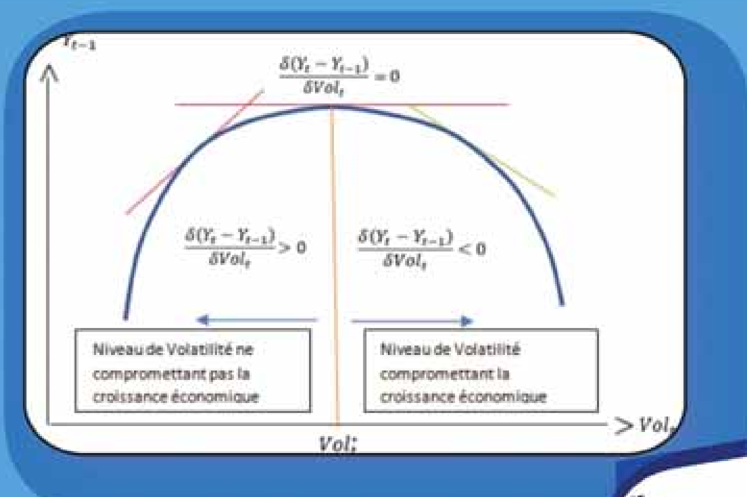
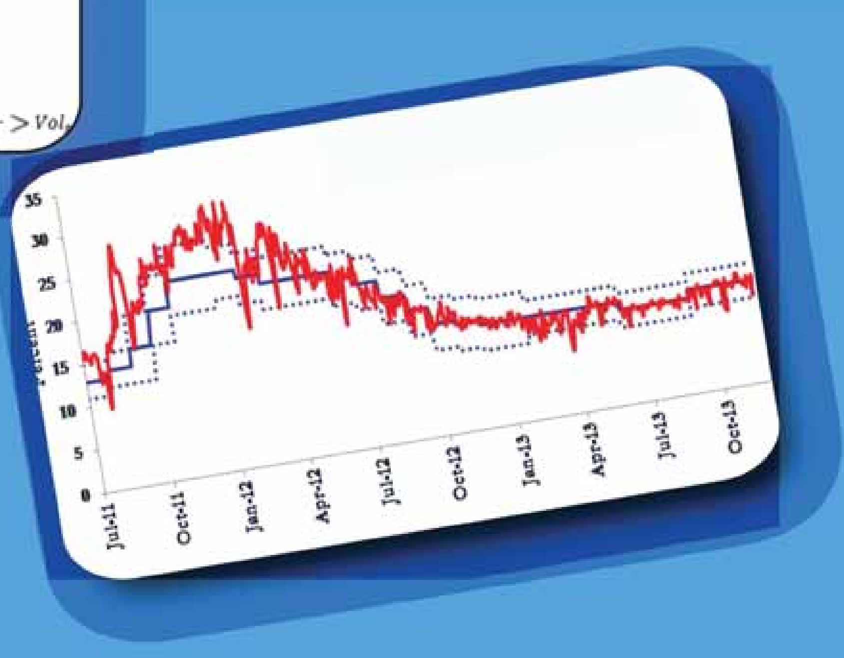
Empirical Analysis of the Effectiveness of Monetary Policy

In Selected COMESA Member Countries





Empirical Analysis of the Effectiveness of Monetary Policy in Selected Comesa Member Countries

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The views expressed herein are those of the author(s) and do not in any way represent the official position of COMESA, its Member States, or the affiliated institutions of the authors.

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Foreword

The primary objective of the COMESA Monetary Cooperation Programme is to create a common area of monetary and financial system stability, which will facilitate the integration of financial markets within the region. The achievement of monetary and financial system stability requires the attainment of macroeconomic convergence, which entails the removal of all macroeconomic disharmonies created by the pursuit of divergent macroeconomic policies and programmes among the Member States. Effective co-ordination and harmonization of existing monetary policies and operations is therefore paramount in any monetary and financial integration framework.

An important issue for each country is the effectiveness of the monetary transmission mechanism - what policy instruments are used and channels through which changes in these instruments are transmitted into changes in inflation and the real economy. In particular, we need to understand the extent to which monetary transmission mechanism differs across countries and reasons for such differences. A successful monetary policy strategy requires an understanding of the relationship between operating instruments of monetary policy and the ultimate goals like the output and price stability. Monetary policy affects the macroeconomic variables through monetary transmission channels. The importance of each of these channels is influenced by the economic, legal and financial structure prevailing in the specific country.

The differences in the structure of the financial markets across countries create asymmetry in the transmission mechanism. When that is the case, a similar monetary policy action would result in different behavior in prices and output, widening cyclical variation between countries within the region. An important concern in the design of a common monetary policy is that the monetary transmission mechanisms across the Member States should be similar. A potential finding of significant heterogeneity would pose challenges for harmonization of monetary policies and for the design and conduct of an effective monetary and exchange rate policy. These case studies have discussed the institutional framework for monetary policy, monetary policy frameworks, the nature of the financial systems, and transmission channels and the efficacy of the monetary policy transmission mechanism in COMESA Member States. The findings contained herein will help inform policy discussions on appropriate frameworks during the transition to monetary policy convergence in the COMESA region.

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Acronyms

ADF	Augmented Dickey-Fuller
ARCH	Autoregressive Conditional Heteroskedasticity
ARDL	Auto-Regressive Distributive Lag
ARIMA	Autoregressive Integrated Moving Average
ARMA	Autoregressive part and a moving average part
ATM	Automated Teller Machine
AIC	Akaike Information Criterion
BACOSSI	Basic Commodity Supply Side Interventions
BIF	Burundian Francs
BNR	National Bank of Rwanda
BoM	Bank of Mauritius
BoU	Bank of Uganda
BoZ	Bank of Zambia
BRB	La Banque de la République du Burundi
CBC	Central Bank of the Congo
CBK	Central Bank of Kenya
CBR	Central Bank Rate
CBS	Central Bank of Swaziland
CMA	Common Monetary Area
COMESA	Common Market for Eastern and Southern Africa
CPI	Consumer Price Index
CRR	Cash Reserve Ratio
CUSUM	Cumulative Sum Control Chart
DRC	Democratic Republic of Congo
DSGE	Dynamic stochastic general equilibrium
EAC	East Africa Community
ECM	Error Correction Model
EIP	Enhanced Interim Programme
ETL	Economic Transformation Law

FAVAR	Factor Augmented Vector Autoregression
FMOC	Financial Markets Operations Committee
FPAS	Forecasting and Policy Analysis System
FPE	Final prediction error
GDP	Gross Domestic Product
GEP	Government's Economic Program
GLS	Generalised Least Squares
IMF REO	International Monetary Fund, Regional Economic Outlook
IPC	l'indice des prix à la consommation
IRF	Impulse Response Functions
IT	Information Technology
ITL	Inflation targeting – Lite
KNBS	Kenya National Bureau of Statistics
LIC	Low Income Countries
LOLR	Lender of Last Resort
LRR	Liquidity Reserve Requirement
MAT	Monetary Aggregate Targeting
MERP	Millennium Economic Recovery Plan
MMO	Masse Monétaire
MPC	Monetary Policy Committee
MPCC	Monetary Policy Consultative Committee
M-PESA	M for Mobile, pesa is Swahili for Money-Mobile money
MPIC	Monetary Policy Implementation Committee
MPTC	Monetary Policy Technical Committee
MTM	Monetary Transmission Mechanisms
NDA	Net Domestic Assets
NEER	Nominal Effective Exchange Rate
NFA	Net Foreign Assets
NX	Net Exportations
OMIR	Old Mutual Implied Rate
OLS	Ordinary Least Squares
OMO	Open Market Operations
PARP	Parastatal Re-Orientation Programme

PC	Phillips curve
PCA	Principal Component Analysis
PLARP	Parastatals and Local Authorities Rehabilitation Programme
PP	Phillip Perron tests
QFA	Quasi-Fiscal Activities
QTM	Quantity Theory of Money
RBM	Reserve Bank of Malawi
RER	Real Exchange Rate
RGDP	Real Gross Domestic Product
RM	Reserve Money
RMA	Rand Monetary Area
RLR	Real Lending Rate
RTGS	Real Time Gross Settlement System
SACU	Southern African Customs Union
SAP	Structural Adjustment Program
SARB	South African Reserve Bank
SME	Small to Medium Enterprises
SVAR	Structural Vector Autoregressive
TVP-VAR	Time Varying Parameter- Autoregressive
VAR	Vector Autoregressive
VECM	Vector Error Correction Model
VDC	Variance Decomposition
VMI	Volume of Manufacturing Index
ZIMPREST	Zimbabwe Programme for Economic and Social Transformation

Executive Summary

The functioning of monetary transmission channels varies across countries due to differences in the extent of financial intermediation, the level of development of domestic capital markets, the degree of central bank autonomy, and each country's specific structural economic conditions. While there is ample theoretical and empirical literature on how monetary shocks affect macroeconomic aggregates in developed and emerging economies with well-functioning financial markets, the evidence in the context of Sub-Saharan Africa is quite limited. Accordingly, gathering evidence on the efficacy of monetary policy transmission remains a priority, especially in the aftermath of the global financial crisis, which has disrupted some channels of monetary transmission.

The COMESA Member States' Central Banks are implementing different Monetary Policy frameworks, ranging from a monetary aggregate targeting framework to some form of Inflation-targeting Monetary Policy frameworks. But in all countries, monetary policy is set within the context of the broad macroeconomic objectives of maintaining price stability and achieving sustainable real economic growth. In most countries, the building blocks necessary for an active and efficient money market are currently in place. Nonetheless, secondary markets remain weak, with the central bank's money market interventions being primarily conducted in the primary market. Some central banks supplement this with interventions in the secondary markets (mainly repos or reverse repos). A synopsis of the institutional framework for monetary policy and the nature of the monetary policy transmission mechanisms in selected COMESA Member States are presented below.

Burundi

Burundi follows a monetary aggregate targeting framework with the reserve money growth as the operating target and growth in M2 as the intermediate targets and the general price level as the ultimate target. Price stability is the primary objective of monetary policy while economic growth is the secondary objective. The Central Bank uses direct instruments as well as indirect instruments of monetary policy to achieve these objectives.

Busogoro notes that one of the main challenges of the monetary aggregate targeting framework in Burundi is the instability of the velocity of money although the money multiplier is stable. This implies that the Central Bank has control over the growth of monetary aggregates but the impact of its actions on inflation is uncertain. The instability of the velocity of money is attributed to financial innovations and the effects of exogenous shocks on the economy.

Based on a structural VAR model, empirical investigation finds the bank lending channel to be an effective monetary policy transmission channel while both exchange rate and interest channels are only partially effective. The study recommends among others the development of financial market and improving monetary policy communication as prerequisites for making monetary policy effective in Burundi. Promoting financial inclusion and diversifying exports are also important consideration in the overall policy direction for the country. The study does not advocate for abandoning of the monetary aggregate targeting framework to alternative frameworks in the short to medium term.

Democratic Republic of Congo (DRC)

Operational independence of the Central Bank in formulating and implementing monetary policy is enshrined in the Constitution. The responsibility of monetary policy formulation and implementation is vested with the Board of the Central Bank. Some Government officials, including those from the Ministry of Finance, Budget, office of the Prime Minister and the Presidency attend Monetary Policy Committee meetings, but they do not have voting rights.

The Central Bank of the DRC uses a monetary aggregate targeting framework, but there is significant dollarization in the economy, where foreign currency deposits account for about 65 percent of money supply. This has reduced the efficacy of monetary policy as an adjustment tool. Nonetheless, Difumba Lumuna finds a stable long-run relationship between the demand for real balances, real income and the opportunity cost variables in the money demand function. However, cycles of one-time instability are observed during the period January 2002 to December 2010, after which relative stability is observed. Despite the observed point of instability, the money demand function generally remained structurally stable.

Difumba Lumuna also shows that the velocity has been declining over time, in line with the developments and innovations in the financial sector. The multiplier has also been generally unstable, especially over the recent period, in part reflecting the impact of financial sector development and innovations. In terms of the transmission mechanism, the variations of the key interest rate significantly affects inflation and the borrowing rate for commercial banks Nonetheless, its magnitude remains very low, as reflected by the relatively small coefficients. However, variations of the exchange rate are not influenced by the key interest rate. The impulse response functions also indicate that a shock to interest rate impacts on inflation immediately and its impact is persistent, lasting for up to 36 months.

Kenya

Kenya pursues monetary targeting framework to achieve inflation objective. The framework has remained basically the same although the Central Bank of Kenya (CBK) has continuously refined its monetary policy operations and procedures in line with the changing financial and economic conditions in order to enhance efficiency and effectiveness. In formulating monetary policy, CBK estimates the money demand function consistent with the target rate of inflation and GDP growth. This forms the basis for setting the desired path for monetary growth to which actual money supply had to conform to during policy implementation stage. However, with the time lag in obtaining information needed for effective control of broad monetary aggregates, the CBK formulates its monetary policy implementation strategy on the basis of reserve money-more readily available as liability of the central bank. The reserve money program design is consistent with desired money supply expansion. The key instruments of monetary policy include Open Market Operations, Reserve Requirements currently set at 4.5 percent of commercial banks liabilities, rediscount Facilities and the Lender of Last Resort Facility.

Nyamongo derives recursive estimates of the money demand function, which seem to suggest that the money demand function in Kenya is unstable, most notably in the period 2007 to 2012. Indeed, this period coincides with the introduction of electronic money in Kenya. This vindicates the premise that financial innovations create instability in the money demand functions. The instability of the money demand function has consequences on the conduct of monetary policy. The instability of the money demand function means that the current monetary policy framework, premised on the assumption of a stable money demand function is in effect not effective, as the instability suggests that the central bank does not have full control over the money supply process. Using a structural VAR framework, he also finds that although the monetary policy transmission is effective, its potency in influencing both real and financial variables in the economy has been weakened by financial innovations.

Malawi

The Reserve Bank of Malawi's main objective is to formulate and implement monetary policy aimed at achieving and maintaining price stability. The independence of the Reserve Bank of Malawi in the formulation and implementation of monetary policy is enshrined in the Constitution of the Republic of Malawi. Immediately after independence, monetary policy was conducted through direct instruments, in the form of credit ceilings and quotas, interest rate caps, and directed lending to key sectors, among others. The Reserve Bank of Malawi (RBM) Act was however repealed in 1989, and institutional independence enshrined in the new Law.

The Reserve Bank of Malawi introduced a monetary aggregate targeting framework, with reserve money as the operating target in 1994. The main instruments of monetary policy are Open Market Operations and sales/purchases of foreign exchange. The Reserve Bank also actively uses the policy rate and the Liquidity Reserve Requirements. The RBM also accords a lender of last resort facility to commercial banks through the Lombard Facility.

In terms of the monetary policy transmission mechanism, Chiumia using a factor augmented VAR – FAVAR finds a negative response of inflation to a one standard deviation innovation to the policy rate. This result was consistent with the findings of Mwautwa (2013) but in contrast to Mangani (2012) and IMF REO (2010), who find a price puzzle for Malawi. The output variable, GDP negatively responds to an interest rate shock in the short-run, a finding that is consistent with New Keynesian thinking that with nominal rigidities monetary policy is able to influence real variables in the short-run. He also finds that money supply is unresponsive to changes in the policy rate, implying that money supply creation could be exogenous. In addition, he finds a significant response of inflation arising to monetary policy innovations. When money supply expands, inflation picks up. A natural policy extension to this is that controlling the growth of money would reduce inflation. But money supply does not respond to changes in interest rate. Put differently, money supply is significant, but the credit channel is impotent. The finding alludes to the role of fiscal dominance in inflation impulses.

The other important finding is the apparent unresponsiveness of the exchange rate to changes in the policy rate. He argues that while theoretically, a rise in policy rate, through the uncovered interest parity condition is expected to lead to a surge in foreign inflows and hence exchange rate appreciation, portfolio inflows are largely non-responsive to interest rate changes in Malawi.

Mauritius

The Bank of Mauritius Act 2004 stipulates that 'the primary objective of the Bank shall be to maintain price stability and to promote orderly and balanced economic development. The mandate of monetary policy formulation is vested with the Monetary Policy Committee, which is comprised of 8 members with voting rights - 3 from the Bank [the Governor, who is the chairman of the Monetary Policy Committee and the two Deputy Governors] and five external members, two (2) of which are appointed by the Prime Minister, while the other three (3) are appointed by the Minister of Finance.

Initially, the Bank of Mauritius conducted monetary policy using direct monetary control, which revolved around ceilings on credit expansion, reserve requirements on deposits and interest rate guidelines issued to banks. In the mid-1990s, with the introduction of a more flexible exchange rate regime, the Bank moved to a framework of indirect monetary control, which essentially revolved around the Bank influencing the growth of money and market determined interest rates. In the late 90s, the Bank introduced the Lombard Rate, which replaced reserve money as the operating target while maintaining the money supply as an intermediate target. In December 2006, the Key Repo Rate was introduced as a key monetary policy instrument.

In terms of the empirical analysis of the monetary policy transmission mechanism, *Sharma and Chutoo* find that the policy rate, the Key Repo rate, has a strong relationship with the weighted average lending rate and the savings rate, but has a very weak relationship with other rates at the short end of the yield curve. The weighted average Treasury Bills rate has no statistically significant relationship with changes in the Repo Rate, although the relationship appears to be stronger when changes in the interbank rate are considered. While the relationship between the savings deposit rate and the policy rate is strong, continued divergence between the short end of the curve and the policy rate could put pressure for banks to de-anchor the savings rate from the policy rate. The impulse response functions also indicate that the strength of the interest rate channel is quite weak and in some cases not statistically significant in influencing inflation and output.

In terms of the credit channel, unexpected shocks to M1, a subcomponent of M2 have a positive albeit small and statistically insignificant impact on CPI for the initial periods. The variance decomposition results of both CPI and output; indicate that close to 33 percent of inflation variability of over time is explained by changes in monetary aggregate, M1. A positive shock to the nominal effective exchange rate (which in this case represents an appreciation) has a negative impact on the CPI, with the effect of the shock being experienced from the 5rd period (two quarters), in part reflecting the slow nature of the exchange rate pass-through in Mauritius. The results also indicate that GDP, which has a bi-directional causal relationship with CPI, accounts for up to 40 per cent of inflation's total variability over time. The response of CPI to an unexpected shock in GDP was also statistically significant. On the other hand, output does not seem to respond much in terms of statistical significance to all policy variables over time. The variance decomposition results also confirm this weak link between output with the nominal effective exchange rate and the short term market interest rate, with each accounting for less than 15 percent of output variability over time. Sharma and Chutoo also find a stable money demand function.

Rwanda

The National Bank of Rwanda operates a monetary aggregate-targeting regime, with reserve Money as the operating target. The authorities signal the policy stance by announcing the policy rate, key repo rate, during the quarterly meetings of the MPC. The primary objective of monetary policy is price stability and this is stipulated in the National Bank of Rwanda Act 2007. The Monetary Policy Implementation Committee (MPIC), also chaired by the Governor meets every week. Subordinate to the MPIC is the Monetary Policy Technical Committee, which is required to submit to Management and to the MPIC regular reports of its activities. The National Bank of Rwanda currently uses an array of monetary policy instruments including among others open market operations and reserve requirements.

