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MONETARY POLICY AND ECONOMIC GROWTH IN RWANDA.

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By:

NKIKABAHIZI Ferdinand

PG :112001319

SUPERVISOR: **Dr. MUGENZI Martin**

Huye, October, 2013

DECLARATION

This is to declare that thesis entitled " **Monetary Policy and Economic Growth in Rwanda**" comprises only my original work and due acknowledgement has been done for all other material used.

Names:

NKIKABAHIZI Ferdinand

PG: 112001319

Signature

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Date

October, 2013

DEDICATION

I dedicate this thesis to
The Almighty God,
My Wife,
NIRERE Marie Jeanne,
My Children,
MUGISHA G. Divin and
MUGISHA Joseph Winner
who have inspired me to achieve miraculous things.
Let this thesis remind you
that miracles
are within your reach, too.

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LIST OF ABBREVIATIONS / ACRONYMS

% :	Percentage
AD:	Aggregate demand
ADF :	Augmented Dickey-Fuller
AIC :	Akaike info criterion
ATM_S :	Automated teller machines
BNR:	Banque National du Rwanda (CBR)
CBR:	Central bank of Rwanda (BNR)
CIEA:	Composite Index of Economic Activities
CPI:	Consumer price index
CV :	Critical value
EAC:	East Africa community
ECM :	Error correction model
FRW:	Franc rwandais
GBP:	Get British Pound
GDP:	Gross domestic product
IGC:	International Growth Center
ISLM :	Investment saving Liquidity money
LR:	Lending rate
MB:	Monetary base
MFIs:	Micro finance institutions
MINECOFIN:	Ministère des Finances et Planification Economiques (Ministry of finance and economic planning)
MPC:	Monetary Policy committee
MPR:	Monetary Policy Reviews
MPS:	Monetary Policy Statements
MTM:	Monetary transmission mechanism
NDA :	Net domestic assets
NER :	Nominal exchange rate
NFA :	Net foreign assets
NGDP:	Nominal gross domestic product

NISR:	National institute of statistics in Rwanda
NPISH:	Non-profit Institutions Serving Households
NPL:	Non performence loan
NX :	Net export
OLS:	Ordinary least square
POS :	Pointof Sale
RAMP:	Reserves advisory and management programme
REER:	Real Effective Exchange rate
REPO:	Repurchase Agreement Operations
RR:	Real rate of interest
SBP:	State Bank of Pakistan
SCH:	Schwarz criterion
TSEC:	Two-stage error correction
UR:	University of Rwanda
USA :	United states of America
USD:	United state dollars
VAR:	Vector auto regressive
YC:	Annual rate of economic growth

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ABSTRACT

This research article focuses on the impact of Monetary Policy on GDP. GDP no doubt is affected by the Monetary Policy of the state. The research papers of various authors have been studied in this regard to prove the Hypothesis and after in depth analysis by applying Regression Analysis technique it has been observed that the relationship between the two exists. The data from 1999 to March 2013 has been used for driving the conclusion. In doing this, the Ordinary Least Squares Method (OLS) is used to analyze data between 1999 and 2013. The study proved that the Lending interest rate have minor relationship with GDP but the Growth in Money Supply and Nominal exchange rate greatly affects the NGDP of Rwandan economy, obviously various unknown factors also affects the GDP. Growth in Money Supply has a huge impact on GDP. The effects of stochastic shocks of each of the endogenous variables are explored using Error Correction Model (ECM). The study shows that Long run relationship exists among the variables. Also, the core findings of this study shows that exchange rate, M3 are statistically significant monetary policy instruments that drive economic growth in Rwanda. In short run, the lending rate is not significant variable explaining economic growth in Rwanda .Indeed it is statistically significant in long run, it's impact on NGDP will be realized after quite 4 quarters.

CHAPTER ONE: GENERAL INTRODUCTION

The objective of this chapter is to give a background on the research topic, highlight the problem statement, give the research objectives and questions, hypothesis, state the scope of study in terms of period but also identify the methodology under which this study will be done. The structure of the thesis shall also be defined.

1.1. Bacground of the study

There are many empirical studies conducted to measure the role of fiscal stimulus and monetary easing to improve aggregate demand and restore economic growth. The impact of monetary policies on real variables of economy such as economic growth has been the subject of dispute between Classics and Keynesians. Theorists in these schools use real evidences and some economic models to support their own theories.Study by Freedman et al. (2009) showed that worldwide expansionary fiscal policy combined with accommodative monetary policy can have significant multiplier effects on the world economy.Cheng (2006) found that monetary policy shocks effectively affect prices and exchange rates in Kenya through the interest rate channel, but have no effect in output.

The issue of the effects of monetary policy on prices and real economic activity lies at the core of macroeconomic theory and at the heart of monetary policy. It is generally agreed that monetary policy, specifically unanticipated monetary shocks, have a significant effect on the economy, even if it is only in the short run. This as money, being the most accepted medium of exchange, has become the most important commodity in modern economies. To successfully conduct monetary policy therefore, policy makers must have an appreciation of the timing and effect of their policies on the economy.This research is all about monetary policy. Monetary policy is all about the manipulation of central banks' instruments to control the level of inflation. This is one of the key aspects of the work of many central banks. The aim is to maintain price stability (i.e. keep inflation low and stable) and it is monetary policy that central banks (or governments) use to achieve this. Doing so, there is the whole process or ways through which the central bank achieve that objective, which is *monetary policy transmission mechanism* (BM Friedman, 2010).The monetary transmission mechanism refers to the process through which changes in monetary policy instruments (such as monetary aggregates or short-term policy interest rates) affect the rest of the economy and, in particular, output and inflation. Monetary policy impulses transmit through various

channels, affecting different variables and different markets, and at various speeds and intensities (Loaza and Schmidt-Hebbel, 2000).

Monetary Policy as a technique of economic management to bring about sustainable economic growth and development has been the pursuit of nations and formal articulation of how money affects economic aggregates dates back the time of Adams Smith and later championed by the monetary economists. Since the expositions of the role of monetary policy in influencing macroeconomic objectives like economic growth, price stability, equilibrium in balance of payments and host of other objectives, monetary authorities are saddled the responsibility of using monetary policy to grow their economies (Charles Onyeiwu, 2012).This research evaluates the capacity of the monetary policy in Rwanda to impact production and price. In this regard, the paper tries to identify potential channels for the transmission of monetary policy based on the indirect instruments since 1999 to 2013. The analysis of different transmission channels helps to describe their specific characteristics, such as their relative dominance, importance, and their propagating policy effects. Before assessing whether monetary policy shocks have an impact on output and price, we first provide a qualitative assessment with respect to the effectiveness of individual channels for the transmission of monetary policy in Rwanda.

1.2. Problem statement

While emerging economies are increasingly integrated with the world economy through trade and financial flows, there are unique policy challenges in monetary policy primarily owing to underdeveloped financial markets and institutions (Hammond et al., 2009). With a well-functioning financial system, changes in the policy rate have a substantial influence upon aggregate demand and thus on the price level (Gerlash and Smets, 1995; RamaswamiandSlok, 1998; Mojon and Peersman, 2001; Smets and Wouters, 2002; Ganevet al., 2002; Norris and Floerkemeir, 2006).

The monetary policy is one of the least understood economic processes but yet the successful conduct of monetary policy requires a clear understanding of the process by which changes in monetary policy affect the economy. Changes in monetary policy are "propagated" throughout the economy via a transmission mechanism, commonly called the monetary policy transmission mechanism.

The empirical results indicate that the capability of monetary policy in Rwanda to influence economic activity and inflation is still limited as in other developing countries, with low

levels of economic monetization. The monetary aggregate channel is important in monetary policy transmission mechanism in Rwanda. There is also some evidence of a pass through, but not very important. This means that the exchange rate channel has a limited impact on price.In developing countries, the lack of a capable financial system hampers this channel.

However, for a variety of reasons, the link between monetary policy instruments and aggregate demand, the monetary transmission mechanism may be significantly weaker in low-income countries like Rwanda than it is in advanced and emerging economies. In particular, the financial structure of such countries suggests that the bank lending channel is likely to be the dominant channel of monetary policy transmission, but its effectiveness, which depends on the domestic institutional context, the structure of the banking system, and the intrinsic stability of the domestic macroeconomic environment, is problematic. Weak and unreliable monetary transmission would suggest restraint in the use of monetary policy, implying that placing primary responsibility for domestic macroeconomic stabilization on central banks may be misguided.Mishra, Montiel,and Spilimbergo (forthcoming).

Assessing the empirical effectiveness of monetary policy on economic growth in Rwanda is therefore an important topic for research.

1.3. Rationale of the study

This research is important from both theoretical and empirical points of view. Special attention is paid to monetary policy that needs to be based on a forecast of the future evolution of the economy and an estimate how the forecast outcome is likely to be affected by possible policy changes.

The formulated conclusions and recommendations determine the practical significance of the paper which may be used in the decision making process of monetary and economic authorities of the country of Rwanda.

Assessing the effects of the monetary policy on economic growth in Rwanda is therefore an important topic for research, and there is now an emerging body of work on this topic.

1.4. Objectives of the Study

The general objective of the study is to identify and underline the interdependence that exists between monetary policy and economic growth from the point of view of the influence of the effects of monetary policy decisions and its instruments upon the evolution and achievement of expected values of macroeconomic variables (Output, Interest rate, Exchange rate, Money supply).

More specifically, the study aims to:

- Examine the conduct of monetary policy in Rwanda
- Examine the determinants of economic growth in Rwanda

1.5. Research Question

What are the effects of the monetary policy on economic growth in Rwanda?

1.6. Hypothesis

Leedy and Ormrod,(2001) Hypothesis plays significant role in the research which solves the problems in research model. The hypothesis of the study is enunciated as under:

Hypothesis one: Growth in Money supply has strongly positive impact on output

Hypothesis two: Interest rate has relationship with economic growth

Hypothesis three: Does exchange rate affect economic growth

1.7. Used methodology

1.7.1. Data collection method

The study is made based on the analysis of **secondary data** obtained from the National Bank of Rwanda (BNR), Ministry of Finance (MINECOFIN) and the National Institute of Statistics in Rwanda (NISR). Also relevant statistical test, spreadsheet analysis has been made to find out the outcome. Tables as well as graphical presentation of the relevant data were used to show its trends and outcomes in this study. Basically this study was confined to the behavior and trend analysis among the components of monetary policy in Rwanda.

1.7.2. Important variables in the study

The monetary policy implementation in Rwanda as conducted by BNR, is made via the following instruments (Money supply (M3),Lending interest rate and nominal exchange rate),from these variables a reseacher has found variables and formulated the statistical model for assessing the effect of monetary policy on economic growth in Rwanda.

Thus for the case of Rwanda, the following variables was strongly considered during the study:

Dependent Variable: Output of the rest of the economy

Independent variables: Money supply (broad money) , exchange rate, interest rate

1.7.3. Scope of the Study

The scope is limited to the effect of monetary policy transmission mechanisms on economic growth in Rwanda and the analysis covers the period between 1999 and 2013.

1.8. Organization of the Study

This study is divided into five chapters:

Chapter one is general introduction and it is composed by the background of the study, Statement of the problem, Research hypothesis, Research questions, Objectives of the study, used methodology, Rationale of the study, important variables in the model, and the Scope of the study.

Chapter two presents the literature in relation to the topic under study, this chapter deals with the monetary policy theory behind economic growth.

Chapter three briefly highlights the various research methods,simply this chapter indicates Data Collection, Sources of Data, Data Collection Procedure , Data Processing and Data analysis.

Chapter four presents data analysis and interpretation of the results. It shows the index of data analysis in a scientific way using software and various tools such as tables, graphs, charts, etc.

Chapter five includes summary of findings, conclusion and recommendations. The researcher analyzes and interprets summarized findings against known practices as elaborated the research questions. Conclusions are drawn basing on the research findings and analysis done, and then possible implications are also indicated. Finally, the researcher gives recommendations on what should be done to implement well the monetary policy in Rwanda.This is where the research will be combined, both qualitative and quantitative, so as to gain an insightful analysis of the relevant facts and figures in explaining the effect of monetary policy on economic growth in Rwanda.

CHAPTER TWO: LITERATURE REVIEW

2.1. Conceptualizing Monetary Policy

Monetary policy is concerned with discretionary control of money supply by the monetary authorities (Central Bank with Central Government) in other to achieve stated or desired economic goals. Governments try to control the money supply because most governments believe that its rate of growth has an effect on the rate of inflation. Hence monetary policy comprises those government actions designed to influence the behavior of the monetary sector.

Monetary Policy is the deliberate use of monetary instruments (direct and indirect) at the disposal of monetary authorities such as central bank in order to achieve macroeconomic stability. Monetary Policy is essentially the tool for executing the mandate of monetary and price stability. Monetary policy is essentially a programme of action undertaken by the monetary authorities generally the central bank, to control and regulate the supply of money with the public and the flow of credit with a view to achieving predetermined macroeconomic goals (Dwivedi, 2005).

Monetary policy can be defined as the process by which the government, central bank, or monetary authority of a country controls (i) the supply of money, (ii) availability of money, and (iii) cost of money or rate of interest, in order to attain a set of objectives oriented towards the growth and stability of the economy. Monetary policy rests on the relationship between the rates of interest in an economy, that is the price at which money can be borrowed, and the total supply of money. Monetary policy uses a variety of tools to control one or both of these, to influence outcomes like economic growth, inflation, exchange rates with other currencies and unemployment (Irfan Hameed and Amen Ume, 2011).

Monetary policy as one of the tools of controlling money supply in an economy of a nation by the monetary authorities in order to achieve a desirable economic growth. Monetary policies are effective only when economies are characterized by well-developed money and financial markets like developed economies of the world. This is where a deliberate change in monetary variable influences the movement of many other variables in the monetary sector.

Monetary policy consists of a Government's formal efforts to manage the money in its economy in order to realize specific economic goals. Three basic kinds of monetary policy decisions can be made about:

a) The amount of money in circulation;

b) The level of interest rate

c) The functions of credit markets and the banking system (Ogunjimi, 1997).

2.2. Objectives of monetary policy

Monetary policy in a country acts as a tool by which the government or central bank, attain a set of objectives oriented towards the growth and stability of the economy. In a case of Pakistan,Monetary policy management and financial sector stability are two primary roles of State Bank of Pakistan (SBP). Monetary policy and process of its formulation in Pakistan has undergone changes with the evolving economic dynamics within the country and the improved empirical and theoretical understanding of the monetary policy across the world.

One of the important and crucial intermediate target variables of monetary Policy in Pakistan is money supply. The SBP has been using M2 aggregate (i.e., currency + demand deposits + time deposits) for policy purposes on the assumption that the demand for M2 function is stable in Pakistan. Utilizing the estimated money demand function the target rate of growth of M2 is set (Qayyum, 2002).

Monetary policy of Pakistan now for some years has been largely supportive of the dual objective of promoting economic growth and price stability. It achieves this goal by targeting monetary aggregates (broad money supply growth as an intermediate target and reserve money as an operational target) in accordance with real GDP growth and inflation targets set by the Government (Shamshad, 2006).

2.3. Conceptualization of Money Supply, Interest rate and Exchange rate

According to Milton Friedman (1987), the **money supply** or money stock, is the total amount of monetary assets available in an economy at a specific time. There are several ways to define "money," but standard measures usually include currency in circulation and demand deposits (depositors' easily accessed assets on the books of financial institutions).

Money supply data are recorded and published, usually by the government or the central bank of the country. Public and private sector analysts have long monitored changes in money supply because of its effects on the price level, inflation, the exchange rate and the business cycle. That relation between money and prices is historically associated with the quantity theory of money. There is strong empirical evidence of a direct relation between money-supply growth and long-term price inflation, at least for rapid increases in the amount of money in the economy. That is, a country such as Zimbabwe which saw rapid increases in

its money supply also saw rapid increases in prices (hyperinflation). This is one reason for the reliance on monetary policy as a means of controlling inflation.

According to Homer et al. (1996), an **interest rate** is the rate at which interest is paid by borrowers for the use of money that they borrow from a lender. Specifically, the interest rate (I/m) is a percent of principal (P) paid a certain amount of times (m) per period (usually quoted per annum). For example, a small company borrows capital from a bank to buy new assets for its business, and in return the lender receives interest at a predetermined interest rate for deferring the use of funds and instead lending it to the borrower. Interest rates are normally expressed as a percentage of the principal for a period of one year.

Interest-rate targets are a vital tool of monetary policy and are taken into account when dealing with variables like investment, inflation, and unemployment. The central banks or reserve banks of countries generally tend to reduce interest rates when they wish to increase investment and consumption in the country's economy. However, a low interest rate as a macro-economic policy can be risky and may lead to the creation of an economic bubble, in which large amounts of investments are poured into the real-estate market and stock market.

According to O'Sullivan et al. (2003), an **exchange rate** (also known as a foreign-exchange rate, forex rate, FX rate or Agio) between two currencies is the rate at which one currency will be exchanged for another. It is also regarded as the value of one country’s currency in terms of another currency.The spot exchange rate refers to the current exchange rate. The forward exchange rate refers to an exchange rate that is quoted and traded today but for delivery and payment on a specific future date.

