AFRICAN CENTRE OF EXCELLENCE IN DATA SCIENCE

ANALYSIS OF EXPANSIONARY FISCAL POLICY ON MACROECONOMIC STABILIZATION IN RWANDA: AN ECONOMETRIC STUDY

BY

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A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN DATA SCIENCE IN ECONOMETRICS AT THE UNIVERSITY OF RWANDA, COLLEGE OF BUSINESS AND ECONOMICS

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DECLARATION

I declare that this dissertation entitled expansionary *"Analysis of expansionary fiscal policy on macroeconomic stability in Rwanda: An econometric study"* is the result of my own work and has not been submitted for any other degree at the University of Rwanda or any other institution.

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APPROVAL SHEET

This dissertation entitled *"Analysis of expansionary fiscal policy on macroeconomic stability in Rwanda: An econometric study"* written and submitted by Mutoni Brenda in partial fulfilment of the requirements for the degree of Master of Science in Data Science majoring in Econometrics is hereby accepted and approved. The rate of plagiarism tested using Turnitin is 18% which is less than 20% accepted by ACE-DS.

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DEDICATION

This dissertation is dedicated to my family for their exceptional constant support and encouragement during my studies so far and my everyday life.

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ABSTRACT

Following the oscillating attitude towards fiscal policy as an efficient tool to foster economic stability and the scarcity of studies on the role expansionary fiscal initiatives play on the economic stability of the country, the present dissertation sought to analyse the impact of expansionary fiscal policies on macroeconomic stabilization in Rwanda. It followed the output framework to investigate the dominance of significant fiscal variables namely government spending, tax revenues and investments which are considered to influence macroeconomic stability. The macroeconomic stability indicator considered for this dissertation was economic growth represented by the value of Real Gross Domestic Product.

Analysis was executed using annual time series data from 1995 to 2018 and various econometric methods were applied. First, all variables were put under stationarity test using Augmented Dickey Fuller test (ADF) for detection of unit root. The results affirmed the stationarity of variables at first difference with function of constant.

Secondly, a Johansen cointegration test was used to check cointegration among variables, the results showed that three or more variables were cointegrated. Subsequently, Vector Error Correction Model (VECM) was applied to present the short run and long run dynamics in the variables. The results showed that government spending and investments positively affect real gross domestic product in the long run, but tax revenues have a negative relationship with real gross domestic product. In the short run, the results found no discernible relationship between any variables.

Finally, a Granger-Wald causality test was applied to detect causalities in our variables; the results indicated no causal relationship between real gross domestic product and fiscal policy variables, however, a unidirectional causality was detected by a pairwise causality test from investment and real gross domestic product to tax revenues.

This dissertation embraced the Keynesian theory of fiscal policy and recommended strengthening use of fiscal policies in macroeconomic stabilization. It also recommended allocating a bigger portion of government expenditures in investment expenditure as investments were found to contribute greatly to economic growth as a macroeconomic stability indicator.

Keywords: Fiscal Policy, Macroeconomic Stabilization, Keynesian Theory, Vector Error Correction Model.

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LIST OF SYMBOLS AND ACRONYMS

ADF: Augmented Dickey Fuller

AIC: Akaike Information Criterion

CEs: Cointegrating Equations

ECM: Error Correction Model

ECT: Error Correction Term

EDPRS: Economic Development and Poverty Reduction Strategy

FDI: Foreign Direct Investments

FE: Full Employment

GDP: Gross Domestic Product

GDPI: Gross Private Domestic Investments

IMF: International Monetary Fund

IS & LM: Investment-Savings (IS) & Liquidity preference-Money supply (LM)

LN: Natural Logarithms

MINECOFIN: Ministry of Economy and Finance

NISR: National Institute of Statistics of Rwanda

OECD: Organization for Economic Co-operation and Development

OLS: Ordinary Least Square

PCE: Personal Consumption Expenditure

Rwf: Rwandan Francs

SC: Schwarz Information Criterion

UR: University of Rwanda

USA: United States of America

VECM: Vector Error Correction Model

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CHAPTER ONE: GENERAL INTRODUCTION

1.1. Background and rationale of the study

One of the primary objectives of any country is ensuring sustainable economic growth; An economy is said to be stable when sensitive macroeconomic indicators such as the rate of economic growth, unemployment, inflation and exchange are at their best levels and do not fluctuate very often. Stability in this macroeconomics study represents a situation where governments use fiscal policies to keep the economy at or near stable condition (Kabir Abdullahi, 2019).

Many economists and policy makers spend a considerable amount of time studying and analyzing how fiscal tools and policies can be used to stabilize the economy and achieve sustainable growth. Theoretically, an expansionary fiscal policy was found to be an important tool for stimulating economic activity and hence economic growth by seeking to increase aggregate demand through a combination of increased government spending and or tax cuts.

Most economic studies propose that by increasing liquidity in the populace, the government can by extension stimulate overall economic activity and thereby lead to a gradual increase in economic output more so in time of depressions or recessions.

On the other hand, this line of action has the potential to adversely affect economic growth in the long run if the expansionary fiscal policies lead to a situation where the government has to rely on internal or external debt to finance expenditure (Mishkin, 2012).

Amid the 2007-2009 economic great recession, countries around the world took different measures to recover their economy and fiscal policy especially fiscal stimulus was among the prominent measures taken to address the impacts of that recession. Amongst others, countries like US initiated the "American Recovery and Reinvestment Act of 2009 (ARRA)" aimed at increasing the public spending and saving jobs, the UK adapted to temporary VAT cut to stimulate demand (Janjala, Cormac, Thomas & Melanie, 2009), and there were other various stimulus packages aimed at increasing GDP in countries all over the world.

Countercyclical fiscal policy has been one of the important post-crisis economic tools in Sub-Saharan Africa; for the period of 2010-12, South Africa recorded a large stimulus on public investment, Tanzania expanded its government spending by around 30% to finance roads and energy projects during 2009-10, while Uganda's budget increased by almost 20%

to support agriculture and infrastructure. However, studies have shown that fiscal policy actions pursued by Sub-Saharan African countries during the recession failed to include follow-up measures to regulate spending or increase government revenues after their economies had regained their growth momentum. Consequently, the region is facing persistent fiscal deficits and government debts and are urged to adopt fiscal consolidation measures (Calderon, Chuhan & Some, 2018).

In order to kick start the economy after 1994, the government of Rwanda pursued a number of strategies that emanated from various plans including but not limited to the EDPRS strategy whose main objective was to reduce poverty in the populace, invest in education, health, governance, increase foreign direct investment, infrastructure development and ultimately transform Rwanda into a middle-income economy by 2020. To fund these plans, an expansionary fiscal policy was utilized to great effect. Invariably, the current fiscal balance has persistently been closing with fiscal deficit over the years which arises when government expenditure exceeds government revenue (Karuranga W.,2015)

While the government has opted to reduced inflow of external grants and experienced external financial aid cuts since 2012; the GDP and government expenditures have both been showing an increasing trend where the recent government spending as per GDP was 14.9% in 2018 from 13.26% in 2008 however, the debt to GDP ratio has also been increasing where it in 2018 it was reported as 41.6% from 19.23% in 2008. From the above scenario, the current dissertation will analyze the effects of expansionary fiscal policy on Rwanda's economy for the period 1995-2018 with aim to answer to question of whether fiscal policies are important for economic development of a country or whether they can only be attributed to increments in sovereign debts.

In this dissertation, the dominance of expansionary fiscal policy variables such as government expenditure, revenues in form of taxes, and total investment on economic activity in Rwanda will be examined to assess the overall impact of expansionary fiscal policy on Rwanda's macroeconomic stability.

1.2. Statement of the problem

Fiscal policy as a tool to foster economic stabilization and growth has been a subject to debate by both academicians and economists since time immemorial. This matter has been a victim of oscillating attitudes of economists since the development of the Keynesian theory in the 1970s after the classical theory was deemed inadequate to address the cause and

provide solutions to the global economic crisis at the time. During this period, there was general confidence in fiscal policy as the best economic tool to offer relevant solutions to stabilize the global economy which was on a downward trajectory (Sebastian D., 2012)

However, questions and doubts on the relevance of the fiscal policy to economic stability started to emerge right after the Vietnam War and the initial oil price fluctuation in 1973. One can describe the macroeconomic environment during this period as toxic characterized with increasing inflation generally and budget deficits of industrialized economies. This toxic macroeconomic environment persisted despite the adoption of fiscal policy which ultimately cast doubt on its relevance to stabilize the economy at the time; this continued throughout the 1980s and 1990s. (Sebastian D., 2012)

There was a resurgence in the confidence in the fiscal policy as a stabilization tool during the 2008 global economic recession. During this time for example, United States of America as well as other Organization for Economic Co-operation and Development (OECD) countries experienced severe economic recession characterized by a decline in the GDP and exponential increase in unemployment levels. In order to reverse the recession and stabilize the economy, the USA government adopted tax cuts and all major OECD countries as well as the most important emerging markets engaged in expansionary stimulus measures which saw various forms of government spending and reduction of taxes (Feldstein, 2002)

However, despite the success of the fiscal policy reversing the economic recession in 2008, policymakers and economists foresee adverse impact on the economy as a result of increased public debt which is obtained to fund the fiscal policy. For example, Reinhart and Rogoff's (2009) assert that there are high chances of slowdown of economic growth once a certain threshold of public debt is reached.

Expansionary fiscal policy has been at the forefront of the economic growth strategies in Rwanda most notably after 1994 when the country's economy was severely affected by the genocide. Despite the use of this tool to stabilize the economy after 1994, the study surrounding the effect of the fiscal policy on the economic growth of Rwanda is still insufficient. Furthermore, there is limited study on macro-econometric model that offer guidance in setting these policies. There are concerns on stability in some macroeconomic indicators in the long run as the country drifts to a more contractionary fiscal policy lately.

Following the oscillating attitude towards fiscal policy as an efficient tool to foster economic stability and the scarcity of studies on the role of the expansionary fiscal policy on the

economic stability of Rwanda; it justified the extensive study on whether expansionary fiscal policy initiatives can be used to stabilize macroeconomic indicators in Rwanda especially in the current period where there is anticipation of economic recession due to the outbreak of COVID-19 global pandemic.

1.3. Objectives of the study

1.3.1. Main objectives

The overall objective of this research is investigating the effect of expansionary fiscal policy on Rwanda's macroeconomic stabilization.

1.3.2. Specific objectives

The specific objectives of this study are:

1. To analyze how GDP responds to an increase in government expenditure, tax revenues and investments in Rwanda.
2. To investigate the casual relationship among GDP, government expenditure, government revenue and investment

1.4. Research questions

The following research questions were answered in this study:

1. What happens when the government increases its expenditure and tax revenues or when there is an increase in capital formation (investments)? Does the GDP respond positively, negatively or it does not respond at all?
2. How does government revenue, government expenditure and investments affect GDP in short run and long run?
3. Is there any causal relationship between GDP, government expenditure, government revenue and investment?

1.5. Scope of the study

The scope of this study was sub divided into subject scope, geographical and time scope.

1.5.1. Content Scope

This research dissertation is within the economics discipline and will focus on the role of expansionary fiscal policies on macroeconomic stabilization in Rwanda. A study on macroeconomic stabilization requires statistics on macroeconomic variables. The most

prominent of these variables are Gross Domestic Product (GDP), inflation, interest rates, and unemployment, but there are many others. For the aim of this study, GDP will be assessed as the main macroeconomic dependent variable reflecting the country's economic growth stability. Expansionary fiscal policies are reflected through government spending and taxes; these will constitute our independent variables together with investments which was found to be a key indicator of economic performance of a country.