Irankunda estimated a money demand function for Rwanda with real GDP, deposit rate and the real exchange rate as explanatory variables. The results indicate that there a significant long-run relation between real GDP, deposit rate, real exchange rate and real money balances. In order to examine short-term dynamics of the model, an error-correction model associated with the long-run money demand function is estimated. The estimated coefficient of the error correction term is -0.17, suggesting that 17 percent of the deviation from equilibrium would be restored within one quarter. The short-run income elasticity and the exchange rate are however not significant. The deposit rate (3 quarters lagged) is significant, meaning that over the short-term, the demand for money in Rwanda is driven by the deposit rate. She found a stable money demand function, which implies that money supply has predictable impacts on inflation, interest rates, and GDP.

The Granger Causality tests indicate that changes in monetary aggregates (M3) Granger causes changes in GDP, but does not Granger cause inflation. Changes in the lending rate causes changes in CPI, but do not cause GDP growth. The impulse response functions also indicate that a shock to monetary aggregate, M3, starts to impact on output after two quarters and dies after seven quarters. A shock to nominal exchange rate impacts on output after one quarter and the impact persists for a long period of time.

Swaziland

Swaziland monetary policy is analyzed within the context of fixed exchange rate parity with the South African rand through the Rand Monetary Area (RMA) agreement dating back to 1974 until 1986, and the Common Monetary Area (CMA) Agreement that serves the country to date. The major departure of the new (CMA) agreement from the old (RMA) was the elimination of the requirement to maintain one to one parity of the Swaziland lilangeni to the South African rand giving Swaziland some latitude to pursue an independent exchange rate policy.

The objective of monetary policy in Swaziland is to maintain price stability in order to create conducive environment for economic growth. However, the country's membership to the CMA coupled with full economic integration and a fixed exchange regime precludes discretional monetary policy or independence. Swaziland has no formal role in the formulation of monetary and exchange rate policies and depends on South Africa. The exchange rate peg has to be fully supported by well-coordinated monetary policy actions and fiscal discipline. Open market operations have not been used as a monetary policy tool but as means to raise cash flow for immediate government obligations and to mop up the excess liquidity, while the scope for independent interest rates is limited and broadly conforms to what prevails in South Africa.

Dlamini provides evidence of the effectiveness of monetary policy in the short-run even though this largely depends on the South Africa Reserve Bank (SARB) monetary policy stance. To a large extend Swaziland CPI in the long-run is driven by money supply, oil prices and exchange rate. In the short-run, Swaziland's CPI is largely driven by imported inflation from South Africa, its major trading partner. The variance decomposition results suggest that inflation react to its own innovations and starts at a high level and declines steadily, but does not fall to zero but instead becomes constant over time. In the case of cross innovation, inflation responds rapidly to innovation of the South African consumer price index (LCPISA), capacity utilization LCU, Central Bank of Swaziland discount rate (DSC) and exchange rate (LZAR). The SVAR impulse response function results show that overall consumer price index for Swaziland (LCPISD) is affected by LCPISA. The results also depicts that the discount rate is effective to control LCPISD when it is consistent with the SARB repo rate or the deviation is not more than 50 basis points. The study recommends that the Central Bank of Swaziland continues to align its monetary policy to the monetary stance and inflation target of the Reserve Bank of South Africa.

Uganda

Operational independence in the conduct of monetary policy is enshrined in the constitution of the Republic of Uganda, and in particular, Article 162, which stipulates that in performing its functions, the Bank of Uganda shall conform to the Constitution and shall not be subject to the direction or control of any person or authority. The mandate for the formulation and conduct of monetary policy is vested with the Monetary Policy Committee, chaired by the Governor. The Financial Markets Operations Sub-committee, which meets daily implements the decisions of the Monetary Policy Committee and monitors financial market developments.

The Bank of Uganda has been implementing an Inflation targeting – Lite (ITL) monetary framework since July 2011, when it abandoned, the reserve money programme, a monetary aggregate targeting framework, which was in place since 1993. The reserve money programme was abandoned because the relationship between money supply and prices had broken down, in part because financial innovations, which made the money multiplier very unstable. Consequently, money supply was no longer a reliable indicator of the monetary conditions in the short run. Under the ITL framework, economic growth and the exchange rate stability are supplementary objectives without prejudice to the price stability objective. A policy interest rate, the Central Bank Rate (CBR), is employed as the operating target.

The Bank of Uganda sets the CBR at a level consistent with the desired monetary policy stance and supplies and/or constrains liquidity conditions in the interbank money market to steer the 7-day interbank money market rate within the CBR band. The level of the CBR is set consistent with the medium-term inflation target of 5 percent. The key ingredient in monetary policy decision-making framework is the inflation projection. If inflation forecasts indicate heightened inflationary pressures, in the near term, then monetary policy will be tightened by increasing the CBR.

Mugume uses the Structural Vector Autoregressive framework to assess the monetary policy transmission mechanism. He uses the 91-day Treasury bills rate as the policy rate instead of the CBR because of two reasons. First, because of the short duration of the CBR; and secondly, prior to the introduction of the CBR, the 91-day Treasury bill rate was used as reference rate. He finds that output and consumer prices respond to shocks to domestic credit, interest rates (the 91-day Treasury bill rate), and the exchange rate. He also finds that monetary policy shocks are transmitted to interbank interest rates, yields on treasury bills, time deposit and lending interest rates. The impact is at maximum after one year and half and dissipates after two years. As expected, the impact on interbank interest rates is immediate. The impact of monetary policy shocks on lending interest rates appears weaker, which reflect a variety factors affecting lending interest rates beyond the monetary policy.

Zambia

Zgambo and Chileshe argue that Prior to the 1990s, the conduct of monetary policy in Zambia was driven by multiple objectives, which included the provision of cheap credit to state-owned enterprises and government, and the promotion of economic growth through various initiatives and incentives. Monetary policy was implemented through direct instruments such as interest rate controls, directed credit allocation as well as core liquid assets and statutory reserve ratios. After a prolonged period of macroeconomic imbalances, the Government initiated macroeconomic reforms aimed at addressing the macroeconomic and structural imbalances in the economy.

The Bank of Zambia Act was amended in 1996, narrowing the central bank's objective to price and financial system stability. Consequently, monetary policy concentrated on creating a stable macroeconomic environment to support sustainable economic growth. The Bank of Zambia subsequently introduced a monetary aggregate targeting framework, with reserve money as the operating target, a framework premised on a strong and stable relationship between the ultimate target (inflation) and money supply. The Bank also introduced indirect market-based instruments of monetary policy including open market operations and purchases/sales of foreign exchange. However, the relative instability of the money multiplier and the weakening relationship between broad money and inflation occasioned the Bank of Zambia to reform its monetary policy framework, with the ultimate objective of introducing an inflation targeting monetary policy framework. The first step in this direction was the introduction of the policy rate in April 2012.

Zgambo and Chileshe find that there is interest rate pass-through from the short to the long end of the market. The impulse response functions indicate that a monetary policy shock leads to statistically significant effects for real GDP, CPI and the exchange rate, which tends to persist for a long time. An expansionary monetary policy results in an increase in real GDP with the maximum effect coming through after 6-7 quarters. However, the effect dissipates after 24 quarters. In the same vein, an expansionary monetary policy leads to an increase in the price level and a depreciation in the exchange rate. The response of prices to a monetary policy shock seems to peak at about 7-8 quarters. The response of the exchange rate to a monetary policy shock is rather instantaneous with the exchange rate depreciating immediately following a monetary expansion. However, when the interest rate is used as a policy variable, impulse response functions suggests statistically insignificant effects on all the relevant variables. This suggests that interest rates as a policy variable is ineffective in influencing the real variables in the economy.

The variance decomposition results also indicate that shocks to broad money explain about 31 percent of the variations in real GDP after 12 quarters, while shocks to the interest rate explain around 9 percent of the variation in real GDP over the same period. As regards variation in prices, shocks to broad money explain around 30 percent of variations after 12 quarters while shocks to interest rates explain about 22 percent of the variation in prices. These results demonstrate the importance of broad money in inflation and real GDP outcomes in Zambia. However, interest rates also seem to be important in explaining variations in prices.

Zimbabwe

Tarinda argues that monetary policy in Zimbabwe has gone through a number of distinct phases since 1980, reflecting fundamental shifts in broad macro-economic policies and developments. During the 1980s, the conduct of monetary policy remained passive against the background of broad macro-economic controls. In the 1990s, most controls on domestic economic activity were removed and a monetary aggregate targeting monetary policy framework introduced. The removal of direct controls also necessitated the introduction and development of indirect instruments of monetary policy.

In the build-up to the turn of the century, the Reserve Bank of Zimbabwe's monetary policy strategy, which hitherto, was premised on monetary targeting, became unsustainable due to increased monetization of fiscal deficits. This triggered inflation and loss of confidence in the local currency, thus precipitating massive speculative currency attacks. Faced with limited options, the Central Bank responded by raising interest rates significantly. The exchange rate nonetheless continued to depreciate. The excessive price build-up, associated with rapid exchange rate depreciation forced Government to re-introduce price controls. This notwithstanding, rapid depreciation pressures continued unabated, with the eventual collapse of the exchange rate, on 14 November 1997, in what has become known as the *"Black Friday"*.

The monetary targeting framework continued to face institutional and operational challenges. The cumulative effect of exchange rate controls and escalating inflation led to shortages of both local and foreign currency. In response to the currency shortages, the Central Bank introduced bearer cheques, as emergency currency notes, which circulated alongside the main currency. All bearer cheques of this series were, however, demonetised in August 2006, following the first re-denomination of currency. Faced with hyperinflation, largely driven by increased monetization of the economy, the Central Bank announced in October 2005, it had moved from the eclectic monetary policy framework to a monetary targeting framework, with reserve money and inflation as the operational target and the ultimate target, respectively.

In line with this policy strategy, the Central Bank announced plans to further tighten monetary policy. Nonetheless, by mid-2006, the high inflation environment had begun to pose technical risks on financial information and accounting systems in the economy. In view of this challenge, the Reserve Bank announced a rebasing of the national currency by knocking off three (3) zeros at the end of July 2006. However, because the underlying macroeconomic imbalances continued to persist, inflation continued rising, reaching 1,281.1 percent by December 2006. The Reserve Bank consequently embarked on a series of currency re-basing exercises, which involved knocking off many zeros, at subsequent intervals, between December 2006 and December 2008. In total, the Zimbabwean currency gained nearly 40 zeros between August 01, 2006 and February 02, 2009. By then, money supply was growing exponentially, at over 432 Quintillion percent (10^{18}) and inflation had also accelerated 231 million percent by July 2008.

Zimbabwe abandoned its own currency and adopted multicurrency in 2009, a form of dollarization, which helped restore macroeconomic and financial stability, budgetary discipline, and re-established monetary credibility. Under the multicurrency system, Government approved the use of major foreign currencies such as the United States Dollar, South African rand, the British pound sterling, Japanese Yen and Botswana Pula, among others, as legal tender without any formal arrangements with the host country's Governments. In 2014, the Chinese Yuan and the Indian Rupee were added to the basket of international currencies, for use by economic agents. The US dollar is, however, the predominant currency, also used as the settlement currency. Under dollarization, there is basically No Monetary Policy in Zimbabwe, as far as the application of traditional monetary policy instruments is concerned.

Chapter 1

Financial Innovations and Monetary Policy in Kenya

By Esman Nyamongo

1.0 Introduction

In 1990's most COMESA Member countries began phasing out the direct monetary instruments such as credit controls, interest rate ceilings; and sometimes directed credit and began moving toward full reliance on indirect instruments, such as open market operation, Rediscount facilities, and reserve requirements. The greater use of indirect monetary instruments can be seen as the counterpart in the monetary area to the wide spread movement toward enhancing the role of price signals in the economy more generally. Perhaps even more critically, moves to indirect instruments are taking place in an increasingly more open economic environment, with widespread adoption of current account convertibility and progress in moving to full convertibility. In such an environment, direct instruments have become increasingly ineffective, leading to inefficiencies and disintermediation. In the absence of indirect instruments of monetary policy, the authorities would, therefore, be unable to counter any problems of excess liquidity, which would impede their efforts to stabilize the economy. However, the choice of monetary policy framework adopted by a country depends on economic, financial and institutional environment within which policy is operating. This paper assesses the impact of financial innovation on monetary policy in COMESA Member States with specific reference to Kenya.

2.0 Financial Innovations in Kenya

The introduction of mobile telephones in Kenya in late 90s to complement the landline telephones has witnessed rapid growth. The number of mobile telephone users increased 900,000 users in 2001 to over 29 million subscribers in June, 2012. Associated with this good performance are a number of innovative products being witnessed in the sector. The landmark innovation that caught the world attention was the M-PESA product which was introduced in 2007 by Safaricom. Since then other service providers have launched similar products to rival M-PESA. The innovation has since cross borders to Uganda and Tanzania. While the service has not been taken very well in other countries, in Kenya, it has continued to grow both in terms of customers and transaction values.

While the numbers of transactions have increased from zero in March 2007 to over 47 million transactions in June 2012, the value of transfers has increased to over 120 billion over the same period. The service has increased financial access to the poor who have previously been left out of the formal banking sector due to illiteracy, prohibitively high fees, and proximity to banking facilities. Increase in the number of agents from 307 in March 2007 to over 61,000 in June 2012 across the country have increased the access points of the service reducing the informal saving that have characterized the country for a long time.

Lack of access to banking services hinders economic development by giving the poor no option other than the informal, cash economy, leaving them vulnerable to risks and without a means to efficiently save or borrow money. Thus, the impact of mobile money technology has increased peoples' ability to save or get a loan. Higher savings rates also make more capital available for investment in development. The adoption of the services by the banking sector has continued to increase monetization of the economy especially the rural economy which has previously been lacking. This has reduced the amount of money held by the public at any one time with an effect on the monetary policy transmission.

Figure 1.1: Growth of electronic money in Kenya

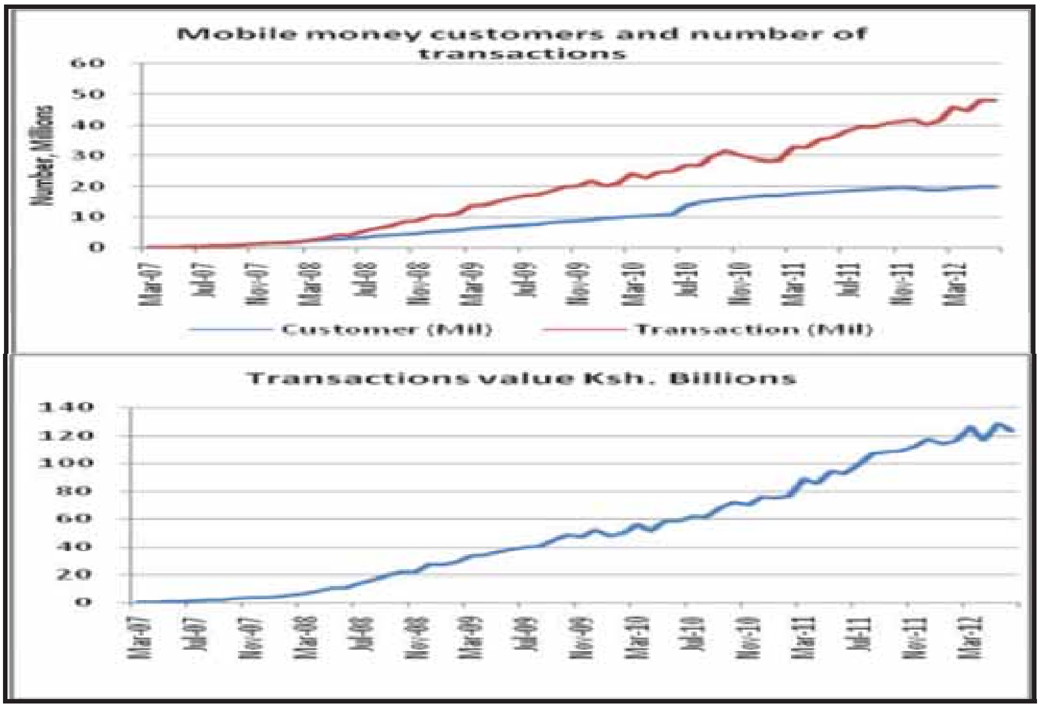
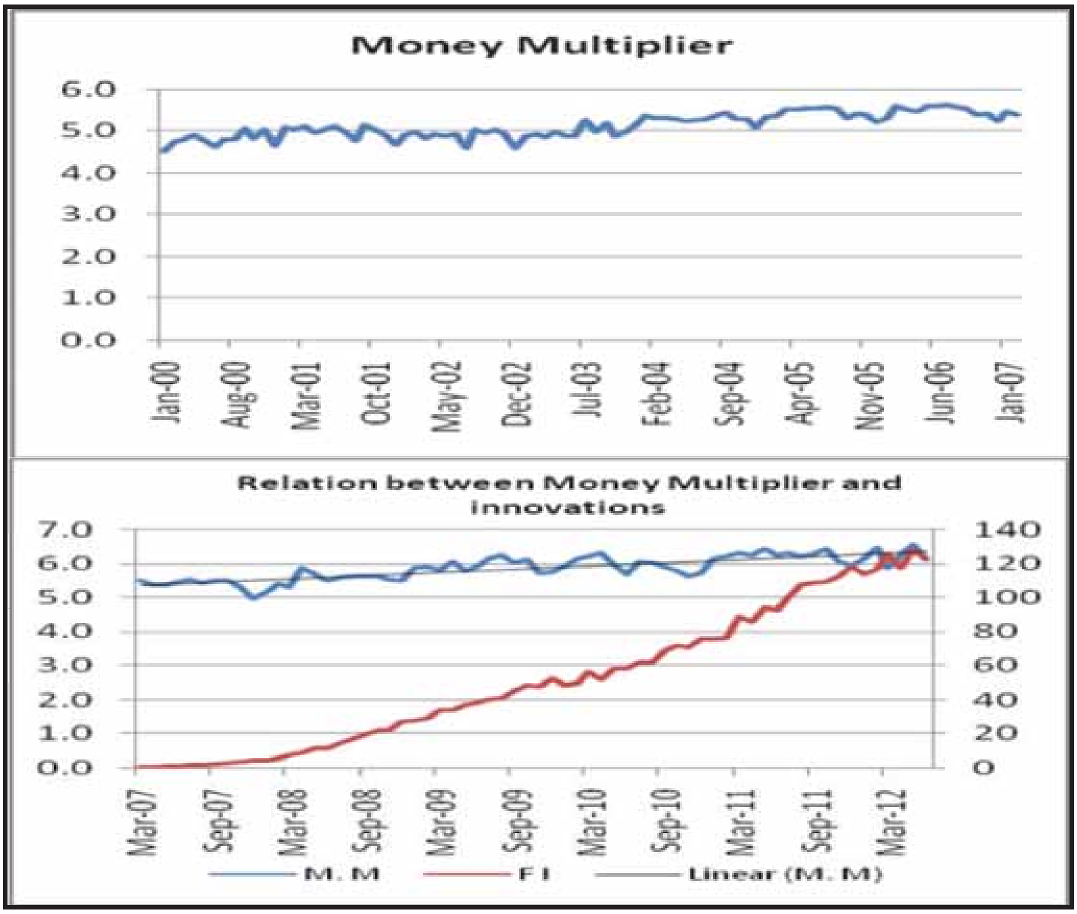


Figure 1.2: Implication of electronic money on the money multiplier

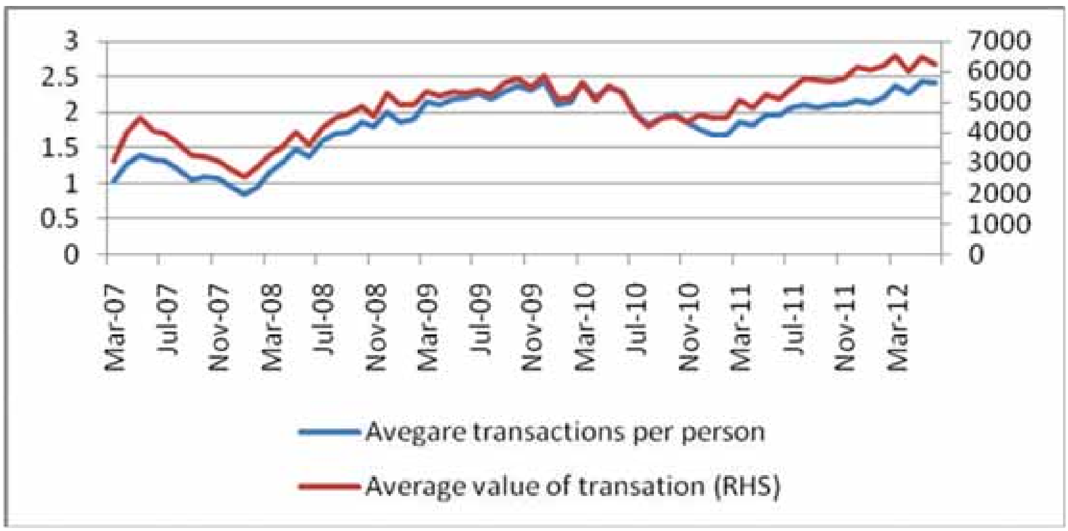


Prior to the financial innovations, the money multiplier was relatively stable at an average of 5. The beginning of innovations in the financial sector saw a rise in the money multiplier. As shown in the figure, the introduction of the mobile money services in 2007 resulted in a sustained increase the value of the transactions through the service. This is associated also with a rise in the money multiplier in the economy.