In the retail currency exchange market, a different buying rate and selling rate will be quoted by money dealers. Most trades are to or from the local currency. The buying rate is the rate at which money dealers will buy foreign currency, and the selling rate is the rate at which they will sell the currency. The quoted rates will incorporate an allowance for a dealer's margin (or profit) in trading, or else the margin may be recovered in the form of a "commission" or in some other way. Different rates may also be quoted for cash (usually notes only), a documentary form (such as traveler's cheques) or electronically (such as a credit card purchase). The higher rate on documentary transactions is due to the additional time and cost of clearing the document, while the cash is available for resale immediately. Some dealers on the other hand prefer documentary transactions because of the security concerns with cash.

2.4. Conceptualizing Economic Growth

Economic growth has long been considered an important goal of economic policy with a substantial body of research dedicated to explaining how this goal can be achieved (Fadare, 2010). Economic growth has received much attention among scholars. According to Khosravi and Karimi (2010), classical studies estimate that economic growth is largely linked to labour and capital as factors of production. The emergence of the endogenous growth theory has encouraged specialists to question the role of other factors in explaining the economic growth phenomenon (Bogdanov, 2010).

Economic growth represents the expansion of a country's potential GDP or output. For instance, if the social rate of return on investment exceeds the private return, then tax policies that encourage can raise the growth rate and levels of utility. Growth models that incorporate public services, the optimal tax policy lingers on the characteristic of services (Olopade and Olopade, 2010). Economic growth has provided insight into why state growth at different rates over time; and this influence government in her choice of tax rates and expenditure levels that will influence the growth rates.

2.5. Monetary policy transmission mechanism

The traditional monetary transmission mechanism (MTM) explains how nominal money supply and nominal interest rate changes affect reel macroeconomic variables such as output, price level and employment level. There are three basic MTM channels: Money channel, other asset price channels (exchange rate and equity price channels) and credit channels. There are several channels of monetary policy transmission, but the functioning and effectiveness of these mechanisms vary across countries due to differences in the extent of financial intermediation, the development of domestic capital markets, and structural economic conditions.

2.5.1. The interest rate channel

The interest rate channel operates through the impact of monetary shocks on liquidity conditions and real interest rates, which in turn affect interest rate sensitive components of aggregate demand such as consumption and investment. Although the interest rate channel is the long-established mechanism of monetary transmission, it may not account for the full extent of output fluctuations, particularly in a small open economy (Taylor, 1995; and Mishkin, 1996).

According to Mishkin (1995) ,the traditional Keynesian view of how monetary tightening is transmitted to real economy can be characterized by a schematic diagram,

$$M \downarrow \Longrightarrow i \uparrow \Longrightarrow I \downarrow \Longrightarrow Y \downarrow$$

Where $M \downarrow$ indicates contractionary monetary policy leading to a rise in real interest rates ($i \uparrow$), which in turn raises the cost of capital, thereby causing a decline in investment spending ($I \downarrow$), thereby leading to a decline in aggregate demand and a fall in output ($Y \downarrow$).

Although Keynes originally emphasized this channel as operating through business' decisions about spending, later research reorganized that consumer's decisions about housing and consumer durable expenditure also are in investment decisions. Thus the interest rate channel of monetary transmission outlined in the schematic above and applies equally to consumer spending in which ***I*** represents residential housing and consumer durable expenditure. John Taylor's paper argues that the interest rate channel of monetary transmission is a key component of how monetary policy effects are transmitted to the economy. In his model, contractionary monetary policy raises the short-term nominal interest rate. Then, through a combination of sticky prices and real expectations, the real long-term interest rate rises as well, at least for a time. These higher intersest rates lead to a decline in business fixed investment, residential housing investment, consumer durable expenditure and inventory investment, which produces the decline in aggregate output. Taylor takes the position that there are strong interest rate effects on consumer and investment spending and, hence, a strong interest rate channel of monetary transmission.

2.5.2. The bank lending (or credit)

The bank lending (or credit) channel works through the response of credit aggregates to changes in interest rates and other policy instruments. Therefore, the credit channel is an extension, an enhancement mechanism to the interest rate channel and amplifies the real effects of monetary policy through changes in the supply of bank credit (Bernanke and Blinder, 1992; and Bernanke and Gertler, 1995). The necessary condition for the credit channel to operate is the significant role of banks as a source of capital for the private sector, especially in bank-based emerging market economies.

In such cases, aggregate demand is often influenced by the quantity of its credit rather than its price (Kamin et al., 1998).

$$M \downarrow \Longrightarrow bank\ deposits \downarrow \Longrightarrow bank\ loans \downarrow \Rightarrow I \downarrow \Longrightarrow Y \downarrow$$

2.5.3. The exchange rate channel

The exchange rate channel works through the impact of monetary developments on exchange rates and aggregate demand and supply. For example, an increase in interest rates would normally lead to an appreciation of the exchange rate, which lowers the price of imported goods and services and thereby pushes down domestic inflation.

The effectiveness of the exchange rate channel depends on the exchange rate regime,the extent of exchange rate pass-through and the degree of openness to capital flows (Taylor, 1995). In a small open economy with a flexible exchange rate regime, the exchange rate channel is typically an important transmission mechanism for monetary policy actions.

2.5.4. The balance sheet channel

The balance sheet channel operates through the impact of monetary innovations on the net wealth and credit worthiness of households and companies. In other words,like the bank lending channel, wealth effects influences consumption demand through changes in real money balances of households and firms that rely on borrowed funds (Mishkin, 1996).

Monetary policy can affect firms' balance sheets in several ways. Contractionary monetary policy $(\boldsymbol{M}\downarrow)$, which causes a decline in equity prices $(\boldsymbol{P_e}\downarrow)$ along lines described earlier, lowers the net worth of firms and so leads lower investment spending $(\boldsymbol{I}\downarrow)$ and aggregate demand $(\boldsymbol{Y}\downarrow)$**,** because of the increase of adverse selection and moral hazard problems. This leads to the following schematic for the balance-sheet channel of monetary transmission.

$$\boldsymbol{M}\downarrow\Rightarrow \boldsymbol{P_e}\downarrow\Rightarrow \boldsymbol{adverse\ selection}\uparrow \&\ moral\ hazard\uparrow\Rightarrow\ lending\downarrow\Rightarrow I\downarrow\Rightarrow \boldsymbol{Y}\downarrow$$

The balance-sheet channel provides a further rationale for asset price effects emphasized in monetarist thinking.

Contractionaty policy that raises interest rates also causes a deterioration in firm's balance sheet because it reduces cash flow. This leads to the following additional schematic for the balance-sheet channel:

$$\boldsymbol{M}\downarrow\Rightarrow \boldsymbol{i}\uparrow \boldsymbol{cash\ flow}\downarrow\Rightarrow \boldsymbol{adverse\ selection}\uparrow \&\ moral\ hazard\uparrow\Rightarrow\ lending\downarrow\Rightarrow I\downarrow\Rightarrow \boldsymbol{Y}\downarrow$$

2.5.5. The asset price channel

The asset price channel operates through the impact of monetary shocks on yields,equity shares, real estate, and other domestic assets, operating through changes in the market value of corporate and household wealth. Changes in short-term interest rates and/or other policy

instruments can alter firms' capacity for fixed investment spending through balance sheet effects, and household consumption through wealth effects (Mishkin, 1996).

A more Keynesian story comes to a similar conclusion because it sees the rise interest rates coming from contractionary monetary policy making bonds more attractive relative to equities, thereby causing the price of equities to fall. Combining these views with the fact that lower equity prices ($P_e \downarrow$) will lead to a lower q ($q \downarrow$), and thus to lower investment spending ($I \downarrow$), leads to the following transmission mechanism of monetary policy:

$$M \downarrow \Longrightarrow P_e \downarrow \Longrightarrow q \downarrow \Rightarrow I \downarrow \Longrightarrow Y \downarrow$$

An alternative channel for monetary transmission through equity prices occurs through wealth effects on consumption. This channel has been strongly advocated by Franco Modigliani (1971), in his life-cycle model, consumption spending is determined by the lifetime resources of consumers, which are made by up of human capital, real capital and financial wealth. A major component of financial wealth is common stocks. When stocks prices fall, the value of financial wealth decreases, thus decreasing the lifetime resources of consumers, and consumption should fall. Since we have already seen that contractionary monetary policy can lead to a decline in stock prices ($P_e \downarrow$), we then have another monetary transmission mechanism:

$$M \downarrow \Longrightarrow P_e \downarrow \Longrightarrow wealth \downarrow \Rightarrow consumption \downarrow \Longrightarrow Y \downarrow$$

2.5.6. The expectations channel

The expectations channel works through the impact of monetary shocks on the perception of households and firms about inter-temporal rates of substitution. Inflation expectations, for example, play a pivotal role by influencing interest rates, exchange rate movements, wages, aggregate demand, and domestic prices (Taylor, 1995).

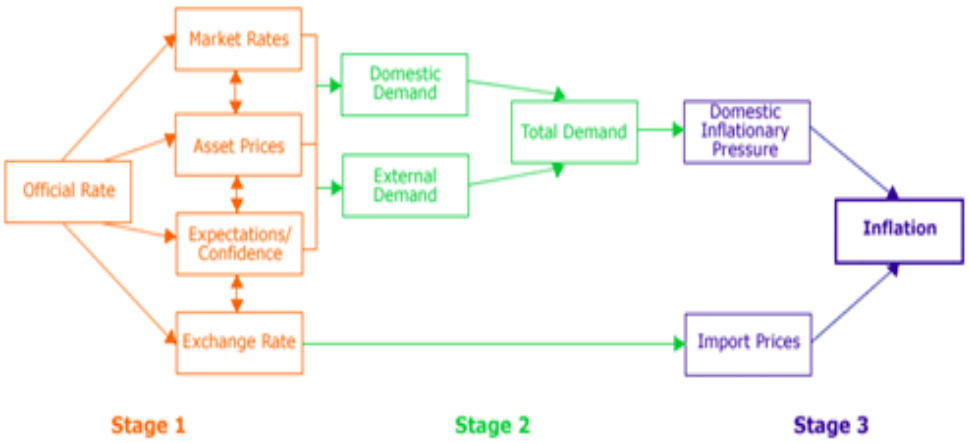
The effectiveness of monetary transmission mechanisms vary and evolve over time,depending on structural economic and financial conditions. Although monetary transmission channels have distinctive effects on the real economy, there are also possible inter-linkages between the channels through which they may magnify or counteract the influence of other channels in the monetary transmission process. Depending on the structure of the economy and financial markets, the effectiveness of various monetary transmission mechanisms varies and evolves over time. Empirical evidence has shown that the interest rate channel is usually the most important transmission mechanism in advanced economies

with developed financial markets, while the bank lending and exchange rate channels are generally the dominant channels of monetary transmission in emerging market economies.The exchange rate channel, on the other hand, appears to be more important in small open economies with flexible exchange rates, where the transmission mechanism of the interest rate channel is relatively weak.

2.5.7. Three stages underwent by Monetary Policy Transmission Mechanisms

In same words, the transmission mechanism of monetary policy is the process by which interest rate changes affect inflation. The transmission mechanism is basically a 3 stage process.

Figure 1: Stages underwent by Monetary Policy Transmission Mechanisms



Source: Bank of Biz/ed, 2012

The **first stage** is that a change in the official interest rate set by the Monetary Policy Committee (MPC) will affect other interest rates. Banks, building societies and other financial institutions have to react to any official rate change by changing their own savings and loan rates. The change will also affect the prices of many assets; shares, houses, gilt-edged security prices and so on. The exchange rate may change as demand and supply of sterling adapt to the new level of interest rates. Finally there may also be an effect on the expectations of both firms and individuals. They may become more or perhaps less confident about the future path of the economy.The **second stage** is that all these changes in markets will affect the spending patterns of consumers and firms. In other words there will be an effect on aggregate demand (AD). Higher interest rates are likely to reduce the level of

aggregate demand, as consumers are affected by the increase in rates and may look to cut back spending. There will also be international effects as the level of imports and exports change in response to possible changes in the exchange rate.The **third stage** is the impact of the aggregate demand change on GDP and inflation. This will tend to depend on the relative levels of aggregate demand and supply. If there is enough capacity in the economy then an increase in AD may not be inflationary. However, if the economy is already at bursting point producing as much as it can, then any further AD increase may be inflationary. (Bank of Biz/ed, 2012)

2.6. Money Supply and Economic Growth

Money supply plays a dominant role in the economy and shows its possible effects on the price level, inflation and the business cycle (Majid, 2007). The relationship between money supply and economic growth has been receiving increasing attention than any other subject matter in the field of monetary economics in recent years (Emenuga, 1996).

As already explained money supply exerts considerable influence on economic activity in both developed and developing economies. The low level of supply of monetary aggregates in general and money stock in particular had been responsible for the fundamental failure of many African countries to attain growth and development.

Various scholars have laid much of the blame for the failure of monetary policies to translate into economic growth on the government and its agencies as a result of poor implementation and in sincerity on the part of policy executors.

Montiel (1995) and Emenuga (1996) all submitted that, possible effect of financial depth (money in circulation) on economic growth can manifest in three channels:

- Improved efficiency of financial intermediation
- Improved efficiency of capital stock and
- Increased national savings rate.

Modern macro-economic theories of money and economic development seem to agree that there exist a systematic relationship between money and economic development (BemankeAlan et al. 1992; Ghatak 1995).

After the Great Depression, JM Keynes who advocates for demand management policies, for the first time recognized the direct effect of money supply on the economic health of a nation. He also argues for intervention of the Central Bank to operate MP to stabilize the economy (Shoaibk, 2010).

M1: “Narrow money includes bills and checkable deposits with high liquidity. These are held by the people for frequent exchanges with cash. M2 and M3 refer to “broad money” as termed deposits with the financial institutions. (Shoaibk 12 June, 2010)

Shrestha’s (2010) research findings are the Price, GDP, M1 and M2 all are stationary at first difference level. GDP and Price are co-integrated with both of M1 and M2. Hence,M1 and M2 both are important variables for consideration (Shrestha, 2010).

According to Kigabo (2013), the narrowest measure is M1 which includes currency in circulation (C) and demand deposits (D) in the case of Rwanda, the M2 is monetary aggregate adds to M1 savings deposits in RFW and the broadest monetary aggregate is M3 composed by M2 and deposits in foreign currency.

Ogunmuyiwa and Ekone (2007) evaluated the effect of money supply within the institutional framework and basic theoretical model on economic growth (Ogunmuyiwaand Ekone, 2010). The findings albeit support that aggregate money supply is positively related to economic growth and development. However, money supply does not have a significant predictive power in explaining the growth of real GDP. Also, the choice between contractionary and expansionary money supply is not significantly responsive to growth as evidenced in the case of GDP growth rate (Khan and Siddiqui, 1990). Despite the upward adjustment in different monetary aggregates, money supply and economic growth gap still exits. Hence, the monetary authorities should harmonize the two policies (contractionary and expansionary) to reduce the rate differential between productive and unproductive credit supplied to the economy, in order to enable the productive sector of the economy to increase the flow of output from the private sector.

Increase in money supply leads to inflation. The currency loses its worth against the goods and services produced and lower the purchasing power. Contractionary monetary policy though controls the inflation but also dampens the economic activity. The investment slows down by individuals and firms. An insight into monetary policy allows making investment decisions considering the cost of capital. (Shoaibk 12 June, 2010)

The other tools of monetary policy like open market operation and discount rates are widely used by the central bank. Minimum reserve requirement conditions also help control the money supply. (Shoaibk 12 June, 2010)

Monetary policy may be inflationary or deflationary depending upon the economic condition of the country. Contractionary policy is enforced to squeeze down the money supply to curb

inflation and expansionary policy is to stimulate economic activity to combat unemployment in recession. (Shane Hall, 2010).

2.7. Interest Rate and Economic Growth

The association between interest rates and economic growth as recognized in the literature on growth can be found in the neoclassical growth framework and the McKinnon-Shaw hypothesis. For instance, McKinnon-Shaw (1973) argued that financial repression, indiscriminate distortions of financial prices including interest rates reduces real rate of growth. One of the basic arguments of McKinnon-Shaw model is an investment function that responds negatively to the effective real loan rate of interest and positively to the growth rate.McKinnon-Shaw school expects financial liberalization to exert a positive effect on the rate of economic growth in both the short and medium runs. Albu (2006) used two partial models to investigate the impact of investment on GDP growth rate and the relationship between interest rate and investment in the case of Romanian economy.

The models are specified as:

$$\mathbf{r\ (a) = a^{*}\alpha + b} \quad , \quad \mathbf{\alpha\ (I) =} \frac{c}{d+i}$$

Where; r = GDP growth rate, **α** = investment rate, i =interest rate, p = inflation, a, b, c, and d are parameters to be estimated.

He found that the behavior of the national economic system and the interest rate, investment, economic growth relationships tend to converge to those demonstrated in a normal market economy.