1.5.2. Geographical scope

This study assessed the macroeconomic indicators and expansionary fiscal policies for Rwanda as a country.

1.5.3. Time scope

The study exclusively looked at Rwanda's macroeconomic variable values for the period of 1995-2018.

1.6. Significance of the study

1.6.1. Personal significance

This research will help the researcher to put into practice theories learnt and develop her research skills. Once the project is completed successfully it will allow her to be awarded a Masters' degree of Science in Data Sciences with specialization in econometrics

1.6.2. Public significance

This research project is one of the very few others done on investigating the contribution of expansionary fiscal policies in macroeconomic stabilization using empirical econometric analysis. Once successfully completed, it will inform policy makers within the economy sector on how economic policies execution can be improved to keep the country's economy stable. It can also be used by the whole public having a stake in expatriate economic policies to add to their knowledge and understanding on these policies, it can be considered as reference document for further similar research.

1.6.3. Academic significance

As for other academic studies, once successful completed, the report of this research will be available in UR's libraries, and it can be used by any students or academician or professional

as reference document about the expansionary fiscal policies contribution to macroeconomic stabilization.

1.7. Structure of the study

This dissertation is comprised of 5 chapters: Chapter 1 provides a general introduction of the study including the background of the study, problem statement, significance of the study, research objectives, research questions and structure of the study; chapter 2 provides a literature review of theories and empirical findings of related studies; chapter 3 describes the methodology used in the study; chapter 4 shows the analysis done and findings and the last chapter of this dissertation provides concluding remarks, policy recommendations along with future research directions.

CHAPTER TWO: LITERATURE REVIEW

2.1. Overview

A number of studies have been done in the past with the aim of understanding the relationship between the expansionary fiscal policies and macroeconomic stability of a given country. This chapter will review existing literature that is related and has been recorded by other scholars or researchers on different theories surrounding expansionary fiscal policies, present a detailed analysis of the determinants of government fiscal policies and relevant empirical review. A critical assessment on the relevance of the existing literature will be presented highlighting some of the gaps that ought to be addressed by researcher on a similar topic in future.

2.2. Theoretical review

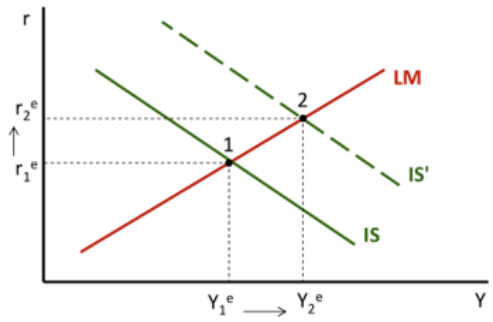
The theoretical review in this topic of study covers macroeconomic theories on fiscal policies as tools for stabilization, specifically; the Classical theory, the Keynesian theory and the New Classical theory will be covered. This section will discuss these theories in detail and further summarize the key points discussed in the theories mentioned herein.

2.2.1. Keynesian theory of fiscal policy

During the great depression in the 1930s, the exiting economic theories neither explained the cause of the worldwide economic collapse nor provided adequate solutions revive the already collapsing world economy. The Keynes theory was developed by John Maynard Keynes in the quest to understand and provide adequate solutions to the prevailing worldwide economic collapse at the time.

At the time of his invasion, the most prevailing idea in the economy was that if markets are left to operate freely, they would automatically generate full employment in the economy; in this situation, every manpower willing to work would get a job if his/her wage demand is flexible. John Maynard Keynes revolutionized this idea and on the contrary, pushed forward the idea that aggregate demand and government are the major driving forces of an economy. He argued that free markets are not capable of reaching full employment on their own and warned the possibility of persistent involuntary employment if government does not intervene (Wendy & David, 1990).

As per the Keynesian theory (1936), government fiscal policy is essential in preventing the fall in aggregate demand as compared to probable aggregate supply. The IS-LM model best illustrates this theory as demonstrated by shift of the IS-curve. In this case, there is an increase in output in the event government spends or cuts taxes and output decreases when government cuts down on spending and increases taxes (Abel, 2010).



Source Abel et al. (2010)

Figure 1: Keynesian IS-LM Curve: Fiscal Policy

According to figure 1, if government decides to increase public spending to stimulate the economy: G↑ → shifting IS to the right → Y↑ and r↑ (new balance in point 2)

We know that Y = C + I + G + X- M; therefore, if G increases, Y increases.

It ought to be noted that IS-LM model majorly focuses on the demand side of the economy that is, an increase in output is basically attributed to an increase in aggregate demand. According to Keynes (1936), a government's increase in public spending leads to increase in people's income which subsequently leads to increase in demand. The resulting rise in interest rates is for keeping money supply and money demand in equilibrium. Fiscal policy is more compelling in a situation where the levels of interest rate are so low to the point that an increase in money does not appeal to investors to give credit services. In the event of such a scenario, one would justifiably argue that the impact of demand depends on the level of interest rates in the economy.

The Keynesian economists are of the view that aggregate demand determines the real GDP of a country in the short run. With prices fixed for a defined period of time, aggregate demand can be changed to attain the desired GDP and employment levels.

One major implication of this theory is that when an economy is not at its full employment level, it will not restore itself without government involvement, therefore unemployment or inflation will persist in that economy.

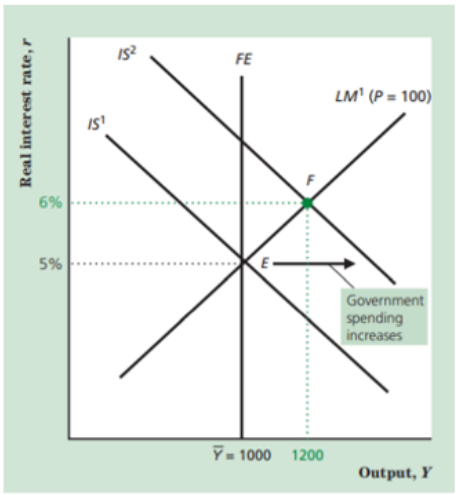
The critics of the Keynes theory have claimed that it does not put into consideration the supply side of a given economy i.e. the theory only considers the demand side of the economy to influence employment levels and also revive an economy. Some economists also regard Keynes as a modern-day "mercantilist" referring to the theory that governments should be responsible for economic welfare (Antony, 2015).

2.2.2. Classical theory of fiscal policy

The Classical theory precedes the Keynesian theory, and it hinders from the groundbreaking work of Adam Smith (1776) in his famous book "The Wealth of Nations". The fundamental principle of classical theory is that the economy has capacity to self-regulate and if markets are left to operate freely, they would keep the economy at its full employment level (Wendy & David, 1990).

The primary assumption in the classical theory is that the natural state of the economy is "full employment" where output is at its optimum point and there is alignment of the demand and supply curve as there is adjustment in the levels of prices, wages, and interest rates. Furthermore, in the case of any shock to economy, the classical theory assumes existence of self-adjusting mechanisms within a free-market system that work towards bringing back the economy to its natural level of output. Say's law supports this theory where it states that "supply creates its own demand" (Steve & David, 2018)

To fully get a grasp of the classical way of thinking, we shall use an illustration of the figure 2 which presents an economy's initial equilibrium at point E. Graph 2 indicates that output matches the full-employment level (Y=1000) at a real interest rate r = 5% and price level P =100.

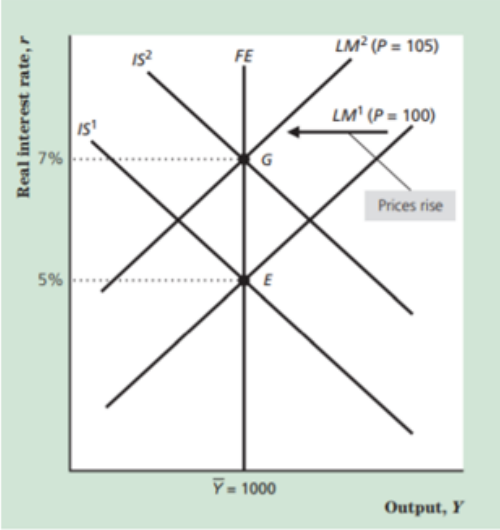


Source Abel et al. (2010)

Figure 2: IS-LM Curve: Classical theory

According to figure 2; increase in government spending shifts the IS curve up and to the right from IS^1 to IS^2. At point F, a new equilibrium (where LM meets IS^2) is observed at a higher real interest rate r = 6%, which reduces private investment, partially offsetting the increase in aggregate demand resulted from rise in government spending. If firms decide to produce extra output Y = 1200 to meet the increased aggregate demand, output will now rise higher than full-employment output.

According to classical economics, the economy takes on a self-correcting trend which automatically returns to full employment disruption shifts it from the general equilibrium. Therefore, the adjustment process in the economy will be almost immediate if market players i.e., firms choose to respond to the increase in demand by revising prices upwards as opposed to increasing production.



Source Abel et al. (2010)

Figure 3: Price implications on IS-LM Curve

figure 3 presents how an economy can self-restore to equilibrium after surplus in aggregate demand caused by government's increased spending. By increasing price level (P = 105), the real money supply would decrease and shift the LM curve from LM^1 to LM^2. This would reduce aggregate demand until general equilibrium restores at point G (here, LM^2 meets IS^2 at FE line) Output has returned to full-employment output of 1000, the price level has risen, and the real interest rate has increased. This shows that in the instance of an increase in government spending, the economy is brought into general equilibrium by adjustment of the price level. Here, investment spending (I) will depend on the level on the interest rate, which will lead to S=I in the long run.

As mentioned in the preceding paragraphs, the fundamental principle in the classical theory is self-regulation of free markets i.e. free from external influence. Adam Smith described this as an "invisible hand" which gravitates markets towards their natural equilibrium in the event there is perfect competition in the market (Rothschild,1994)

To differ from the Keynesian theory discussed in the preceding section, government intervention is not required to maintain economic stability and therefore fiscal policy is considered ineffective to rectify the economy as free markets have the ability to generate favorable outcomes on their own without any external influence.

The analysis of the classical theory is critical to this dissertation as it basically opposes any form of government intervention through fiscal policy to stabilize or grow a given economy. Although the classical theory did not seem to offer answers or solutions during the 1930 global economic crisis prior to the development of Keynesian approach, one can also be interested in knowing the extent to which it (classical theory) applies to economies today. Therefore, it is important to extensively examine the relationship between the macroeconomic indicators and government fiscal policy initiatives in Rwanda to understand the relevance of the classical theory to economic growth.

2.2.3. New classical macroeconomics expansionary fiscal policy

New classical macroeconomics was developed in the 1970s after policy makers observed that much of the difficulty they encountered was attributed to a shift in aggregate supply. The Keynesian economists had actually focused more on aggregate demand as a primary factor to attain economic growth. This consequently led to the development of the new classical macroeconomics way of thinking that focused on individual decisions and also factored in uncertainty and how rational expectations would affect the entire spectrum of economic activities (Wendy & David, 1990)

Similar to the Classical theory explained in the preceding section, the new classical doctrine assumes that the economy is operating at full employment unless distracted by unexpected shocks or government policies.

The new classical macroeconomics is founded on three key assumptions: all individual economic agents are assumed to maximize utility on the basis of rational expectations; markets clear more or less continuously with complete information and prices are correctly anticipated because of rational expectations. This school of economists generally assumes that information is readily available in the economy and everyone in the economic system is making full use of it (Wendy & David, 1990).

The new classical model disregards the role of government in directing the operations of the economy at a natural rate as the economy is assumed to be in equilibrium at a unique natural disregarding the regular market disruption. Furthermore, the government's attempt at reducing unemployment below the natural rate will not succeed.