Due to the innovative financial products especially in the mobile banking, the velocity increased. The mobile money transfer service however does not add to money supply growth but only increases the frequency with which the same amount of cash is availed in the market. Whilst financial innovation is dynamically improving the performance of the financial sector and enhancing inclusiveness, there is need to ensure that regulatory oversight is improved to ensure that innovative financial products do not undermine efforts aimed at improving the effectiveness of monetary policy in curbing inflation.

Factors that reduce demand for money increase velocity for money. These include among others; use of cards (debit and credit card) and other forms of credit, evolution of financial instruments and other forms of financial technology. Financial innovations in Kenya have reduced demand for money by providing a broader array of financial instruments that can be used as stores of wealth. This has enabled firms and individuals to hold fewer money balances relative to expenditures helping to account for an upward trend in velocity. This is also confirmed by Mukisa, (1998) that financial innovation significantly influenced velocity of broad money in Uganda.

Figure 1.3: Electronic money indicators



3.0 Literature Review

The literature on financial innovation is still evolving as new financial instruments, financial services and operational techniques continue to enter the market. The existing scanty literature has focused on evolution of the financial system in the developed world with little, if any studies on developing countries. Existing studies have analysed the linkages between general financial innovation and monetary policy, growth and inflation and some analysis of linkages between specific financial innovation products, macroeconomic variables and monetary policy transmission mechanisms. In this section, we briefly survey theoretical and empirical work of some of these previous studies with a bias towards COMESA countries.

The first strand of literature analyses the impact of electronic money on the central bank's ability to control money supply. According to this line of thought, increasing usage of electronic money would completely replace currency. Under this framework, the ability to control money supply depends on its definition, in this case M1 (currency and demand deposits). If the usage of current variables in M1 decreases due to increased reliance of electronic money, then M1 would not serve as an accurate measure of money in the economy. The decrease in ability to measure monetary aggregates will limit the central bank's ability to conduct open market operations and target money supply. This school of thought further argues that usage of electronic money is likely to increase the velocity of money if electronic money is first adopted as a major form of money and if it is added to the aggregates used to compute the velocity of money. This is because transactions will take place in real time across thousands of miles and transactions costs are greatly reduced causing people to increase the number of transactions made. However the inability to measure velocity when electronic money is not included in monetary aggregates decreases the central bank's ability to control monetary policy (Al-laham et al., 2009).

Using the Gurley-Shaw theory, Hasan (2009) found that financial innovations and other changes in the financial market increase the interest elasticity of money demand. These findings imply that policy makers and monetary authorities should de-emphasize an explicit monetary targeting in the conduct of monetary policy and instead focus on a much wider array of economic indicators that have shown predictive power for inflation. Theoretically, as new interest-bearing substitutes of money develop, money holdings become more sensitive to changes in interest rates, thus raising the interest elasticity of money demand. Moreover, if elasticity of money demand increases due to financial innovations, then the predictability and stability of the relationship between monetary aggregates and ultimate goal variables related to output, prices and interest rates as predicted in the convectional money demand functions are weakened, effectively complicating the conduct and efficacy of monetary policy.

Extensive literature explores the effect of financial innovation on the stability of the money demand function, with a general consensus that evolution on new financial products create instability in the traditional money demand function. Arrau and De Gregorio (1993) examined the estimation of money demand equations in Chile and Mexico. Their results showed suggested that there is an important permanent component in the demand for money not captured by traditional variables but by financial innovation, which is modeled as an unobservable shock that has permanent effects on money demand. Using market share of credit cards as an indicator of financial innovation Viren (1992) empirically examined the relationship between financial innovations and currency demand. The author's results show that credit card transactions have a strong offsetting effect on currency demand.

According to Cho and Miles (2007) who applied Gregory-Hansen co-integration method to Korean data, the downward trend in velocity was attributed to monetization of the economy. It is expected that velocity should increase over time as payments systems evolve or cash management improves. An increasing ability to manage money holdings would be expected to raise velocity, however, financial liberalization allows agents to minimize cash balances but it also permits greater interest to be paid on many categories of money. The basic argument in the perverse sign observed and obtained in their case is based on the fact that, there is increased willingness to hold M2 as income increases. The coefficient of real GDP was more than one indicating a high level of monetization in the Korean economy.

In the COMESA region, experiences are diverse, however, one major innovation that has started dominating the literature is the M-PESA in the Kenyan financial market. An M-PESA account with the network operator Safaricom provides money transfer services as banks do in the developed countries (Hughes and Lonie, 2007). Although the study notes that there was a gap in the market that M-PESA filled, which constituted the unbanked, unconnected and often semi-illeterate population in Kenya, currently, the M-PESA commands a huge market including literate populations with bank accounts. To the extent that it accepts balances of over 1000 dollars and it is cheaper than maintaining balances in some bank accounts and that it provides a 24-hour safe money transfer services, it is possible that it would be diverting deposits that would otherwise be available for banking in the commercial banks with implications on monetary policy efficacy.

A few studies exist focusing on the examination of the linkages between financial innovation and the stability of the money demand function. Proponents of this view contend that financial innovation (improved technology and financial products) is associated with lower demand for currency. Using Granger causality and VAR methodologies, Kovanen (2004) examined the determinants of currency demand and inflation dynamics in Zimbabwe. The author measured financial innovation as the ratio of broad money to currency. However, the results from the VAR estimation for financial innovation are not significant. Lungu et al (2012) did a similar study using Malawian data but in this case financial innovation has a significant effect on the demand for money in the short run. A summary of similar studies for most of the other COMESA countries is tabulated in the Appendix (Awad, 2010; 2008)

Sichei and Kamau (2012) conducted a similar study using Kenyan Data. They used number of ATMs as a proxy for financial innovation and their results did not indicate any significant effect of innovations on the demand for money. However, this study used only one measure of financial innovation, which is also mostly used only in urban centers. While acknowledging that data for other more inclusive measures such as M-PESA may not have been available and adequate in terms of observations to warrant plausible empirical investigation, but still the author did not explore other financial innovation measures used in previous studies. Misati et al (2010) used bank assets to GDP ratio and M3/M1 as measures of financial innovation and found that financial innovation dampens the interest rate channel of monetary transmission.

4.0 Framework for Assessing the Effectiveness of Indirect Monetary Policy Instruments

4.1 Income Velocity Approach

This framework involves expressing the quantity of money in terms of the quantity of goods and services it can buy. i.e, in real money terms. In an equation form, this is shown as:

$$\frac{M}{P} = ky \qquad (1)$$

Where:

M is stock of money, P is the price level, k is a constant and y is real GDP. This demand function states that the quantity of real money balances demanded is proportional to real income. Rearranging equation 4.1 yields the following equation:

$$M\left(\frac{i}{k}\right) = Py \qquad \text{(2)}$$

Which is equivalent to:

$$Mv = Py \qquad \text{(3)}$$

Where v=1/k. Equation (3) can be rewritten as:

$$Mv = Y \qquad \text{(4)}$$

Where Y is the nominal GDP obtained by multiplying the price level P by real GDP (y). Because velocity (v) is fixed in the short run, any change in the money supply leads to a proportionate change in nominal GDP as indicated in the following equation.

$$v = \frac{Y}{M} \qquad \text{(5)}$$

The money velocity is often assumed to be relatively stable in most countries. Thus, a constant velocity is assumed in the forecasting of the monetary aggregates. This involved multiplying the velocity with the forecasted nominal GDP to get the monetary aggregate. In an equation form, this is indicated as follows:

$$M = Y * v \qquad \text{(6)}$$

Velocity and money multiplier are 2 variables that are of primordial importance for any central bank in its attempts to contain price inflation. The basic nature of the money supply is analytical. To understand it fully requires understanding of how it is used for purposes of monetary policy. Understanding the causality between the monetary base, money supply and price inflation is key to forecast the various items in the monetary survey. It is worth noting that underestimating the expected velocity tends to overstate the demand for money and this is therefore likely to result in a higher inflation and perhaps a worsening in the balance of payments. The reverse is true.

Central banks cannot determine directly the rate of monetary expansion. The rate of monetary expansion depends on a multitude of factors outside the immediate sphere of influence of a central bank. These forces the monetary authorities to identify yet another intermediate target: the interest rate or monetary base. Once the link between the monetary base and the money supply is understood, a strong positive correlation between the evolution of the money supply and that of prices is postulated. This correlation is not always straightforward, because it depends on the stability and predictability of velocity, and, ultimately, on money demand. Money stock / monetary base = money multiplier. This relationship is depicted in equation (7) given below.

$$mm = \frac{M}{HH} \quad \text{.......} \quad (7)$$

Because deposits are larger than the sum of bank reserves and cash held in vaults, the mm>1. The smaller the monetary base is in relation to the money stock, the larger is the money multiplier.

4.2 The Stability of Money Demand Function

There are numerous factors that can lead to instability of money. One factor emphasized by economists is the increased pace of innovation and changes in the financial system spurred by deregulation and intense competition which enable banks and other financial institutions to provide the public with many new financial assets from which to choose, as well as a variety of new portfolio management techniques. Some of these innovations can reduce or increase the demand for money and the relationship between money demand and its principal macroeconomic determinants- the price level, income, and interest rates may shift erratically.

Instability in money demand equations however do not mean that money demand equations are useless. In fact, they can be quite useful for forecasting money demand when the regulatory environment is stable and when no major financial innovations occur. When regulations change or new financial instruments are developed, however, these changes must be taken into account when using money demand equations to predict the levels of money holdings. See Appendix 1 for factors that determine the demand for money.

4.3 The Monetary Policy Transmission Mechanism Approach

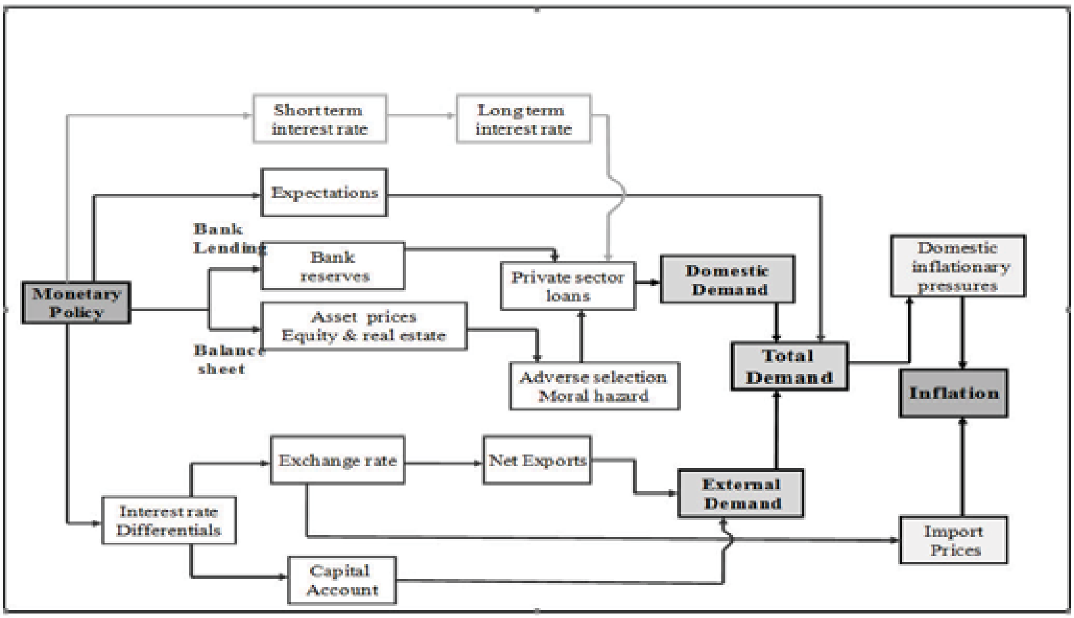
One practical difficulty faced by monetary Policy makers is determining exactly how monetary affects the economy. Economists identified two primary ways in which monetary policy affects economic activity and prices. First according to the Keynesian IS-LM analysis, a reduction in the money supply raises real interest rates, which in turn reduces aggregate demand (spending by consumers and firms). Declining aggregate demand leads to falling output and prices. The effects of monetary policy on the economy that works through changes in real interest rates are called the interest rate channels of monetary policy.Second, in open economies, a tightening of monetary policy raises the real exchange rate. A higher real exchange rate, by making domestic goods more expensive for foreigners and foreign goods cheaper for domestic residents, reduces the demand for the home country's net exports. All else being equal, this reduced demand for net exports also reduces aggregate demand, depressing output and prices. The effects of monetary policy working through changes in the real exchange rate are called the Exchange Rate Channel. According to some economists, a tightening of monetary policy also works by reducing both the supply and demand for credit, a mechanism referred to as the credit channel of monetary policy.

Controversy swirls about the relative importance of these different channels of monetary policy. That in turn increases the difficulty that policymakers have in judging how "tight" or "easy" monetary policy is at any particular time. For example a central bank observes that real interest rates are currently high but that the domestic currency has been falling. Is monetary policy tight or not? It is hard to say, unless we know the relative strength of the interest rate channel and the exchange rate channel. Similarly, suppose that the real interest rate is low (suggesting an easy monetary policy) but that borrowing and lending have been unusually weak (suggesting a tight monetary policy). Again, the signals are conflicting, and the judgment about whether monetary policy is expansionary or contractionary depends on the relative strength of the different channels.

According to the credit channel theory, tight monetary policy leads to reduced lending by banks. As banks cut back on their lending, borrowers who depend on banks for credit, such as consumers and small firms, are unable to obtain the credit they need to make planned purchases. The resulting decline in spending depresses aggregate demand and thus economic activity. On the demand side of the credit market, according to proponents of the credit channel, tight monetary policy has the effect of making potential borrowers less credit worthy.

Monetary policy comprises the policy rules and actions adopted by the central bank to achieve its objectives, mainly price stability. Usually monetary policy action is invoked as a result of domestic and/or external shocks that impact the attainment of the stated objectives. Monetary policy changes are implemented via resetting policy instruments such as the short-term interest rate or the monetary or bank credit aggregate. Resetting these instruments affect the economy through various channels of transmission, affecting different variables and different markets at different speeds and intensities to impact the ultimate goals as shown in Figure 4. There are a number of channels identified in the literature that show how monetary policy stance is transmitted into the real economy, namely: *Asset Price Channel, Interest Rate Channel, Exchange Rate Channel, Credit Channel, and expectations channel*

Figure 1.4: Monetary Policy Transmission Mechanism



Source: Misati and Nyamongo (2012)

- *Interest rate channel*— is the traditional channel and taken to be the most important channel of monetary policy transmission. The interest rate channel works by impacting the short-term nominal interest rate, which in turn impacts the long-term interest rates such as lending rate. For example, increasing short-term interest rates will impact long-term lending rates thus reducing the demand for investment expenditures, as real cost of borrowing over the horizons has increased. Also, households cut spending on consumption of durables due to higher costs of borrowing resulting in a fall in aggregate demand and consequently, lower inflationary pressures.

- *Exchange Rate Channel*-when the central bank pursues a tight monetary policy the domestic interest rates rise relative to the foreign interest rates. However, to restore equilibrium in the foreign exchange rate market the domestic currency depreciates (uncovered interest parity). This depreciation requires an initial appreciation of the domestic currency, which makes domestically, produced goods more expensive than foreign-produced goods. Net exports fall, resulting to a fall in aggregate demand. In addition, the rise in the domestic interest rate above foreign interest rate attracts capital inflows, which occasion an appreciation of the domestic currency.
- *Credit channel*- it works in two ways namely the bank lending and balance sheet of households and firms. When the central bank reduces money stock by reducing the reserve money, the bank reserves decline hence reducing the amount banks have available for lending out. On the other hand, the reduction in money stock leads to a worsening of households and firms balance sheet through the fall in the asset and equity prices. This reduces the net worth of the borrowers. Banks then have to screen borrowers in order to avoid adverse selection and then monitor the borrowers to reduce moral hazard. This process reduces the amount of loans given by the banks. The adverse selection and moral hazard are driven by information imperfections in the market. In both cases, the effects would reduce domestic demand, total demand and eventually output. Key assumptions are that bank loans are the principal and important sources of funds for firms, for which few close substitutes exist.
- *Expectations and confidence channel:* Changes in the official rate can influence expectations about the future course of real economic activity and, the confidence with which those expectations are held. Changes in perception are likely to affect participants in the financial markets as well as economic agents in other markets. However, it is hard to predict the direction in which such effects work.

