNER	0.042509	0.003874	10.97277	0.0000
LNRIR	0.044121	0.014997	2.941922	0.0037
LNDC	-0.043388	0.006055	-7.166076	0.0000
LNM2	0.029566	0.013174	2.244288	0.0261
Short Run Equation				
COINTEQ01	-0.876315	0.098335	-8.911559	0.0000
D(LNER)	-0.087568	0.055523	-1.577162	0.1166
D(LNRIR)	0.079298	0.036766	2.156857	0.0324
D(LNDC)	-0.132908	0.055736	-2.384583	0.0182
D(LNM2)	-0.559904	0.507761	-1.102692	0.2717
C	3.216769	0.351646	9.147748	0.0000

Mean dependent var	0.003157	S.D. dependent var	0.401850
S.E. of regression	0.196771	Akaike info criterion	-2.342311
Sum squared resid	6.814536	Schwarz criterion	-1.485864
Log-likelihood	332.0504	Hannan-Quinn criteria.	-1.996992

*Note: p-values and any subsequent tests do not account for model selection.

Dependent Variable: D(LNCPI)
Method: ARDL
Date: 05/29/19 Time: 17:43
Sample: 1993 2017
Included observations: 225
Maximum dependent lags: 1 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (1 lag, automatic): LNER LNRIR LNDC LNM2
Fixed regressors: C
Number of models evalulated: 1
Selected Model: ARDL(1, 1, 1, 1, 1)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
		Long Run Equation		
LNER	-0.447644	0.044686	-10.01762	0.0000
LNRIR	-0.452840	0.156502	-2.893510	0.0043
LNDC	0.123941	0.063358	1.956220	0.0520
LNM2	0.942304	0.149555	6.300739	0.0000
		Short Run Equation		
COINTEQ01	-0.729127	0.092676	-7.867514	0.0000
D(LNER)	0.793483	0.583049	1.360920	0.1753
D(LNRIR)	-0.693554	0.404173	-1.715982	0.0879
D(LNDC)	-0.101743	0.269290	-0.377817	0.7060
D(LNM2)	-0.856905	0.214555	-3.993878	0.0001
C	2.520586	0.587935	4.287187	0.0000

Mean dependent var	-0.016024	S.D. dependent var	0.915400
S.E. of regression	0.656500	Akaike info criterion	0.641036
Sum squared resid	75.85465	Schwarz criterion	1.497483
Log-likelihood	-17.00119	Hannan-Quinn criteria.	0.986355

*Note: p-values and any subsequent tests do not account for model selection.

Dependent Variable: D(LNBOP)
Method: ARDL
Date: 05/29/19 Time: 17:45
Sample: 1993 2017
Included observations: 225
Maximum dependent lags: 1 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (1 lag, automatic): LNER LNRIR LNDC LNM2
Fixed regressors: C
Number of models evalulated: 1
Selected Model: ARDL(1, 1, 1, 1, 1)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Long Run Equation				
LNER	0.121474	0.035679	3.404667	0.0008
LNRIR	-0.007662	0.072301	-0.105974	0.9157
LNDC	0.344627	0.055733	6.183530	0.0000
LNM2	-0.673419	0.142781	-4.716448	0.0000
Short Run Equation				
COINTEQ01	-0.241898	0.106372	-2.274079	0.0242
D(LNER)	0.614406	0.538368	1.141238	0.2553
D(LNRIR)	-0.319899	0.329729	-0.970189	0.3333
D(LNDC)	0.970157	1.044413	0.928902	0.3542
D(LNM2)	-1.096540	1.067290	-1.027406	0.3056
C	5.487421	2.396290	2.289966	0.0232

Mean dependent var	-0.011967	S.D. dependent var	1.998035
S.E. of regression	1.572744	Akaike info criterion	-2.120596
Sum squared resid	435.3403	Schwarz criterion	-1.264149
Log likelihood	306.1098	Hannan-Quinn criter.	-1.775277