The new classic school of economics tends to give a resounding argument against fiscal policy as it claims that fiscal policy whether expansionary or contractionary does not have any influence on aggregate demand in a given economy. This school of economics argues that in an expansionary fiscal policy where government increases spending or makes tax cuts will increase deficit and reduce surplus. They further argue that such policies will increase public debt which will consequently push players in the economy to anticipate that they will end up more taxes in future to mitigate the public debt. As a result, the consumption will reduce thus justifying the new classical thinking that fiscal policies do not have any effect on aggregate demand in an economy. They however point that if the government wants to influence the economy, it should communicate this and because agents are rational thinkers, they'll know what to expect and act on the new (Wendy & David, 1990)

New classic macroeconomics position in particular its position on expansionary fiscal policy is very essential to this study. It will be taken into account when establishing the relationship between the expansionary fiscal policy and the macroeconomic indicators in Rwanda. It is important to understand whether this school of thinking has any relevance at all when it comes to determining economic growth or stability in Rwanda.

2.2.4. Summary of key insights in theoretical review

In the preceding paragraphs, macroeconomic theories such as Keynesian theory; classical theory and new classical macroeconomics doctrines have been examined and their relevance to this study established. Some of the key takeaways from the considered theories include but not limited to the following:

- The level of aggregate demand is critical in determining general output and employment levels according to the Keynesian theory.
- As per the Keynesian theory, government intervention is key to the wellbeing of the economy. An intervention by government in the economy will increase the level of aggregate demand i.e., a rise in government spending will shift the aggregate demand. Prices will be pushed by additional demand for output, and this will lower the real wage making it profitable for firms to raise employment and increase output to meet additional demand. Here investment is a function of interest rates and savings are not fixed at a unique full employment level, but rathe depend on the actual employment.
- Classical economist emphasizes on free markets and ability of an economy to operate on its own. Here, full employment is the natural state of the economy, and any effort of government intervention will be useless if not worsen the situation.
- Changes in prices determine aggregate demand and supply according to the Classical theory. Further, it is the flexibility in the interest rates that ensure investment matches the full given employment level of savings.
- In the classical model, any rise in government spending will have the effect of pushing up the interest rate until investment has been reduced by exactly the amount of the rise in government expenditure.
- The new classical model has similar view on the role government intervention and natural state of the economy under conditions of perfect foresight where there are rational behaviors and expectations from economic agents. Therefore, the debate on fiscal policy effectiveness categorizes the classical and new classical models as one.

2.3. Empirical review

Binata R. S. et.al (2019) studied the impact of expansionary fiscal policy on output in Bangladesh. Annul time series data from 1994-2017 was used to examine the impact fiscal policy variables namely government expenditure, total revenue, and total investment on output in Bangladesh. Their study applied vector error correction model (VECM) to find out both short run and long run relationship between gross domestic product, government expenditure, tax revenue and investment. Results of their study confirmed a positive relationship between gross domestic product and tax revenue as well as investment but there existed a negative relationship between government expenditure and gross domestic product. Their study recommended proper planning of tax revenues as they greatly affect the country's output reducing government expenditure and inviting foreign investments.

In Nigeria, a study by Amadi,s: N. et al. (2011) which run Johnanen's co-integration test on a number of macroeconomic performance indicators found a very high association between fiscal policy variables (government's spending) and macroeconomic performance indicators where the variation in government spending accounted for 94% of changes in macroeconomic variables. The result showed that government expenditure had a strong effect on determining the macroeconomic performance of the Nigerian economy within the period 1970-2007.

Another study on Malaysia's economy by Hussain Ali Bekhet (2012) used Malaysia's time series data for 1970-2011 period to examine the causal relationship among government expenditure, external debt, GDP, export and FDI. Applying co-integration test to detect the long run relationship and granger causality to evaluate the direction of causality, the results of their study showed the existence of long run relationship among variables and unidirectional causality running from government expenditure and GDP growth to external debt. However, it was found that there was no causal relationship between government expenditures and GDP growth. The study concluded that expansionary fiscal policy in Malaysia could increase the burden of the country rather than directly stimulating economic growth.

In another instance, Anthony Mutua Muthini (2015) investigated the relationship between macroeconomic indicators and government fiscal policy initiatives; Using both autoregressive and linear regression models for the data from 1985 to 2014 in Kenya, government fiscal policy initiatives were measured in terms of GDP growth and its components which were consumption, investments, government expenditure and net

exports.

The study used econometric data analysis where stationarity of the data was tested using augmented dickey fuller test. Afterwards, the study performed a Cointegration test using Johnsen cointegration test and the results indicated that the variables were not cointegrated. As a result of no cointegration between variables, Vector Auto Regression (VAR) model was used for modeling the effect of GDP and the results indicated that increase in GDP had a positive effect on all independent variables. The results of linear regression analysis indicated a positive relationship between macroeconomic indicators and government fiscal policy initiatives in Kenya since all variables were positively related but on the short run. Also results after co integration and vector auto regression analysis supported the positive relationship in the short run. As a result, the findings suggested that the relationship between macroeconomic indicators and government fiscal policy initiatives in Kenya hold in the short run since there was no co integration amongst the variables indicating absence of a long run relationship.

Finally, G. Chipaumire, et al (2014), investigated the validity of the Keynesian macroeconomic framework and the Classical perspective of a long run relationship and causality between government expenditure and economic growth in South Africa using quarterly data from 1990-2010. The study applied both Augmented-Dickey Fuller and Philips-Perron tests to test for stationarity. The Johansen Maximum Likelihood test techniques followed using both the trace and maximum eigenvalues test to check cointegration in the variables. Both the stationarity and Johansen procedures found an existence of long run relationship between government spending and economic growth in South Africa.

From the results of their study, increased government spending in South Africa showed no meaningful contribution to economic development of the country which contradicts the Keynesian stance. In fact, the empirical results indicated a negative relationship between government spending and economic growth where a 1 percent increase in the government expenditures led to a 6.54 percent decrease in the GDP. It was expected that an increase in government spending would positively affect country's output through a multiplier according to the Keynesian theory, however the results of the study indicated a negative sign. The study mentioned that the reason of a negative relationship between government spending and economic growth in South could have been due to the inefficiency of public programs which led to wastages and losses.

2.4. Conceptual framework

From the previous theories and empirical reviews in this dissertation, the concept of macroeconomics shows a broad range of aggregate indicators such as economic growth, unemployment, and inflation among others and the conscious manipulations of a number of policy instruments - fiscal, monetary, exchange rates and income policy measures to achieve a certain level of macroeconomic performance objectives which includes full employment, economic growth rate, price stability etc.

Despite disagreement among scholars and policy makers on the performance and magnitude of effects of fiscal policy on the economy, there is a remarkably strong agreement that fiscal policy has some impact on the economy. The sequence of events that occur-in the process and the theoretical relationship between fiscal policy and macroeconomic performance measures in our dissertation are shown below:

Open economy

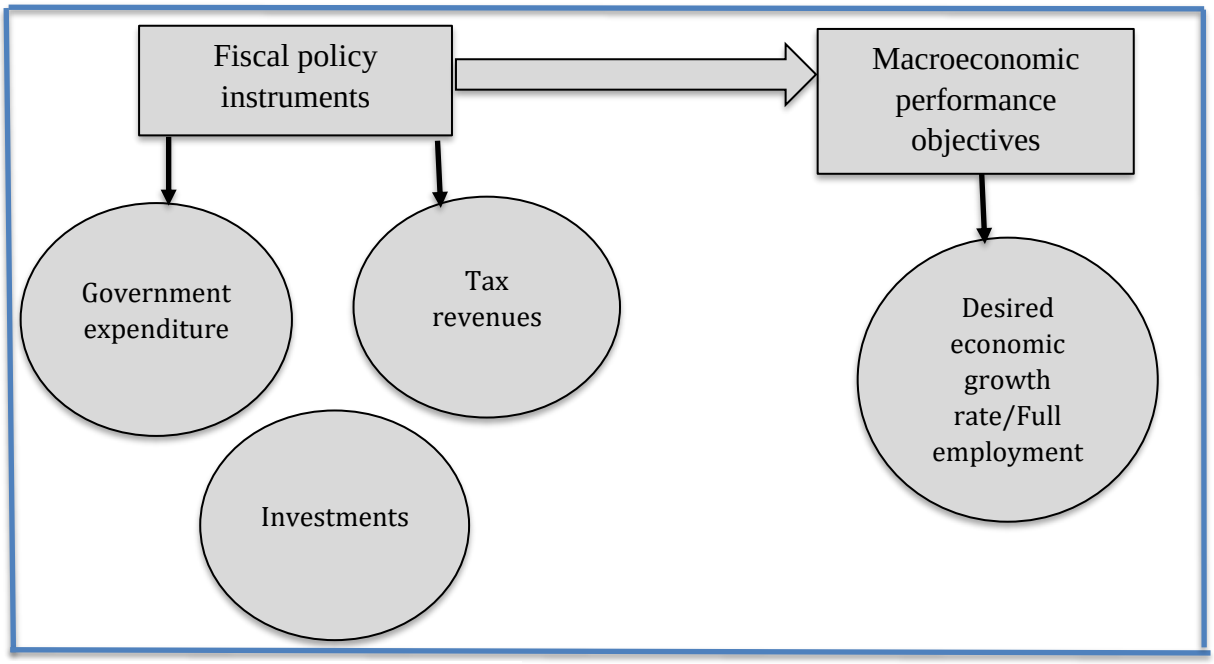


Figure 4: Conceptual framework

Source: author, 2020

Figure 4 illustrates a framework in which a fiscal policy instrument such as government expenditure, investments or tax revenues can be manipulated to achieve a certain macroeconomic objective such as desired economic growth. In relation to how the empirical results rhyme with prior expectations of the relationship between the variables in this dissertation, the framework implies that a single policy action initiated in the economy will have impacts on various economic sectors.

2.5. Chapter summary

The above studies reveal both positive and negative relationship between fiscal policy variables such as government expenditure, tax revenues, investment, and macroeconomic indicators such as economic growth. From the empirical review some studies have revealed a healthy relationship between government expenditure, taxation, and gross domestic product where scholars have argued that expansion of government expenditure contributes positively to economic growth. On the contrary, others did not support the claim that increasing government expenditure promotes economic growth, instead they assert that higher government expenditure may slowdown overall performance or the relationship between macroeconomic indicators and government fiscal policy is only positive in the short run but negative in the long run. Based on these conflicting results, and concern among policy makers, this dissertation will attempt to investigate the relationship between macroeconomic indicators and government fiscal policy initiative.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1. Introduction

“Just as there are posts along the way as you travel to your destination, so there are practical steps through which you must pass in your research journey in order to find the answers to your research questions” (Ranjit Kumar, 2011). Research methodology is the path to finding answers to your research questions and it is defined as a systematic way to conduct you research and arrive at end objectives (Ranjit Kumar, 2011)

At each operational step, a purposeful selection of methods, procedures and models of research methodology was made to best achieve the targeted research objectives. This chapter details the methodology used in this dissertation. The following will be described in this chapter: research design undertaken, research methods which a clear description of data collection, data processing and data analysis methods and tools that were used to conduct the research.

3.2. Research Design

Creswell & Plano Clark (2007) defined research design as a procedural plan for collecting and analyzing evidence that will make it possible for the investigator to answer research questions validly, objectively, and accurately.
Various research designs can be undertaken according to the purpose, type, or scope of the research. There exists basic, applied, descriptive, and analytical research (Amrhein, Trafimow, & Greenland, 2019). Since the purpose of this research is to investigate the existence of correlation between macroeconomic indicator (GDP) and expansionary fiscal policies; this research combined a quantitative approach and descriptive method.