4.4 A Formal VAR Framework

To investigate the effect of financial innovations on monetary policy we use a VAR framework. We use a 5 variable VAR that include the following variables:

- the log of real GDP;
- the log of the price level (CPI)
- the log of money supply (M3)

- the short-term interest rate (r)
- the nominal real effective exchange rate (NEER)

These endogenous variables can be denoted by a vector, X, given in equation (8) and a vector of reduced form residuals denoted by ε_t

$$X_t' = [Y_t \quad CPI_t \quad M3_t \quad r_t \quad NEER_t \quad] \qquad (8)$$

The benchmark reduced-form VAR is given by equation (9).

$$X_t = \alpha_0 + \alpha_1 t + A(L) X_{t-1} + \varepsilon_t \qquad (9)$$

Where α_0 is a constant, t is a linear trend, $A(L)$ is an nth-order lag polynomial and ε_t is a k-dimensional vector of reduced-form disturbances

$\varepsilon_t \equiv \left[\varepsilon_t^{Y}\ \varepsilon_t^{CPI}\ \varepsilon_t^{M3}\ \varepsilon_t^{r}\ \varepsilon_t^{NEER}\right]'$ with $E(\varepsilon_t)=0$, $E(\varepsilon_t\varepsilon_t')=\sum_\varepsilon$, $E(\varepsilon_t\varepsilon_s')=0$ for $t \neq s$.

Equation (9) is transformed from the reduced form-model into a structural model by pre-multiplying it by the (kxk) matrix A_0 to yield:

$$A_0 X_t = A_0 \alpha_0 + A_0 \alpha_1 t + A_0 A(L) X_{t-1} + B \nu_t \qquad (10)$$

Where $B\nu_t = A_0\varepsilon_t$ describes the relation between the structural disturbances ν_t and the reduced form disturbances ε_t. Using the AB model we know that the structural disturbances ν_t are uncorrelated with each other, that is, the variance-covariance matrix of the structural disturbances Σ_ν is diagonal. The matrix A_0 describes the contemporaneous relation among the variables in the vector X_t.Without restrictions on the parameters of A_0 and B the structural model is not identified. In this paper identification is by way of recursive approach.

4.4.1 *Identification Scheme*

The study uses the recursive identification scheme, which requires that the B matrix in Equation (10) be restricted to a k-dimensional identity matrix, and A_0 to a lower triangular matrix with unit diagonal, which implies the decomposition of the variance-covariance matrix of the form given in equation (11).

$$\Sigma_\varepsilon = A_0^{-1}\Sigma_\nu (A_0^{-1})' \qquad (11)$$

This decomposition is obtained from the Cholesky decomposition $\Sigma_\varepsilon = PP'$, by defining a diagonal matrix D, which has the same diagonal as P and by specifying $A_0^{-1} = PD^{-1}$ and $\Sigma_v = DD'$, that is, the elements on the main diagonal of D and P are equal to the standard deviation of the respective structural shocks. In this regard, given a k-variable model there are $k!$ possible orderings.

In our specification, real output is ordered first, CPI ordered second, money stock ordered third, short-term interest is ordered fourth, nominal effective exchange rate is ordered fifth and, stock market index is ordered last. Thus the relation between the reduced form disturbances ε_t and the structural disturbances v_t takes the following form given in equation (12).

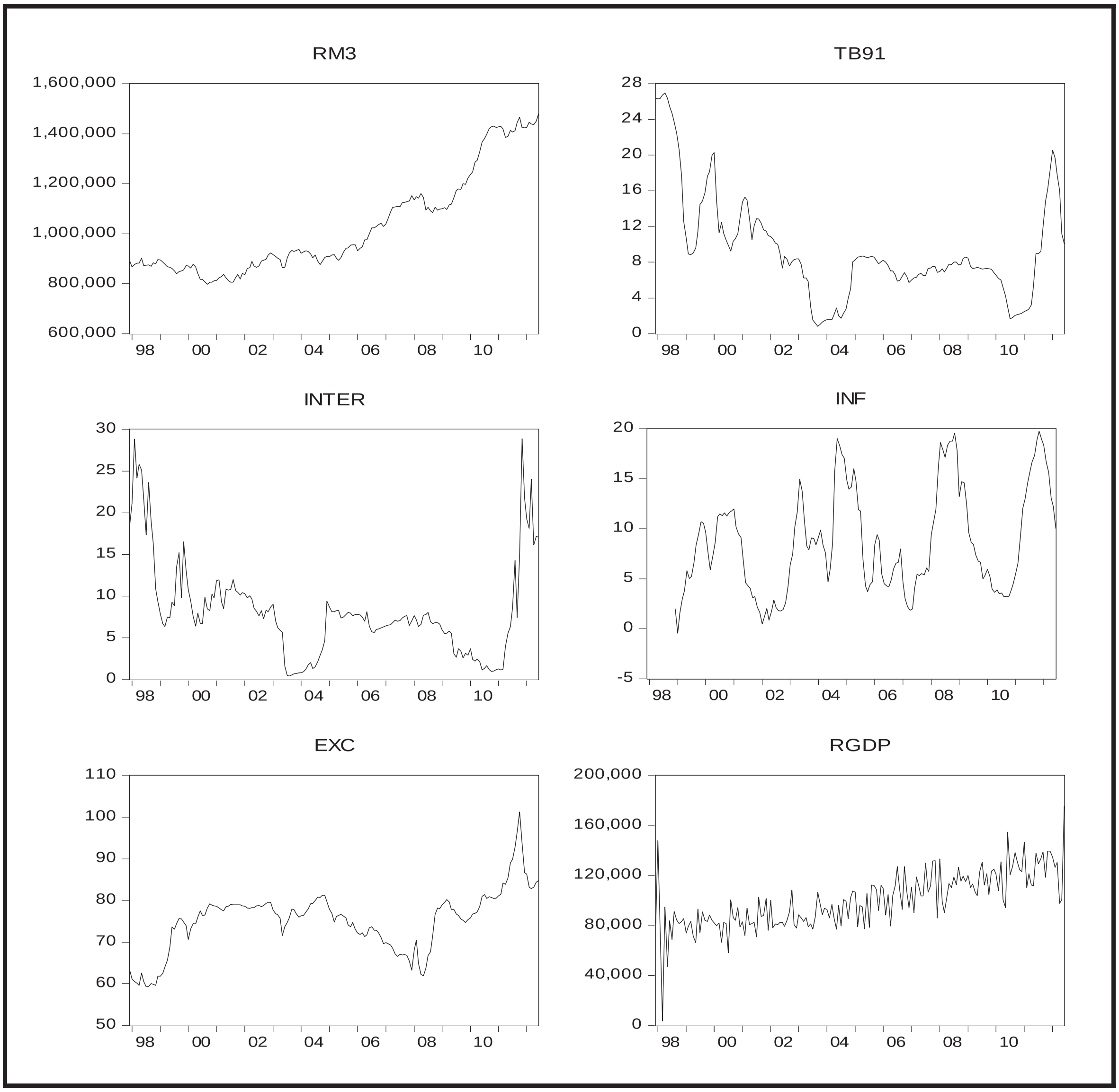
$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ -\alpha_{21} & 1 & 0 & 0 & 0 \\ -\alpha_{31} & -\alpha_{32} & 1 & 0 & 0 \\ -\alpha_{41} & -\alpha_{42} & -\alpha_{43} & 1 & 0 \\ -\alpha_{51} & -\alpha_{52} & -\alpha_{53} & -\alpha_{54} & 1 \end{bmatrix} \begin{bmatrix} \varepsilon_t^{Y} \\ \varepsilon_t^{CPI} \\ \varepsilon_t^{M3} \\ \varepsilon_t^{r} \\ \varepsilon_t^{NEER} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} v_t^{Y} \\ v_t^{CPI} \\ v_t^{M3} \\ v_t^{r} \\ v_t^{NEER} \end{bmatrix} \qquad (12)$$

This particular ordering has the following implications: (i) Real GDP does not react contemporaneously to shocks from other variables in the system. (ii) CPI does not react contemporaneously to shocks originating from all factors except real GDP. (iii) money stock (M3) does not react contemporaneously to real GDP but is affected contemporaneously by short-term interest rate, nominal effective exchange rate (iv) the interest is affected contemporaneously by all shocks in the system, except those from the nominal effective exchange rate (v) nominal effective exchange rate is affected contemporaneously by all shocks in the system.

4.5 Data and Sample Characteristics

The data used in this study is obtained from the Kenya National Bureau of Statistics (KNBS) and the Central Bank of Kenya (CBK). All the variables are in monthly frequency. However, data on real GDP is normally reported on quarterly frequency but we have interpolated the data to obtain the monthly GDP series. In addition, we have de-seasonalised real GDP and real money supply using the X-12 ARIMA framework in view of the seasonal pattern exhibited by these variables. Figure 5 shows the variables used in this study. Looking at these variables it is possible to see that they are not stationary.

Figure 1.5: Variables used in the study



Formal unit roots tests are also conducted to ascertain the order of integration of the variables. The results of the Augmented Dickey-Fuller (ADF) unit roots test are reported Table 1. As shown in the table, all the variables are non-stationary in levels and become stationary after first differencing, that is, they are integrated of order 1.

Table 1.1: Unit root tests

Variable	Level	First Difference
Inf	-0.811165	-7.990280
exch	0.794748	-9.803338
Inter	-1.672185	-15.90195
Rm3	3.291151	-11.00106
Rgdp	-0.942666	-23.08209
cpi	9.528882	-6.568446
Tb91	-0.954899	-7.300139
M3	14.78976	-6.994651
Test critical values: 1%: - 2.579315; 5%: -1.942805; 10%: -1.615400		

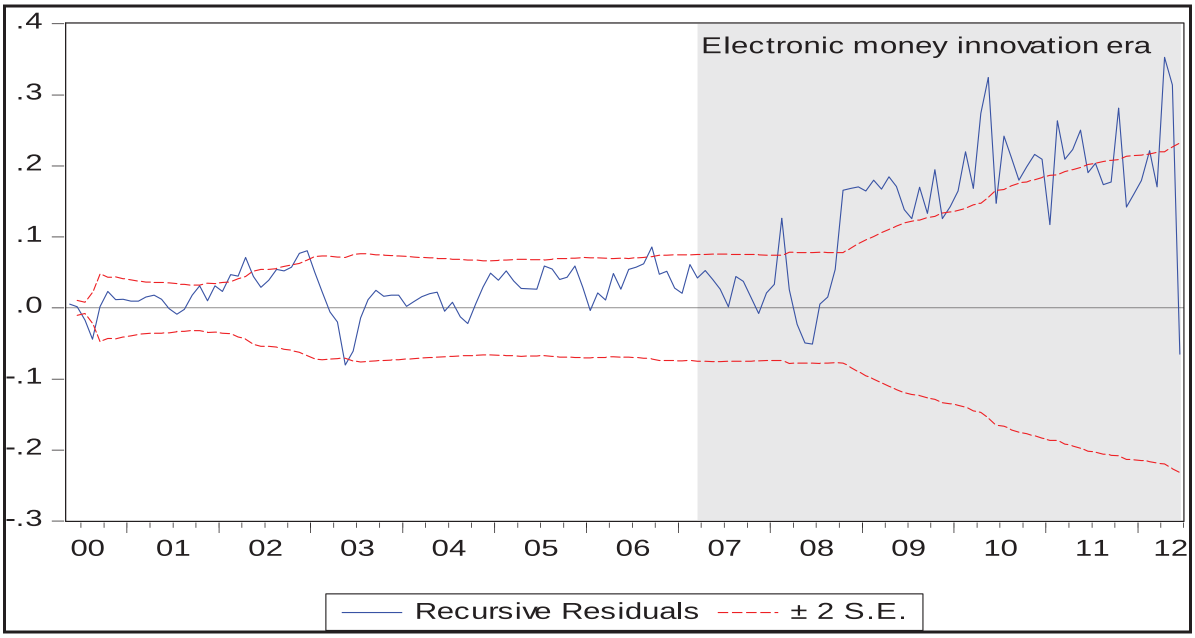
5.0 Empirical Results

In this section we seek to show the effect of financial innovations on monetary policy. This is done by (i) checking its effect on the stability of the money demand function (ii) conducting monetary policy experiments to establish if the innovations have impacted on the transmission of monetary policy.

5.1 Stability of Velocity, Money Multiplier and the Money Demand in Kenya

In their paper titled 'The implication of innovations in the financial sector on the conduct of monetary policy in East Africa 'Weil, Mbithi and Mwega (2012), notes that electronic money has implications on the measurement of monetary aggregates and monetary policy. As shown by Gurley and Shaw (1960) financial innovations lead households and firms to economize on money holdings. In Kenya a number of financial innovations have emerged including electronic money. It is therefore possible that these innovations have impacted on the key monetary indicators. Studies conducted on Kenya in the 1980s and 1990s (see Durrat 1985; Mwega, 1990; Adam, 1990) shows that money demand was stable at the time. However, following the financial innovations of the late 1990s and 2000s recent studies have established that demand function has become unstable (see Sichei and Kamau, 2012; Weil, Mbithi and Mwega, 2012). So the issue of the instability of money demand is not in contention. In this Section we present a final output from our estimation to confirm these findings[1]

Figure 1.6: Recursive estimates of the money demand



We also seek to briefly highlight the evidence of the instability of the money demand function. In the literature there is a number of ways in which the stability of money demand is established. The most commonly used method is using recursive estimates on the money demand function. Using this framework as shown in Figure 4.2 the money demand function in Kenya appears to be unstable. Notably the period 2000 to 2007 the demand function appears to have been relatively stable. However, during the period 2007 to 2012, it appears that the money demand function is not stable. This period coincides with the period when the electronic money was introduced in Kenya. The instability of the money demand function has consequences on the conduct of monetary policy. The instability of the money demand function means that the current monetary policy framework, guided by the assumption of a stable demand for broad money is not consistent with monetary theory. The instability of the money demand function suggests that the central bank has no full control of the money supply process

1 Here we do not seek to dwell on the rigorous estimation processes of the money demand equation. However we have estimate a standard money demand equation as a function of real income, interest rate (91 day Treasury bill rate and exchange rate. We have reported the recursive estimates to show the instability of the money demand to confirm available evidence.

which makes it problematic to steer reserve money with a view to creating monetary conditions that are consistent with the objective of price stability.

5.2 Transmission of Monetary Policy

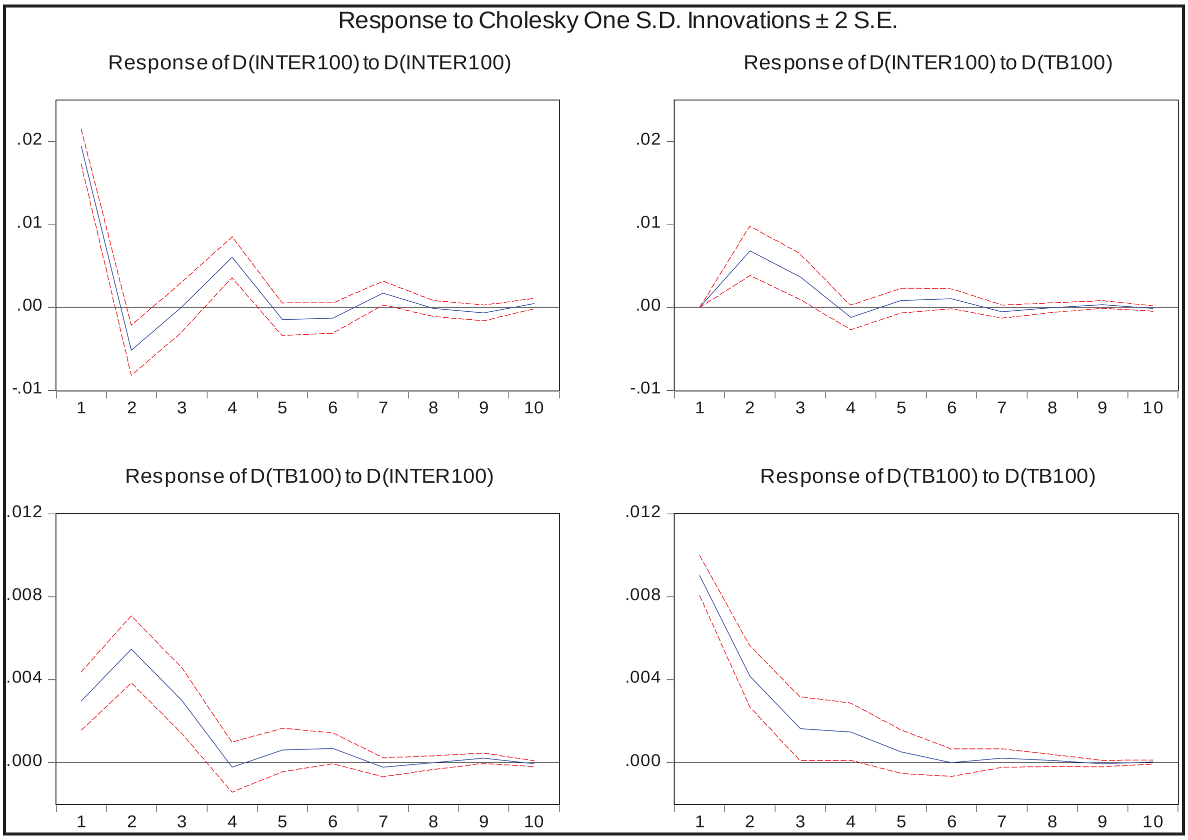
The next question to be asked is whether or not the innovations, having impacted on the stability of the money demand, have a bearing on the transmission of monetary policy in Kenya. In this regard we test this using the VAR framework covering the period December 1997 to June 2012. We conduct 3 experiments. Using the standard variables i.e. real GDP, CPI, money supply, interest rate and exchange rate we run three VARs as follows (1) December 1997- June 2012 to cover the entire sample period (2) December 1997 – February 2007 to cover the period before the electronic money was introduced (3) March 2007 – June 2012 to coincide with the period when the electronic money was in use. This in our view will bring out differences, if any, of financial innovations on the effectiveness of monetary policy. We accomplish this by (i) investigating the interest rate pass-through (ii) transmission to the real sector.

5.2.1 Interest Rates Pass-through

Here we focus on how monetary policy rate impacts on the other rates. In this regard we formulate a VAR with 2 variables namely the interbank rate (monetary policy rate) and the 91 day Treasury bill rate. We are aware that the Central Bank of Kenya uses the Central Bank Rate (CBR) to signal other rates. However, data on the CBR is not available in a consistent manner and therefore we have opted to show the transmission in relation to the movement from interbank rate to the Treasury bill rate.

In the full sample case, own shock of interbank rate raises interbank rate by 2 percent and it lasts for a period of 1 month. The interbank shock has a significant effect on the 91 day Treasury bills rate. The 91 day Treasury bill rate rises by approximately 0.5 percent and lasts for a period of 3 months.