Oosterbaan et al. (2000) estimated the relationship between the annual rate of economic growth (YC) and the real rate of interest (RR) in equations of the basic form:

$$YC = \beta_0 + \beta_1(RR + \beta_2).(RR + \beta_2)$$

De Gregorio and Guidotti (1995) cited in Oosterbaan et al. (2000) suggest that the relationship between real interest rates and economic growth might resemble an inverted U-curve: Very low (and negative) real interest rates tend to cause financial disintermediation and hence to reduce growth. However, the World Bank reports, cited in Oosterbaan, et al. (2000) show a positive and significant cross-section relationship between average growth and real interest rates.

2.8. Exchange rate and Economic growth

Economists have long known that poorly managed exchange rates can be disastrous for economic growth. Avoiding overvaluation of the currency is one of the most robust imperatives that can be gleaned from the diverse experience with economic growth around the world, and it is one that appears to be strongly supported by cross-country statistical evidence (Razin and Collins 1997, Johnson, Ostry, and Subramanian2007, Rajan and Subramanian 2007). The results in the well-known papers of Dollar (1992) and Sachs and Warner (1995) on the relationship between outward orientation and economic growth are largely based on indices that capture degrees of overvaluation (Rodriguez and Rodrik 2001). Much of this literature on cross-national policy regressions is now in doubt (Easterly 2005, Rodrik 2005).

According to Edwards (1986), Devaluation of the domestic currency has been an important component of the orthodox stabilization programme leading to trade policy reforms. By raising the domestic currency price of foreign exchange devaluation increases the price of traded goods relative to non trade ones. This causes a reallocation of resources resulting in increased production in import competing sectors. Devaluations are also believed to contribute to the enhancement of external competitiveness stimulating production in the export sector. On the other hand,as a direct consequence of nominal devaluations import prices go up, which is likely to depress the demand for imports in the domestic economy. Increased exports and reduced imports are expected to improve the external trade balance, and many developing countries have relied upon devaluations to correct fundamental disequilibria in their balance of payments.It is argued that by expanding the production of the traded sector in general and exports in particular, devaluation should have an expansionary effect on the overall economy.However, although nominal devaluations help achieve the goal of relative price adjustment along with an improvement in trade balance, they might do so at a high cost. There are concerns that indirect costs of devaluation can actually outweigh its benefits adversely affecting the overall output growth. This is what is known as the contractionary effect of devaluation.

First, Diaz-Alejandro (1965) examined the impacts of devaluation on some macroeconomic variables in Argentina for the period 1955–61. He observed that devaluation was contractionary for Argentina because it induces a shift in income distribution towards savers,

which in turn depresses consumption and real absorption. He equally observed that current account improved because of the fall in absorption relative to output.

Another study by Mireille (2007) argues that overvaluation of exchange rates have constituted a major setback in the recovery process of Nigeria and Benin Republic. In addition, the author suggests that devaluation accompanied with well-targeted measures along side an upward adjustment in the domestic price of tradable goods, could restore exchange rate equilibrium and improve economic performance.

Kamin and Klau (1998) using an error correction technique estimated a regression equation linking the output to the real exchange rate for a group of twenty seven countries. They did not find that devaluations were contractionary in the long term. Additionally, through the control of the sources of spurious correlation, reverse causality appeared to alternate the measured contractionary effect of devaluation in the short term although the effect persisted even after the introduction of controls. Apart from the findings from simulation and regression analyses, results from VAR models, though not focused mainly on the effects of the exchange rate on the output per sector, are equally informative.

In conclusion, most of the econometric analyses indicated that devaluations (either increases in the level of the real exchange rate or in the rate of depreciation) were associated with a reduction in output and increase in inflation. The studies reviewed above equally supported the existence of a contractionary devaluation in the sampled countries. However, most cases of contractionary devaluations had been focused on Latin America and other developed nations. Only few studies had been conducted on the issue in sub-Saharan Africa, particularly Nigeria, thus, warranting research on the subject.

2.9. Monetary Policy and Economic Growth

According to Éva Kaponya (2012), the long-run neutrality of money is a concept accepted in economics and widely supported by experience. This theory states that although monetary policy is able to influence economic growth in the short term, i.e. to stimulate or dampen demand, it has no influence on real variables − employment, growth, etc. − in the longer term. This is because the long run equilibrium levels of those variables are determined by movements in supply, the use of available technology, demographic factors or the preferences of economic agents.There is a maximum attainable level of production in an economy,which is achieved by a full utilization of all available factors of production.This is

referred to in the economic literature as potential output.The highest rate of economic growth which does not contribute to inflation is called potential growth rate.

To illustrate the long-term neutrality of monetary policy, suppose that we gift economic agents with money which they can spend buying any thing they want. Income earned in this way will generate extra demand, which supply will try to satisfy by stepping up production. When, however, existing capacities are no longer sufficient to satisfy demand, prices will begin to rise. At a higher level of prices, demand will decline and supply and demand will return to balance. In fact,the balance between supply and demand has developed at the original level of output, but at a higher price level. So the expansionary effect of monetary policy has proved to be temporary: the short-term increase in demand has been offset by a rise in the price level.

The above example highlights two points. First, the central bank is able to stimulate or constrain economic activity in the short term, i.e. to smooth out fluctuations in output. But, second, it is unable to generate permanent changes in output,and its actions will ultimately lead to changes in the general price level. Growth in potential output − or (long-term) potential growth − is determined by the improvement in supply-side factors (technological progress, capital accumulation,an increase in the pool of labour available to work, etc.). It is important to note, however, that monetary policy can greatly contribute to the development of a predictable and certain environment, a precondition for the economy to realise its longer-term growth potential, by maintaining price stability, and it can have a positive indirect effect on long-term growth.

The recent financial crisis has also shown that monetary policy must face a degree of economic overheating which is not necessarily (or not immediately) reflected in an increase in inflation. Often this masks financial imbalances (e.g. asset price bubbles or large indebtedness) which are difficult to identify during their build-up phase, but the 'bursting' of such bubbles may lead to severe recession in extreme cases. Because these risks cannot be captured using traditional forecasting systems, the central bank must take particular care to identify such imbalances early enough and prevent them from developing. It can best do that by conducting macro prudential analysis, performing regular analysis of financial and credit market developments and by using various forward-looking, early warning indicators. Accordingly, price stability is a necessary but not necessarily sufficient condition for long-

term sustainable economic growth, and the central bank must seek to achieve macroeconomic stability using the instruments at its disposal.

CHAPITER THREE: USED METHODOLOGY

3.1. Introduction

This chapter describes the methodology that has been used in this study. According to Bailey (1978:26), "methodology means the philosophy of research process". This includes the assumptions and values that serve as rationale for research and standards of criteria that the researcher uses for data interpretation and drawing conclusion.

The study covers the period of 1999-2013. It includes explanatory variable such as Inflation , Money Supply, Interest rate and Exchange rate in Rwanda. GDP growth is used as the dependent variable in the estimation. The study employs an econometric analysis. The data discussed in this study are secondary data obtained from National Bank of Rwanda, its reports and Ministry of Finance publications .

3.2. Research Design

A research design is a master plan specifying the methods and procedures for collecting and analyzing the required information. Research design is the plans and the procedures for research that span the decisions from broad assumptions to detailed methods of data collection and analysis. The overall decision involves which design should be used to study a topic. Informing this decision should be the worldview assumptions the researcher brings to the study; procedures of inquiry (called strategies); and specific methods of data collection, analysis, and interpretation.

The selection of a research design is also based on the nature of the research problem or issue being addressed, the researchers' personal experiences, and the audiences for the study. (Creswell,2008,P .3)

According to Grinner and Williams (1990,P.279), research design is the entire process of the study, the problem formulation through dissemination of findings. It sometimes used to refer to graphic presentation of the independent variables.

According to Churchill (1992:39), "a study design is simply the frame work or plan for the study used as a guide in collecting and analyzing data". The research design related to this study was based on the techniques set at each objective to have all the objectives achieved.

3.2.1. Quantitative research

According to Creswell (2008, P.4), **Quantitative research** is a means for testing objective theories by examining the relationship among variables. These variables, in turn, can be measured, typically on instruments, so that numbered data can be analyzed using statistical

procedures. The final written report has a set structure consisting of introduction, literature and theory, methods, results, and discussion. As a researcher I have used quantitative research among three types of research designs (qualitative, quantitative, and mixed methods).I was interested to assess the effect of monetary policy on economic growth in Rwanda

3.2.2. Data Collection

3.2.1.1. Sources of Data

Data collection was done through the secondary Data. The MINECOFIN is the primary source on GDP growth and BNR is the main source of monetary policy instruments, which in this study are represented by the variation of Money supply, lending interest rate and Exchange rate from 1999 to 2013.

3.2.1.2. Data Collection Procedure

Most of the data have been obtained from the MINECOFIN and BNR. Researcher has visited BNR especially the department of monetary policy and economic analysis, department of reseach , where data on all independent variables have been found and department of Macroeconomic in MINECOFIN where data on nominal GDP have been found.The website for both BNR ,NISR and MINECOFIN were consulted for more documentations.

3.2.3. Data Processing

The present paper investigates the impact of monetary policy on economic growth in Rwanda between 1999 and 2013. Many of economic and social changes have been taken place in Rwanda during this period. It is very important to analyze and evaluate the factors that affected the economic growth over this period. The data for the study have been collected mainly from the statistical publications of Central Bank of Rwanda (BNR). To find out the impact of monetary policy on the GDP and to test the study hypotheses, regression model were used to test the relation between the dependent and independent variables. Therefore, multiple regression model were developed to achieve the above objectives.

In our model, GDP is the dependent variable while Money supply (which is represented by M3), Interest rate and Exchange rate are the independent variables. In this study we can analyze the impact of monetary policy through the monetary policy transmission mechanism on the economic growth in Rwanda. The study covers MINECOFIN and BNR quarterly data from 1999 to 2013.

In this empirical study, data have been processed and information related to the hypothesis and objectives of the study was taken into account and transformed into meaningful data for easy interpretation and understanding. This has been carried out by the use of Eviews package.

3.2.4. Data Analysis

Analysis of data is a process of inspecting, cleaning, transforming, and modeling data with the goal of discovering useful information, suggesting conclusions, and supporting decision making. Data analysis has multiple facets and approaches, encompassing diverse techniques under a variety of names, in different business, science, and social science domains.

Data analysis is a body of methods that help to describe facts, detect patterns ,develop explanations, and test hypotheses. It is used in all of the sciences. It is used in business, in administration, and in policy.(Joel H. Levine , 1996)

The researcher used quantitative data which is data that is expressed in numerical terms, in which the numeric values could be large or small. numerical values may correspond to a specific category or label.

The researcher had more than one indepentents variables in the model (instruments of monetary policy) ,multiple linear regression analysis has been used to find out the effect of monetary policy on economic growth in Rwanda.

A multiple linear regression analysis is carried out to predict the values of a dependent variable, Y(Nominal GDP), given a set of p explanatory variables or predictors (X_1,X_2,X_3,X_4…X_P),which were represented by the following instruments in our study: Money supply (M_3),Lending interest rate and Nominal exchange rate for the case of Rwanda.

All data was analyzed through econometric analysis by use of Eviews as software which helped reseacher to test stationarity, cointegration or long run realationship between dependent and independent variables, the short run relationship were tested using error correction model, the Granger causality test were used in ordet to test if independent variable (predictor) can be used in predicting dependent variable .

Some statistical summaries are also produced , these are R square (R^2 for testing the goodness of fit of the statistical model), the Durbin watson value for testing the presence of serial correlation , the t-statistics and critical value at different level of significance,the coefficients for every independent variables and their probabibilities were also found for the

whole regression leading to exploring the relationships among the variables and to the confirming of a significant (or no significance) relationship between variable *Y* and one or more of the predictors.

The descriptive statistics was also used by calculation of correlation coefficient between variables , tables, graphs and charts. This was done to enable the easy analysis and interpretation by the users.

The analysis of results was followed by their interpretation, and making comparison between expected signs via theory and true signs found after long and short run estimation.

3.2.5. Data strategies

Different strategies provide data analysts with an organized approach to working with data; they enable the analyst to create a "logical sequence" for the use of different procedures (Migrant & Seasonal Head Start Technical Assistance Center, Academy for Educational Development , P 9)

3.2.5.1 Trend Analysis

This strategy was looking at data collected at different periods of time for the reasons of identifying and interpreting (and, potentially, estimating) change. The most general goal of trend analysis is to look at data over time, one aspect of trend analysis that is discussed in this study and encouraged is that of comparing one time period to another time period. This form of trend analysis is carried out in order to assess and show the prio link between variables (both dependent and independents)

3.2.5.2 Estimation

This strategy is chosen by researcher for using actual data values to predict a future value and for showing how much dependent variable (Nominal GDP) will vary due to the shock of every independent variable (Monetary policy variables) .Estimation is one of many tools used to assist planning for the future and it works well for forecasting quantities that are closely related to actual quantities. Estimation is the combination of information from different data sources to project information not available in any one source by itself.

CHAPITER 4: DATA ANALYSIS AND INTERPRETATION OF THE RESULTS

4.1. Overview of Monetary policy in Rwanda

4.1.1. Introduction (BNR' Missions, Vision, Functions and Core values)

The National Bank of Rwanda's vision is to become a leader Central Bank by implementing efficient monetary policy, granting price &financial stability and ensuring efficient payment systems for sustainable economic growth.

According to article 5 of the law governing BNR, its main mission is to: Ensure and Maintain Price Stability; Enhance and Maintain a Stable and Competitive Financial System without any exclusion; and support Government's General Economic Policies without damaging the two above mentioned missions.

To achieve the mission described above, the Bank has the following functions:

- To define and implements the monetary policy;
- To organize, supervise and regulate the foreign exchange market;
- To supervise and regulate the activities of financial institutions;
- To supervise and regulate payment systems;
- To mint and manage money;
- To hold and manage official foreign exchange reserves;
- To act as State Cashier;
- To carry out any other task that this law or another law may assign to the Bank

The Bank's core values are Integrity, Accountability, Efficiency and Effectiveness. (BNR, 2012)

4.1.2. Monetary Policy Developments in Rwanda

4.1.2.1 Monetary Policy stance

During the first quarter 2013, BNR continued to implement a tight monetary policy in response to persistent uncertainties in international economic and financial environment, although inflationary pressures have eased in both the sub-region and national economies.

On December 21st, 2012 and on 20th March 2013, the Monetary Policy Committee decidedto maintain the BNR monetary policy stance by keeping the key repo rate at 7.5% in order to contain and minimize any risks of monetary inflation, but without jeopardizing the financing of productive activities. (BNR, 2013)

4.1.2.2 Inflation

The inflation rate has been maintained at low levels since 2012 as a result of prudent and efficient monetary policy, good economic performance and well-coordinated economic policies to limit the impact of exogenous shocks, easing inflationary pressures in trading partners as well as stable international oil prices.

Annual headline inflation fell to 3.7% in June of 2013 from 5.9% and 3.9% recorded in June and December 2012 respectively. Core inflation (excluding seasonal and volatile prices of fresh food and energy) was 3.4% in June 2013 after 6.8% and 3.9% in June and December 2012 respectively. (BNR, 2013)

Table 1:Headline annual inflation by origin and category, in percentage

	2011	2012	2013					
	Dec.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.
Overall inflation	**8.3**	**3.9**	**5.7**	**4.8**	**3.3**	**4.4**	**3.0**	**3.7**
Local Goods	8.3	4.1	6.3	5.0	3.2	4.5	2.9	4.1
Food and non-alcoholic beverages	11.2	7.9	8.3	4.7	1.9	4.1	2.6	4.4
Fresh food	8.3	10.0	10.7	1.8	-3.8	0.0	0.4	6.3
Vegetables	8.7	9.4	11.6	1.9	-3.5	2.5	1.4	10.8
Imported Goods	8.6	3.2	3.0	4.0	3.4	4.0	3.5	1.9
Energy	9.3	5.7	5.6	8.5	4.6	6.4	2.5	0.9
Underlying inflation	**8.3**	**3.9**	**4.7**	**5.1**	**4.8**	**5.2**	**3.5**	**3.4**

***Source**: BNR, Statistics Department*

In terms of origin, moderate inflation rate was largely attributed to domestic inflation which stood at 4.1% in June 2013 from 6.8% and 4.1% in June and December 2012 respectively. Imported inflation significantly slowed down to 1.9% in June 2013 from 2.7% and 3.2% respectively in June and December 2012, partially offsetting the impact of domestic inflation**.**

4.1.2.3 Money Supply and Demand

By the end of first quarter of 2013, broad money M3 marginally declined by 0.4% against an increase of 6% recorded in the fourth quarter 2012 and 4.3% in the first quarter 2012. This fall was attributable to a decline in net foreign assets (-14.4%) whereas net domestic assets increased following notably expansion in net credit to Government (+43.2%) and credit to private sector (+3.4%). At some extent, these counterparts of M3 had evolved in the same direction during the first quarter of the last year. However, compared to dynamics in the previous quarter, the situation is quite different as expansion in M3 was driven by a boost in

NFA towards end 2012 and increasing credit to private sector while net credit to Government had gone down.