Quantitative approach was undertaken to define the research questions based on the trends in the variables of this research. J. Creswell (2012) describes quantitative approach as path to follow when the researcher is looking to identify research problem based on the situations in the field or if there is a need to explain the existence of a matter.

This research is classified under descriptive research design with correlation method. Descriptive approach used is particularly the descriptive statistic approach due to quantitative approach. Orodho and Kombo (2002) explains that descriptive research studies have been designed in order to gather information that concerns the present situation found

in field in order to come up with conclusions that are valid based on the facts discussed and there in no control of variables in this research.

According to J. Creswell (2012); a correlation research design is a design in which correlation statistical test is used establish or discover whether there is a relationship/association/interdependence between two or more variable without the need to manipulate the variables.
Two types of correlation study exist: explanatory and prediction designs (J. Creswell 2012). This dissertation aligns with the explanatory design in which the researcher aims at measuring the degree of association at which variables co-vary.

The above elaboration of deigns explains the reason why the mentioned methods are the best to use to reach our research objectives.

3.3. Research methods

Under selected research design, a researcher must use a range of methods which includes various techniques, procedures, schemes, algorithms, and tools to find answers to research questions. The combination of all those methods are referred to as research methods. They are essentially systematic and help a researcher to find solutions to defined research problems using verifiable facts and not own reasoning (Goundar S. 2012).

According to our research design, the following research methods will be applied to find solutions to our research questions.

3.3.1. Data collection methods

In order to obtain results for our research objectives, secondary data sources for Rwanda's macroeconomic time series variables were considered for the period of 1995-2018. All the dataset was obtained from MINECOFIN and IMF data portals.

3.3.2. Model specification

In the quest to investigate the relationship between fiscal policies and macroeconomic stability; this dissertation followed the Keynes model of employment where output stability is determined by aggregate demand and fall in investments reduces aggregate demand (Wendy & David, 1990). There are basically four determinants of aggregate demand, these include: consumption; government expenditure; investments and net export. The role played

by the determinants mentioned herein towards the development of a fiscal policies for output or economic growth stabilization are discussed below.

- **Gross Domestic Product**

Gross Domestic Product (GDP) is a key measure of a country's economic growth in a given period. GDP is defined as the total value of final goods and services produced in a nation's economy over a defined period of time (IMF, 2020).

In practice, GDP of a given economy is determined annually, however GDP can also be determined quarterly depending on the needs of a specific economy (Trivedi, 2009).

In computing GDP of a given economy, an economist considers personal/household consumption, government expenditures, investments and net exports that occur within a defined territory. GDP computation has been proven over time to have a high degree of accuracy in comparing productivity of more than one states.

While deciding on formulating a fiscal policy, policy makers or governments use GDP to compare and assess the performance of an economy on year-to-year basis. GDP popularity as a macroeconomic indicator in part stems from its measuring of value added through economic processes (Van Den Heuvel, 2009).

- **Consumption**

Personal consumption expenditures (PCE) is a tool used to determine the how much money consumers in a given economy spend over a defined period of time. It measures consumer's spending on goods and services in a given economy. PCE is arguably the primary engine that drives future economic growth as it accounts for more than a half of nation's final spending (Chen, 2014).

A number of economic decisions in a given state are determined by the level of consumption; in most cases, economists are keen to relate consumption and consumers' income. In this way consumption plays a significant role in making economic decisions.

There are a number of approaches adopted by different scholars in the conceptualization of both production and consumption. For example, mainstream economists disregard expenses made on fixed investment, intermediate consumption while developing the concept of consumption; they only consider purchase of final good and services. However, other economists have adopted a broader definition of consumption to take into consideration the aggregate of all economic activity (Prokeinova, 2014).

- **Government Expenditure**

Government expenditure refers to goods and services purchased by the state. It is simply a term that describes the funds that the state spends on consumption such as goods and services to satisfy public needs; investments such as goods and services acquired for future use, and transfer of payments which normally consists of income transfers (Alesina et al, 1998).

All public institutions or levels of government including but not limited to the decentralized public entities to the executive arm of government undertake public expenditure.

In a given free market economy, production shortages might occur where produced goods and services are not enough to satisfy available demand or price constraints limit their accessibility for average consumers. Consequently, the government expenditure is geared to filling these gaps in order to satisfy its population. This funding of population needs by government is generally referred to as government final consumption (Knight et al, 2003).

- **Investments**

Gross private domestic investment (GPDI) is the measure of the amount of money invested in domestic businesses by private sector. It is one of the components considered by economists when computing a given country's GDP as it serves as an indicator of future productivity of a specific economy (Resosudarmo et al, 2002).

GPDI includes nonresidential investment usually known as business investment, residential investment, and change in inventories. Net investment is therefore gross investment minus depreciation. The key difference between GPDI and net investment is the consideration of depreciation in computation (Lin, 2010).

From the above determinants, independent variables retrieved for this dissertation are fiscal variables namely tax revenues (TR), government expenditure (GE) and investment (INV) whereas the dependent variable considered is real gross domestic product (GDP). To generate results of analysis, E-Views 10 statistical software was used for all tests and data manipulations.

This dissertation followed an econometric model of the following form:

$$Y = f(X_1, X_2, X_3)$$

This model can be expressed as follows:

$$GDP = f(GE, INV, TR)$$

$$GDP = \alpha_0 + \alpha_1 GE + \alpha_2 INV + \alpha_3 TR + \mu$$

Where;

GDP: real Gross Domestic Product

GE: Government Expenditure

INV: Investment

TR: Tax revenues

α: coefficients of the equation

μ : Error term

3.3.3. Data Processing

Data processing refers to how data collected is manipulated in order to give out information that has meaning. The process by which data is analyzed contains several stages. Quantitative analysis was used in manipulation of the data in order to assist the researcher to be able to describe the distribution meaningfully without using much indices.

To avoid meaningless results from our analysis, unit root will be checked in each variable by using Augmented Dickey Fuller (ADF) test; this test is important in examining the stationarity of a time series. Under a null hypothesis (H0) on non-stationarity, each variable will be subject to ADF test where H0 will be rejected for an instance of higher absolute value of ADF's test statistic as compared to critical values.

A time series is said to be stationary if there are no constant fluctuations in its mean, variance and the autocovariances over time. Non-stationarity may create spurious regression where variables trended overtime may produce significant coefficients and high R^2 while the relationship is meaningless (Gujarati, 2010).

3.3.4. Methods of Data analysis

Data analysis is the process by which inspection and modelling of data is done with the aim of suggesting conclusions, supporting decision-making and finding useful information. In order to achieve the objectives of this dissertation, appropriate statistical and econometric techniques will be applied.

- Ordinal Least Square (OLS)

First, regression techniques will be used to examine the relationship amongst our variables. Depending on the results of the stationarity tests made; we will apply the classical Ordinal

Least Square (OLS) Method to analyze the relationship between our expansionary fiscal policy indicators and GDP if our time series variables are found to be stationary.

However, as most economic time series data are integrated at first difference I (1) where the non-stationary variables become stationary at first difference; we will apply a co-integration test to investigate the long run equilibrium relationship at which our variables converge overtime. This relationship if found, will imply that our variables move closely together and the distance between them will be stationary overtime (Engle and Granger, 1987).

- Augmented Dickey Fuller test

Co-integration will be investigated by testing the stationarity in the residuals of our cointegrating regressions; if the residuals are stationary at level, it will indicate a long run equilibrium relationship among our variables. To test this stationarity, Engle-Granger's ADF test will be used with a null hypothesis of "no cointegration" which will be rejected if the value of ADF statistic for residuals is smaller than the critical value of ADF; this will mean that our variables are cointegrated.

Assuming our variables are co-integrated, the Error Correction Model (ECM) also known as the dynamics of adjustment will be estimated using the lagged differences of our series; the estimated model will allow us to study the short-run dynamics in our variables towards equilibrium and measure the speed of adjustment of our GDP to its equilibrium level. Highly significant error correction term emphasizes the existence of a stable long-term relationship.

- Johansen's co-integration test and Vector Error Correction Model (VECM)

Again, for the purpose of this dissertation, we would also prefer to conduct a Johansen (1988) test of long-run equilibrium relationship between our time series. Johansen's co-integration test will help us to determine the number of cointegrating equations (CEs) that exist between our variables when more than two variables are considered. This procedure will also help us to get the Vector Error Correction Model (VECM) which will be used to identify the nature of the long run equilibrium relationship.

If our non-stationary series are integrated of the first order I (1) and are found to be cointegrated, the VECM will be used to examine the short run and long-run dynamics of the cointegration series. Additionally, the t-statistics of error correction terms and regressors estimated will provide information about whether values of variables used this study are affected by their past values; is long-run casual effects within our variables.

- Granger Wald statistic test

Lastly, we will investigate the existence of short run causal relationships between our variables. This investigation will be done using the Granger Wald statistic test on lagged explanatory coefficients from the previously estimated VECM. The null hypothesis will be that all short run coefficients are jointly zero. This H0 will be accepted if the probability of the chi-square value statistic is greater than 5% significant level meaning that there is no causality, otherwise there is a short run relationship. Following that, pairwise granger causality test will be applied to see the direction of causality.
With the above-mentioned techniques, our analysis will focus on investigating whether movements in GDP in the period of study were caused by government's expansionary fiscal policies and inspecting short run and long run relationships amongst our variables.

Results will be graphically as well as articulated to provide clear empirical findings of the analysis.

3.4. Limitations

This dissertation was designed to investigate the relationship between expansionary fiscal policies in Rwanda and macroeconomic indicators, specifically GDP. Although the main objective of the dissertation can be achieved, one of the limitations encountered was the inconsistency in the given secondary data from MINECOFIN. Rwanda has put effort in data accessibility and several institutions have data portals that are freely accessible, however, during this study, the MINECOFIN's published macroeconomic framework public dataset found in January 2020 had some differences in the updated dataset of July 2020. This pushed the researcher to consult MINECOFIN and NISR to ensure consistent data is provided and used.

Also, in order to carry out the research, time constraints were faced especially during the ongoing COVID-19 global pandemic where many agencies were closed and access to resources like data and e-views software for analysis got delayed.

CHAPTER FOUR: DATA ANALYSIS, PRESENTATION, AND INTERPRETATION

4.1. Introduction

This chapter provides a structured analysis of the collected data. Using tables, major findings of the study will be presented in a sequential order according to research questions in the dissertation. Different econometric methods were used to analyze the data collected. Collected data was evaluated and tabulated to clearly depict the results of expansionary fiscal policies on macroeconomic stability of Rwanda.

4.2. Descriptive statistics of our variables

Table 1: Descriptive statistics

Variables	Mean	Median	Maximum	Minimum	Std. Dev.	Jarque-Bera	Probability
GROSS_DOMESTIC_PRODUCT	2853.116	1915.661	8189	324.9	2482.179	3.427089	0.180226
GOVERNMENT_SPENDING	428.5305	312.8792	1220	53.7	358.1749	2.87942	0.236997
INVESTMENT	659.9845	343.7641	1995	50.7	654.9292	2.989616	0.224292
TAX_REVENUE	398.6365	217.2914	1324.653	21.59242	401.5608	3.904795	0.141933

Source: E-Views 2010

Table 1 presents the primary statistics of our variables. Average annual GDP in Rwanda is 2853.11 billion Rwf with 8189 billion Rwf being the maximum and 324.9 billion Rwf minimum. The standard deviation is 2482.179 billion which indicates high deviations or spread in Rwanda's GDP values under period of study. The Jarque-Bera test statistic tests the normality distribution in our variables with H0: Series are normally distributed. Looking at the probability shown, which is higher than 1%, 5% and 10% significance levels we accept H0 and conclude that GDP series are normally distributed. This is the same for government spending, investment, and tax revenues.