*Note: p-values and any subsequent tests do not account for model selection

Appendix 5: Short run coefficients' for individual country

1. Cross section short-run coefficient between lnGDPGR, lnER, lnRIR, lnDC and lnM2

Burundi

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.558719	0.030586	-18.26740	0.0004
D(LNER)	0.051581	0.019443	2.652944	0.0768
D(LNRIR)	0.150107	0.004142	36.23837	0.0000
D(LNDC)	-0.083255	0.016879	-4.932392	0.0160
D(LNM2)	-0.080120	0.012017	-6.667401	0.0069
C	1.979441	0.386457	5.122029	0.0144

Ethiopia

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.887048	0.023736	-37.37177	0.0000
D(LNER)	0.087349	0.020798	4.199802	0.0246
D(LNRIR)	0.065745	0.004022	16.34695	0.0005
D(LNDC)	-0.437258	0.028275	-15.46424	0.0006
D(LNM2)	-0.099976	0.008414	-11.88215	0.0013
C	3.422298	0.364337	9.393210	0.0026

Kenya

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.738290	0.032080	-23.01379	0.0002
D(LNER)	-0.122694	0.006258	-19.60664	0.0003
D(LNRIR)	-0.010225	0.002333	-4.383197	0.0220
D(LNDC)	-0.082123	0.015571	-5.274181	0.0133
D(LNM2)	0.011202	0.035146	0.318724	0.7708
C	2.741853	0.446630	6.138985	0.0087

Madagascar

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-1.159387	0.038560	-30.06715	0.0001
D(LNER)	-0.112557	0.033381	-3.371855	0.0434
D(LNRIR)	-0.015816	0.021080	-0.750260	0.5076
D(LNDC)	-0.358894	0.030422	-11.79738	0.0013
D(LNM2)	0.068546	0.048515	1.412881	0.2526
C	4.084536	0.485495	8.413134	0.0035

Rwanda

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.916565	0.084703	-10.82097	0.0017
D(LNER)	-0.336472	4.788541	-0.070266	0.9484
D(LNRIR)	0.327066	0.544126	0.601086	0.5902
D(LNDC)	-0.178671	0.499936	-0.357388	0.7445
D(LNM2)	-4.598367	1.059053	-4.341962	0.0225
C	3.311198	1.363796	2.427927	0.0935

Seychelles

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.481666	0.032850	-14.66280	0.0007
D(LNER)	-0.369260	0.027303	-13.52462	0.0009
D(LNRIR)	0.122335	0.004144	29.51974	0.0001
D(LNDC)	0.032108	0.024113	1.331575	0.2751
D(LNM2)	-0.432568	0.028016	-15.43994	0.0006
C	1.852591	0.473040	3.916352	0.0296

Tazania

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-1.412554	0.031788	-44.43734	0.0000
D(LNER)	-0.001298	0.001836	-0.707156	0.5305
D(LNRIR)	-0.015725	0.000116	-135.9244	0.0000
D(LNDC)	0.060536	0.000471	128.4411	0.0000
D(LNM2)	-0.103446	0.002424	-42.67383	0.0000
C	5.075090	0.409974	12.37905	0.0011

Uganda

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.706716	0.043912	-16.09382	0.0005
D(LNER)	0.048080	0.009653	4.981021	0.0156
D(LNRIR)	0.030026	0.003022	9.936031	0.0022
D(LNDC)	-0.048690	0.000806	-60.44609	0.0000
D(LNM2)	0.071348	0.016943	4.211035	0.0245
C	2.525423	0.569072	4.437789	0.0213

Zambia

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-1.025889	0.026660	-38.48087	0.0000
D(LNER)	-0.032840	0.006143	-5.346293	0.0128
D(LNRIR)	0.060169	0.000655	91.86712	0.0000
D(LNDC)	-0.099920	0.003707	-26.95393	0.0001
D(LNM2)	0.124246	0.011189	11.10403	0.0016
C	3.958489	0.404014	9.797906	0.0023