On annual basis, change in M3 has been moderate comparing 2012 and 2013 at the end of the first quarter, despite strong increase in credit to private sector and net credit to Government. Once again the decline in NFA has been behind a weak growth in M3.

Table 2:Monetary aggregates developments (in FRW billion)

	Mar-12	Jun-12	Sep-12	Dec-12	Mar-13	Change in %			
						Dec-11/ Mar-12	Dec-12/ Mar-13	Mar-11/ Mar-12	Mar-12/ Mar-13
Net foreign assets	**579.2**	**513.7**	**468.8**	**555.8**	**475.6**	**-12.8**	**-14.4**	**24.7**	**-17.9**
Net foreign assets (BNR)	469.9	451.8	372.2	457.1	366.7	-16.7	-19.8	32.9	-22.0
Net foreign assets (Banks)	109.3	61.9	96.6	98.8	108.9	9.3	10.2	-1.5	-0.3
Net domestic assets	**235.0**	**365.0**	**371.0**	**334.1**	**410.8**	**101.4**	**23.0**	**45.0**	**74.8**
Domestic credit	417.6	550.2	565.6	545.6	627.1	39.6	14.9	29.1	50.2
Central government (net)	-138.5	-52.3	-101.3	-137.2	-77.9	34.8	43.2	-40.5	43.7
Autonomous Agencies	-1.6	-2.2	-2.1	-2.3	-2.8	-52.7	-22.0	-179.7	-74.6
Public enterprises	2.1	2.6	5.0	2.5	2.3	-24.7	-5.3	84.0	10.9
Private sector	555.6	602.2	663.9	682.5	705.4	9.0	3.4	31.8	27.0
Other items net (Assets: +)	-182.6	-185.2	-194.6	-211.5	-216.2	0.0	-2.2	-13.2	-18.4
Broad money M3	**814.1**	**878.8**	**839.9**	**889.9**	**886.4**	**4.3**	**-0.4**	**29.9**	**8.9**
Broad money M2	688.7	746.5	703.2	725.3	728.4	6.8	0.4	34.9	5.8
Money M1	409.4	443.6	417.2	425.7	424.3	7.2	-0.3	26.7	3.6
Currency in circulation	99.3	111.6	102.2	107.0	105.6	-3.4	-1.3	18.2	6.4
Deposits	714.9	767.2	737.6	782.9	780.8	5.4	-0.3	31.8	9.2
o/w:demand deposits	310.2	332.0	315.0	318.7	318.7	11.1	0.0	29.7	2.7
time deposits	279.3	302.9	286.0	299.6	304.1	6.1	1.5	48.9	8.9
foreign currency	125.4	132.3	136.6	164.6	158.0	-7.5	-4.0	8.2	26.1

Source: *BNR*

Looking at movement in monetary aggregates in previous quarters since 2012, the upward trend in M3, M2 and M1 was sustained except in the third quarter 2012. Another point worthy to mention is the slowdown in credit to private sector for the second consecutive quarter. On the demand side, time deposits recorded the highest growth amid sustained higher deposit interest rate while foreign currency deposits contracted after a significant increase in the fourth quarter 2012 as the FRW has stabilized against major currencies in the first quarter 2013 compared to the two previous quarters.(BNR, 2013)

Table 3: Monetary aggregates developments on quarterly basis

	Change in % in 2012				Change in % in 2013
	Q1	Q2	Q3	Q4	Q1
Net foreign assets	-12.8	-11.3	-8.7	18.6	-14.4
Net domestic assets	101.4	55.3	1.6	-10.0	23.0
Domestic credit	39.6	31.8	2.8	-3.5	14.9
Net credit government	34.8	62.2	-93.5	-35.5	43.2
Private sector	9.0	8.4	10.3	2.8	3.4
Broad money M3	4.3	7.9	-4.4	6.0	-0.4
Broad money M2	6.8	8.4	-5.8	3.1	0.4
Money M1	7.2	8.3	-5.9	2.0	-0.3
Currency in circulation	-3.4	12.4	-8.4	4.7	-1.3
Deposits	5.4	7.3	-3.9	6.1	-0.3
o/w: demand deposits	11.1	7.0	-5.1	1.2	0.0
time deposits	6.1	8.5	-5.6	4.8	1.5
foreign currency	-7.5	5.5	3.3	20.5	-4.0

Source: *BNR*

4.1.2.3.1 Money supply

4.1.2.3.1.1 Net foreign assets (NFA)

The expansion of NFA contracted during the first quarter 2013 due mainly to less than planned in flows from donors especially grants for government projects in January and February while expenditures in forex have been contained in line with initial projections. This development negatively affected BNRs' NFA which contracted by 19.8% between end December 2012 and end March 2013.

Meanwhile, NFA of commercial banks were healthy as they expanded by 10.2% but their effect on total NFA of the banking system was limited due to their small weight in total NFA, though BNRs' NFA share declined to an average of around 77% from 82% recorded in the previous quarter, implying that the share of commercial banks NFA gained to reach around 23% on average in the same periods. The NFA of commercial banks expanded amid good performance on different sources, including tourism receipts, NGOs transfers, remittances and exports revenues. (BNR, 2013)

4.1.2.3.1.2 Net domestic assets (NDA)

On one hand, increase in NDA was essentially driven by net credit to Government to offset the shortfall of Government foreign revenues as some expected inflows from abroad didn't materialize. On the other side, outstanding domestic credit to private sector kept on increasing for the first quarter 2013 but continuing the slower pace observed since the previous quarter compared to the first three quarters of 2012. In fact, growth in new authorized loans has recently been slowing down, limiting notably personal loans and loans

to the service sector (commerce and hotels, transports and warehousing, services) amid a slight increase in average lending rates.

There has been a minor improvement in loans to deposits ratio which reached an average 0.88 in the first quarter 2013 from 0.89 in the fourth quarter 2012. This ratio is still high compared with the situation in the last two years. Regarding the competitiveness on loans market, there were no noticeable changes in this first quarter 2013 as Herfindahl index remained around 0.15, indicating that the market is not yet fully competitive despite significant improvement compared to the previous years.(BNR, 2013)

4.1.2.3.2 Money demand

Currency in circulation decreased in Q1 2013 by 1.3% following its seasonal trend. In the same period of 2012, currency in circulation had declined by 3.4%. Also, similar to the previous quarters, the share of currency in circulation in M3 continued to gradually decline as it reached an average of 11.6% in Q1 2013 from 12% in Q4 2012. This positive trend is a result of ongoing financial sector reforms and development marked by a rapid banks network expansion and payment systems modernization. (BNR, 2013)

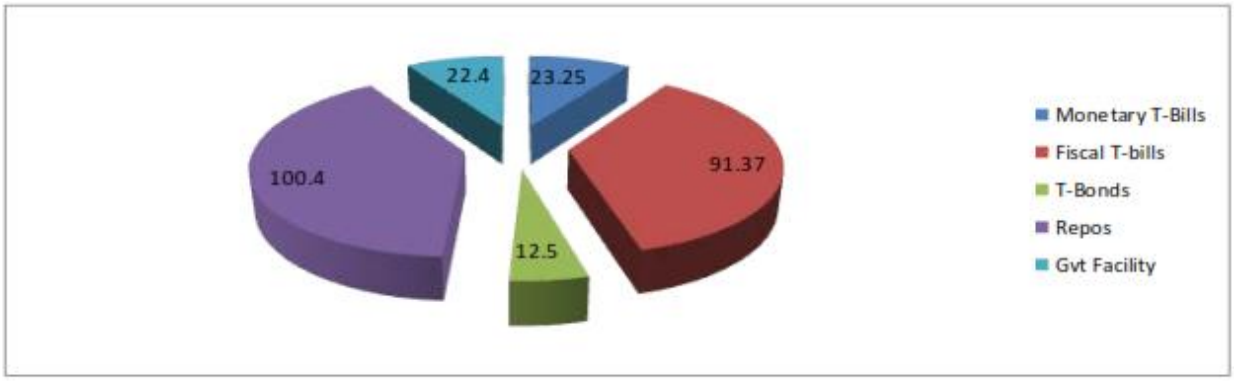
4.1.2.4 Banking System Liquidity Conditions

The banking system liquidity continued to improve during the first half of 2012 and BNR has intervened frequently to manage liquidity through REPO operations and issuance of treasury bills to meet the reserve money targets.

By end of June 2012, total outstanding liquidity resulting from mopping up operations amounted to FRW 215 billion compared to FRW 160.8 billion by end December 2011, treasury bills accounting for 53.3% against 46.6% for Repos. Besides, outstanding Government long term deposit facility reached FRW 22.3 billion by end June 2012 against FRW 20.6 billion by end December 2011 and was used to finance especially mortgages and equipment with 52% and 36% respectively.

Within the framework of developing the capital market, BNR issued Government Treasury Bonds and by end June 2012, the total Bonds listed on Rwanda Stock Exchange amounted to FRW 12.50 billion .

Figure 2: Outstanding amount of BNR and Government securities (RWF billion)



Source: BNR

Regarding the interbank market development in the first semester 2012, a significant decrease of 95% has been recorded in the total volume transacted. It stood at 14.38 billion RWF end June 2012 from 294.88 billion in end June 2011. This trend was driven by comfortable liquidity conditions in almost banking system leading to more investment in money market instruments as mentioned above.

Outstanding short term money market instruments owned by the banking system kept on increasing in the first half of 2013, from FRW 145 billion by end December 2012 to FRW 239.3 billion by end June 2013, showing a comfortable level of the banking liquidity. (BNR, 2013).

Table 4: Most liquid assets of commercial banks (in FRW billion)

	2012				2013					
	Jan	Feb	Mar	Dec	Jan	Feb	Mar	April	May	June
T-bills	64.9	52.9	41.9	55.5	72.2	74.5	76.5	83.1	74.2	105.5
Repo	79.3	97.6	109.0	52.5	20.0	20.0	17.1	25.4	54.0	90.2
Excess	11.8	8.6	-9.1	14.8	12.4	16.4	20.3	13.0	13.7	15.3
Cash in vault	16.6	18.1	16.3	22.3	20.8	22.7	20.2	22.7	24.5	28.3
Total	**172.6**	**177.2**	**158.1**	**145.0**	**129.5**	**139.3**	**134.0**	**144.2**	**166.4**	**239.3**

Source: *Monetary Policy and Economic Analysis Department*

The banking sector is continuously growing in terms of assets, loans and deposits. The sector recorded a growth of 15.1% of total assets from RWF 1.12 trillion end March 2012 to RWF 1.29 trillion end March 2013. For the same period, the net loans and overdrafts increased by 11.8% from RWF 610.2 billion to RWF 771.8 billion while deposits increased by 11.8% from RWF 775 billion to RWF 866.4 billion. Banks are adequately capitalized with the solvency ratio standing at 24.6% end March 2013, well above the regulatory

requirement of 15%. The NPL as a measure of asset quality deteriorated slightly from 6.3% end March 2012 to 6.6% end March 2013. (BNR, 2012)

Table 5: Banking sector performance indicators

	Mar.12	Jun.12	Sept.12	Dec.12	Mar.13
Total Assets in billions	1,123.25	1,207.84	1,202.63	1,247.68	1,292.92
Total Deposits in billions	775.01	827.88	803.38	844.02	866.45
Total Loans / Advances in billions(net)	610.23	669.30	729.98	747.35	771.84
NPLs in billions	44.47	45.12	52.19	52.10	57.80
Profit After Tax in billions	6.44	12.96	21.18	27.32	8.31
Capital adequacy ratio (benchmark = min 15%)	26.6%	25.1%	24.1%	23.9%	24.6%
NPLs ratio (benchmark = max 5%)	6.3%	5.8%	6.3%	6.1%	6.6%
Return on Average Assets (benchmark = min 1%)	2.5%	2.3%	2.3%	2.2%	2.6%
Return on Average Equity (benchmark = min	11.7%	10.9%	11.1%	10.4%	12.2%
Liquid Assets Ratio (benchmark = min 20%)	48.9%	47.6%	40.2%	41.2%	37.5%
Gross Loans to Total Deposits (max 80%)	81.4%	83.6%	94.1%	91.9%	92.5%

Source: *BNR*

4.1.2.5 Interest Rate Developments

After the BNR kept its policy rate (Key Repo Rate) unchanged at 7.5% in May 2012, short terms interest rates have been adjusting accordingly with easing liquidity conditions. Interbank rate and T-bills fell respectively to 10.0% and 12.2% in March 2013 from 11.1% and 12.4% in December 2012. It is worth mentioning that increasing Government borrowing has had an impact on the observed hike in T-bills and interbank interest rates since mid-year 2012. On the other hand, repo rate fell to 7.0% in March 2013 from 7.4% in December 2012 as there was less demand from the BNR for mop up the excess liquidity.

Table 6: Interest rates (in percentage)

	2012				2013					
	Mar	Jun	Sep	Dec	Jan	Feb	Mar	Apr	May	Jun
BNR Policy Rates										
Key Repo Rate	7.0	7.50	7.50	7.5	7.5	7.5	7.5	7.5	7.5	7.0
Discount Rate	11.0	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.0
Money Market Rates										
Repo rate	6.9	7.4	7.5	7.5	7.4	7.4	7.0	7.2	7.1	6.7
Standing Deposit Facility	-	-	-	5.5	5.5	5.5	5.5	5.5	5.5	5.0
Standing Lending Facility	-	-	-	9.5	9.5	9.5	9.5	9.5	9.5	9.0
Treasury Bills Rate	7.7	9.3	12.3	12.4	12.4	12.2	12.2	12.0	12.0	10.8
Commercial Banks										
Interbank Rate	7.7	9.0	10.8	11.1	11.1	10.2	10.0	10.9	10.3	9.6
Deposit Rate	8.2	7.9	8.5	10.0	11.8	10.3	10.4	10.7	11.6	10.6
Lending Rate	16.3	16.8	17.1	16.5	17.1	17.1	17.2	17.3	17.6	17.7

Source: *BNR, Statistics Department*

Regarding market rates, deposit rates have increased from an average of 10.0% in December 2012 to 11.6% in May 2013 before slightly declining to 10.6%. The move was due to increased competition as commercial banks sought to attract new deposits to finance loans. As a result the weighted average lending rate increased from 16.5%to 17.7% between December 2012 and June 2013. However, interest rate spread between lending rate and deposit rate has been reducing over time from 8.9% in June2012 to 7.1% in June 2013. This trend is attributed to the increasing competition within the banking system as a result of recent reforms in the financial sector leading to a network expansion, with new banks and new products. (BNR, 2013)

4.1.2.6 Exchange rate and forex market developments

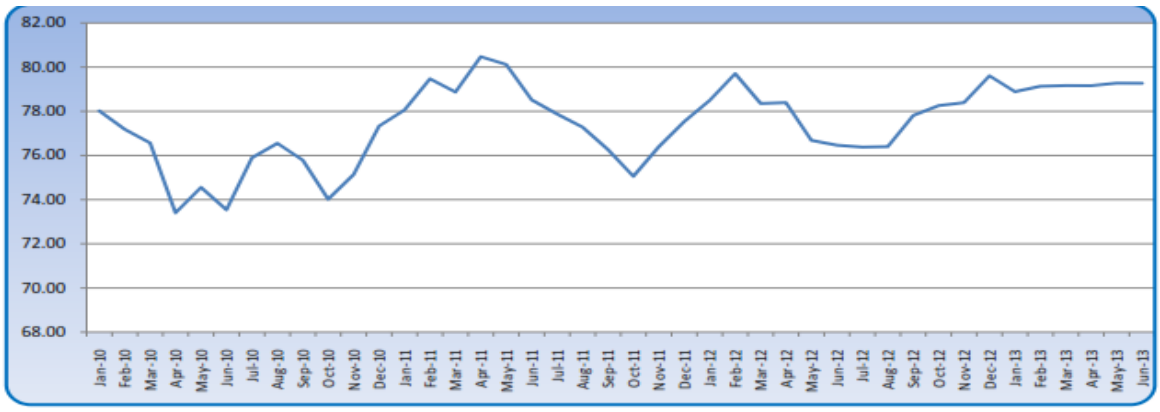
4.1.2.6.1 Exchange rates developments

In the first half of 2013, the FRW has regained its stability depreciating moderately by 1.8%, trading between FRW 631.41 end December 2012 and 642.66 end June 2013 against a depreciation of 4.5% recorded for the whole year 2012. In the same period, FRW appreciated by 5.0% against the GBP and slightly depreciated by 1.2% versus the EURO.

Similarly, the FRW depreciated against all EAC currencies by 1.7%; 0.3%; 4.3% and 0.1% versus Kenyan shilling, Tanzanian shilling, Ugandan shilling and Burundian franc respectively.

Following an appreciation recorded in the second half of 2012, the FRW Real Effective Exchange Rate (REER) has quite stabilized in the first half of 2013. Indeed, the moderate bilateral depreciation against USD, EURO and GBP recorded during the period has been offset by a moderate inflation differential with most of trading partners.(BNR, 2012)

Figure 3: The trend of real effective exchange rate



Source: BNR, *Monetary Policy and Economic Analysis Department*

4.1.2.6.2 Domestic foreign exchange market

There have been a number of developments in the domestic foreign exchange market which led to its improvement. The Central Bank has spearheaded the establishment of the Dealers' Association in order to ensure an organized domestic foreign exchange market. This has not only enforced rules of the game, but also provided the platform for information sharing and capacity building.