Figure 1.7: Impulse Response Functions



However, in the sub-sample (1997- 2007) the innovation from the interbank raises the interbank rate by 1.5 percent while it lasts for 1 month as well. The same shock impacts on the 91 day Treasury bill rate by increasing it by 0.7 percent and it takes 3 months to die. In the period after March 2007, when the financial innovations were in place, it is shown that a shock from interbank has an impact on the Treasury bill rate. However, it takes 1 month for the shock to be significant on the 91 day Treasury bill rate and the effect lasts 2 months i.e the 2nd month to the 3rd month. The maximum effect is found in the second month where the 91 day Treasury bill rate rises by 0.4 percent.

Figure 1.8: Impulse response functions

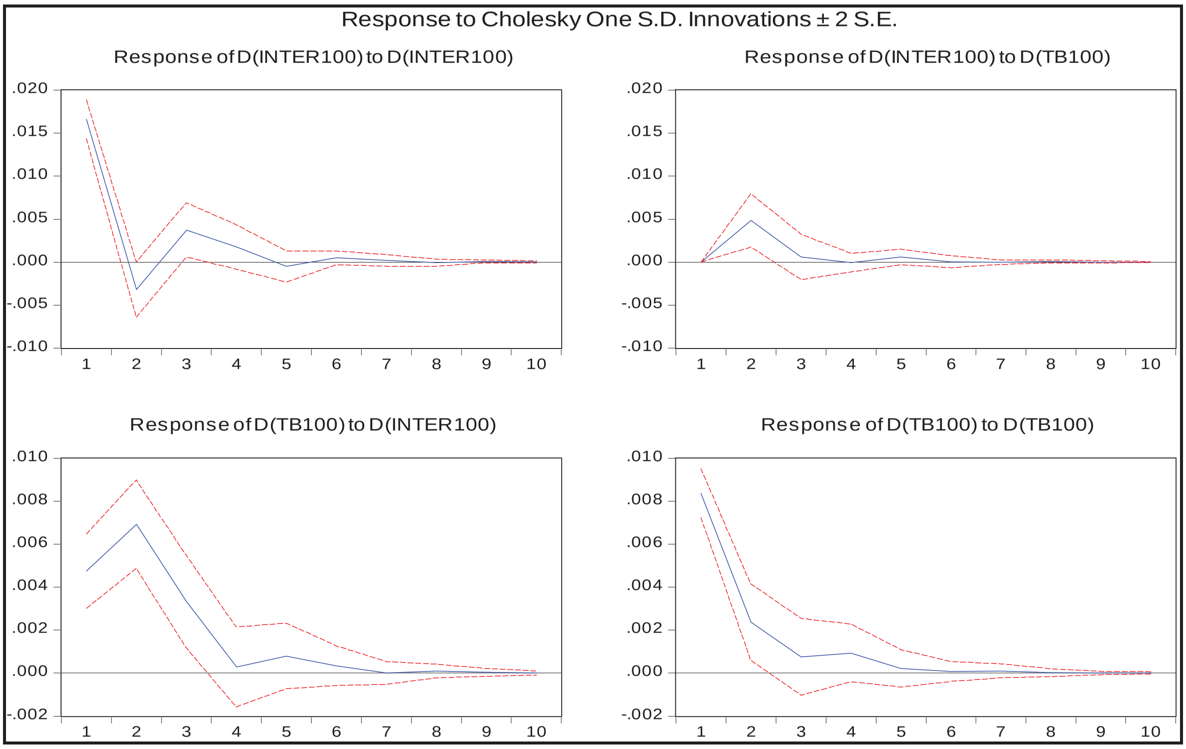
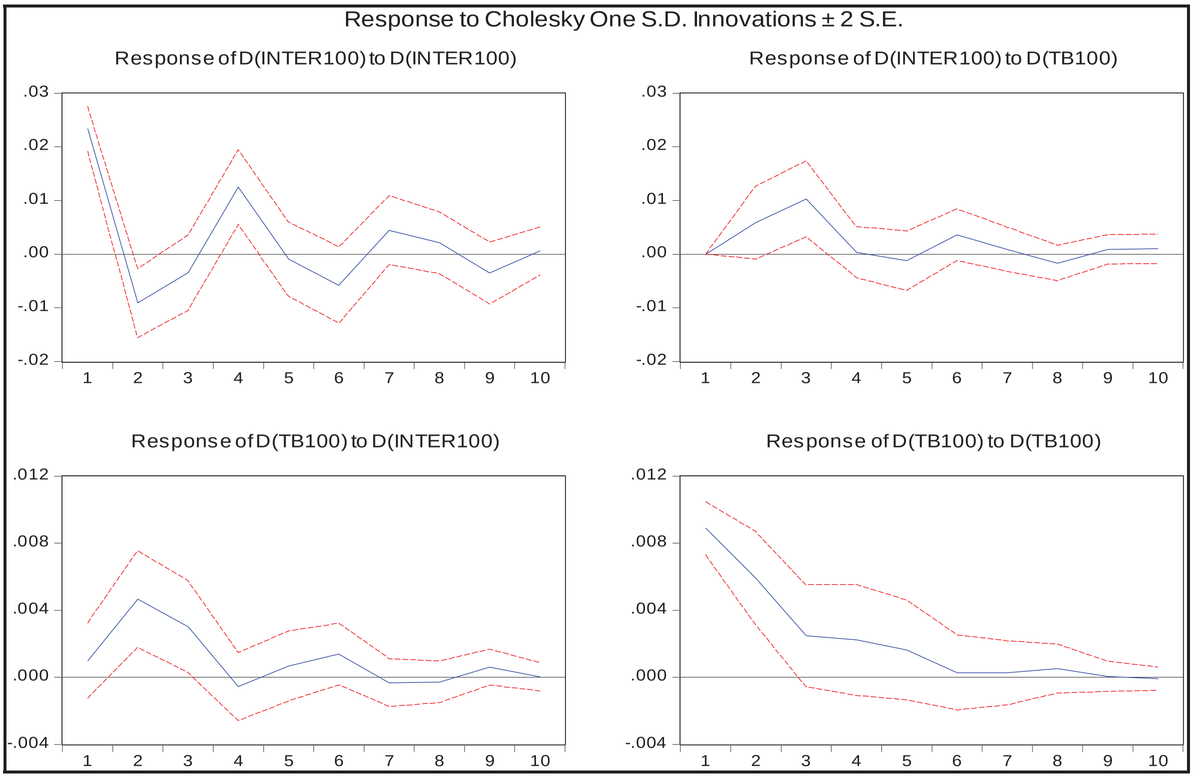


Figure 1.9: Impulse response functions



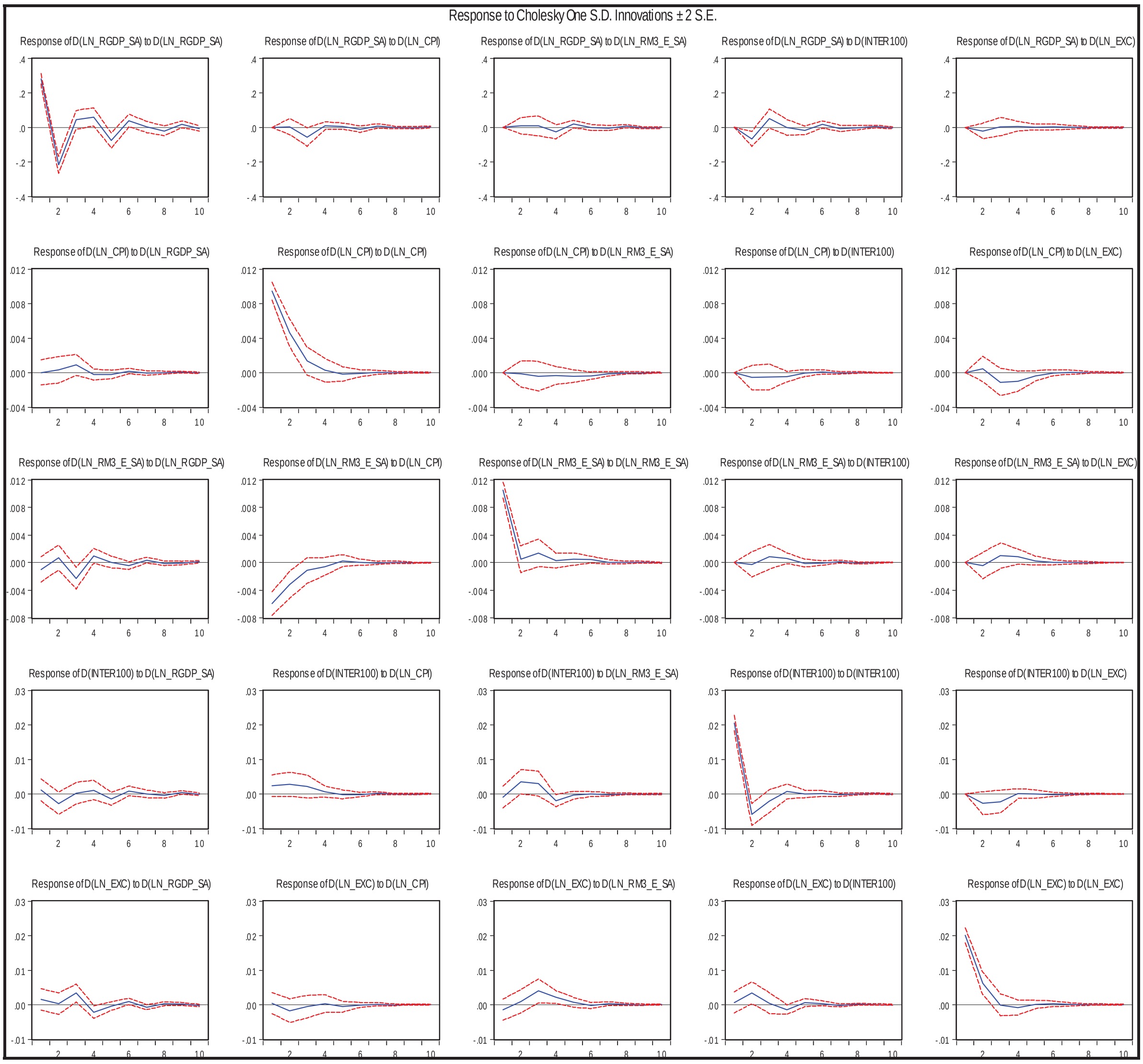
These findings suggest that during the period before innovations were introduced, the Treasury bill rate could response immediately to the monetary policy shock (interbank shock) and the effect could last 3 months. However, under the financial innovations regime, the effect of the shock shows up in the Treasury bill rate with a lag of 1 month and lasts for 2 months. In addition, before the innovations where introduced the 91 day Treasury bill rate responded by a bigger magnitude compared to the period after the innovations where in place.

5.2.2 Transmission to the real sector

To test the effect of monetary policy on the real sector we follow the standard approach where the following variables are used in the VAR: real GDP, CPI, real money supply, short term interest rates (91 day or interbank rate) and the exchange rate. Here we then conduct three experiments viz. the full sample (1997-2012); sub-sample (1997-2007) and sub-sample (2007-2007). The impulse response functions obtained from here are shown in Figures 4.7-4.9. Figure 4.7, shows the impulse response functions of the 5 variables used in the model. Because the exercise is menant to show the response of key real sector variables to a monetry policy shock we therefore restrict our discussion to those responses that relate to monetry policy.

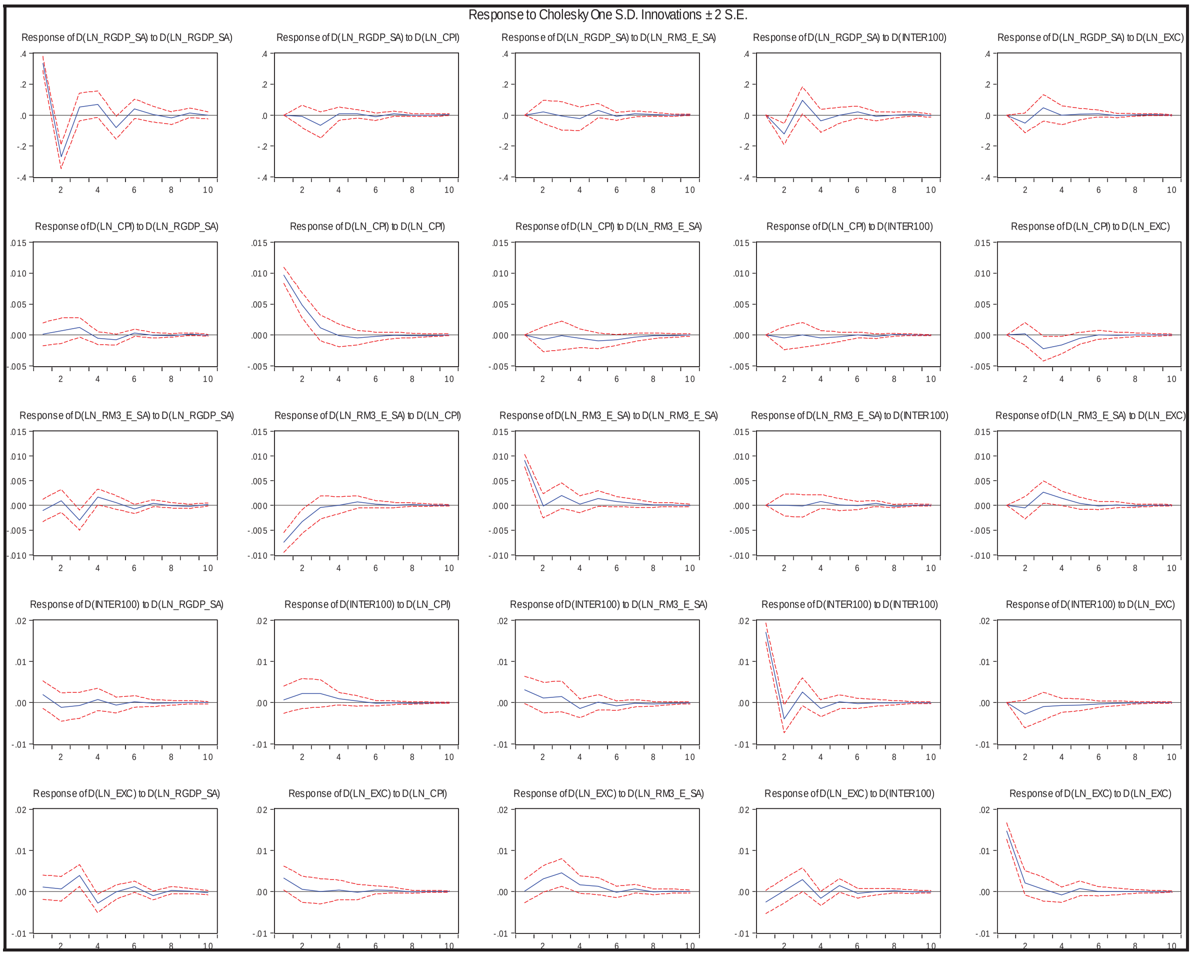
In the full sample a monetry policy shock appears to have a signifcant effect on the real output. The effect of the shock appears to last for up to 2 months before it dies out. In the period up to 2007, a monetry policy shock had a significant effect on the real output. The monetary policy shock causes the real output to decline reaching the lowest decline in the second month. However, after the second month the effect dies out. During the period 2007-2012 the response of the real GDP to monetra policy shock appears to be insignificant. Suggesting that during the period of financial innovation, the real output does not appear to repond meanifully monetray policy shocks.

Figure 1.10: Impulse Response Functions



During the entire period it is shown that the effect of monetry policy in impacting the price level is quite weak. Partitioning the sample into the period before the financial innovations were introduced and the period after does not show any meaningful differences. This therefore suggests that with or without financial innovations the effectiveness of monetry policy in infuencing price level is quite limited. This finding is intuitive because in kenya inflation is caused by a number of factors most of which the central bank has little or no control over.

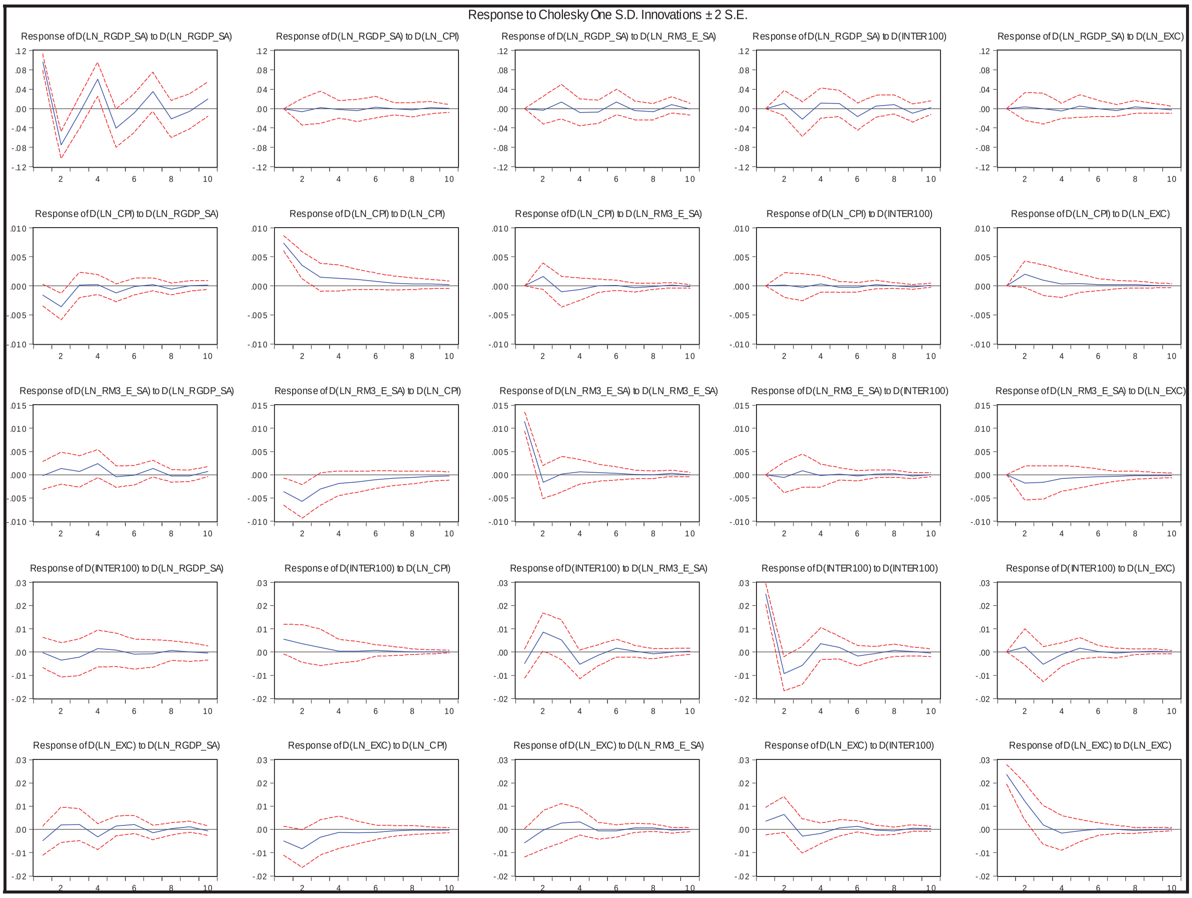
Figure 1.11: Impulse Response Functions



During the entire period it is shown that a monetry policy shock appreciates the exchange rate[2]. However, it takes one month for the effect to show up. The effect of the monetary policy shock becomes signficant in the 2nd month and dies in the same month. During the period before financial innovations were introduced the effect of monetry policy on exchange rate is similar to that of the full sample. However, during the period after 2007, the effectivess of monetray policy at influenecing exchange rate is also not significant.