Statistics on government spending presented in Table 1 shows that average annual government spending is 428.5305 billion with minimum spending of 53.7 and maximum of 1220 billion Rwf. This also indicates high spreads in government spending on annual basis. The average investments in Rwanda is 659.9845 billion Rwf with a minimum of 1995 and maximum of 343.7641. the average tax revenue is 398.6365 billion Rwf with minimum of 21.592421 billion Rwf and maximum of 324.653 billion Rwf. The standard deviation in investment and tax revenue are 654.9292 and 401.5608 billion Rwf respectively. These are

very high and indicate how in Rwanda; either taxes or revenues have been highly deviating from the average during the period of study.

4.3. Model estimation

In this analysis, the selected macroeconomic indicator; real Gross Domestic Product (GDP), and fiscal variables such as government revenue in form of taxes (TR), government expenditure (GE) and investment (INV) were used to generate results of analysis.

The econometric model applied in this dissertation is of the following function:

$$Y = f(X_1, X_2, X_3)$$

This is expressed as follows:

$$GDP = f(GE, INV, TR)$$

$$GDP = \alpha_0 + \alpha_1 GE + \alpha_2 INV + \alpha_3 TR + \mu$$

However, the following figure 5 shows that our variables have been growing exponentially and are not following a linear trend; therefore, we introduce the natural logarithms (LN) in our variables.

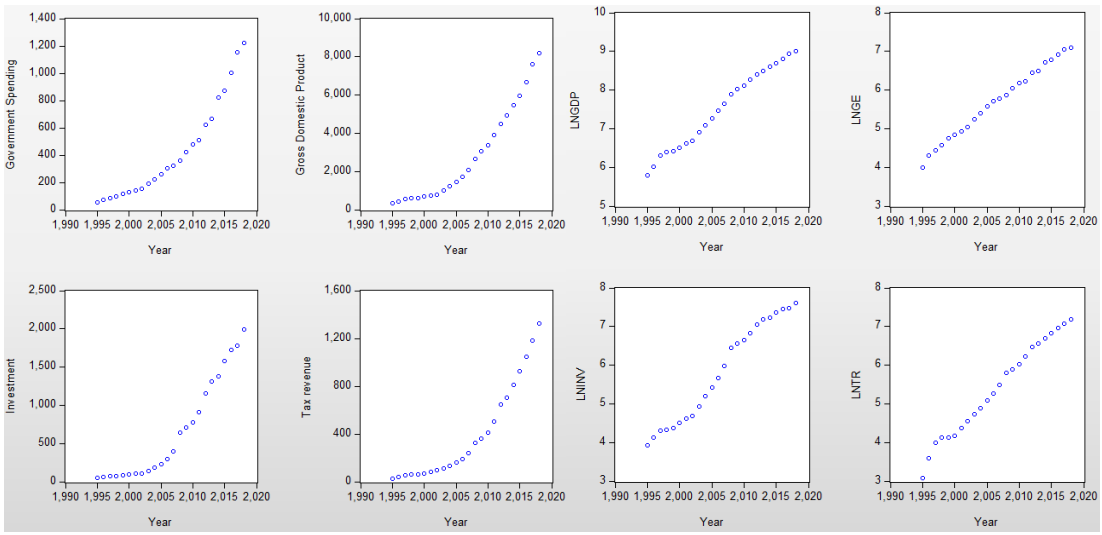


Figure 5: Trend in variables (numerical vs logarithmic forms)

Source: E-Views 2010

Under this linearity assumption among our dependent and independent variables and because our model will be presented in terms of %; our model will then be expressed in following terms:

$$LNGDP = \alpha_0 + \alpha_1 (LNGE) + \alpha_2 LNINV + \alpha_3 LNTR + \mu$$

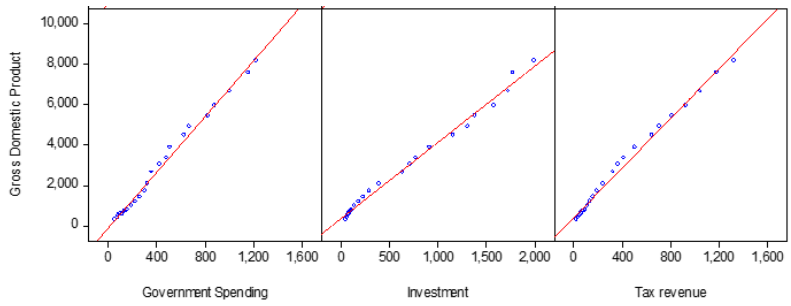


Figure 6: Regression line (variables in their numerical form)

Source: E-Views 2010

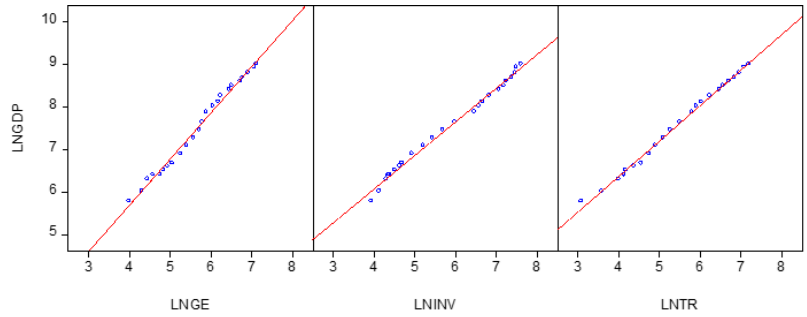


Figure 7: Regression line (variables in natural logarithmic form)

Source: E-Views 2010

Comparing figure 5 and figure 6, it is shown that introduction of natural log was useful in ensuring linearity in our series.

4.4. ADF Unit root test (Stationarity tests)

To avoid meaningless results from our analysis, we will first test the unit root for each variable by using Augmented Dickey Fuller (ADF) test; this test is important in examining the stationarity of a time series. Table 2 below contain p-values from ADF test done on variables of our model using AIC lag criterion.

Table 2: Augmented Dickey Fuller Test P-Values

Variables	With a constant			With a constant and trend			With None		
	level	1st diff	2nd diff	level	1st diff	2nd diff	level	1st diff	2dn diff
LNGDP	0.3281	0.0529	0.0002	0.422	0.1137	0.0021	0.9895	0.1071	0.0000
LNGE	0.5325	0.0000	0.0075	0.0035	0.0411	0.045	1.0000	0.3015	0.0003
LNINV	0.8729	0.0704	0.0003	0.1397	0.2209	0.0154	0.9825	0.1113	0.0000
LNTR	0.2429	0.0052	0.0008	0.0604	0.0408	0.02	0.996	0.0113	0.0000

Source: E-Views 2010

- Table 2 shows that LNGDP is not stationary at level neither at 1%, 5% nor 10% significance levels. LNGDP is again not stationary at 1st difference with 1% nor 5%

significance levels. It is however stationary at 1st difference on 10% significance level with constant. Finally, LNGDP is stationary at 2nd difference at all 1%, 5% and 10% significance levels.

- LNGE is stationary at level with a constant and trend at 5% and 10% significance levels.
- LNINV is not stationary at level neither at 1%, 5% nor 10% significance levels; it is however stationary at 1st difference on 10% significance level with constant.
- LNTR is stationary at level with a constant and trend at 10% significance level.

In general, Table 2 shows that all the series are stationary at the 1st difference at 10% significance level with function of constant and they are stationary at 2nd difference at different significance levels with function of constant, constant & trend and with none.

4.5. Cointegration and VECM

Cointegration is used to assess long run relationship in non-stationary variables that can form a stationary linear combination in the long run. That stationary linear combination is referred to as a cointegrating vector. A cointegration test can establish both short run and long relationship between or among variables. Two tests are used to check cointegration; those are Engle-Granger and Johansen test; however, for a single equation model, the Engle-Granger test is the best fit while Johansen cointegration test is advised for multiple equations. Therefore, we proceed with Johansen test for our model.

Before assessing cointegration in our variables, we'll first select appropriate lag and lag criteria for efficiency in our tests.

4.5.1. Lag selection

Table 3: Lag order selection

VAR Lag Order Selection Criteria
Endogenous variables: LNGDP LNGE LNINV LNTR
Exogenous variables: C
Date: 09/11/20 Time: 15:34
Sample: 1995 2018
Included observations: 22

Lag	LogL	LR	FPE	AIC	SC	HQ
0	62.1581	NA	5.94E-08	-5.2871	-5.088729	-5.24037
1	149.5486	135.0581	9.32E-11	-11.77715	-10.78529	-11.5435
2	186.0234	43.10659*	1.72e-11*	-13.63849*	-11.85315*	-13.21792*

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Source: E-Views 2010

Table 3 presents different lag orders selected by the criterion. In general, the information criterion with the minimum criterion value indicates the most ideal lag length to choose (Chris B., 2008). According to the results in Table 3, lag 2 is selected and Schwarz information criterion is chosen because it is having the lowest criterion value.

4.5.2. Johansen Cointegration Test

Table 4: Johansen trace and maximum eigenvalue statistics

Trace							
Max rank	Ho	Hi	Eigenvalue	Statistic	Critical Value	Prob.**	Decision
0	r=0	r>0	0.74728	57.43062	47.85613	0.0049	None *
1	r<=1	r>1	0.50851	28.54566	29.79707	0.0692	At most 1
2	r<=2	r>2	0.420478	13.62907	15.49471	0.0937	At most 2
3	r<=3	r>3	0.098281	2.172497	3.841466	0.1405	At most 3
* denotes rejection of the hypothesis at the 0.05 level							
Trace test indicates 1 cointegrating eqn(s) at the 0.05 level							
Maximum Eigen							
Max rank	Ho	Hi	Eigenvalue	Statistic	Critical Value	Prob.**	Decision
0	r=0	r>0	0.74728	28.88496	27.58434	0.0339	None *
1	r<=1	r>1	0.50851	14.91659	21.13162	0.2948	At most 1
2	r<=2	r>2	0.420478	11.45657	14.2646	0.1328	At most 2
3	r<=3	r>3	0.098281	2.172497	3.841466	0.1405	At most 3
* denotes rejection of the hypothesis at the 0.05 level							
Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level							

Source: E-Views 2010

Under the null hypothesis of “r cointegrating vectors” for trace statistic and “m cointegrating vectors” for maximum eigen statistic; Table 4 shows that None (no cointegrating vectors) is rejected at 5% significance level. The rest shows us that at 5% level we fail to reject r<=1, r<=2, r<=3 meaning that there at least 3 cointegrating vectors in our model. Both the trace and maximum eigenvalue tests indicate the existence of 1 cointegrating equation at 5% significance level.

Table 5: Johansen's normalized cointegrating equation

Normalized cointegrating coefficients (standard error in parentheses)			
LNGDP (dependent variable)	LNGE	LNINV	LNTR
	-4.263508	-2.18953	4.792558
	(-0.69176)	(-0.33891)	(-0.86407)

Source: E-Views 2010

Table 5 presents the Johansen normalization for confirming cointegration in our model. The signs of coefficients are reversed in the long run and the above coefficients explain that in the long-run, LNGE and LNINV has a positive impact on LNGDP while LNTR has a negative impact on LNGDP on average, other things held constant. Note that these coefficients are all significant at 1% level ((coefficient/standard error) > 1.995) and we can conclude that there is a cointegrating relationship in the model.