Besides, the foreign exchange resources in the banking system have increased by 2.6% in the first half of 2013 compared to the same period of last year. However, this increase has not been sufficient enough to meet the high demand for imports.

Consequently, the Central Bank intervened on the Foreign exchange market by selling to banks USD 118.78 million in the first half of 2013. (BNR, 2012)

Table 7: Foreign Capital flows (Jan-June, in USD million)

	Jan-Jun 2011	Jan-Jun 2012	Jan-Jun 2013
Commercial banks resources	1,315.6	1,525.7	1,565.4
Exports receipts	142.6	166.1	240.6
Receipts on services	137.7	162.4	165.1
Private transfers received	901.2	968.8	1,041.0
Purchases forex from NBR	134.1	228.5	118.8
Commercial banks expenditures	**1,445.6**	**1,470.3**	**2,053.4**
Imports of goods	860.8	937.1	1,531.8
Imports of services	226.3	216.9	218.9
Private transfers paid	284.2	242.5	284.4
Sales to Forex Bureaus	74.3	73.8	18.4
Deficit (-) Excess (+)	**-130.0**	**55.4**	**-488.0**
Memorandum items			
Budget Support	181.5	88.7	195.6
Government Projects	67.9	132.8	116.9
Sovereign bond proceeds		0.0	400.0

Source: *BNR, Statistics Department*

4.1.2.7 Reserves money developments

By end Q1, 2013, reserve money edged up by 1.5% from its level of end Q4, 2012, although in January and February it was below compared to end December 2012 level due mainly to declining NFA. However, it is worthy to note that NFA partially recovered in March and together with increasing net credit to Government have led to an increase in reserve money. On the demand side, currency outside BNR decreased by 2.7% as expected in Q1 due to

seasonal factors. However towards the end of Q1 2013, currency started to recover as the coffee campaign begun. In the mean time, commercial banks deposits recorded an increase of 10.4%. Since the introduction of Reserve Money band of ±2% around a central Reserve Money target, commercial banks deposits at BNR have remained at a high level as central bank mop up operations have been less extensive.

Table 8: Reserve money developments, in RWF billion

	2012			2013		Change in %			
	Mar	Jun	Sep	Dec	Mar	Dec-11/ Mar-12	Dec-12/ Mar-13	Mar-11/ Mar-12	Mar-12/ Mar-13
Net foreign assets	**469.9**	**451.8**	**372.2**	**457.1**	**366.7**	**-16.7**	**-19.8**	**32.9**	**-22.0**
Net domestic assets	**-325.0**	**-275.1**	**-197.9**	**-267.8**	**-174.6**	**19.3**	**34.8**	**-45.8**	**46.3**
Domestic credit	-283.5	-232.3	-152.4	-218.7	-130.7	19.0	40.2	-68.9	53.9
Government(net)	-150.9	-115.3	-132.4	-165.4	-118.8	42.3	28.1	-14.0	21.2
Nongovernment credit	-131.1	-114.8	-17.9	-51.0	-9.1	-49.9	82.2	-274.7	93.1
Commercial banks (net)	-138.4	-122.0	-25.2	-58.5	-16.7	-45.8	71.5	-231.0	88.0
Other items net	-41.4	-42.9	-45.5	-49.1	-43.9	20.8	10.6	24.8	-5.9
Reserve money	**144.9**	**176.7**	**174.4**	**189.3**	**192.1**	**-10.3**	**1.5**	**10.9**	**32.6**
Currency	**115.6**	**129.9**	**122.8**	**129.3**	**125.8**	**-2.0**	**-2.7**	**17.8**	**8.9**
Currency in circulation	99.3	111.6	102.2	107.0	105.6	-3.4	-1.3	18.2	6.4
Cash in vault held by banks	16.3	18.3	20.6	22.3	20.2	7.5	-9.3	15.5	23.8
Commercial banks deposits	28.3	45.7	49.8	58.2	64.3	-32.5	10.4	-10.5	127.2
Other nonbank deposits	1.0	1.1	1.8	1.8	2.1	-39.9	13.1	7.6	99.9

Source: *BNR*

Commercial banks deposits with the BNR kept on gaining in terms of share in reserve money as they reached 33.5% by the end of Q1, 2013 from 30% in Q4, 2012. Subsequently, the share of currency outside BNR declined to 65.5% in Q1, 2013 from 68.2% in Q4 2013. This was the same tendency in same quarters of 2012.

As broad money M3 was stagnant while reserve money grew, it implies that the money multiplier slightly contracted to reach 4.6 from 4.7 in Q4, 2012. This was associated with an increase in one components of the M3 multiplier namely reserves to deposits ratio which went up to 0.082 in Q1,2013 from 0.074 in Q4,2012 while currency to deposit ratio declined to 0.196 from 0.165 in Q1,2013 and Q4,2012 respectively. (BNR, 2013)

4.1.2.8 Communication Strategy

To further build and shape market expectations, the BNR continued to enhance its communication strategy by exchanging information with all stakeholders, with a particular focus on financial institutions and the business community. In addition to the biannual Monetary Policy and Financial Stability Statement, the communication strategy has been enhanced by a financial services awareness program for investors and consumers.

Specifically, it has been highlighted different modes of access to finance as well as different noncash financial instruments notably the mobile banking, the Automated Teller Machines (ATMs), the Point of Sale (POS), the telephone banking and the internet banking. (BNR, 2012).

In providing the public with the skills, knowledge and information, this program contributes to improving the monetary policy transmission mechanism.

4.1.2.9 Research to Support Monetary Policy Management

The year 2012 began with economic uncertainties mainly originating from hovering debt crisis in European countries and USA and surging oil prices in international markets. The Bank embarked on close monitoring and research on global and regional economic development to make appropriate monetary policy decisions.

Down ward and upward risks were considered in short-term and medium term inflation forecast, this gave a clear guidance to monetary policy orientation.

The Bank has been relying on short-term univariate models to forecast inflation and other monetary aggregates. To extend the forecast horizons of its key monetary policy variables, jointly with International Growth Center (IGC), the Bank has embarked on building a small-macro model, which will be used in medium and long-term inflation forecasting as well as conducting policy simulations for monetary policy considerations. In this regard, a number of research papers were conducted as an in-put to the macro-model, these include; Inflation dynamics, Money demand and the transmission channels of monetary policy in Rwanda.(BNR, 2012)

4.2 Economic Growth

The Rwandan economy has maintained its good performance over the year 2012 recording high economic growth, above the initial projections of 7.7% and moderate inflation, despite regional and global uncertainties. The real GDP grew by 8.7% in quarter four 2012 after 6.9% in quarter three and 8.4% in the fourth quarter 2011. For the whole year, the real GDP growth rate was 8.0% against 8.2% in 2011. Last year high economic growth emanated mainly from the good performance in Services (+12.0%) and Industry (+10.9%) sectors, supported by a continued improvement in the financing of the economy by the banking system. Construction, trade, transport and communication, finance and insurance are among the key activities which have continued to record high and sustained performance.

Agriculture sector was moderate as it increased only by 3.0% in 2012 due to unfavorable weather conditions.

In 2013, real GDP growth is projected to slow down to 7.5% due to prevailing uncertainties in external inflows to support domestic economic activities. Except the agriculture sector expected to significantly improve compared to the last year weak performance, industry and Services are projected to slowdown respectively to 9.1% and 7.0%. (BNR, 2013)

Table 9:Real GDP growth, in percentage

	2011					2012					2013
	Annual	QI	QII	Q III	QIV	Annual	QI	QII	Q III	Q IV	Proj
GDP	8.2	6.5	6.1	11.9	8.4	8.0	7.0	9.4	6.9	8.7	7.5
Agriculture	4.7	0.7	0.4	8.5	8.7	3.0	3.4	3.8	1.8	3.2	6.7
Industry	17.6	14.9	14.3	22.4	18.6	7.2	1.2	9.2	7.3	10.9	9.1
Services	8.9	7.9	9.8	12.1	5.9	12.2	12.7	13.4	10.9	12.0	7.0

Source: *National Institute of Statistics of Rwanda (NISR)*

The Rwandan economy remains resilient, continuing to grow at a sustained path while recording moderate inflation and relatively stable FRW exchange rate regardless of global uncertainties. The external sector continues to perform well, with exports increasing significantly despite the decline in some international commodity prices. (BNR, 2013).After 8.0% in 2012, the real economic growth stood at 5.9% in the first quarter 2013 on annual basis, in line with the 2013 projection of 7.5% for the whole year.

Table 10: Rwanda Real GDP growth (quarterly on annual basis, in %)

	2011					2012					2013	
	Q1	Q2	Q3	Q4	Ann	Q1	Q2	Q3	Q4	Ann	Q1	Ann
GDP	**6.5**	**6.1**	**11.9**	**8.4**	**8.2**	**7.0**	**9.4**	**6.9**	**8.8**	**8.0**	**5.9**	**7.5**
Agriculture	**0.7**	**0.4**	**8.5**	**8.7**	**4.7**	**3.4**	**3.8**	**1.8**	**3.2**	**3.0**	**5.5**	**6.7**
Food Crops	0.4	0.4	9.4	9.4	5.0	4.1	4.1	2.5	2.5	3.2	5.4	7.0
Industry	**14.9**	**14.3**	**22.4**	**18.6**	**17.**	**1.2**	**9.2**	**7.3**	**10.9**	**7.2**	**14.3**	**9.1**
Manufacturing	-2.3	9.7	18.5	5.9	8.1	3.6	-0.1	-10.8	-2.4	-3.0	0.0	4.6
Construction	24.3	18.6	24.4	26.5	23.6	-0.7	16.8	25.1	21.8	15.4	23.5	12.0
Mining and quarrying	109.4	9.0	45.9	58.5	49.7	1.1	-0.4	-15.6	-19.5	-9.8	5.6	9.4
Electricity, gas, & water	8.4	12.9	19.5	19.4	15.2	23.0	16.2	15.5	13.9	16.9	7.8	17.8
Services	**7.9**	**9.8**	**12.1**	**5.9**	**8.9**	**12.7**	**13.4**	**11.0**	**12.1**	**12.2**	**4.0**	**7.0**
Wholesale and Retail	4.7	10.9	17.2	7.8	10.2	14.9	11.1	14.2	9.1	12.2	3.6	6.0
Hotels and Restaurants	10.2	-3.6	5.0	4.3	3.9	13.3	13.3	4.4	0.1	7.5	-7.6	8.4
Finance and Insurance	28.5	33.6	40.3	-	20.3	8.6	16.4	3.9	46.5	17.5	7.0	9.9
Public administration	10.1	18.2	18.7	11.7	14.7	10.2	22.2	1.6	16.0	12.1	18.5	5.6
Education	18.0	18.0	18.0	18.0	18.0	6.3	6.3	6.3	6.3	6.3	7.2	7.7
Health	-4.3	20.1	-8.4	2.6	2.1	10.7	6.0	9.4	14.2	10.1	3.4	5.9

Source: National Institute of Statistics of Rwanda (NISR)

The first quarter 2013 growth was mainly driven by good performance in industry (+14.3%) and agriculture (+5.5%) sectors, while services recorded a moderate growth of 4.0%. High growth in industry sector is attributed mainly to construction (+23.5%), while good performance in agriculture production was on account of food crops (+5.4%) and export crops (+27.8%). Indeed, the harvest in the season 2013A has increased by 7.8% compared to 4.4% recorded in the same period of 2012.Non-agriculture economic activities also continued to perform well in the second quarter of this year as evidenced by the National Bank of Rwanda Composite Index of Economic Activities (CIEA) which increased by 12.25% on annual basis in June 2013 from 18.7% in March 2013. Furthermore, total turnovers in Industry and Services sectors increased by 10.9% in the second quarter 2013 compared to the first quarter of 2013. Compared to June 2012, turnovers in Industry rose by 19.0% against 15.1% in Services in June 2013, however less than 20.2% and 32.9% recorded in the same period of 2012. Improved economic activity in the second quarter 2013 were supported by the banking system which granted more loans amounting FRW 122.9 billion from FRW 97.6 billion in the first quarter, as the liquidity in the banking system increased following higher Government spending.

4.3 Model specification

The concept of causality due to Hameed Gul, Khaid Mughal and Sabit Rahim (2012) is appropriate and used by most of the studies for testing the relationship between Economic Growth and Monetary Policy.

As Monetary policy actions are transmitted to the rest of the economy through changes in financial prices (e.g., interest rates, exchange rates, yields, asset prices, and equity prices) and financial quantities (money supply, credit aggregates, supply of government bonds, foreign denominated assets), the model is included:

$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + U_{it}$

Where Y is output of the rest of the economy, X_1 is inflation, X_2 is money supply, X_3 is exchange rate, X_4 is interest rate, and U_{it} is error term or control variables. (**Hameed et al., 2012)**

Unstructured OLS (ordinary least squares) method were used.

The monetary policy implementation in Rwanda as conducted by BNR, is made via the following instruments (Money supply (M3),Lending interest rate and nominal exchange

rate),from these variables a reseacher has found variables and formulated the statistical model for assessing the effect of monetary policy on economic growth in Rwanda.

Thus the following list of variables was strongly considered during the study:

Dependent Variable: Output of the rest of the economy

Independent variables: Money supply (broad money) , exchange rate, interest rate.

For the case of Rwanda, both inflation and exchange rate are used to measure economic stability and they can't be used in the same model accordingly, inflation is not considered as monetary channel, depending on nature of broad money the credit channel can't be taken into account for avoiding duplication in the model, therefore the following is a statistical model to be used in assessing the impact of monetary policy on economic growth in Rwanda.

Y= F (Money supply, Exchange rate, Interest rate)

$Y = \beta_0 + \beta_1 LM + \beta_2 LER + \beta_3 R$

Y= Output

LM= Log of Money supply

LER= Log of Exchange rate

R= Interest rate (monetary policy instrument)

$Y \text{ or } NGDP = \beta_0 + \beta_1 \ln M_3 + \beta_2 \ln NER + \beta_3 LR$

NGDP = Nominal GDP or Y

$\ln M_3$= Log of money supply (M_3)

ln NER= Log of Nominal exchange rate

LR= Lending Interest rate (monetary policy instrument, %)

Table 11: Quarterly Data on Variables during the Period of 1999-2013

Period	NGDP (Billion)	M3 (Billion)	Nominal Exchange rate (Billion)	Lending rate (%)
Q1/99	145.12	113.02	331.88	16.14
Q2/99	149.57	110.52	335.77	16.14
Q3/99	153.98	121.3	334.54	16.51
Q4/99	158.34	117.56	338.89	16.5
Q1/00	162.65	115.54	358.37	16.23
Q2/00	166.91	123.59	374.57	16.34
Q3/00	171.13	123.47	402.95	16.89

Q4/00	175.3	138.16	424.19	16.48
Q1/01	179.74	141.91	433.59	16.54
Q2/01	183.7	145.72	438.68	15.72
Q3/01	187.48	145.76	443.78	16.59
Q4/01	191.09	130.69	456.23	16.57
Q1/02	188.59	129.7	459.36	16.46
Q2/02	194.23	135.6	466.22	16.51
Q3/02	202.07	135.3	478.38	16.24
Q4/02	212.12	144.31	497.44	15.64
Q1/03	229.21	149.48	512.38	15.93
Q2/03	241.73	159.67	525.61	16.25
Q3/03	254.51	167.73	547.38	15.49
Q4/03	267.55	178.01	566.27	16.3
Q1/04	280.71	169.8	582.43	15.9
Q2/04	294.35	174.57	580.82	15.94
Q3/04	308.32	180.62	577.06	15.9
Q4/04	322.62	206.17	569.75	16.21
Q1/05	336.42	207.92	563.87	16.31
Q2/05	351.7	224.66	558.67	15.36
Q3/05	367.64	224.51	554.6	15.54
Q4/05	384.23	246.23	554.09	15.9
Q1/06	366.8	244.9	553.55	15.45
Q2/06	414.24	269.83	552.16	15.58
Q3/06	455.57	287.4	551.36	16.23
Q4/06	479.87	320.97	549.94	16.2
Q1/07	475.56	313.18	548.11	15.99
Q2/07	497.37	341.84	546.19	15.9
Q3/07	522.6	374.19	548.19	16.05
Q4/07	549.07	425.65	545.53	15.95
Q1/08	554.85	422.05	543.89	16.06
Q2/08	618.44	453.95	543.35	16.27
Q3/08	686.28	466.57	547.14	16.32
Q4/08	717.04	466.4	553.76	16.39
Q1/09	724.72	432.86	566.51	16.08
Q2/09	711.8	437.06	567.89	16.78
Q3/09	743.7	460.31	568.71	17.42
Q4/09	804.8	526.58	569.97	16.61
Q1/10	793.2	502.77	572.51	16.77
Q2/10	785.9	554.94	579	17

Q3/10	827	571.06	588.9	16.98
Q4/10	873.6	615.94	592.12	17.26
Q1/11	863	625.99	598.84	16.37
Q2/11	919.6	720.2	600.18	16.69
Q3/11	1006.9	721.79	600.03	16.86
Q4/11	1038.7	780.74	602.17	16.75
Q1/12	1013	814.15	605.42	16.51
Q2/12	1052	878.8	608.51	16.8
Q3/12	1142	839.9	614.92	16.91
Q4/12	1172	889.9	628.33	16.58
Q1/13	1122	884.6	633.17	17.09

Source: BNR

4.4 Definitions of Variables and the Expected Signs

4.4.1 Nominal Gross Domestic Product (NGDP)

In economics, GDP is defined as the value of all goods and services produced within the geographic territory of an economy in a given interval, such as a year. A well-known formula for GDP has been stated as the total market value of all final goods and services produced in a country in a given year, equal to total consumer, investment and government spending, plus the value of exports, minus the value of imports. GDP is the most commonly known measures of national income, output, and growth. GDP is of two types. Nominal GDP is a measure of money spent. Real GDP corrects the gross nominal GDP figure for inflation, making real GDP more useful for historical comparison. Nominal GDP is sometimes called money GDP, and real GDP is sometimes called inflation- corrected GDP or constant price GDP. For purpose of this study data for Nominal GDP for the period 1999-March 2013 has been considered.