2 Exchange rate is defined as US$ per Ksh.

Figure 1.12: Impulse Response Functions



6.0 Conclusions

This paper investigates the effect of financial innovations on the conduct of monetary policy in COMESA countries. It observes that most COMESA countries have discarded direct monetary instruments such as credit controls, interest rate ceilings; and sometimes directed credit and began moving toward full reliance on indirect instruments, such as open market operation, Rediscount facilities, and reserve requirements. The greater use of indirect monetary instruments can be seen as the counterpart in the monetary area to the wide spread movement toward enhancing the role of price signals in the economy more generally. However, the monetary policy environment has been complicated by the realization the money demand function is unstable in a number of countries in the region. One of the reasons for this is the rapid growth of financial innovations which have been introduced such as ATMs, credit and debit cards. In addition, the electronic money has complicated the conduct of monetary policy.

References

Abdel-Baki, M. (2010). Alterations in monetary transmission mechanism in Egypt in the wake of the triple-F crisis, *Investment Management and Financial Innovations*, Vol. 7, No.2, pp. 217-227.

Al-Laham, M. Al-Tarawneh, H. and Abdallat, N. (2009). Development of electronic money and its impact on the central bank role and monetary policy, *Issues in Informing Science and Information Technology*, Vol. 6, pp. 339-349.

Allen, F., Santomero, A.M. (2001). What do financial intermediaries do? *Journal of Banking and Finance*, 25, 271-294.

Arrau, P. and De Gregorio, J. (1993). Financial innovation and money demand: Application to Chile and Mexico, *The Review of Economics and Statistics*, Vol. 75, No.3, pp. 524-530

Awad, I. (2010). Measuring the stability of the demand for money function in Egypt, *Banks and Banking Systems*, Vol. 5., No., 1, pp. 71-75.

_____ '(2008). Switching to the inflation targeting regime: the case of Egypt, *East West Journal of Economics and Business*, Vol. X1, No. 1 & 2, pp. 106-131.

Bahmani-Oskooee, M. and Abera, G. (2009). How stable is the demand for money in African countries, *Journal of Economic Studies,* Vol. 36, No. 3, pp. 216-235.

Boot.A.,Thakor.A (1997), Banking Scope and Financial Innovation, *Review of Financial Studies*, (10) 1099-1131

Buzzacchi, L., Colombo, M.G., Mariotti, S. (1995). Technological regimes and innovation in services: the case of the italian banking industry, *Research Policy*, 24, 151-168.

Cargill & Garcia, "Financial Reform in the 1980s", Stanford, Hoover Ins. Press, 1985

Centre for the study of African economies (2012). Financial Architecture and the Monetary Transmission Mechanism in Tanzania. CSAE Working Paper WPS/2012-03

Cevik, S. and Teksoz, K. (2012). Lost in transmission?: The effectiveness of monetary policy transmission channels in the GCC countries, *IMF Working Paper*, WP/12/191.

Chirinko, R. and Dorsey, F. (1996). Financial innovations, money demand and disaggregation: Some *time series evidence*, RWP, No. 96-06

Cho, D and Miles, W. (2007). Financial innovation and the stability of money demand in Korea, *Southwestern Economic Review*, Vol. 34, No.1, pp. 51-60

Ebrahim, M.S., Hussain, S. (2010). Financial development and asset valuation: the special case of real estate, *Journal of Banking and Finance*, 34, 150-162.

Edward Kane (1982). Selected Monetary Targets in Changing Financial Innovations, *FRB of Kansas*, Aug 1982

Finnerty, J. D. (1992). An overview of corporate securities innovation, *Journal of Applied Corporate Finance* 4(4):23-39.

Galande, J., Fuente, J.M. (2003). Internal factors determining a firm's innovation behavior, *Research Policy*, 32, 715-736.

Gan Peigen, Kang Shunxin (1989), General discussion of financial innovation and its origin, its influence (in chinese) [J], *Journal of International Financial Research,* (8):62-63

Ghalwash, T. (2010). An inflation targeting regime in Egypt: A feasible option?, *Modern Economy*, Vol.1, No. 2, pp. 89-99.

Hasan, M. (2009). Financial innovations and the interest rate elasticity of money demand in the United Kingdom, 1963-2009, *International Journal of Business and Economics*, Vol. 8, No.3, pp. 225-242.

Hughes, N. and Lonie, S. (2007). M-PESA: Mobile money for the "Unbanked" Turning cellphones into 24-hour tellers in Kenya, *Journal of Innovations: Technology, Government, Globalization*, Vol. 2, No. 1-2, pp. 63-81

Ireland, P. (1995). Endogeneous financial innovation and the demand for money, *Journal of Money, Credit and Banking*, Vol. 27, No. 1, pp. 107-123

James L. Butkiewicz & Zeliha Ozdogan (2008), Financial crisis, monetary policy reform and the monetary transmission mechanism in Turkey, University of Delaware.

Khan, M. and Ahmed, A. (2011). Macroeconomic effects of global food and oil price shocks to the Pakistan economy: A structural vector autoregressive (SVAR) analysis, Available at htt://www.PIDE.org.Pk.

Khemraj, T. (2008). Excess liquidity, oligopolistic loan markets and monetary policy in LDCs, *DESP Working Paper*, No.64

Kovanen, A. (2004). Zimbabwe: A quest for a nominal anchor", IMF Working Paper, WP/04/130

Lungu, M., Simwaka, K and Chiumia, A. (2012). Money demand function for Malawi-implications for monetary policy conduct, *Banks and Bank Systems*, Vol. 7, No.1, pp. 50-63

Masoud, M. (1997). Financial innovations and the interest elasticity of money demand: Evidence from an error correction model, *Antlantic Economic Journal*, Vol. 25, No. 2, pp. 155-163.

McKinnon, R., 1973. Money and Capital in Economic Development. The Brooking's Institution, Washington.

Merton, R.C. (1992). Financial innovation and economic performance*", Journal of Applied Corporate Finance* 4(4):12-22.

Michael K. F and Arnold C. C (2004), Diffusion of off-balance-sheet financial innovations, Information complementarity and market competition. *Pacific-Basin Finance Journal,* (12): 525–540.

Misati, R. et al., (2010). Financial innovation and monetary policy transmission in Kenya, *International Research Journal of Finance and Economics*, Vol. 50, pp. 123-36.

Mishkin, F. (2000). From monetary targeting to inflation targeting: Lessons from industrialized countries, in Banco de Mexico, Stabilization and Monetary Policy: The International Experience (Bank of Mexico: Mexico City, 2002): 99-139.

Mukisa, I. 1998. "The determinants of income velocity of money in Uganda: 1990-1997". MAResearch Paper, University of Nairobi.

Niehans.J. (1983) Financial innovation, multinational banking and monetary policy. *Journal of banking and Finance*,537-551.

Opolot, J. (2007). A re-examination of the demand for money in Uganda: nature and implications for monetary policy, *Bank of Uganda Staff Paper Journal*, Vol.1, No.1, pp. 5-32.

Patrick.V. Managing Product Innovation in Financial Services Firms (2003), *European Management Journal,* 2003 (22):43-50

Porter, M.E. (2004). Competitive strategy, New York edition.

Roberts, P.W. & Amit, R., (2003). The Dynamics of Innovative Activity and Competitive Advantage: The Case of Australian Retail Banking, 1981 to 1995. Organization Science, 14 (2), March-April, 107-122

Rutayisire, M. (2010). Economic liberalization, monetary policy and money demandin Rwanda: 1980-2005, *AERC Research Paper*, No. 193.

Shaw, E., 1973. Financial Deepening in Economic Development. Oxford University Press, London.

Shigeyuki, H. (2008), "Empirical analysis of the money demand function in SSA", *Economic Bulletin*, Vol. 15, No.4, pp. 1-15.

Sichei M. and Kamau A. (2012). Demand for money: Implications for the conduct of monetary policy in Kenya*", International Journal of Economics and Finance*, Vol. 4, No. 8, pp. 72-82

Sims, C., Stock, J. and Watson, M. (1990), "Inferences in linear time series models with some unit roots", *Econometrica*, Vol. 58, No. 1, pp. 113-144.

Singh, P. and Pandey, M. (2010). Financial innovation and stability of money demand function in post-reform, period in India, *Economics Bulletin*, Vol. 30, No. 4, pp. 2895-2905

Subramanian, S. (2009). The Gambia: Demand for broad money and implications for monetary policy conduct, *IMF Working Paper*, WP/09/192.

Suliman, S. and Dafaalla, H. (2011). An econometric analysis of money demand function in Sudan, 1960-2010, *Journal of Economics and International Finance*, Vol. 3, No 16, pp. 793-800.

Viren, M. (1992). Financial innovations and currency demand: Some new evidence, Empirical Economics, Vol. 17, No. 4, pp. 451-461.

Vrolijk, C. (1997). Derivatives effect on monetary policy transmission, IMF Working Paper, WP/97/121.

Woodford, M. (2007). How important is money in the conduct of monetary policy, Journal of Money, Credit and Banking, Vol. 40, No. 8, pp. 1561-1598

Yildirim, H.S., Philippatos, G.C. (2007). Restructuring consolidation and competition in Latin American banking markets, *Journal of Banking and Finance*, 31, 629-639.

Appendices

Appendix 1: Macroeconomic Determinants of the Demand for Money

An increase in	Causes money demand to	Reasons
Price level, P	Rise proportionally	A doubling of the price level doubles the amount of currency needed for transaction
Real income, Y	Rises less than proportionally	Higher real income implies more transactions and thus a greater demand for liquidity.
Real interest rate, r	Fall	Higher real interest rate means a higher return on alternative assets and thus a switch away from money
Expected inflation	Fall	Higher expected inflation means a higher return on alternative assets and thus a switch away from money
Nominal interest rate on money	rise	Higher return on money makes people more willing to hold money
Wealth	Rise	Part of the increase in wealth may be held in the form of money
Risk	Rise, if risk of alternative assets increases. Fall, if risk of money increases	Higher risk of alternative assets makes money more attractive. Higher risk of money makes it less attractive
Liquidity of alternative assets	Fall	Higher liquidity of alternative assets makes these assets more attractive
Efficiency of payment technologies	Fall	People can operate with less money

Chapter 2

Effectiveness of Monetary Policy in Malawi: Evidence from a Factor Augmented Vector Autoregressive Model

By Austin Chiumia

1.0 Introduction

After decades of pursuing various macroeconomic policy frameworks, Malawi still remains in the grip of severe macroeconomic instability. Real GDP growth has equally been volatile and relatively low, averaging around 4.3 percent over the same period. Inflation has remained high and volatile, averaging around 20 percent since 1990. The fact that, inflation has remained stubbornly volatile prompts the question of whether the current monetary policy framework is indeed effective.

Malawi started to actively use Monetary Aggregate Targeting (MAT) in the early 1990s, when the structural and political adjustments were being implemented and a flexible exchange rate system was commissioned (1994). Monetary aggregate targeting involves the use of reserve money growth as an operational target to influence broad money supply, which is the intermediate target. These targets must ultimately be consistent with the inflation target. Major assumptions in the implementation of the MAT framework are the stability of money demand and money multiplier. These conditions enable the pass-through of changes in reserve money aggregates to monetary aggregates and target variables (price and GDP). In their absence, the framework becomes ineffective.

The Reserve Bank of Malawi's main objective is to formulate and implement monetary policy aimed at achieving and maintaining stability in the general level of prices in order to achieve desired growth rates. In recent periods, concerns have been raised about the effectiveness of monetary policy due to eminent inability to deal with inflationary episodes. Furthermore the sources of inflation in LICs are largely supply rather than demand driven. These have called into question whether the active use of the policy rate to combat supply driven inflationary pressure is a correct approach. These issues are also reflected in diverse findings on monetary policy effectiveness in Malawi.

In recent periods, there have been concerns from various researchers regarding the effectiveness of monetary policy in Malawi. Ngalawa (2011), Mangani (2012) and Mangani (2013, unpublished) use the Vector Auto Regressive frameworks and find evidence of price puzzles. These counterintuitive results can arguably be attributed to methodological issues. Sims (1992) argues that the price puzzles result from imperfectly controlling for some factors in the VAR models. Specific factors pertaining to low income countries are adverse terms of trade, agriculture dependence, fiscal dominance and huge supply side shocks, which result in structural breaks in data.

The environment for monetary policy in Malawi has also undergone fundamental transformation. At the same time, the economy is profoundly different from those of emerging market and advanced countries, with, among other features, a much smaller financial sector, a high incidence of supply shocks, and a large share of food in consumption. These features and the perceived failure of monetary policy to deal with inflation, calls for interrogation on whether the policy instruments are effective within alternative modelling framework.

The study contribute to the current monetary policy debate on appropriateness of money or interest rate based monetary policy anchors by re-examining the monetary policy transmission mechanism in Malawi using a Factor Augmented VAR. The rest of the paper is structured as follows. Section 2 provides a brief background of the Malawian economy. Section 3 discusses theoretical as well as empirical literature on monetary policy effectiveness with specific reference to Malawi. Section 4, lays out the VAR modelling framework, the Principal Component Analysis and the FAVAR implementation framework. Section 5 presents and discusses results, and finally, section 6 concludes and provides implications for policy.

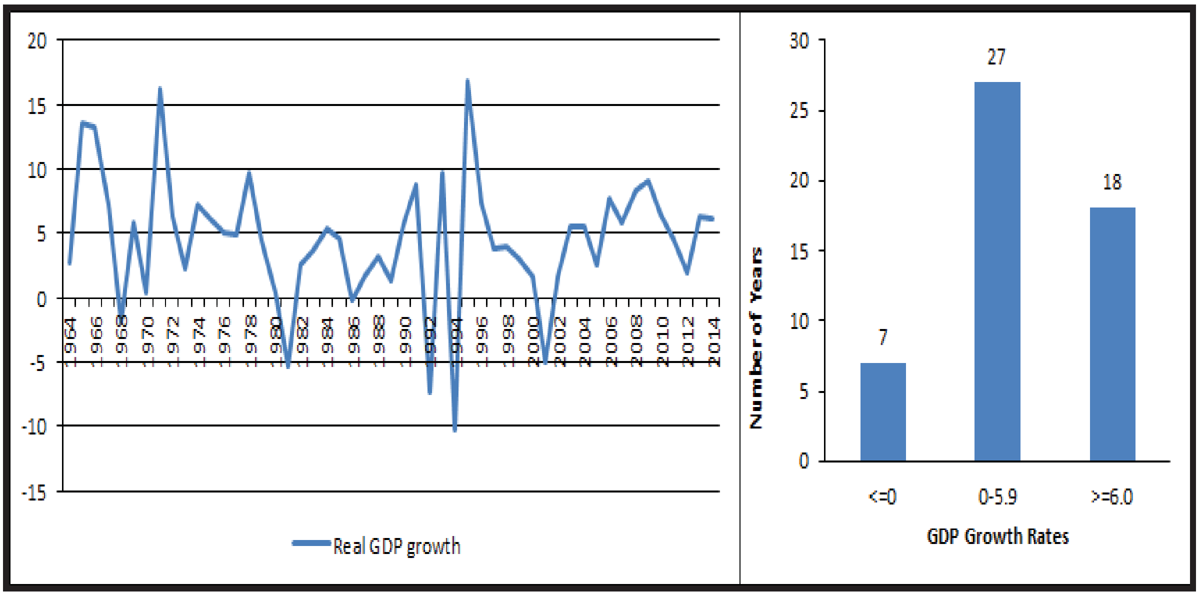
2.0 Features of the Malawian Economy

Malawi is a small open land locked economy with gross domestic product estimated at US$5.8 billion, equivalent to per capita income of US$380. The country mostly exports raw materials, with tobacco alone generating over 60 percent of the country's foreign exchange. The country's key imports include fertilizer, fuel and pharmaceuticals. About 72 percent of the agricultural output is produced by the smallholder sector, while the balance is from estates. Manufacturing output is mostly derived from agro-processing. Up to 40 percent of the country's revenue is financed by donors, leaving the country susceptible to changing donor approaches to budget support.

Real GDP growth has been low and quite volatile. The major contributor to economic growth is agriculture, which by its nature exposes the economy to volatility, given its dependence on rainfall and international commodity price developments. Although still remaining the largest, the contribution of agriculture to overall GDP has however shrunk from 35 per cent in 2002 to around 28 per cent in 2010. Over the same period, the wholesale and retail sector, which is the second largest sector, grew from 15.5 per cent to 20.7 per cent (See appendix vii).

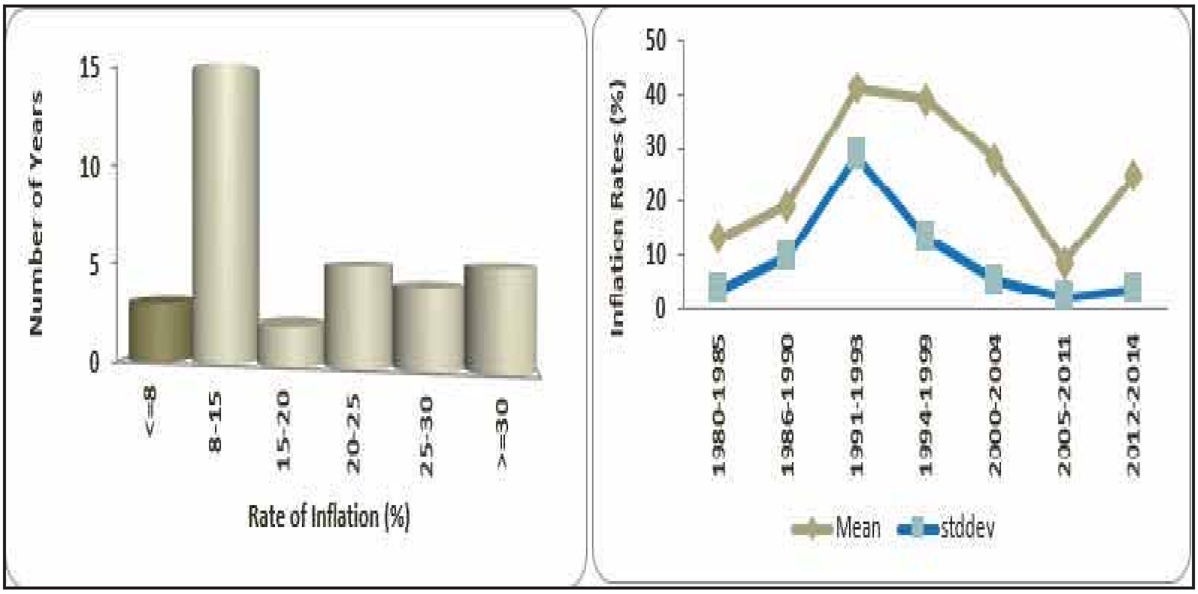
A review of inflation developments shows that inflation rate has remained stubbornly high and volatile. Figure 2 however shows that inflation variability has trended downwards since 1994. One major characteristic of the period after 1994 is the initial introduction of seed starter pack programme which was later, in 2004, scaled up to a full input subsidy programme. This helped to raise food production and reduce food inflation which together with a defacto exchange rate peg to the US dollar (despite being a dejure managed float system) yielded substantially lower inflation rates. From 2013, the weight of food inflation in the overall Consumer Price Index Basket was reduced from 58.1 percent to 50.1 percent. This revision in part reflects successful rising consumption of non-food items.