2. Cross section short-run coefficient between lnCPI, lnER, lnRIR, lnDC and lnM2

Burundi

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.811506	0.028399	-28.57488	0.0001
D(LNER)	0.763567	0.378628	2.016667	0.1371
D(LNRIR)	-0.331420	0.126353	-2.622965	0.0788
D(LNDC)	-0.713345	0.303594	-2.349664	0.1003
D(LNM2)	-0.763450	0.287058	-2.659563	0.0764
C	3.513507	0.824310	4.262363	0.0237

Ethiopia

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.884983	0.041600	-21.27362	0.0002
D(LNER)	4.061644	10.38834	0.390981	0.7219
D(LNRIR)	-3.437484	2.771176	-1.240442	0.3030
D(LNDC)	1.873742	20.62002	0.090870	0.9333
D(LNM2)	-0.516554	6.244401	-0.082723	0.9393
C	0.815405	0.598801	1.361728	0.2665

Kenya

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.708825	0.033788	-20.97879	0.0002
D(LNER)	1.373977	0.352109	3.902142	0.0299
D(LNRIR)	0.254860	0.171562	1.485523	0.2341
D(LNDC)	0.083211	0.999728	0.083233	0.9389
D(LNM2)	-1.933278	2.193532	-0.881354	0.4430
C	1.858130	0.483775	3.840901	0.0311

Madagascar

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.299845	0.056195	-5.335766	0.0129
D(LNER)	0.294209	0.438520	0.670913	0.5503
D(LNRIR)	-1.548220	0.475335	-3.257116	0.0472
D(LNDC)	-0.367268	0.401298	-0.915198	0.4276
D(LNM2)	-0.587137	0.678512	-0.865331	0.4505
C	1.447052	1.318186	1.097759	0.3525

Rwanda

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.846671	0.029161	-29.03475	0.0001
D(LNER)	-2.280880	0.454085	-5.023025	0.0152
D(LNRIR)	-0.618796	0.125026	-4.949340	0.0158
D(LNDC)	-0.829455	0.097476	-8.509352	0.0034
D(LNM2)	-1.782868	0.195013	-9.142286	0.0028
C	3.756919	0.933306	4.025390	0.0275

Seychelles

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.261043	0.012118	-21.54120	0.0002
D(LNER)	2.196536	0.523144	4.198720	0.0247
D(LNRIR)	-1.069603	0.108954	-9.817005	0.0022
D(LNDC)	0.098676	0.386504	0.255303	0.8150
D(LNM2)	-0.007417	0.569652	-0.013020	0.9904
C	0.057765	0.041488	1.392331	0.2581

Tanzania

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.941090	0.033491	-28.09983	0.0001
D(LNER)	0.097512	0.173408	0.562326	0.6132
D(LNRIR)	0.272999	0.015244	17.90830	0.0004
D(LNDC)	-0.379802	0.044618	-8.512225	0.0034
D(LNM2)	-0.319829	0.146381	-2.184907	0.1168
C	4.341290	1.361746	3.188031	0.0498

Uganda

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-1.082342	0.045475	-23.80086	0.0002
D(LNER)	-0.334572	0.423463	-0.790087	0.4872
D(LNRIR)	0.309475	0.116944	2.646359	0.0772
D(LNDC)	-0.142389	0.035731	-3.985002	0.0283
D(LNM2)	-1.109555	0.872708	-1.271393	0.2932
C	5.288185	1.897854	2.786403	0.0686

Zambia

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.725837	0.009231	-78.62677	0.0000
D(LNER)	0.969351	0.066081	14.66912	0.0007
D(LNRIR)	-0.073796	0.006757	-10.92068	0.0016
D(LNDC)	-0.539053	0.035862	-15.03139	0.0006
D(LNM2)	-0.692054	0.100364	-6.895434	0.0062
C	1.607020	0.303839	5.289044	0.0132