4.4.2 Money Supply (M_3)

Money supply is the total amount of money available in an economy at a particular point of time.

4.4.3 Nominal exchange rate (NER)

An **exchange rate** (also known as a foreign-exchange rate, forex rate, FX rate or Agio) between two currencies is the rate at which one currency will be exchanged for another.

4.4.4 Lending interest rate (LR)

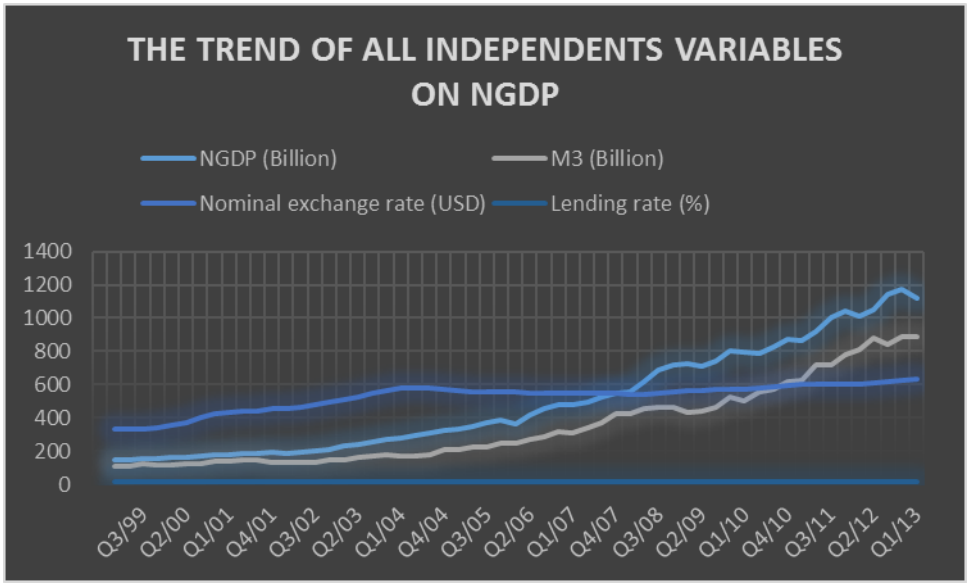
The term interest rate usually means any bank lending rate. However, the rates don't always move rapidly because they are driven by different forces.

The general regression equation is of the form:

$NGDP = \beta_0 + \beta_1 \ln M_3 + \beta_2 \ln NER + \beta_3 LR$

The chart below shows the trends of all Independent variables on dependent variable of our model equation.

Figure 4: The trend of all independent variables on NGDP



Source: Own work

4.5 Theory and prior signs

4.5.1 M3 and NGDP

This study evaluates the effect of money policy within the institutional framework and basic theoretical model on economic growth. The findings albeit support that aggregate money supply is positively related to economic growth and development.(M. S. Ogunmuyiwa* and A. Francis Ekone**, 2010)

4.5.2 Interest rate and NGDP

Evidences in economy of countries such as Germany and Japan showed that low interest rate accompanies high economic growth: but the question is: has high economic growth decreased interest rate or vice versa? In order to answer this question, interstate observations have been used in 2004-2010. The obtained results with use of panel database indicate that

there is one-sided causal relationship between economic growth and interest rate and negative effect of economic growth on interest rate has been estimated. On the other hand, increase of economic growth causes to decrease interest rate in economy (Javad Taherizadeh Anaripour, 2004 -2010).The traditional Keynesian ISLM view of the monetary transmission mechanism can be characterized by the following schematic showing the effects of a monetary expansion:$M\uparrow \rightarrow i_r\downarrow \rightarrow I\uparrow \rightarrow Y\uparrow$, where M↑ indicates an expansionary monetary policy leading to a fall in real interest rates ($i_r\downarrow$), which in turn lowers the cost of capital, causing a rise in investment spending (I↑), thereby leading to an increase in aggregate demand and a rise in output (Frederic S.Mishkin, 1996)

According to T.M.Obamuyi (1970-2006), the empirical results indicate that real lending rates have significant effect on economic growth. There also exists a unique long-run relationship between economic growth and its determinants, including interest rate. The results imply that the behavior of interest rate is important for economic growth in view of the relationships between interest rates and investment and investment and growth. Thus, the formulation and implementation of financial policies that enhance investment-friendly rate of interest is necessary for promoting economic growth in Nigeria.

The higher the interest rate ,the lower the level of investment and hince the decline of economic activities which leads to the decrease of output and vice versa.

4.5.3 Nominal exchange rate and NGDP

According to Frederic S.Mishkin, 1996, the lower value of the domestic currency makes domestic goods cheaper than foreign goods, thereby causing a rise in net exports ($NX_e\uparrow$) and hence in aggregate output.

The expected signs of independent variables of our model are summarized in the table below:

Table 12: Summary of expected signs

Variable	Definition	Expected Sign
$NGDP_t$	The Nominal Gross Domestic Product (The value of final goods and services evaluated at current year prices) for each year. $NGDP_t = Q_t * P_t$	
$M3_t$	Money supply (M3), is the broadest measure of money, it is used by economists to estimate the entire supply of money with an economy. M3 = M2 + all other CDs (Certificates of Deposits), deposits of Eurodollars and repurchase agreements.	(+)
NER_t	The Nominal Exchange Rate is simply the price of one currency in terms of the number of units of some other currency $NErate = \frac{E*P\prime}{P}$, Where E is real exchange rate, P' is the foreign price and P is domestic price.	(+)
LR_t	The Lending Rate is the charge that a lender charges a borrower in order to make a loan. The term "lending rate" is synonymous with the term "interest rate." $r = (\frac{A}{P})^{1/t} - 1$, Where P is the initial investment,r is the interest rate per period (converted to a decimal),t is the number of periods, A is the amount of money in the bank after t periods.	(-)

Source: Own work

4.6 Results and Analysis of Findings

4.6.1 Introduction

The econometric software engaged for the model estimation and simulation is EViews. EViews is a straight forward to use, interactive econometrics software package providing the tools most frequently used in econometrics.

The model is estimated after taking into account the time-series properties of the variables.

T-statistics (t-stat.) of parameter estimates are given in parentheses. All the equations are estimated in the two-stage error correction (TSEC) form (Engle and Granger, 1987). This involves two stages:

In the first stage:

All the individual variables are tested for stationarity and if the null hypothesis of non-stationarity is accepted, the variables are tested for cointegration. If the cointegration hypothesis is accepted the equation is estimated in levels (long-run equation). If the cointegration hypothesis is not accepted, the equation is estimated in first-differences.

In the second stage:

The residual is used as an explanatory variable (error correction term) and the variables are estimated in the first difference (short-run equation).This procedure ensures that all parameters are consistently estimated and that reported t-statistics can be used for hypothesis testing.

4.6.2 Test of lags

In economics the dependence of a variable *Y* (the dependent variable) on another variable (s) *X* (the explanatory variable) is rarely instantaneous. Very often, *Y* responds to *X* with a lapse of time. Such a lapse of time is called a *lag (Gujarati: 1978)*. To illustrate the nature of the lag, we consider the lag from the less value between the values of Akaike info criterion (AIC) and Schwarz criterion (SCH)

Table 13: The summary of lags for every variables in the model

VARIABLES	TREND AND INTERCEPT	INTERCEPT	NONE
NGDP	2	2	2
M3	5	5	5
LR	0	2	2
NER	2	2	1

Source: Researcher computation using Eviews 3.1

4.6.3 Stationarity test

For the purposes of our macroeconomic modeling, it is important that all the core variables used in the empirical analysis have been tested for unit roots or stationarity. There are several ways of testing for the presence of a unit root. In this study, we perform the one widely used unit root tests: the Augmented Dickey-Fuller (ADF) and our findings are displayed below tables. The emphasis however will be on using the ADF approach to testing the null hypothesis that a series does contain a unit root (i.e.it is non-stationary). Tables below show that for the majority of variables the unit root hypothesis, under the ADF test, is rejected when applied to their first differences, but provide no evidence with which to reject the unit root hypothesis when the tests are applied to their levels.

Hypothesis:

Null hypothesis H_0: Variable is not stationary or got unit root

Alternative hypothesis H_1: Variable is stationary

4.6.3.1 Unit Root Test of NGDP

Table 14: Augmented Dickey- Fuller test of NGDP

ADF Test Statistic	-5.428775	1%	Critical Value*	-4.1383
		5%	Critical Value	-3.4952
		10%	Critical Value	-3.1762

*MacKinnon critical values for rejection of hypothesis of a unit root.

Source: Researcher computation using eviews 3.1

The ADF T-statistics (-5.428775) is less than the critical value at 5% (-3.4952). Then NGDP is stationary around the trend at first difference. We fail to reject H1

NGDP is stationary around the trend at first difference, NGDP is I (1)

4.6.3.2 Unit Root Test of M3

Table 15: Augmented Dickey- Fuller test on M3

ADF Test Statistic	-3.579650	1%	Critical Value*	-4.1540
		5%	Critical Value	-3.5025
		10%	Critical Value	-3.1804

*MacKinnon critical values for rejection of hypothesis of a unit root.

Source: Researcher computation using eviews 3.1

The results from the test of ADF on M3, shows that at 5% the critical value of -3.5025 is greater than the ADF Test statistic which is -3.579650 which means that M3 in the second difference has no unit root meaning that M3 is stationary in our model.

M3 is stationary at second difference, M3 is I (2)

4.6.3.3 Unit Root Test of NER

Table 16: Augmented Dickey- Fuller test on NER

ADF Test Statistic	-5.139252	1%	Critical Value*	-4.1420
		5%	Critical Value	-3.4969
		10%	Critical Value	-3.1772

*MacKinnon critical values for rejection of hypothesis of a unit root.

Source: Researcher computation using eviews 3.1

The results from table above shows that the value of ADF Test statistic of -5.139252 is less than the critical value of -3.4969 at 5% , which means that NER in the second difference has not the Units Root , meaning that NER is stationary in our model.NER is stationary at second difference, NER is I (2)

4.6.3.4 Unit Root Test of LR

Table 17: Augmented Dickey- Fuller test on LR

ADF Test Statistic	-10.77159	1%	Critical Value*	-4.1314
		5%	Critical Value	-3.4919
		10%	Critical Value	-3.1744

*MacKinnon critical values for rejection of hypothesis of a unit root.

Source: Researcher computation using eviews 3.1

The table above gives the results of ADF Test of LR in our model; it shows that the value of ADF T- statistic of -10.77159 is less than the critical value at 5% (-3.4919), which means that Lending rate in the first difference has not unit root test meaning that LR is stationary in our model.

The ADF T t-Statistic shows that LR is stationary at first difference, LR is I (1)

Table 18 reports the summary results for the Stationary tests in our model

Table 18: Stationarity tests – Augmented Dickey – Fuller (ADF) unit root tests

Variables	ADF **with Trend and Intercept**						
	At level	CV (5%)	At first difference	CV (5%)	At second difference	CV (5%)	Conclusion
NGDP	-1.118786	-3.4935	-5.428775**	-3.4952	-	-	I (1)
M3	-0.254271	-3.4987	-3.000128	-3.5005	- 3.579650***	-3.5025	I (2)
NER	-3.295315	-3.4935	-3.373047	-3.4952	- 5.139252***	-3.4969	I (2)
LR	-3.932280	-3.4904	-10.77159**	-3.4919	-	-	I (1)

Source: Researcher computation using eviews 3.1

The null hypothesis is that the series is non-stationary, or contains a unit root. The rejection of null hypothesis for ADF test is based on the MacKinnon critical values.Table above reports the unit root results using ADF tests with Trend and intercept. The models indicate that the null of the unit root is rejected for all variables as the values of ADF T-Statistics are well below the 5% critical value (CV) of the test statistic. Thus, we conclude that some variables series are stationary after the first difference (NGDP and LR) and others are stationary after second difference (M3 and NER) (See (**) and (***).

4.6.4 Testing for Cointegration

Since our time series were shown to be non-stationary, we could follow the Box Jenkins approach to purge the non-stationarity by differencing and estimate using only differenced variables. But this would mean that valuable information from economic theory concerning the long-run equilibrium properties of the data would be lost, as was stressed by those developing the error-correction model (ECM) approach (Kennedy, 1998).Econometricians have discovered a way out of this dilemma by testing whether the variables are cointegrated: although individually they are integrated of order one, I(1), a particular linear combination of them is integrated of order zero, I(0). In other words, if a set of I(1) variables are cointegrated, then regressing one on the others should produce residuals that are I(0). EViews implements VAR-based cointegration tests using the methodology developed by Johansen, (1991, 1995)

4.6.4.1 Long run relationship

4.6.4.1.1 First step: Estimation of long run equation

$$\mathbf{LNGDP_t = -1.86 + 0.88LM3_t + 0.59LNER_t - 0.053LR_t\ (-4)}$$

$$\mathbf{(0.0175)\ (0.0000)\quad (0.0000)\quad (0.0166)}$$

4.6.4.1.2 Second step: Stationarity of residuals

The ADF T- Stat (-3.065565) is less than the critical value at 5% (-1.9471), the residuals are stationary at level, they are I (0) therefore there is cointegration, meaning that there is a long run relationship between NGDP and all independent variables (M3, NER and LR).

4.6.4.1.3 Interpretation of results in the long run equation

After estimation, the long run equation is

$$\mathbf{LNGDP_t = -1.86 + 0.88LM3_t + 0.59LNER_t - 0.053LR_t\ (-4)}$$

$$\mathbf{(0.0175)\ (0.0000)\quad (0.0000)\quad (0.0166)}$$

4.6.4.1.3.1 Coefficient of determination R^2

The coefficient of determination r^2 (two-variable case) or R^2 (multiple regression) is a summary measure that tells how well the sample regression line fits the data.

The quantity R^2 thus defined is known as the (sample) coefficient of determination and is the most commonly used measure of the goodness of fit of a regression line. Verbally, R^2 measures the proportion or percentage of the total variation in dependent variable explained by the regression model.

Two properties of R^2 may be noted:

1. It is a nonnegative quantity.

2. Its limits are $0 \leq R^2 \leq 1$, An R^2 of 1 means a perfect fit

On the other hand, an R^2 of zero means that there is no relationship between the regressand and the regressor (Domadar N.Gujarati, 1978:113)

$R^2 = 0.990598$, shows that the NDGP is explained by the valuables we used in the model at 99%, the remaining was explained by unknown factors. The R^2 is used to test the goodness of fit from the regression results, the value is 0.99 implies that in the long run, 99% of the variations in Nominal GDP is explained by the independent variables (broad money supply (M3), nominal exchange rate and Lending interest rate).

So we reject null hypothesis and the relationship among the variables exists.

4.6.4.1.3.2 Analysis of results based on economic criteria (Probabilities and coefficients)

The probability of the constant **(**0.0175**)** is less than 5%, meaning that it is significantly different from zero. The probability of LR_t **(**0.0166**)** is less than 5% meaning that the coefficient of the LR_t is significantly different from zero, meaning that after quite 4 quarters, there is significant long run relationship between $NGDP_t$ and LR_t. The increase of 1% of LR_t will reduce the $NGDP_t$ by – 0.053%

This may depend on the structure of our economy where the financial sector is not yet developed and peoples don't have alternative ways for borrowing. The demand for credit does not depend on the LR but mainly on the income. The shock from lending interest rate doesn't impact the NGDP directly ,it riquires a lapse of period to have a significant impact on NGDP.