Figure 2.1: Real GDP Growth Rates



Source: National Statistics Office

Figure 2.2: Inflation Variability



Source: National Statistics Office

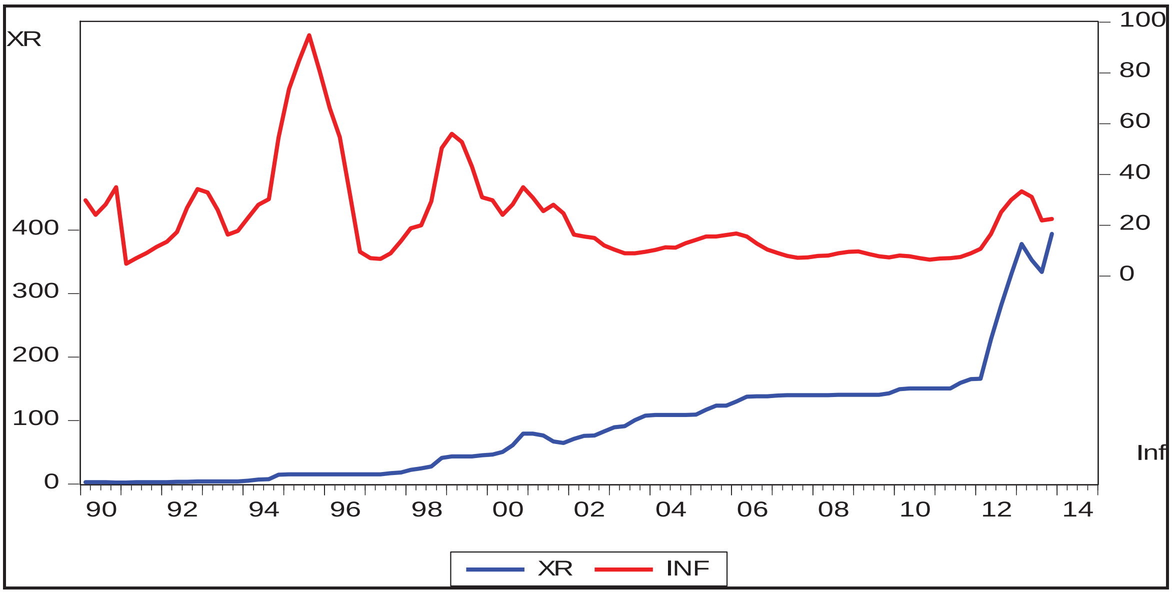
Exchange rate behaviour displays large seasonal patterns appreciating during harvest period and depreciating during lean periods and reflects the country's dependence on commodity exports for foreign exchange earnings. The fact that Malawi mostly exports raw materials makes it captive to movements in international prices. Furthermore the consumption and production patterns largely rely on imports. With the wholesale and retail sector gaining ground, it can be expected that demand for foreign exchange will continue surpassing supply in the near term. Donor inflows in the form of budgetary and project support provide alternative and substantial source of foreign exchange inflows. While helping to appreciate the currency, the resulting liquidity injections alongside those created from fiscal impulses have been a source of continuous threats to inflation. This international trade pattern alongside dependence on donor inflows have led to several exchange rate policy reversals (see appendix Vi).

Figure 3 displays the trend in the MK/US$ exchange rate during the period 1990 – 2013. Pressure on the kwacha strengthened after its flotation in February 1994, leading to persistent depreciation. Authorities unequivocally opted to fix it at about MK139/US$ in May 2006. This decision was costly given the limited foreign reserves available to the country. Responding to the persistent pressure on foreign exchange reserves, the kwacha was allowed to weaken and was selling at K151.5/US$ by end January 2010. It remained around that level until August 2011 when it was devalued by 10 percent. Malawi suffered from a decline in global tobacco prices in 2011. This together with withdrawal of budgetary support due to disagreement over economic management policies resulted in substantially low reserves of around 0.5 months of official import cover.

The country could no longer import to sustain previous levels of consumption and production. Capacity utilisation reduced to as low as 54% (RBM 2012 Inflation Expectations Survey). The Kwacha traded at a premium of over 80% on the parallel market. As a result, the authorities devalued the currency by 49 percent in early May 2012 and immediately floated it. Following this, inflation which remained quite low for long period increased from 12.4 percent in April 2012 to 29.7 percent in December 2012 due to the high pass-through effect.

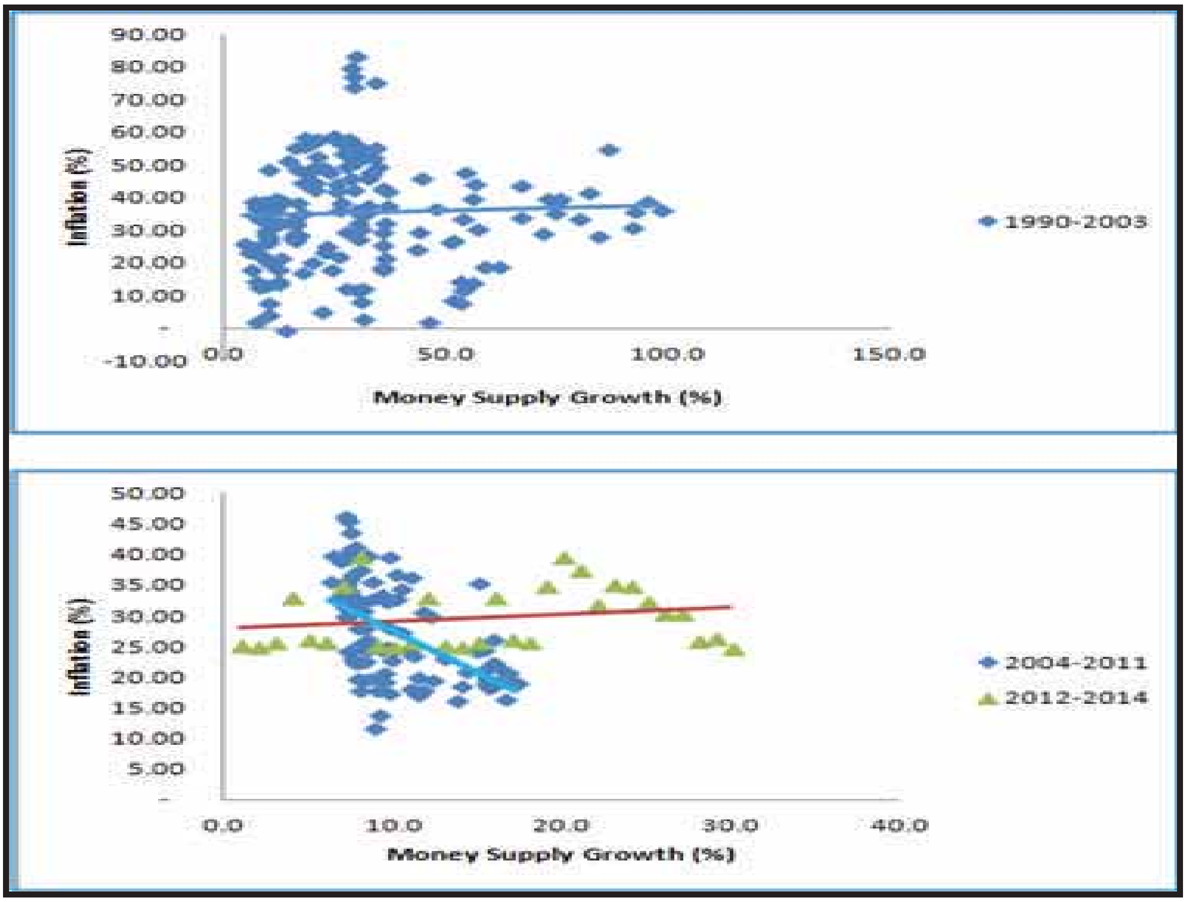
Monetary and exchange rate policy reversals have characterised the economy since 1990. Policy reversals are reflected in Figure 4, where the positive correlation between money supply and inflation as proposed by Fischer is observed between 1990 and 2003, and between 2012 and 2014, but disappears between 2004 and 2011. Contrary to the implications of Fisher's equation, this declining trend in inflation rates correlates with significant growth in money supply in some years with a very noticeable break down between 2004 and 2011. This break down could be owed to a defacto exchange rate system that the country was pursuing and fiscal dominance over monetary policy.

Figure 2.3: Exchange Rate and Inflation DevelopmentS



Source: Reserve Bank of Malawi

Figure 2.4: Money Supply and Inflation-1990-2014

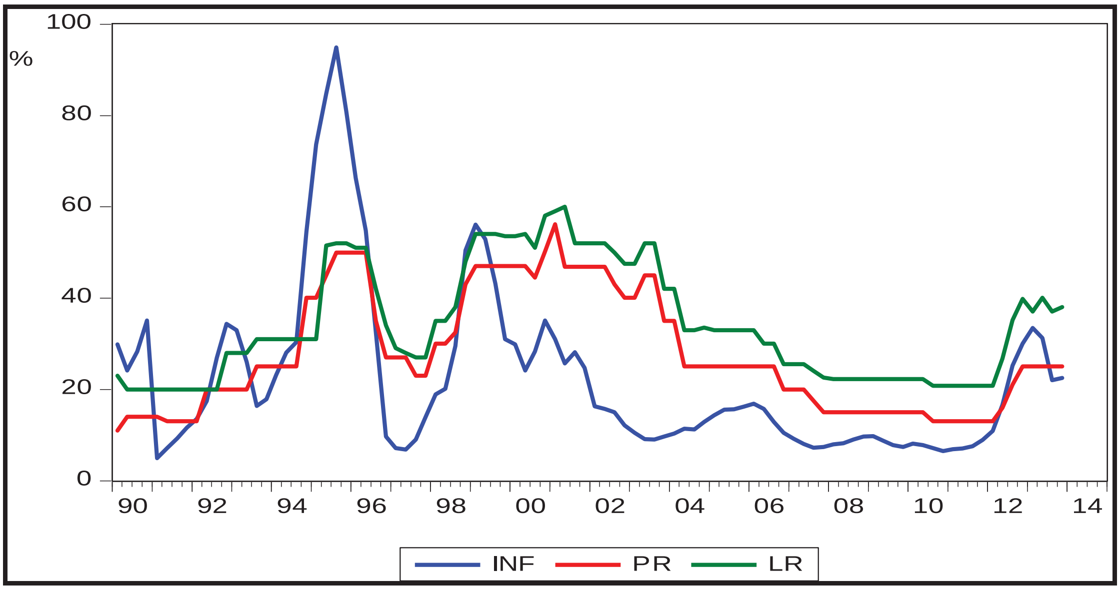


Source: Authors' Calculation

There is high level of domestic debt arising from persistent fiscal deficits. This has resulted in institutionalization of fiscal dominance. Initially this occurred alongside high external debt accumulation, which was written down by US$3.2 billion in August 2006 when the country reached a HIPC completion point. Fiscal deficits relate to fiscal dominance as they reflect government financing requirements from the domestic financial market. Additionally, treasury and open market operations may be competing in similar segments of the yield curve, bidding interest rates up" (Coates and Rivera, 2004).

Until 2012, Malawi had enjoyed a decade of declining inflation and progressive lowering of interest rates. As long as inflation was declining, it was in the interest of monetary authorities to reduce interest rates to aid the growth process. However, growth was largely driven by peasant agriculture, which did not generate the foreign exchange necessary given the country's dependence on imports. Interest rate levels were arguably not sustainable and were reversed in May 2012 as inflationary pressure and macroeconomic imbalances grew.

Figure 2.5: Inflation and Interest Rate Devlopments



Source: Reserve Bank of Malawi.

3.0 Monetary Policy

After independence in 1964, the conduct of monetary policy in Malawi was through direct instruments, in the form of credit ceilings and quotas, interest rate caps, directed lending to candidate sectors, among others. These controls were ostensibly designed for agents who engaged in the agriculture sector as a way of empowering the peasant natives. The Reserve Bank of Malawi (RBM) Act was repealed in 1989, in a way giving the RBM legal independence. Prior to repealing the act, the RBM was subordinated to the Treasury. During the same period, there was evident failure of an activist monetary policy through direct instruments as evidenced by widening domestic and external imbalances. In line with structural adjustment programmes which commenced in 1989, attempts to dismantle control regimes, liberalize foreign exchange markets and establish more robust fiscal frameworks (often in the context of IMF-supported stabilization programmes) commenced. This opened up space for indirect monetary policy instruments to function. Consequently in 1994, the country started to actively pursue monetary aggregate targeting.

The mandate of the RBM is to influence money supply, availability of credit, interest rates and the exchange rate in order to promote price stability, economic growth and a sustainable balance of payments position (Part III (1)(d) of the Reserve Bank of Malawi Act 1989). Kwalingana (2007) observes that implementing such a broad mandate could be practically challenging, since some of the policy objectives could be in conflict with each other. Certainly some objectives may not be directly achievable solely through the central bank's monetary policy operations. To operationalize these broad policy objectives in the short to medium term, it has become conventional for the Bank to consolidate them and focus on price stability. The RBM therefore set price stability as its measurable monetary policy objective with a view that achieving this would serve as a prerequisite and the foundations for sustainable balance of payments position as well as GDP growth.

3.1 Monetary Framework and Policy Instruments

A monetary policy framework guides the central bank in formulating and implementing monetary policy in order to deliver on its mandate. It represents institutional arrangement within which monetary policy is formulated and implemented. There are four major types of frameworks, namely, direct targeting of interest rates, credit or prices; monetary aggregates targeting; exchange rate targeting, and inflation targeting[3]. Theory and evidence show that the choice of monetary policy framework for any particular country is a function of diverse factors. Kasekende (2010) observes that in Africa, there are 18 countries pursuing

3 For detailed discussion of various policy framework see Mishkin (1998),

monetary aggregate targeting (MAT), 23 countries pursuing exchange rate targeting while about 6 are either actively pursuing or seriously considering migrating to inflation targeting.

The pursuit of MAT with reserve money (RM) as an operational target is based on Fischer's quantity theory of money (QTM). According to monetarists, controlling growth of monetary aggregates should ideally lead to controlling inflation, given stability of the money multiplier and velocity. QTM is expressed as follows:

$$M_t v_t = P_t Y_t$$

Where M_t is nominal money supply, V_t is velocity of circulation, P_t is general price level and Y_t is real GDP growth. This equations states that the rate of inflation is approximately equal to the rate of growth of money in excess of the growth rate of real output given constancy in velocity.

To operationalise the QTM, first real GDP and inflation projections are made by government. These are combined with the assumed velocity of circulation, i.e. demand for money and money multiplier to derive money supply growth which is consistent with arriving at the projected inflation. Since the central bank cannot directly control money supply growth, it uses its balance sheet items namely Net Domestic Assets (NDA) and Net Foreign Assets (NFA) to alter liquidity conditions of the banking system. A ceiling on NDA as well as a floor on NIR is set consistent with desired growth in reserve money which is eventually set to influence money supply growth on to an inflation consistent path. These targets have mostly been set within the confines of the country's economic programme agreed with the IMF.

Other than the Open Market Operations which include foreign exchange operations, the central bank actively uses the policy rate and the Liquidity Reserve Requirements. The RBM also accords a lender of last facility to commercial banks through the Lombard Facility. Monetary policy was largely contractionary until 2004, as both the policy rate and the Liquidity Reserve Requirement (LRR) ratio were maintained at high levels and the authorities typically intensified OMO to mop up liquidity resulting from fiscal as well as donor injections. Later, in the pursuit of an expansionary monetary policy stance, the policy rate was reduced sequentially from 35 percent in January 2004 to 13 percent by August 2010. However, inflationary pressure witnessed beyond 2010 led to an increase in the policy rate to 25% by December 2013.

4.0 Literature Review

4.1 Theoretical Literature

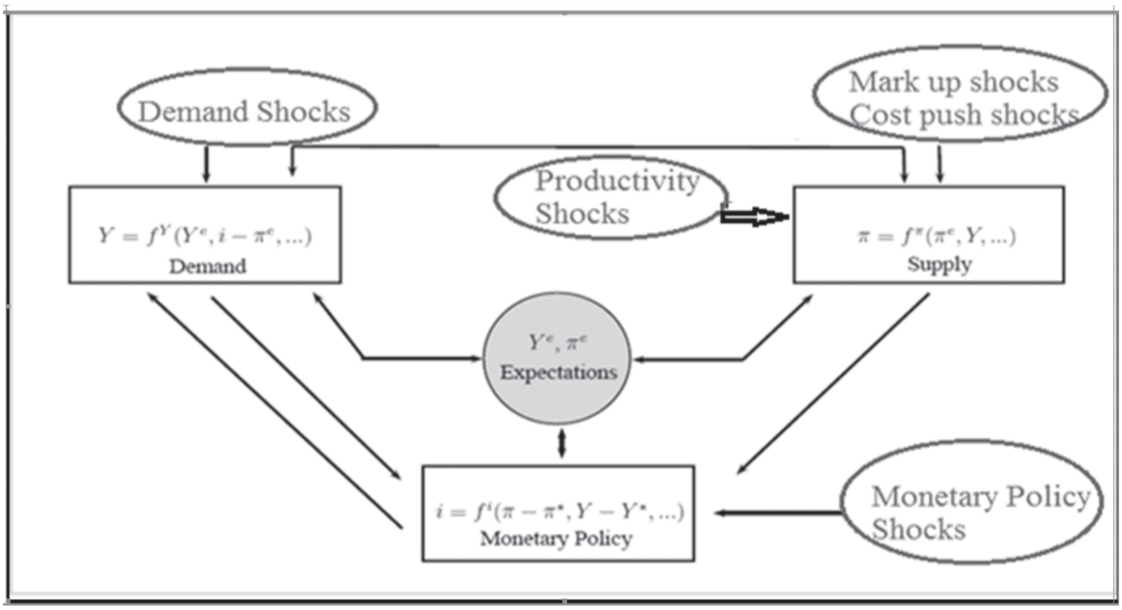
There are contending theories regarding the role and nature of monetary policy and their impact on nominal and real variables. These debates which are mostly framed with developed countries in mind also appeal to low income countries with some basic modifications to recognise features of the LICs countries. The major areas of divergence among these theories include: the relationship between prices (wages) and output (unemployment) as specified by the Phillips curve (PC); and the nature of prices and wages inflexibility and the role of money in monetary process.