4.5.3. Estimating VECM

After confirming that there is cointegration in our variables; we are going to use VECM estimates to find the short run dynamics and establish long run equilibrium in our variables. The representation theorem as stated by Granger (Engle and Granger, 1987) stressed that if there exist is a cointegration relationship in a set of variables, the data can then be represented with an error-correction model. Our VECM model has the following form:

$$\Delta LNGDP_t = \beta_0 + \sum_{f=1}^{\rho} \beta_1 \Delta LNGDP_{t-f} + \sum_{j=1}^{\rho} \beta_1 \Delta LNGE_{t-j} + \sum_{i=1}^{\rho} \beta_2 \Delta LNINV_{t-i} + \sum_{k=1}^{\rho} \beta_3 \Delta LNTR_{t-k} + \gamma ECT_{t-1} + \varepsilon_t$$

Where ρ is the lag for the model, Δ represents the first difference and ECT is the error correction term which is represented in the following form:

$$ECT_{t-1} = LNGDP_{t-1} - \alpha_1 LGE_{t-1} - \alpha_2 LNINV_{t-1} - \alpha_3 LNTR_{t-1} - \alpha_0$$

The ECT coefficient γ represents the speed of adjustment and measures the speed at which GDP converges towards equilibrium after changes in government spending, investment, and tax revenue.

Table 6: ECT - Long run equation

Vector Error Correction Estimates Date: 09/12/20 Time: 15:24 Sample (adjusted): 1997 2018 Included observations: 22 after adjustments Standard errors in () & t-statistics in [ ]	
Cointegrating Eq:	CointEq1
LNGDP (-1)	1
LNGE (-1)	-1.123405 (-0.0732) [-15.3466]
LNINV (-1)	-0.843167 (-0.0464) [-18.1712]
LNTR (-1)	0.934072 (-0.08722) [10.7094]
C	-1.254192

Source: E-Views 2010

Table 6 shows the breakdown of the error correction term which gives us the long run model and the cointegrating equation as follows:

$$ECT_{t-1}=1\ LNGDP_{t-1} - 1.123LGE_{t-1} - 0.843LNINV_{t-1} + 0.934LNTR_{t-1} - 1.254$$

The normalized equation would be:

LNGDP= 1.254 + 1.123 LNGE + 0.84LNINV – 0.93 LNTR

Note that the signs of coefficients are reversed in the long run and all the coefficients are statistically significant (t-statistics > 2).

Table 6 indicates that with every 1% increase in government expenditure, GDP increases by 1.123%. Similarly, investment coefficient shows to every 1% increase in investment, the GDP increases by 0.84%. Lastly, the results show that tax revenue have a significant negative impact on GDP and with every 1% increase in tax revenue, the GDP reduce by 0.93%. From these findings, it is obvious that although tax revenues have a higher impact on GDP that investment does; government spending has a much higher impact on GDP that the rest of the variables. GE induces more than a proportionate change GDP.

4.5.4. Tests of the residuals

Table 7: Serial correlation LM test

VAR Residual Serial Correlation LM Tests Date: 09/13/20 Time: 11:49 Sample: 1995 2018 Included observations: 22						
Null hypothesis: No serial correlation at lag h						
Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	15.05392	16	0.5207	0.931236	(16, 19.0)	0.5527
2	15.28279	16	0.504	0.949974	(16, 19.0)	0.5365
Null hypothesis: No serial correlation at lags 1 to h						
Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	15.05392	16	0.5207	0.931236	(16, 19.0)	0.5527
2	36.37794	32	0.272	0.998349	(32, 9.0)	0.5414

Source: E-Views 2010

Table 8 : Normality test

Null Hypothesis: Residuals are multivariate normal Date: 09/13/20 Time: 11:50 Sample: 1995 2018 Included observations: 22			
Component	Jarque-Bera	df	Prob.
1	0.412578	2	0.8136
2	0.888908	2	0.6412
3	0.070911	2	0.9652
4	1.52917	2	0.4655
Joint	2.901567	8	0.9404
*Approximate p-values do not account for coefficient estimation			

Source: E-Views 2010

Table 9: Heteroskedasticity test

VAR Residual Heteroskedasticity Tests (Levels and Squares)		
Date: 09/13/20 Time: 11:51		
Sample: 1995 2018		
Included observations: 22		
Joint test:		
Chi-sq	df	Prob.
160.8731	160	0.4657

Source: E-Views 2010

To ensure validity of our estimates and the adequacy of the model used; different diagnostic tests were done among which serial correlation, normality, and conditional heteroscedasticity in residuals were checked. Table 7, Table 8, and Table 9 present results from residual tests done and they all indicate good results and estimates based on different residual tests done. Table 7 presents the results on serial autocorrelation test where H0: Null hypothesis: No serial correlation at lag 2 was accepted at 5% significance level. The conclusion is that there is no serial autocorrelation in the variables. The second test done on normality in residuals is presented in Table 8 where under H0: Residuals are multivariate normal; the H0 is accepted at 5% significance level and results confirm that our residuals are normally distributed. Lastly, Table 9 presents the residuals heteroskedasticity test and H0: residuals are homoscedastic is accepted at 5% significance level. With these 3 tests; we can conclude that that our model is adequate.

4.5.5. Testing and estimating short run relationship / dynamics in variables

Table 10: Short run equations from VECM

Error Correction:	D(LNGDP)
CointEq1	-0.428943 (-0.16116) [-2.66159]
D(LNGDP(-1))	0.085672 (-0.36615) [0.23398]
D(LNGE(-1))	-0.119357 (-0.24863) [-0.48006]
D(LNINV(-1))	0.045843 (-0.17528) [0.26154]
D(LNTR(-1))	0.208533 (-0.16869) [1.23616]
C	0.094964 (-0.03726) [2.54840]

Source: E-Views 2010

Since we are interested with LNGDP as the dependent variable; Table 10 gives us the VECM as follows:

$$\Delta LNGDP_t = 0.094 + 0.856\Delta LNGDP_{t-1} - 0.119\Delta LNGE_{t-1} + 0.04\Delta LNINV_{t-1} + 0.208\Delta LNTR_{t-1} - 0.428ECT_{t-1}$$

The specified VECM induces the long run behavior of our variables to converge into a cointegrating relationship of long-run equilibrium while accommodating short run dynamics.

The results from Table 10 presents the short run equation for the dependent variable of our estimated model.

The coefficient of the ECT (-1) is -0.428943. The ECT coefficient represents the speed of adjustment towards long-run equilibrium and the negative sign confirms the stability of the system. The magnitude of the ECT (-1) coefficient indicates that the speed of adjustment is around average (42.8%). This means that if shocks/disequilibrium occur, 42.8% of that disequilibrium is dissipated before the next time period. For our model, we can estimate that it takes approximately 1.3 years for 50% of the disequilibrium in GDP to be dissolved if a shock occurs. However, we keep in mind that other new shocks may also add or subtract from the disequilibrium in the next period.

Running estimates to see the significance of coefficients:

Equation:D(LNGDP)=C(1)*(LNGDP(-1)-1.12340540771*LNGE(-1)-0.84316661067*LNINV(-1)+0.934072287473*LNTR(-1)-1.25419241432)+ C(2)*D(LNGDP(-1)) + C(3)*D(LNGE(-1)) + C(4) *D(LNINV(-1)) + C(5)*D(LNTR(1)) + C(6)

Table 11: Testing significance of short-run coefficients

System: VECM Estimation Method: Least Squares Date: 09/12/20 Time: 15:31 Sample:1997-2018 Included observations: 22 Total system (balanced) observations 88				
	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.428943	0.161161	-2.66159	0.0098
C(2)	0.085672	0.366151	0.233981	0.8157
C(3)	-0.11936	0.248629	-0.48006	0.6328
C(4)	0.045843	0.175282	0.261541	0.7945
C(5)	0.208533	0.168694	1.236162	0.2209
C(6)	0.094964	0.037264	2.5484	0.0132

Source: E-Views 2010

Table 11 presents results of significance of the estimated coefficients. The ECT (-1) coefficient is negative and statistically significant; this explains that around 42.8% deviation from long run equilibrium in GDP is corrected at each year. It also tells us that the model is converging in the long run. The rest of the short run coefficients associated with GDP are statistically insignificant which means that in the short run, the equilibrium cannot be

attained, however, the variables will adjust to converge to the long run equilibrium where they will start moving together.

4.6. Causality test

The existence of long run relationships between variables does not prove causality or the direction of influence. Therefore, causality test is necessary to prove causality and show its direction in our variables. The Granger Wald statistic causality test was done in e-views and Table 12 below presents the results:

Table 12: Granger - Wald test

Wald Test:			
Equation: VECM			
Test Statistic	Value	df	Probability
F-statistic	0.551906	(3, 16)	0.6542
Chi-square	1.655717	3	0.6468
Null Hypothesis: C(3)=C(4)=C(5)=0			
Null Hypothesis Summary:			
Normalized Restriction (= 0)		Value	Std. Err.
C(3)		-0.11936	0.248629
C(4)		0.045843	0.175282
C(5)		0.208533	0.168694
Restrictions are linear in coefficients.			

Source: E-Views 2010

Using the probability statistic for interpretation; the null hypothesis suggested by Granger-Wald test is that all short run coefficients are jointly zero. This is not rejected because probability of the chi-square value statistic (0.6468) is greater than 5% significant level meaning that there is no causality, otherwise there is a short run relationship in our variables. The results from the above Granger-Wald causality test confirm no short-term causality on GDP as seen in the VECM results; this suggested independence among the variables where the coefficients were not individually significant. However, performing a pairwise causality; we observed some short-term causalities within the tax revenues as presented in table 13 below:

Table 13: Pairwise Granger causality test

Pairwise Granger Causality Tests Date: 09/12/20 Time: 15:43 Sample: 1995 - 2018 Lags: 1			
Null Hypothesis:	Obs	F-Statistic	Prob.
LNGE does not Granger Cause LNGDP	23	0.48584	0.4938
LNGDP does not Granger Cause LNGE		2.49595	0.1298
LNINV does not Granger Cause LNGDP	23	1.54207	0.2287
LNGDP does not Granger Cause LNINV		0.528	0.4759
LNTR does not Granger Cause LNGDP	23	2.15462	0.1577
LNGDP does not Granger Cause LNTR		16.2679	0.0007
LNINV does not Granger Cause LNGE	23	3.90009	0.0623
LNGE does not Granger Cause LNINV		1.08089	0.3109
LNTR does not Granger Cause LNGE	23	0.72905	0.4033
LNGE does not Granger Cause LNTR		2.80032	0.1098
LNTR does not Granger Cause LNINV	23	6.30E-05	0.9937
LNINV does not Granger Cause LNTR		14.2999	0.0012

Source: E-Views 2010

The short-term causality on tax revenues come from GDP and investment as illustrated in the table above where LNGDP significantly granger causes LNTR and LNINV significantly granger causes LNTR. This means that there is a unidirectional causality from LNGDP to LNTR and from LNINV to LNTR. This can imply that tax revenues are not only explained by its past values but also contains some effects of past values of GDP and investments. Further research is needed to go deeper in explaining how those factors affect the tax revenues in Rwanda.

4.7. Impulse response of GDP to changes in government spending, investment, and tax revenues.

To further explain the long-run and short run dynamics in our variables, impulse response was used to graphically check how GDP responds to shocks or sudden changes in independent variables but especially the test was done to assess the duration of those effects.