The probability of NER_t **(0.0000)** is less than 5%, meaning that the coefficient of the NER is significantly different from zero, meaning that there is significant long run relationship between $NGDP_t$ and NER_t.The increase of 1% of NER_t will increase the $NGDP_t$ by 0.59 %

The probability of $M3_t$ **(0.0000)** is less than 5%, meaning that the coefficient of the $M3_t$ is significantly different from zero, meaning that there is significant long run relationship between $NGDP_t$ and $M3_t$. The increase of 1% of $M3_t$ will increase the $NGDP_t$ by 0.88%

Constant was -1.86 which means even when the M3, NER and the Lending Rate were Zero still NGDP was – 1.86

4.6.4.2 Short run relationship

4.6.4.2.1 Estimation of the Error correction model (ECM)

$$\underset{}{DLNGDP_t} = \underset{(0.0000)}{0.49\ DLM3_t} + \underset{(0.0189)}{0.58 DNER_t} + \underset{(0.3598)}{0.011\ DLR_t} - \underset{(0.0112)}{0.216284\ RESID\_LR(-1)}$$

4.6.4.2.2 Interpretation of results in the short run equation

$$\underset{}{DLNGDP_t} = \underset{(0.0000)}{0.49\ DLM3_t} + \underset{(0.0189)}{0.58 DNER_t} + \underset{(0.3598)}{0.011\ DLR_t} - \underset{(0.0112)}{0.216284\ RESID\_LR(-1)}$$

The probability of $DLM3_t$ (0.0000) is less than 5%, meaning that the coefficient of the DLM3 is significantly different from zero, meaning that there is significant short run relationship between NGDP and DLM3.The increase of 1% of M3 will increase the NGDP by 0.49%

The probability of $DLNER_t$ (0.0189) is less than 5%, meaning that the coefficient of the DLNER is significantly different from zero, meaning that there is significant short run relationship between NGDP and DLNER.The increase of 1% of NER will increase the NGDP by 0.58%

The probability of DLR_t (0.3598) is greater than 5%, meaning that the coefficient of the DLR_t is not significantly different from zero, meaning that there is no significant short run relationship between NGDP and LR. For this ECM model, the lending rate is not significant which is normal because even in the long run equation it was significant after quite 4 quarters.

As residuals have a probability of 0.0112 which is less than 5%, its coefficient is significantly different from zero.The coefficient (-0.216284) means that the effect of the shock will reduce by 21 % each quarter, meaning that it will end at $4.7 \approx 5$ quarter.

4.6.5 Granger causality test

The Granger (1969) approach to the question of whether x causes y is to see of the current y can be explained by p values of y and then to see whether adding lagged values of x can improve the explanation. Y is said to be Granger- caused by x if x helps in the prediction of y, or equivalently if the coefficients on the lagged x's are statistically significant.

It is important to note that the statement " x Granger causes y" does not imply that y is the effect or the result of x. Granger causality measures precedence and information content but does not by itself indicate the causality in the more common use of the term.

The results from test reveals the pairwise Granger causality test and as it advisable to use more rather than fewer lags, lag 4 was chosen in this test. The results for the **first** null hypothesis "NER does not Granger Cause NGDP" indicates the p-value of 0.55750 which is greater than 5% critical value, meaning that we accept the null hypothesis stating that NER does not Cause NGDP. On the other side the **second** null hypothesis "NGDP does not Granger Cause NER" indicates the p-value of 0.34677 which is greater than 5% critical value, meaning than we accept the null hypothesis, meaning that NGDP does not Cause NER.

The **third** null hypothesis "M3 does not Granger Cause NGDP" gives the p-value of 0.00999 which is less than the 5% critical value, meaning that we reject that statement and accept that M3 causes NGDP. The **fourth** hypothesis "NGDP does not Granger Cause M3" has the p-

value of 0.10254 which is greater than 5% critical value, as result we accept the null hypothesis, meaning that NGDP does not cause M3.

The **fifth** hypothesis "LR does not Granger Cause NGDP" has the p-value of 0.31302 which is greater than the 5% critical value, as the conclusion we accept that statement which means that LR does not Cause NGDP. Another side the **sixth** hypothesis "NGDP does not Granger Cause LR" has the p-value of 0.21946 which also greater than the 5% critical value, that gives the same results concluding that we accept the null hypothesis and NGDP does not Cause LR.

As the outcome of the whole Granger causality test, there is one direction causality between M3 and NGDP but in the case of NGDP and other variables there is no causality.

4.6.6 Correlation Test

4.6.6.1 Coefficient of correlation (r)

A measure of the interdependence of two random variables that ranges in value from -1 to +1, indicating perfect negative correlation at -1, absence of correlation at zero, and perfect positive correlation at +1

By using Excel, the coefficient of correlation between NGDP and every independent variables (M3,NER and Lending rate) are summarized in the table below:

Table 19: Summary of correlation (r) coefficient

Variables	Coefficient correlation	Sign	Conclusion
M3 and NGDP	**0.99**	**+**	**Very high correlation**
NER and NGDP	**0.74**	**+**	**Strong correlation**
LR and NGDP	**0.52**	**+**	**Modest or moderate correlation**

Source: Researcher computation

4.6.7 Non significance of Lending rate in short run equation

As found in short run equation, the coefficient of Lending rate has positive sign and its probability is greater than 5%, meaning that there is no short run relationship between Lending rate and NGDP. The test for correlation coeficient is conducted in order to explain why.Values of r closer to 0 indicate a weaker linear relationship between Lending rate and NGDP .In our model the correlation coefficient is **0.52** and shows us that the relationship between them is weak.

If the test concludes that the correlation coefficient is not significantly different from 0 (it is close to 0), we say that correlation coefficient is "not significant".

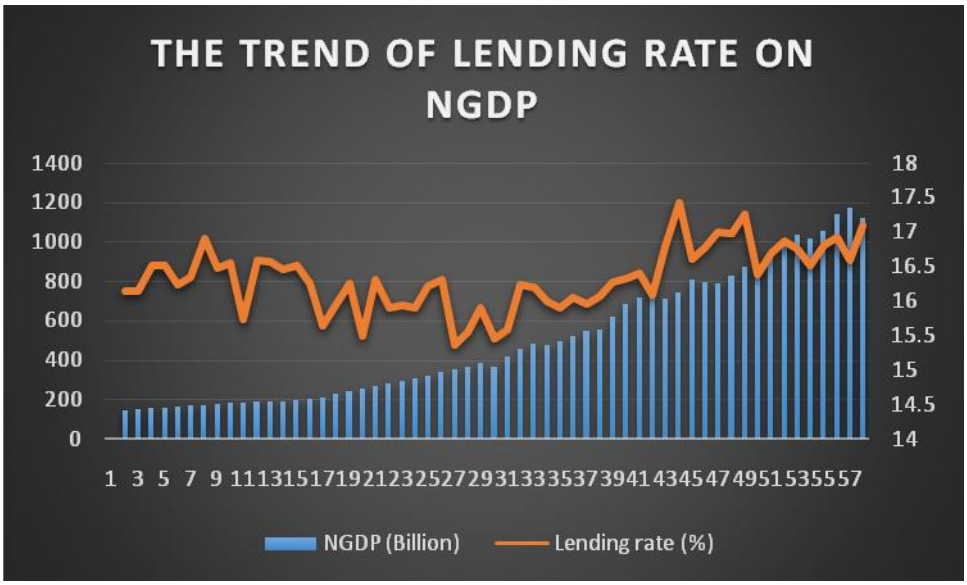
Conclusion: "The correlation coefficient is not significant."

What the conclusion means: We do not believe that there is a significant linear relationship between x (Lending rate) and y (NGDP) . Therefore we can not use the regression line to model a linear relationship between x and y in the population.

If r is not significant or if the scatter plot does not show a reasonable linear trend, the line should not be used for prediction.The chart below shows us that Lending rate has the weak link with NGDP

Lending rate will be significant after a lapse of period , after quite four quarters in our model.In short run the coefficient of lending rate is positive because it doesn't affect NGDP, NGDP continues to increase till when the shock will commence to have significant impact on NGDP; after 4 quarters as found.

Figure 5: The trend of Lending rate on NGDP



Source: Own work

4.6.8 Summary of link between findings and prior Signs

From results obtained in the regression, the result is expected to follow the prior expectation of magnitude and sign. Thus, table below, analyses the outcome of the parameters

Table 20: Findings and prior signs

Variables	Expected	Obtained	Correlation
NGDP			
M3	Positive	Positive	Confirmed
NER	Positive	Positive	Confirmed
LR	Negative	Negative	Confirmed

Source: Researcher computation

In terms of the signs and magnitude of the coefficients which signify the effect of monetary policy on economic growth, it was observed from the model that M3, NER and LR had their expected signs. The relation between NGDP and both M3 and NER is positive , which means that as one goes up as other goes up also. The link between NGDP and Lending rate is negative as expected, it means that if LR decreases NGDP increases and vice versa.The

level of investment depends whether on interest rate, therefore the lower the rate of interest rate the higher the level of investment which in turn increases economic activities leading to the increase of output. The interest rate behavior depends on monetary policy and objectives conducted by the central bank (expansionary or contractionary monetary policy).

In addition to the above, the coefficient of individual variables is examined to determine the nature of the relationship between monetary policy and other macroeconomic variables. The co-efficient of M3 and NER was observed to be positive and significant, the coefficient of lending interest rate was observed to be negative and significant in the long run but it was observed to be positive and insignificant in short run which is normal because the effect of shock from LR will be significant only in long run after 4 quarters, before the economy continues to increase.Therefore all theoretically expected signs were empirically obtained.

CHAPTER 5: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1. Summary of findings

The objective of this research work was to determine the impact of monetary policy on economic growth in Rwanda.Using secondary data from BNR, using time series data from 1999-2013, the results show an impact of monetary policy on economic growth in Rwanda.

We **first** conducted the standard augmented Dickey-Fuller test for all variables simultaneously (NGDP, NER, M3 and LR) to test whether each variable taking individually was stationary or not. ADF test results show that all variables were non-stationary in levels but some variables are stationary in first differences (NGDP and LR) and others are stationary in second differences (M3 and NER).

The **second** stage was to perform the cointegration test using the popular method developed by (Johansen S, 1988)and (Juselius K. , 1990). By Estimation of long run equation and testing Stationarity of residuals, we found in the preliminary analysis that there is a long run relationship between NGDP and all independent variables (M3, NER and LR).

Third stage, after computing the long-run cointegration relationships using the Johansen method, the short-run dynamics of the long-run NGDP function is analyzed by computing an error -correction model (ECM). The results show that there is significant short run relationship between DNGDP and DLM3, there is significant short run relationship between DNGDP and DLNER and there is no significant short run relationship between DNGDP and DLR.

Fourth stage was to conduct Pairwise Granger Causality Tests. The results show that NER does not Granger Cause NGDP, NGDP does not Cause NER, NGDP does not Granger Cause M3, M3 causes NGDP, LR does not Granger Cause NGDP, NGDP does not Cause LR .

The **fifth** stage, the Correlation Test was conducted. The result shows that there is evidence of positive correlation between NGDP and each independent variables..

The **last** stage of the Non significance test of Lending rate in the model was analyzed. The results show that Lending rate has modest linear relationship with NGDP (with $r = 0.52$)

5.2. Specific findings

5.2.1.Broad money (M3) and NGDP

From our findings, there is a positive relationship between broad money and nominal GDP, the coefficient of broad money is 0.88 which implies that a one percent increase in broad

money will increase nominal GDP by 0.88 percent.This is also confirmed by correlation test where the correlation coefficient found is 0.99 which means that there is very high correlation between M3 and NGDP or there is statistically significant positive linear relationship. As M3 goes up as NGDP goes up.

5.2.2. Nominal exchange rate (NER) and NGDP

From our findings, there is a positive relationship between nominal exchange rate and nominal GDP, the coefficient of NER is 0.59 which implies that a one percent increase in NER will increase nominal GDP by 0.59 percent.This is also confirmed by correlation test where the correlation coefficient found is 0.74 which means that there is a strong correlation between NER and NGDP or there is statistically significant positive linear relationship. As NER goes up as NGDP goes up.

5.2.3. Lending rate (LR) and NGDP

From our findings, there is a negative relationship between lending rate and nominal GDP, the coefficient of lending rate is - 0.053 which implies that through monetary expension ,the lending rate will decrease and causes investments activities to raise thereby growing economic growth,therefore a one percent increase /decrease in lending rate will decrease/increase the nominal GDP by 0.053 percent. If LR goes up, NGDP goes down in the long run. The probability of coefficient (0.0166) is less than 5%, there is significant relationship in the long run. In short run there is no significant realtionship between LR and NGDP, the coefficient is 0.011 and it's probability is 0.3598 which is greater than 5% and this is normal because even LR is significant in the long run after quite 4 quarters.

This is also confirmed by correlation test where the correlation coefficient found is 0.52 which means that there is modest or moderate correlation between LR and NGDP or there is no statistically significant linear relationship in the short run.

5.3. Conclusion

It has been established in this study that monetary policies implemented in Rwanda depended on major policy instrument such as Money supply, Exchange Rate and Lending Rate. This study also evaluates the impact of monetary policy variables within the institutional framework and basic theoretical model on economic growth.

The study therefore concluded that, the significant relationship between M3, nominal exchange rate , lending rate and NGDP in this research work reflect the potency of the variables as an important conduct in transmitting monetary policy impulses to the aggregate

economy. Overall, the study found evidence that monetary policy innovations have both real and nominal effects on economic parameter depending on the policy variable selected.

The findings of the study suggest that existence of co-integration vectors indicates a valid long run relationship among nominal gross domestic product and other macroeconomic variables. Rwanda's long run nominal gross domestic product appears to be influenced by the nominal exchange rate. Exchange rate affects the foreign financial flows, net exports and thus aggregate demand. It was found that overall, BNR's monetary policies play crucial role in influencing the level of productivity in the country. This result gives weight to the place of Central bank in the national development process of a nation.

The conclusions of the study can be summarized as follows: M3 positively affects NGDP, Nominal exchange rate (NER) positively affect NGDP, the increase of M3 and NER has a similar effect of increasing NGDP while the Lending rate negatively affects NGDP in the long run and LR positively affects NGDP in the short run but the link is very weak as shown by cointegration test (long run and short run (ECM)) and correlation test between them.

In our regression analysis, we conclude that both money supply nominal exchange rate have a significant effect on the changes in NGDP in Rwanda between years 1999 and 2013,while lending rate is not statistically significant in short run in explaining the relationship between it and dependent variable (NGDP) in our regression model.The effect of changing LR will impact NGDP after quite 4 quarters (in long run), in short run the economy continues to raise, LR is insignificant in the short run.

5.4. Recommendations

For a small open economy like Rwanda high levels of nominal gross domestic product (NGDP) are necessary for economic growth. Recently, there has been a productive debate on alternative monetary policy frameworks in Rwanda. Based on the findings made in the course of this study, particularly the results of the multiple regression models, it is clear that the development of the Rwandan economy is highly dependent on the monetary policy transmission mechanism, which will in no doubt encourage economic growth and development. Keeping in view these arguments and empirical analysis, following recommendations are hereby made for monetary policy and economic growth in Rwanda:

5.4.1. To the Government of Rwanda

(a) Government should introduce a specification of the financial structure that is richer than the existing ones, recognizing the positive effect of a stable monetary policy.

(b) Attempts should be made by the government to improve on its infrastructure in order to reduce cost of production and increase exportation so as to achieve the objective of fighting Rwandan francs devaluation. This adds to the country's national income and in general promotes the nominal GDP.

(c) Government should formulate policy that is aimed at raising broad money supply so that by so doing it would encourage capital flight into the country and increase nominal GDP since its coefficient is quite higher.

(d) Government should intensify its effort in pursuing the policies that are anti-inflationary in nature such that its monetary policy objective will not be derailed.

(e) The government of Rwanda should also endeavour to make the financial sector less volatile and more viable as it is in developed countries. This will allow for smooth execution of the Central Bank monetary policies.

5.4.2. To the Central bank of Rwanda (BNR)

- ✓ The Central Bank of Rwanda should find a way of reducing the level of deficit financing, improve funding of the informal sector and the SMEs and promote their integration into the formal sector while at the same time working with government to improve the tax regime to make the tax capacity to approach the tax potential so as to reduce tax evasion to barest minimum and ensure that there is proper balancing between capital and recurrent expenditures of government.
- ✓ The Central Bank has to apply the appropriate tools to combat inflation in order to keep the balance between growth of GDP and money supply (M3)
- ✓ The CBR/BNR should also look into the transmission mechanisms of money supply in order to determine its lag effects on economic growth.
- ✓ Money supply is important macroeconomic variable because it is linked with other important variables such as inflation rate and the growth rate of GDP.The implication of this crucial interdependence is determined by the monetary policy adopted by the central bank. The Central Bank in Rwanda must control the quantity of money supply in the economy to make sure it is enough to finance the economic growth.

- ✓ As in many transition economies, the interest rate channel remains weak in Rwanda and exchange rate channel appears to impact price, even if the pass through is not important. The National Bank of Rwanda should therefore continue to intervene in the exchange market in the context of the management of bank liquidity, keeping in mind the stability of the Rwandan francs, because a significant depreciation would pose an inflationary risk.
- ✓ The monetary authorities should develop a money stable policy that would propel the economy towards a positive end.
- ✓ Monetary policies should be used to create a favourable investment climate by facilitating the emergency of market based interest rate and exchange rate regimes that attract both domestic and foreign investments, create jobs, promote export and revive industries that are currently operation far below installed capacity.
- ✓ The monetary policy must concentrate on the tools to create the change in money supply needed to reach the target of GDP growth.