3. Cross section short-run coefficient between lnBOP, lnER, lnRIR, lnDC and lnM2

Burundi

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.000938	0.000184	-5.104783	0.0145
D(LNER)	0.018269	0.000330	55.41390	0.0000
D(LNRIR)	0.012085	6.85E-05	176.4925	0.0000
D(LNDC)	-0.017033	0.000279	-61.07506	0.0000
D(LNM2)	-0.003241	0.000214	-15.17019	0.0006
C	0.019216	0.097602	0.196877	0.8565

Ethiopia

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.871862	0.036157	-24.11309	0.0002
D(LNER)	4.896725	68.82125	0.071151	0.9478
D(LNRIR)	-2.954682	17.41012	-0.169711	0.8760
D(LNDC)	9.314421	126.4596	0.073655	0.9459
D(LNM2)	-9.560574	36.79624	-0.259825	0.8118
C	19.38749	20.25841	0.957009	0.4092

Kenya

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.128997	0.014884	-8.666978	0.0032
D(LNER)	0.390886	0.199350	1.960805	0.1447
D(LNRIR)	0.117250	0.084946	1.380287	0.2614
D(LNDC)	0.263509	0.593469	0.444014	0.6871
D(LNM2)	-1.101845	1.445143	-0.762447	0.5013
C	2.942316	8.061946	0.364963	0.7394

Madagascar

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.686169	0.020446	-33.55962	0.0001
D(LNER)	-0.030420	0.005396	-5.637814	0.0110
D(LNRIR)	0.023761	0.004490	5.292445	0.0132
D(LNDC)	-0.162179	0.007605	-21.32634	0.0002
D(LNM2)	0.345916	0.011656	29.67735	0.0001
C	15.82232	11.17574	1.415774	0.2518

Rwanda

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.233497	0.005312	-43.95390	0.0000
D(LNER)	-0.153744	0.004980	-30.87020	0.0001
D(LNRIR)	-0.004733	0.001635	-2.894267	0.0628
D(LNDC)	-0.139111	0.001753	-79.37235	0.0000
D(LNM2)	0.096356	0.003887	24.78772	0.0001
C	5.406535	2.839140	1.904286	0.1530

Seychelles

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.029852	0.000625	-47.77955	0.0000
D(LNER)	-0.016315	0.000515	-31.67261	0.0001
D(LNRIR)	0.001059	6.33E-05	16.72801	0.0005
D(LNDC)	-0.001089	0.000347	-3.140143	0.0517
D(LNM2)	-0.013768	0.000493	-27.90000	0.0001
C	0.717635	0.356743	2.011633	0.1378

Tanzania

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.176339	0.007251	-24.32065	0.0002
D(LNER)	0.323818	0.177641	1.822879	0.1658
D(LNRIR)	0.009235	0.011372	0.812040	0.4762
D(LNDC)	-0.333444	0.044726	-7.455317	0.0050
D(LNM2)	0.294392	0.146276	2.012579	0.1376
C	4.000889	3.826106	1.045682	0.3725

Uganda

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.079329	0.001870	-42.42495	0.0000
D(LNER)	0.058107	0.011928	4.871401	0.0165
D(LNRIR)	-0.061246	0.003399	-18.01726	0.0004
D(LNDC)	-0.048940	0.001033	-47.38297	0.0000
D(LNM2)	0.046273	0.022506	2.056031	0.1320
C	1.813940	0.988364	1.835297	0.1638

Zambia

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	0.029902	0.007804	3.831726	0.0313
D(LNER)	0.042324	0.016809	2.517871	0.0863
D(LNRIR)	-0.021823	0.001782	-12.24647	0.0012
D(LNDC)	-0.144718	0.007462	-19.39337	0.0003
D(LNM2)	0.027627	0.016385	1.686157	0.1904
C	-0.723550	4.361013	-0.165913	0.8788