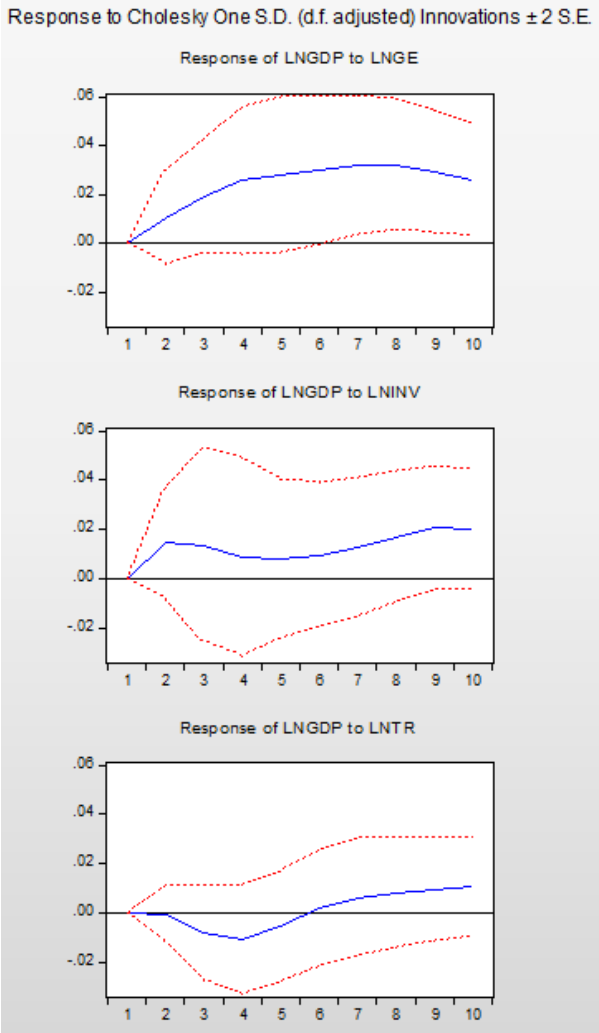


Figure 8: Impulse response functions

Source: E-Views 2010

The impulse response functions which are shown by the blue lines in figure 8 above explain the response of LNGDP due to impulses/shocks in LNGE, LNINV and LNTR.

The first figure explains that a one standard deviation shock to LNGE initially and continuously increases LNGDP throughout, this response goes up until the 4th period where reaches its steady value. The figure also shows that LNGDP respond positively to a change in LNGE.

The next figure shows that a shock in LNINV immediately increases LNGDP at the initial period, but this increasing response sharply declines in the second period to the 4th period before rising again to reach its equilibrium state in the 8th period.

The last figure shows that a shock in LNTR has no impact on LNGDP at the initial period; however, towards the end of that period, it dramatically reduces LNGDP until the response function reaches its bottom value in the 4th period. Reaching there it starts increasing

although in the negative region and reaches the positive region at the end of the 5^{th} period. From there it continually increases to attain its steady value in the 7^{th} period.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATION

5.1. Introduction

This chapter presents the summary of findings, discussion and conclusions drawn from the findings as well as recommendations made. The conclusions and recommendations drawn were focused on addressing the purpose of the dissertation. This dissertation sought to assess the impact of fiscal policies in macroeconomic stabilization of Rwanda.

5.2. Summary of findings

In this dissertation, impact of expansionary fiscal policy on a macroeconomic variables notably real gross domestic product was empirically investigated via Johansen cointegration and VEC method which was adapted in order to capture both the short-run and long-run dynamics in our variables achieve our study objectives.

From the result of the Johansen cointegration test, it was observed that there exists 1 cointegrating equation in the model since both the trace and max-eigenvalues tests rejected the null hypothesis of "none". This equation was confirmed via VECM estimates, the results show a long-run relationship between LNGDP and LNGE, LNINV as well as LNTR, through significant coefficients of the ECT equation.

The VECM estimates results showed that both government expenditure and investments effect positively the gross domestic product in the long run whereas the tax revenues significantly affect gross domestic product negatively in the long run.
The impulse – response functions pointed that a shock in the government expenditure and investment have positive effect on gross domestic product while a shock in tax revenues has a negative effect on gross domestic product. The fact that the effects last for almost 4 periods before converging to their equilibrium state can be an indicator that fiscal policy tools are likely to have very significant impact on the macroeconomic structure. These results are in agreement with Amadi, S. N. et al. (2011).

Although long-run relationship was found in our model; there was clearly no short run relationship in the model; all the short run VECM coefficients of our variables of interest (GE, INV and TR) were found insignificant. This implies that all variables in the model restore to their equilibrium state at a high speed and the effects of their short run dynamics are not significant.

The Granger Wald causality test concluded that government spending, investment and tax revenues do not have a causal link with gross domestic product. The result of this dissertation confirms the relevance of Keynesian paradigm in the case of Rwanda.

5.3. Conclusion and recommendations

From the findings of empirical analysis, a general conclusion drawn from this dissertation is that expansionary fiscal policies play a significant role in achieving stable economic growth in the long run. In a country's macroeconomic system, any regulation related with tax revenues or government spending will inevitably have a long run impact on stability of its macroeconomic variables. The study also concludes that investments play a vital role in accelerating economic growth in Rwanda. Thus, a strategic manipulation of those regulations in accordance with the findings obtained from analyses done is key to the success of fiscal policies towards achieving economic objectives.

As it was mentioned in chapter two of this dissertation, in some countries, studies reveal ineffectiveness in fiscal policies and some of the factors associated with this failure are high corruption in tax revenues systems, ineffective public spending programs, incompatible policy mix, timing of fiscal policies which is not suitable, or the duration of budgeting and approval process of these fiscal policies. All those factors and many others are attributed to the poor performance of fiscal policies. As recommendation, government should keep strengthening its implementation plans system for fiscal policies to be effective and just as there is an entity in charge of controlling monetary policies (BNR); there can also be one in charge of fiscal policies.

In addition, the findings have revealed a very significant contribution of investments towards the stabilization of economic growth as a macroeconomic objective; therefore, the government can redirect its expenditures allocation focusing on investment expenditures rather than consumption expenditures; this would pave the way towards sustained economic development.

Finally, self-reliance strategies should be supported and strengthened to stimulate economic activities in the country at the same time reducing trade balances which tend to push the country in tedious deficits on its balance of payments at the end of fiscal year. Thus, through a systematic implementation of fiscal policy, the government can reduce taxes for local producers aiming supporting the already existing made-in Rwanda initiative and at maximally utilizing available resources.

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APPENDINCES

Appendix 1: Data used

Year	real Gross Domestic Product	Government Spending (expenditure)	Investment (GCF)	Tax revenue
1995	324.9	53.7	50.7	21.6
1996	411.7	73.5	61.8	35.9
1997	546.5	84.6	73.4	54.6
1998	605.6	97.1	76.6	62.1
1999	607	115	80	61.5
2000	676	126	90	64.7
2001	742	139	102	78.9
2002	797	156	108	93.8
2003	993	191	138	114
2004	1,206	221	181	133.9
2005	1,440	262	227	161.8
2006	1,739	302	292	192.8
2007	2,092	324	395	241.8
2008	2,658	357	637	327.6
2009	3,057	422	714	364
2010	3,367	479	774	412.8
2011	3,897	510	914	505
2012	4,494	625	1,158	645.8
2013	4,929	667	1,308	707
2014	5,466	824	1,382	810.295
2015	5,968	874	1,578	928.1
2016	6,672	1,006	1,727	1,044.60
2017	7,597	1,156	1,776	1180
2018	8,189	1,220	1,995	1,324.70

Appendix 2: Lag selection

VAR Lag Order Selection Criteria

Endogenous variables: LNGDP LNGE LNINV LNTR

Exogenous variables: C

Date: 09/11/20 Time: 15:34

Sample: 1995

2018

Included observations: 22

Lag	LogL	LR	FPE	AIC	SC	HQ
0	62.1581	NA	5.94E-08	-5.2871	-5.08873	-5.24037
1	149.5486	135.0581	9.32E-11	-11.77715	-10.7853	-11.5435
2	186.0234	43.10659*	1.72e-11*	-13.63849*	-11.85315*	-13.21792*

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Appendix 3: Johansen cointegration

Date: 09/11/20 Time: 16:24

Sample (adjusted): 1998 2018

Included observations: 21 after adjustments

Trend assumption: Linear deterministic trend

Series: LNGDP LNGE LNINV LNTR

Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

		Trace	0.05	
Hypothesized No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	**0.74728**	**57.43062**	**47.85613**	**0.0049**
At most 1	0.50851	28.54566	29.79707	0.0692
At most 2	0.420478	13.62907	15.49471	0.0937
At most 3	0.098281	2.172497	3.841466	0.1405

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

		Max-Eigen	0.05	
Hypothesized No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	**0.74728**	**28.88496**	**27.58434**	**0.0339**
At most 1	0.50851	14.91659	21.13162	0.2948
At most 2	0.420478	11.45657	14.2646	0.1328
At most 3	0.098281	2.172497	3.841466	0.1405

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

LNGDP	LNGE	LNINV	LNTR
11.88379	-50.66665	-26.01989	56.95377

18.74088	-2.26858	-19.61943	7.635407	
			-	
105.7016	-34.80497	-48.76602	9.743317	
			-	
-27.30978	14.36899	15.36611	5.733725	
Unrestricted Adjustment Coefficients (alpha):				
D(LNGDP)	-0.022266	0.021503	0.002628	0.006548
			-	
D(LNGE)	0.015534	0.01146	0.007469	0.007072
D(LNINV)	-0.036895	0.033377	0.035768	0.010631
D(LNTR)	-0.019515	0.006758	0.012056	0.008772
1 Cointegrating Equation(s):		**Log likelihood**	**181.7533**	
Normalized cointegrating coefficients (standard error in parentheses)				
LNGDP	LNGE	LNINV	LNTR	
1	-4.263508	-2.189528	4.792558	
	-0.69176	-0.33891	-0.86407	
Adjustment coefficients (standard error in parentheses)				
D(LNGDP)	-0.264603			
	-0.14014			
D(LNGE)	0.1846			
	-0.11225			
D(LNINV)	-0.438457			
	-0.29642			
D(LNTR)	-0.23191			
	-0.13151			
2 Cointegrating Equation(s):		**Log likelihood**	**189.2115**	
Normalized cointegrating coefficients (standard error in parentheses)				
LNGDP	LNGE	LNINV	LNTR	
1	0	-1.013489	0.279279	
		-0.20242	-0.22732	
			-	
0	1	0.275838	1.058583	
		-0.06491	-0.07289	

Adjustment coefficients (standard error in parentheses)			
D(LNGDP)	0.13838	1.079358	
	-0.21858	-0.49957	
D(LNGE)	0.399373	-0.813042	
	-0.19507	-0.44583	
D(LNINV)	0.187063	1.793646	
	-0.50646	-1.15751	
D(LNTR)	-0.105261	0.97342	
	-0.24138	-0.55167	
3 Cointegrating Equation(s):		**Log likelihood**	**194.9398**
Normalized cointegrating coefficients (standard error in parentheses)			
LNGDP	LNGE	LNINV	LNTR
			-
1	0	0	0.855681
			-0.01
			-
0	1	0	0.749685
			-0.01177
			-
0	0	1	1.119854
			-0.02597
Adjustment coefficients (standard error in parentheses)			
D(LNGDP)	0.416118	0.987905	0.029346
	-1.06041	-0.60392	-0.57585
			-
D(LNGE)	-0.390062	-0.5531	0.264818
	-0.91775	-0.52268	-0.49838
			-
D(LNINV)	3.967768	0.548752	1.439078
	-2.17244	-1.23724	-1.17973
D(LNTR)	1.16913	0.553794	-0.21276
	-1.10728	-0.63061	-0.6013