5.4.3. To the financial sector

- ❖ The Rwandan financial system should be made more effective in its monetary management by making all financial markets organized so as to accentuate the effects of monetary policy variables like Broad money supply, lending Interest rate and nominal exchange rate. This promotes nominal GDP in Rwanda.
- ❖ In order to strengthen the financial sector, the Central Bank of Rwanda has to encourage the introduction of more financial instruments that are flexible enough to meet the risk preferences and sophistication of operators in the financial sector.

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APPENDICES

APPENDIX 1: Chosing lag for NGDP

lags	Trend and Intercept		Intercept		None	
	AIC	SCH	AIC	SCH	AIC	SCH
0	9.265144	9.373645	9.324915	9.397249	9.309437	9.345604
1	9.307221	9.453209	9.373988	9.483479	9.358950	9.431944
2	8.737920	8.922085	8.839665	8.986997	8.834466	8.944965
3	8.787979	9.011031	8.881781	9.067657	8.874079	9.022781
4	8.784896	9.047563	8.861528	9.086672	8.850836	9.038455
5	8.740668	9.043700	8.839862	9.105015	8.832046	9.059319
6	8.787247	9.131411	8.898769	9.204693	8.893713	9.161396
7	8.833045	9.219131	8.960326	9.307804	8.958949	9.267818
8	8.890729	9.319546	8.997870	9.387703	8.994874	9.345724
9	8.832291	9.304669	9.003122	9.436136	9.010322	9.403970
10	8.835638	9.352428	9.067300	9.544337	9.082819	9.520103

APPENDIX 2: Chosing lag for M3

lags	Trend and Intercept		Intercept		None	
	AIC	SCH	AIC	SCH	AIC	SCH
0	9.158490	9.266991	9.190276	9.262610	9.157762	9.193929
1	9.049139	9.195126	9.080521	9.190011	9.045771	9.118765
2	9.005050	9.189215	9.042452	9.189784	9.008557	9.119056
3	8.991194	9.214246	9.016385	9.202261	8.978780	9.127481
4	8.889756	9.152423	8.928895	9.154039	8.900770	9.088390
5	8.683785	8.986817	8.718735	8.983888	8.679551	8.906825
6	8.731338	9.075502	8.755375	9.061299	8.717657	8.985340
7	8.691942	9.078028	8.749445	9.096923	8.709101	9.017970
8	8.759559	9.188376	8.806893	9.196726	8.765238	9.116088
9	8.745926	9.218304	8.810529	9.243542	8.768999	9.162647
10	8.809855	9.326645	8.878249	9.355286	8.835444	9.272728

APPENDIX 3: Chosing lag for LR

lags	Trend and Intercept		Intercept		None	
	AIC	SCH	AIC	SCH	AIC	SCH
0	0.899129	1.007630	0.920453	0.992787	1.086569	1.122736
1	0.910727	1.056715	0.914996	1.024487	0.978449	1.051443
2	0.825422	1.009587	0.832093	0.979425	0.829157	0.939656
3	0.850003	1.073055	0.866287	1.052163	0.997646	0.848944
4	0.910222	1.172889	0.924182	1.149325	0.902998	1.090618
5	0.965802	1.268833	0.982913	1.248066	0.964155	1.191429
6	0.947300	1.291464	1.006288	1.312212	0.982656	1.250340
7	1.004398	1.390483	1.069413	1.416890	1.047634	1.356503
8	1.041801	1.470618	1.136584	1.526418	1.114897	1.465747
9	1.026357	1.498735	1.045651	1.478664	1.024771	1.418420
10	1.009086	1.525876	1.073896	1.550933	1.039781	1.477065

APPENDIX 4: Chosing lag for NER

lags	Trend and Intercept		Intercept		None	
	AIC	SCH	AIC	SCH	AIC	SCH
0	6.895248	7.003749	6.862317	6.934651	7.107024	7.143191
1	6.192204	6.338192	6.207264	6.316755	6.299321	6.372315
2	6.134363	6.318529	6.163154	6.310486	6.337283	6.447782
3	6.159554	6.382606	6.183790	6.369666	6.367095	6.515796
4	6.176127	6.438794	6.181945	6.407089	6.248788	6.436408
5	6.205769	6.508800	6.222175	6.487328	6.310141	6.537415
6	6.172620	6.516784	6.167532	6.473455	6.178478	6.446161
7	6.181801	6.567887	6.198799	6.546276	6.202077	6.510946
8	6.060840	6.489657	6.111895	6.501728	6.180183	6.531033
9	6.076822	6.549200	6.172952	6.605965	6.239881	6.633530
10	6.121917	6.638707	6.232512	6.709549	6.304569	6.741853

APPENDIX 5: Unit Root Test of NGDP

Trend and intercept at level

ADF Test Statistic	-1.118786	1%	Critical Value*	-4.1348
		5%	Critical Value	-3.4935
		10%	Critical Value	-3.1753

*MacKinnon critical values for rejection of hypothesis of a unit root.

Test of significance of the trend

Dependent Variable: NGDP
Method: Least Squares
Date: 10/05/13 Time: 12:47
Sample: 1999:1 2013:1
Included observations: 57

Variable	Coefficient	Std. Error	t-Statistic	Prob.
@TREND(1999:1)	17.96025	0.340403	52.76169	0.0000

R-squared	0.930822	Mean dependent var	498.1161
Adjusted R-squared	0.930822	S.D. dependent var	317.3250
S.E. of regression	83.46201	Akaike info criterion	11.70405
Sum squared resid	390090.8	Schwarz criterion	11.73989
Log likelihood	-332.5654	Durbin-Watson stat	0.094406

The probability of the trend (0.0000) is less than 5%, then the trend is significant in our model

Stationarity test of residuals

ADF Test Statistic	-1.686948	1%	Critical Value*	-2.6048
		5%	Critical Value	-1.9465
		10%	Critical Value	-1.6189

*MacKinnon critical values for rejection of hypothesis of a unit root.

The ADF Test statistic from above tables are greater than the critical values at 5%, therefore NGDP is not stationary around the trend and we have to differentiate accordingly.

Stationarity test of NGDP at first difference

Augmented Dickey- Fuller test of NGDP

ADF Test Statistic	-5.428775	1%	Critical Value*	-4.1383
		5%	Critical Value	-3.4952
		10%	Critical Value	-3.1762

*MacKinnon critical values for rejection of hypothesis of a unit root.

APPENDIX 6 : Unit Root Test of M3

Trend and intercept at level

ADF Test Statistic	-0.254271	1%	Critical Value*	-4.1458
		5%	Critical Value	-3.4987
		10%	Critical Value	-3.1782

*MacKinnon critical values for rejection of hypothesis of a unit root.

Test for the significance of the trend

Dependent Variable: M3
Method: Least Squares
Date: 10/05/13 Time: 13:03
Sample: 1999:1 2013:1
Included observations: 57

Variable	Coefficient	Std. Error	t-Statistic	Prob.
@TREND(1999:1)	12.81177	0.350531	36.54957	0.0000

R-squared	0.873090	Mean dependent var	350.9832
Adjusted R-squared	0.873090	S.D. dependent var	241.2540
S.E. of regression	85.94527	Akaike info criterion	11.76269
Sum squared resid	413649.0	Schwarz criterion	11.79853
Log likelihood	-334.2366	Durbin-Watson stat	0.080516

The probability of the trend (0.0000) is less than 5%, then the trend is significant in our model

Test for stationarity of residuals

ADF Test Statistic	-0.164417	1%	Critical Value*	-2.6048
		5%	Critical Value	-1.9465
		10%	Critical Value	-1.6189

*MacKinnon critical values for rejection of hypothesis of a unit root.

Stationarity test of M3 at first difference

ADF Test Statistic	-3.000128	1%	Critical Value*	-4.1498
		5%	Critical Value	-3.5005
		10%	Critical Value	-3.1793

*MacKinnon critical values for rejection of hypothesis of a unit root.

Stationarity test of M3 at second difference

Augmented Dickey- Fuller test on M3

ADF Test Statistic	-3.579650	1%	Critical Value*	-4.1540
		5%	Critical Value	-3.5025
		10%	Critical Value	-3.1804

*MacKinnon critical values for rejection of hypothesis of a unit root.

APPENDIX 7: Unit Root Test of NER

Trend and intercept at level

ADF Test Statistic	-3.295315	1%	Critical Value*	-4.1348
		5%	Critical Value	-3.4935
		10%	Critical Value	-3.1753

*MacKinnon critical values for rejection of hypothesis of a unit root.

At 5% the NER is not stationary

Test of the significance of the trend

Dependent Variable: NER
Method: Least Squares
Date: 10/05/13 Time: 13:32
Sample: 1999:1 2013:1
Included observations: 57

Variable	Coefficient	Std. Error	t-Statistic	Prob.
@TREND(1999:1)	15.04394	0.861622	17.46003	0.0000

R-squared	-5.758042	Mean dependent var	525.4056
Adjusted R-squared	-5.758042	S.D. dependent var	81.26459
S.E. of regression	211.2573	Akaike info criterion	13.56142
Sum squared resid	2499261.	Schwarz criterion	13.59726
Log likelihood	-385.5004	Durbin-Watson stat	0.003509

The probability of the trend (0.0000) is less than 5%, then the trend is significant in our model

Test for stationarity of residuals

ADF Test Statistic	-0.733304	1%	Critical Value*	-2.6048
		5%	Critical Value	-1.9465
		10%	Critical Value	-1.6189

*MacKinnon critical values for rejection of hypothesis of a unit root.

NER is not stationary around the trend at level, we move to the first difference test

First difference test of NER

ADF Test Statistic	-3.373047	1%	Critical Value*	-4.1383
		5%	Critical Value	-3.4952
		10%	Critical Value	-3.1762

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey- Fuller test on NER

ADF Test Statistic	-5.139252	1%	Critical Value*	-4.1420
		5%	Critical Value	-3.4969
		10%	Critical Value	-3.1772

*MacKinnon critical values for rejection of hypothesis of a unit root.

APPENDIX 8: Unit Root Test of LR

Trend and intercept at level

ADF Test Statistic	-3.932280	1%	Critical Value*	-4.1281
		5%	Critical Value	-3.4904
		10%	Critical Value	-3.1735

*MacKinnon critical values for rejection of hypothesis of a unit root.

Test for significance of the trend

Dependent Variable: LR
Method: Least Squares
Date: 10/06/13 Time: 10:27
Sample: 1999:1 2013:1
Included observations: 57

Variable	Coefficient	Std. Error	t-Statistic	Prob.
@TREND(1999:1)	0.436145	0.033432	13.04588	0.0000

R-squared	-313.658604	Mean dependent var	16.32246
Adjusted R-squared	-313.658604	S.D. dependent var	0.462096
S.E. of regression	8.196953	Akaike info criterion	7.062790
Sum squared resid	3762.642	Schwarz criterion	7.098633
Log likelihood	-200.2895	Durbin-Watson stat	0.005105

The probability of the trend (0.0000) is less than 5%, then the trend is significant in our model

Stationarity test for residuals

ADF Test Statistic	-2.585373	1%	Critical Value*	-2.6048
		5%	Critical Value	-1.9465
		10%	Critical Value	-1.6189

*MacKinnon critical values for rejection of hypothesis of a unit root.

LR is not stationary around the trend at 1% at level, we move to first difference

First difference test of LR

Augmented Dickey- Fuller test on LR

ADF Test Statistic	-10.77159	1%	Critical Value*	-4.1314
		5%	Critical Value	-3.4919
		10%	Critical Value	-3.1744

*MacKinnon critical values for rejection of hypothesis of a unit root.

APPENDIX 9 : Cointegration test or long relationship

Appendix 9.1: First step: Estimation of long run equation

Dependent Variable: LNGDP
Method: Least Squares
Date: 01/08/14 Time: 10:44
Sample(adjusted): 2000:1 2013:1
Included observations: 53 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNER	0.599410	0.110437	5.427626	0.0000
LM3	0.884524	0.022939	38.56066	0.0000
LR(-4)	-0.053546	0.021580	-2.481298	0.0166
C	-1.864956	0.758448	-2.458910	0.0175

R-squared	0.990598	Mean dependent var	6.071061
Adjusted R-squared	0.990022	S.D. dependent var	0.640060
S.E. of regression	0.063935	Akaike info criterion	-2.589420
Sum squared resid	0.200298	Schwarz criterion	-2.440719
Log likelihood	72.61964	F-statistic	1720.837
Durbin-Watson stat	0.664307	Prob(F-statistic)	0.000000

Appendix 9.2: Second step: Stationarity of residuals

ADF Test Statistic	-3.065565	1% Critical Value*	-2.6081
		5% Critical Value	-1.9471
		10% Critical Value	-1.6191

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RESID_LT)
Method: Least Squares
Date: 01/08/14 Time: 11:47
Sample(adjusted): 2000:3 2013:1
Included observations: 51 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID_LT(-1)	-0.367863	0.119998	-3.065565	0.0035
D(RESID_LT(-1))	0.103570	0.142066	0.729027	0.4695

R-squared	0.162917	Mean dependent var	-0.002556
Adjusted R-squared	0.145834	S.D. dependent var	0.050813
S.E. of regression	0.046962	Akaike info criterion	-3.240520
Sum squared resid	0.108067	Schwarz criterion	-3.164762
Log likelihood	84.63327	Durbin-Watson stat	1.942372

APPENDIX 10: Estimation of the Error correction model (ECM)

Dependent Variable: DLNGDP
Method: Least Squares
Date: 01/08/14 Time: 09:52
Sample (adjusted): 2000Q1 2013Q1
Included observations: 53 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID_LR(-1)	-0.216284	0.082026	-2.636779	0.0112
DLM3	0.490634	0.079663	6.158893	0.0000
DLNER	0.580748	0.239107	2.428824	0.0189
DLR	0.011261	0.012183	0.924353	0.3598

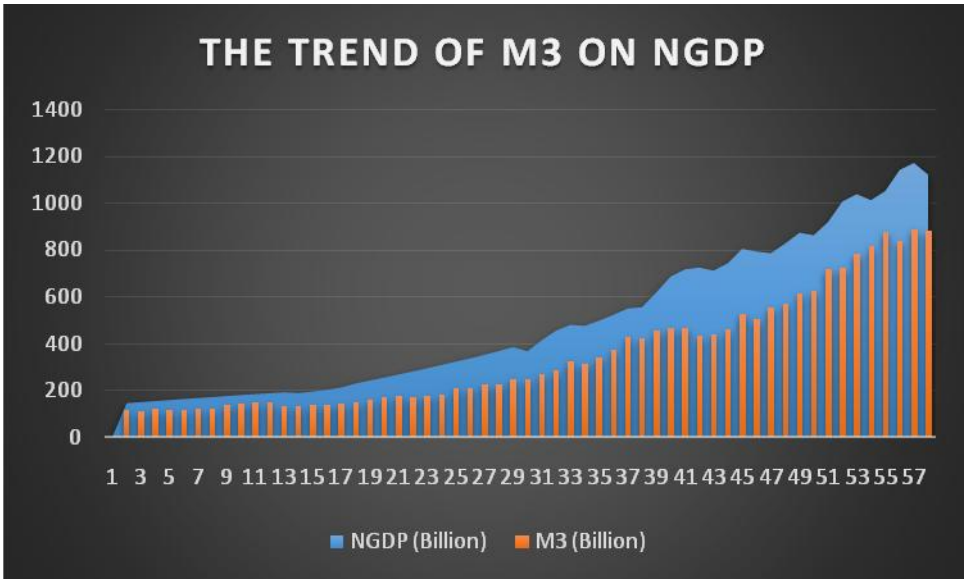
R-squared	0.001503	Mean dependent var	0.036946
Adjusted R-squared	-0.059630	S.D. dependent var	0.035902
S.E. of regression	0.036957	Akaike info criterion	-3.685630
Sum squared resid	0.066927	Schwarz criterion	-3.536929
Log likelihood	101.6692	Hannan-Quinn criter.	-3.628447
Durbin-Watson stat	1.386337		

APPENDIX 11: Granger causality

Pairwise Granger Causality Tests
Date: 09/25/13 Time: 02:48
Sample: 1999:1 2013:1
Lags: 4

Null Hypothesis:	Obs	F-Statistic	Probability
NER does not Granger Cause NGDP	53	0.75913	0.55750
NGDP does not Granger Cause NER		1.14784	0.34677
M3 does not Granger Cause NGDP	53	3.77922	0.00999
NGDP does not Granger Cause M3		2.05883	0.10254
LR does not Granger Cause NGDP	53	1.22739	0.31302
NGDP does not Granger Cause LR		1.49718	0.21946

APPENDIX 12: The trend of M3 on NGDP



APPENDIX 13: The trend of NER on NGDP