Appendix 4: VECM Equations

Vector Error Correction Estimates				
Date: 09/12/20 Time: 15:24				
Sample (adjusted): 1997 2018				
Included observations: 22 after adjustments				
Standard errors in ( ) & t-statistics in [ ]				
Cointegrating Eq:	CointEq1			
LNGDP(-1)	1			
LNGE(-1)	-1.123405			
	(-0.0732)			
	[-15.3466]			
LNINV(-1)	-0.843167			
	(-0.0464)			
	[-18.1712]			
LNTR(-1)	0.934072			
	(-0.08722)			
	[10.7094]			
C	-1.254192			
Error Correction:	D(LNGDP)	D(LNGE)	D(LNINV)	D(LNTR)
CointEq1	-0.428943	0.146911	-0.34099	-0.89797
	(-0.16116)	(-0.15812)	(-0.348)	(-0.15773)
	[-2.66159]	[0.92912]	[-0.97987]	[-5.69310]
D(LNGDP(-1))	0.085672	-0.16302	0.365315	0.460077
	(-0.36615)	(-0.35924)	(-0.79064)	(-0.35836)
	[0.23398]	[-0.45378]	[0.46205]	[1.28386]
D(LNGE(-1))	-0.119357	-0.21089	-0.20495	-0.722855
	(-0.24863)	(-0.24394)	(-0.53687)	(-0.24334)

	[-0.48006]	[-0.86455]	[-0.38176]	[-2.97061]
D(LNINV(-1))	0.045843	0.087312	0.288762	-0.391187
	(-0.17528)	(-0.17197)	(-0.37849)	(-0.17155)
	[0.26154]	[0.50771]	[0.76293]	[-2.28031]
D(LNTR(-1))	0.208533	0.153252	-0.16462	0.48391
	(-0.16869)	(-0.16551)	(-0.36427)	(-0.1651)
	[1.23616]	[0.92594]	[-0.45191]	[2.93096]
C	0.094964	0.138491	0.117446	0.174145
	(-0.03726)	(-0.036560)	(-0.08047)	(-0.03647)
	[2.54840]	[3.78796]	[1.45958]	[4.77491]
R-squared	0.534377	0.210643	0.242036	0.760299
Adj. R-squared	0.38887	-0.03603	0.005172	0.685393
Sum sq. resids	0.040341	0.038833	0.188097	0.038642
S.E. equation	0.050213	0.049265	0.108425	0.049144
F-statistic	3.672512	0.853935	1.021837	10.14998
Log likelihood	38.09907	38.51826	21.16358	38.57251
Akaike AIC	-2.918097	-2.95621	-1.37851	-2.961137
Schwarz SC	-2.62054	-2.65865	-1.08095	-2.66358
Mean dependent	0.135921	0.127696	0.157932	0.163982
S.D. dependent	0.064231	0.048401	0.108707	0.087616
Determinant resid covariance (dof adj.)		6.63E-12		
Determinant resid covariance		1.85E-12		
Log likelihood		172.2858		
Akaike information criterion		-13.1169		
Schwarz criterion		-11.7283		
Number of coefficients		28		

Appendix 5: Significance of short run coefficients

System: VECM Coefficients

Estimation Method: Least Squares

Date: 09/12/20 Time: 15:31

Sample: 1997 2018

Included observations: 22

Total system (balanced) observations 88

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.428943	0.161161	-2.66159	0.0098
C(2)	0.085672	0.366151	0.233981	0.8157
C(3)	-0.119357	0.248629	-0.48006	0.6328
C(4)	0.045843	0.175282	0.261541	0.7945
C(5)	0.208533	0.168694	1.236162	0.2209
C(6)	0.094964	0.037264	2.5484	0.0132
C(7)	0.146911	0.158119	0.929116	0.3563
C(8)	-0.163017	0.35924	-0.45378	0.6515
C(9)	-0.210894	0.243936	-0.86455	0.3905
C(10)	0.087312	0.171973	0.507707	0.6134
C(11)	0.153252	0.16551	0.925938	0.358
C(12)	0.138491	0.036561	3.787956	0.0003
C(13)	-0.340994	0.347998	-0.97987	0.3308
C(14)	0.365315	0.790639	0.46205	0.6456
C(15)	-0.204953	0.53687	-0.38176	0.7039
C(16)	0.288762	0.37849	0.762932	0.4483
C(17)	-0.164615	0.364266	-0.45191	0.6529
C(18)	0.117446	0.080465	1.459579	0.1493
C(19)	-0.89797	0.15773	-5.6931	0
C(20)	0.460077	0.358356	1.283855	0.2038
C(21)	-0.722855	0.243335	-2.97061	0.0042
C(22)	-0.391187	0.17155	-2.28031	0.0259
C(23)	0.48391	0.165103	2.930959	0.0047
C(24)	0.174145	0.036471	4.774905	0
Determinant residual covariance	1.85E-12			

Equation: D(LNGDP) = C(1)*(LNGDP(-1) - 1.12340540771*LNGE(-1) -

0.84316661067*LNINV(-1) + 0.934072287473*LNTR(-1) - 1.25419241432) + C(2)*D(LNGDP(-1)) + C(3)*D(LNGE(-1)) + C(4) *D(LNINV(-1)) + C(5)*D(LNTR(-1)) + C(6)

Observations: 22

R-squared	0.534377	Mean dependent var	0.135921
Adjusted R-squared	0.38887	S.D. dependent var	0.064231
S.E. of regression	0.050213	Sum squared resid	0.040341
Durbin-Watson stat	1.897113		

Equation: D(LNGE) = C(7)*(LNGDP(-1) - 1.12340540771*LNGE(-1) - 0.84316661067*LNINV(-1) + 0.934072287473*LNTR(-1) - 1.25419241432) + C(8)*D(LNGDP(-1)) + C(9)*D(LNGE(-1)) + C(10) *D(LNINV(-1)) + C(11)*D(LNTR(-1)) + C(12)

Observations: 22

R-squared	0.210643	Mean dependent var	0.127696
Adjusted R-squared	-0.036031	S.D. dependent var	0.048401
S.E. of regression	0.049265	Sum squared resid	0.038833
Durbin-Watson stat	2.529869		

Equation: D(LNINV) = C(13)*(LNGDP(-1) - 1.12340540771*LNGE(-1) - 0.84316661067*LNINV(-1) + 0.934072287473*LNTR(-1) - 1.25419241432) + C(14)*D(LNGDP(-1)) + C(15)*D(LNGE(-1)) + C(16) *D(LNINV(-1)) + C(17)*D(LNTR(-1)) + C(18)

Observations: 22

R-squared	0.242036	Mean dependent var	0.157932
Adjusted R-squared	0.005172	S.D. dependent var	0.108707
S.E. of regression	0.108425	Sum squared resid	0.188097
Durbin-Watson stat	1.934925		

Equation: D(LNTR) = C(19)*(LNGDP(-1) - 1.12340540771*LNGE(-1) - 0.84316661067*LNINV(-1) + 0.934072287473*LNTR(-1) - 1.25419241432) + C(20)*D(LNGDP(-1)) + C(21)*D(LNGE(-1)) + C(22) *D(LNINV(-1)) + C(23)*D(LNTR(-1)) + C(24)

Observations: 22

R-squared	0.760299	Mean dependent var	0.163982
Adjusted R-squared	0.685393	S.D. dependent var	0.087616
S.E. of regression	0.049144	Sum squared resid	0.038642
Durbin-Watson stat	1.95212		

Appendix 6: Causality Test

1) Wald-test

Wald Test:			
Equation: VECM			
Test Statistic	Value	df	Probability
F-statistic	0.551906	(3, 16)	0.6542
Chi-square	1.655717	3	0.6468
Null Hypothesis: C(3) =C(4)=C(5)=0			
Null Hypothesis Summary:			
Normalized Restriction			
(= 0)		Value	Std. Err.
C(3)		-0.11936	0.248629
C(4)		0.045843	0.175282
C(5)		0.208533	0.168694
Restrictions are linear in coefficients.			

2) Granger-Causality

VEC Granger Causality/Block Exogeneity Wald Tests			
Date: 09/12/20 Time: 15:38			
Sample: 1995 2018			
Included observations: 22			
Dependent variable: D(LNGDP)			
Excluded	Chi-sq	df	Prob.
D(LNGE)	0.230457	1	0.6312
D(LNINV)	0.068404	1	0.7937
D(LNTR)	1.528096	1	0.2164
All	1.655717	3	0.6468
Dependent variable: D(LNGE)			
Excluded	Chi-sq	df	Prob.
D(LNGDP)	0.205918	1	0.65
D(LNINV)	0.257766	1	0.6117
D(LNTR)	0.857362	1	0.3545
All	1.812187	3	0.6123
Dependent variable: D(LNINV)			
Excluded	Chi-sq	df	Prob.
D(LNGDP)	0.21349	1	0.644
D(LNGE)	0.145737	1	0.7026
D(LNTR)	0.204223	1	0.6513
All	0.479713	3	0.9233
Dependent variable: D(LNTR)			
Excluded	Chi-sq	df	Prob.
D(LNGDP)	1.648285	1	0.1992
D(LNGE)	8.824521	1	0.003
D(LNINV)	5.199829	1	0.0226
All	9.829504	3	0.0201

3) Pairwise causality

Pairwise Granger Causality Tests

Date: 09/12/20 Time: 15:43

Sample: 1995 2018

Lags: 1

Null Hypothesis:	Obs	F-Statistic	**Prob.**
LNGE does not Granger Cause LNGDP	23	0.48584	0.4938
LNGDP does not Granger Cause LNGE		2.49595	0.1298
LNINV does not Granger Cause LNGDP	23	1.54207	0.2287
LNGDP does not Granger Cause LNINV		0.528	0.4759
LNTR does not Granger Cause LNGDP	23	2.15462	0.1577
LNGDP does not Granger Cause LNTR		16.2679	**0.0007**
LNINV does not Granger Cause LNGE	23	3.90009	0.0623
LNGE does not Granger Cause LNINV		1.08089	0.3109
LNTR does not Granger Cause LNGE	23	0.72905	0.4033
LNGE does not Granger Cause LNTR		2.80032	0.1098
LNTR does not Granger Cause LNINV	23	6.30E-05	0.9937
LNINV does not Granger Cause LNTR		14.2999	**0.0012**

Appendix 7: Plagiarism check

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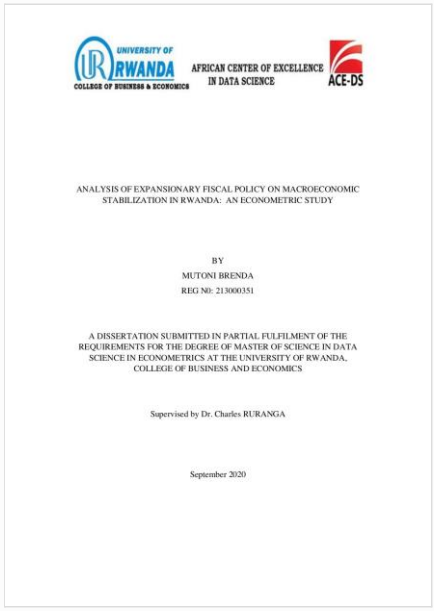

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ACE-DS

ANALYSIS OF EXPANSIONARY FISCAL POLICY ON MACROECONOMIC STABILIZATION IN RWANDA: AN ECONOMETRIC STUDY

BY
MUTONI BRENDA
REG N0: 213000351

A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN DATA SCIENCE IN ECONOMETRICS AT THE UNIVERSITY OF RWANDA, COLLEGE OF BUSINESS AND ECONOMICS

Supervised by Dr. Charles RURANGA

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