The modern design of monetary policy is tilting towards the use of short-term interest rates to achieve price-stability. The objective of price-stability is centred on the supply-side equilibrium and the inability of monetary policy to have long-run impact on real variables (Fontana, 2009a). In the short-run, however, the existence of nominal rigidities means that policy can affect real variables temporarily. At the centre of this is the relationship between price and real variables is the Phillips curve, which is central to monetary policy analysis. This illustrates the trade-off between output and inflation in the short-run and implies that disinflation would result in temporary output loss and/or increased unemployment. In the long-run, however, the vertical Phillips curve based on rational expectations and continuous market clearing, suggests that monetary policy can only influence prices and not real variables. Thus, monetary policy should aim exclusively at price-stability.

The economy is characterized by three interrelated entities; households, firms, and monetary authorities. Each of these entities react to shocks based on the need to maximise utility within their budget constraint, technological and institutional constraints in the economy. The demand block determines the real sector activity (Y) as a function of the expected future real activity (Y_e) and the real interest rate. Demand is negatively affected by real interest rate. On the contrary, there is a positive functional relationship between expected real activity and demand representing the eagerness of economic agents to spend more as incomes rise.

The supply block relates positively the inflation level and the level of real activity; it also postulates a positive relation between current inflation and expected inflation. Based on Sbordone et al. (2010), the values of economic activity and inflation arising from the interaction of demand and supply manifest into the monetary policy block. Monetary policy itself is prescribed by a central bank, by either setting the short-term nominal interest rate – potentially according to the Taylor-type policy rule (Taylor,1993), or using discretion – or following some money growth rule as in McCullum (2000). The monetary authority move the nominal interest rate and money supply quantities in response to deviations of current inflation and real activity from their respective target values. Thus, the policy reaction function of the monetary authority closes the model allowing for a complete description of the relationship between the policy variables, output and inflation.

Figure 2.6: Theoretical Exposition of Monetary Policy Transmission



Source: Sbordone et al (2010)

The effectiveness of monetary authorities' action in delivering the price stability goal depends on the policy transmission mechanism. Transmission is the process by which monetary policy decisions are propagated to affect goal variables which include aggregate spending and domestic prices. Several theories exist on the transmission process of monetary policy. These include credit channel, interest rate channel, exchange rate channel, asset price channels and expectations channel. These channels have mainly been discussed within the variants of IS-LM-framework proposed by Keynes and formalised by Tobin (1969), a recent innovation discusses transmission within the confines of DSGE models which takes account of expectations as summarised by Sbordone *et al.* (2010).

Interest Rate Channel

Under the conventional Keynesian interest rate channel, an increase in short-term interest rates following a policy rate hike increases the cost of capital, and hence depresses spending on durable goods. Evidence of effectiveness of this channel in Africa has been documented by (Al-Mashat & Billmeier, 2007) and (Cheng, 2006) for Egypt and Kenya, respectively. This channel is not without critics. Forexample, Bernanke and Gertler (1995) argue that monetary policy has large effects on purchases of long-lived assets which should be more responsive to real long-term rates than real short-term rates.

Money Supply Channel

Conversely, Friedman and Schwartz (1963) show that the level of prices in the economy reflects money market conditions. This implies that, starting from money market equilibrium, a reduction in money balances (due to action by monetary authorities) will reduce aggregate demand and hence prices and vice-versa. This view, which is contrary to the Keynesian school, implies that monetary authorities can achieve price stability by controlling the growth in money supply.

Credit channel

The credit channel explores financial market imperfections and seeks to explain the effectiveness of the transmission mechanism. Bernanke and Gertler (1995) perceive this channel as an extension to interest rate channel with a set of factors that intensify and promulgate conventional interest rate effects. The interest rate effect is viewed as being amplified by wedge between the costs of externally-raised and internally-raised investment funds-external financing premium.

The size of this premium is a reflection of market imperfections, and a change in market interest rates due to monetary policy is positively related to a change in the premium, hence credit conditions, money supply, prices and output. The credit channel is under the balance sheet and the bank lending channels. In the former, as monetary policy tightens, borrowers' balance sheets weakens, lowering their collateral value and raising external finance premium. This eventually raises adverse selection and moral hazard problems, leading to curtailment in lending and investment spending by commercial banks. The bank lending channel posits that a disruption in the supply of bank loans resulting from tight monetary policy makes loan-dependent producers incur costs associated with finding new lenders

(Ehrmann & Worms, 2001). This directly increases their external finance premium, lowers the levels of their borrowing, and reduces real economic activity.

Exchange rate channel

Assuming flexible exchange rates, a rise in domestic real interest rates resulting from tighter monetary policy stance results in net capital inflows due to interest rate differentials. This leads to domestic currency appreciation, as well as a fall in exports and hence output. Additionally, the appreciation makes imports more cheap, a leakage in the national income identity which lowers aggregate output and weakens the current account balance. Changes in the exchange rate have implications for individual spending, and firms' investment behaviour, price stability and employment.

Expectations channels

Under this channel, changes in interest rates change economic agent's expectations of future interest rates, growth, and inflation. These expectations often affect decisions of firms and households about current saving and investment choices, and they affect wages, the prices of goods and services, and asset prices. If, for example, inflation were expected to rise in the future, longer-term interest rates would typically rise to reflect this expectation. Similarly, exchange rate expectations have implication on the current behaviour of exchange rate and hence prices.

In summary therefore, while the Keynesian view is that a shock to short-term real interest rates could be more effective in achieving monetary policy objectives, the standard monetarist view is that changes in the supply of reserves and hence money supply are more potent. Although, it remain a research issue, literature converges on the fact that long-run effects of monetary policy fall almost entirely on prices, with no discernible impact on the real variables (Walsh, 2003:15), an occurrence termed as the long-run "neutrality of money".

4.2 Empirical Literature

There are diverse empirical findings on effectiveness of money vis-à-vis interest rates as monetary policy instruments. Poole (1970) interacted GDP and Inflation with money, interest rates and other variables within the small scale DSGE model and found that the use of interest rates results in lower volatility of GDP than when reserve money is used as a monetary policy instrument. The original analysis of Poole was conducted within the standard textbook IS-LM framework and used output volatility as the sole evaluation criterion. The shortcomings of this model are cited by Canzoneri et al. (1983) who reworked the Poole model within the imperfect information, rational expectations model and found that instability in the LM (IS) curve favours interest rate (money supply) targeting. He further notes that within this class of models, the choice of the targeting procedure tends to be ambiguous when supply shocks are the dominant source of macroeconomic instability.

In its 2010 Regional Economic Outlook (pp 26), the IMF answers the question of how monetary policy affect macroeconomic performance in sub-Saharan Africa countries. This study is particularly important because it summarises information for a vast number of countries. We therefore discuss in detail their findings. The study uses single equations and panel VAR framework using several banking sector variables which include (Private sector credit, Lending rates among others) and outcome variables (growth, inflation, broad monetary aggregates, and the exchange rate). Their results show that a positive shock to reserve money growth generates increases in output growth, inflation, and monetary aggregates, and leads to exchange rate depreciation in floating exchange rate regimes. Real interest rates become negative, although the results are not significant.

The effects of reserve money growth on inflation strengthens over time. The central message from the study is that money is a strong determinant of inflation in most countries Sub-Saharan African countries, contrary to the weak links observed in advanced countries who have ultimately resorted to inflation targeting. Literature identifies several reasons for constrained effectiveness of monetary policy in sub-Saharan Africa including Malawi. These impediments include reserve levels that exceed required levels in many countries; significant central bank financing of fiscal deficits, weak financial systems in general, and underdeveloped financial markets (IMF REO, 2008 & 2010). Recent improvements in these areas have helped to enhance the effectiveness of monetary policy.

Studies on Malawi have concentrated on assessing the transmission mechanism, the stability of money demand and studying some relationships between key monetary policy variables and goal variables, inflation and GDP. Mangani (2012) uses a VAR framework to assess the impact of monetary policy on prices in Malawi. He estimates six models using different combinations of inflation (both food and non-food), lending rates, exchange rate and broad money supply. The key result from the study is that the Policy rate does not transmit to changes in inflation, contrary to the postulated interest rate channel of monetary policy. This is in contrast to the findings by Friedman & Schwartz, (1963) and IMF REO (2010) discussed above on other sub-Sahara African countries. The study further finds evidence that reserve money and broad money had no discernible impact on prices.

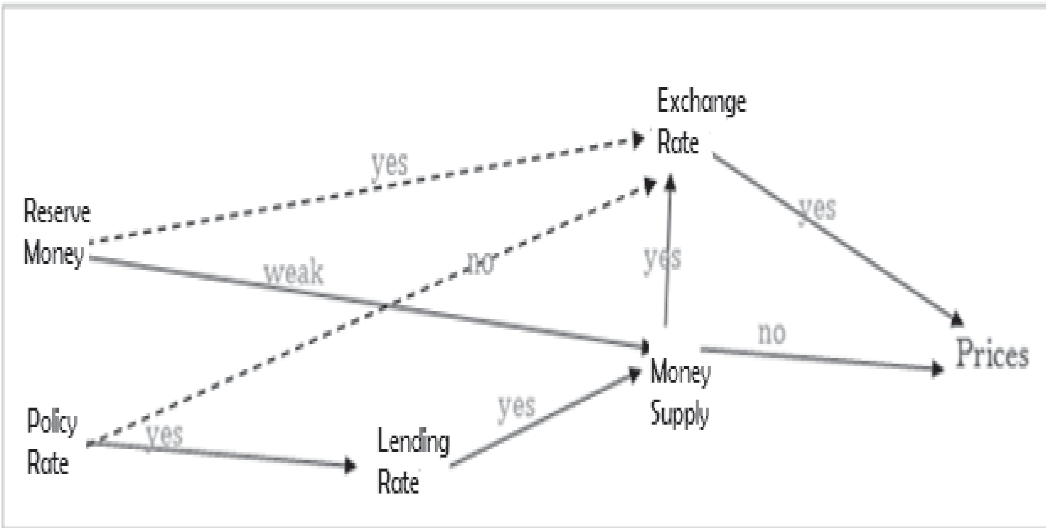
A consensus with other literature which emerges from this study is that exchange rate has significant impact on prices, a finding which is consistent with small open economies whose production and consumption systems are import dependent. The study recommends reserves accumulation as a means of dealing with imported inflation. The study however completely ignores the income variable in the estimation process. The inclusion of the real GDP could have strengthened the empirical content of the study.

Simwaka *et al* (2012), used an error correction model to estimate the impact of money supply on prices in Malawi by using data from 1995 to 2011. The variables in the model include, inflation, money supply, lending rates, index of industrial production. The study finds that inflation in Malawi is both monetary and supply factors' driven. Money supply growth is found to have impact on prices with a lag of three to six months. In addition, the exchange rate is found to have high pass-through to inflation. Based on this, the study recommends targeting exchange rate stability in order to anchor inflation expectations. Shawa (2012), uses annual data from 1970 to 2005 and the Johansen Cointegration framework to test the stability of the money demand function. He finds that money demand is stable, positively responds to changes in income, and also finds significant but low response of money to changes in interest rates. The stability of the money demand points to the fact that monetary aggregate targeting remains relevant for Malawi.

Lungu *etal* (2012), use a vector error correction model to estimate money demand function and its related implications on monetary policy conduct in Malawi. The study uses quarterly data from 1985 to 2010 with the following variables on quarterly basis; real GDP, inflation, exchange rate, treasury bill rates and financial deepening. The study finds the money demand is insensitive to changes in interest rates in the short run but weakly significant in the longrun. The implication of this finding is that insensitivity of the money demand to changes in interest rates brings difficulties in the implementation of the reserve money programming framework.

Ngalawa (2011), examines the dynamic effects of monetary policy in Malawi. He uses monthly time series data in a Structural VAR framework for the period 1988 to 2005. Variables analyzed include real GDP, inflation, policy rate, exchange rate and reserve money. One interesting finding from the study is that Monetary Authorities have employed hybrid operating procedures using the Policy Rate as well as Reserve Money. The study also finds that after the 1994 floatation of the Kwacha, the role of the exchange rate reduced while the role of money and bank lending in the monetary policy transmission process became enhanced. He notes that monetary policy transmission evolved to become clearer after the 1994 floatation of the Kwacha. The finding that the transmission process became enhanced after adoption of the flexible exchange rate is revealing to monetary authorities especially in light of the quest to enhance the monetary policy process in Malawi.

Figure 2.7: Summary of Researched Transmission Channels on Malawi



Source: Authors' Summary

Mwabutwa, Bittencourt and Viegi (2013), employ quarterly data from 1981 to 2010 in a time varying parameter autoregressive (TVP-VAR) model with stochastic volatility to investigate the evolution of monetary policy transmission mechanism in Malawi. Particularly, the study assesses how real GDP and inflation respond to changes in exchange rate, policy rate and credit shock shocks over time. The study does not find evidence of the existence of the price puzzle in Malawi and argues that from 2000, after financial policy reforms, monetary policy transmission has performed consistently with predictions of economic theory. He finds evidence that transmission mechanism is not observed prior to reforms; is blurred during the reforms and gets clearer after reforms.

Further research on Malawi regarding effectiveness of monetary policy is necessary based on the following reasons: Firstly, some studies e.g. Shawa (2012) use annual time series data different from high frequency analysis as required my monetary authorities. We note however that the application of high frequency modelling is affected by the absence of quarterly real sector statistics e.g. GDP. Their proxies are blemished by methodological issues. Secondly, most studies do not control for changes in the data generation process as data are treated uniformly across various policy regimes through standard application of econometric techniques. Several fundamentals have changed in Malawi, such as shifting from administered pricing to automatic pricing mechanism for fuel, automatic adjustment of electricity and water tariffs, and growing share of the retail sector. Clearly, therefore the diverse findings on efficacy of monetary policy could reflect methodological issues where standard statistical techniques have been applied to very different economic stages. For example while Mangani (2011) uses VAR analysis and finds sufficient evidence for price puzzle, Mwabutwa (2013), with a rather more robust econometric technique, disputes this and finds that money has impact on prices, but notes that it is the transmission mechanism that has changed.

Thirdly, nearly all studies on Malawi have used error correction techniques in the VAR framework. Soares (2011) shows that the small-scale VARs generate price puzzles – a counterintuitive positive reaction of prices to an increase in the official interest rate. Sims (1992) argues that price puzzles result from imperfectly controlling for information that the central bank may have about leading indicators of inflation within the VAR.

In view of diverse findings, this study intends to enrich the policy debate by moving from conventional VAR analysis to a Factor Augmented VAR (FAVAR) after controlling for breaks using the Principal Component Analysis to examine the effectiveness of monetary policy in Malawi. Including factors in the VAR widens the information set and allows for a more coherent picture of the effects of monetary policy innovations by increasing the understanding and precision of the responses. Since the pioneering work of Bernanke and Boivin (2003) and Bernanke, et al (2005), studies on monetary policy using FAVAR have been conducted in different countries: Zunica (2011) on Mexico, Kabundi and Ngwenya (2011) on South Africa; Figueiredo (2010) on Brazil; Munir and Qayyum (2012) on Pakistan and Ribon (2011) on Israel.

5.0 Methodology

5.1 Vector Autoregressive Framework

Given the difficulties in distinguishing between exogenous and endogenous policy interventions, the VAR, commonly used for forecasting systems of interrelated time series and analysing the dynamic impact of random disturbances on the system of variables is useful. The VAR was introduced by Sims (1980). This paper sidesteps structural modelling and harnesses the dynamic impact of random disturbances by treating every endogenous variable in the system as a function of the lagged values of all of the endogenous variables in the system and an exogenous shock. The mathematical representation of a VAR is:

$$y_t = A_1 y_{y-1} + ... + A_p y_{t-p} + \beta x_t + \varepsilon_t \quad \text{......................................} \quad (1)$$

Where y_t is a K vector of endogenous variables, x_t is a vector of exogenous variables, A and B are matrices of coefficients to be estimated, and e_t is a vector of innovations that may be contemporaneously correlated but are uncorrelated with their own lagged values and uncorrelated with all of the right-hand side variables. Since only lagged values of the endogenous variables appear on the right-hand side of the equations, simultaneity is not an issue and OLS yields consistent estimates. Moreover, even though the innovations may be contemporaneously correlated, OLS is efficient and equivalent to Generalised Least Squares (GLS) since all equations have identical regressors. Considering the shortcomings of the VAR – precisely inability to control for all the information – we augment the model with a factor and estimate the Factor Augmented Vector Autoregressive model.

5.2 Factor Augmented VAR

The model detailed below is reflective of the one developed by Bernanke *et al* (2005). Letting Y_t be an *M x 1* vector of observable economic variables whose interactions represent the economic dynamics. Following the standard approach in VAR literature, Y_t contains policy indicator and observable measures of real activity and prices. The conventional approach of estimating VAR is to use data contained in the vector Y_t alone and assess the impact of policy variables of real sector activities and prices. In practice, however, vast additional economic information is not reflected in this vector and could be extremely relevant to understanding of the dynamics of the economy and effectiveness of monetary policy.

Assume that this information is condensed in second vector, *K X 1*, of unobserved factors denoted as F_t. For implementation purposes *K* is expected to be relatively small as the FAVAR is a data reduction methodology. Bernanke (2005) observes that these factors can be construed as capturing fluctuations in unobserved potential output or reflecting theoretically motivated concepts such as economic activity, price pressures, or credit conditions that cannot easily be represented by one or two series but rather are reflected in a wide range of economic variables. It is this additional richer information set that enriches the monetary policy analysis under FAVAR. We model the joint dynamics of the two vectors as:

$$\begin{bmatrix} F_t \\ Y_t \end{bmatrix} = \phi(L) \begin{bmatrix} F_{t-1} \\ Y_{t-1} \end{bmatrix} + \varepsilon_t \quad \text{.........} \quad (2)$$

Where ϕL is a lag polynomial of finite order *d*. The error term ε_t is mean zero with covariance matrix Q. Equation (1) can be interpreted as an a theoretic VAR in (F_t and Y_t). If the terms in ϕL which relate Y_t and F_t are all zeros, the system degenerates into a standard VAR. If not then equation 2 will be referred to as a factor augmented vector auto regression, or FAVAR. Because the FAVAR model nests standard VAR analyses, estimation of equation 2 allows for easy comparison with existing VAR results and provides a way of assessing the marginal contribution of the additional information contained in F_t.

Bernanke (2005) notes that if the true system is a FAVAR, estimating a standard VAR system in Y_t excluding F_t, will in general lead to biased estimates of the VAR coefficients and related quantities of interest, such as impulse response coefficients. The assumption that F_t is embedded in Y_t, it has been argued is one reason for price puzzle findings in several studies. Need therefore arises to exploit the information F_t to properly identify the effects of monetary policy. If the number of variables N in the information sample was small enough, it would be directly included in *Y,* e.g the inclusion of commodity price indices to deal with price puzzles. But practically N would be large and the VAR would suffer from overparamitisation.

Equation 2 cannot be estimated directly because the factors are unobservable. However, we can infer information about the factors from observations on a variety of other observable economic time series. Assume that the informational time series X_t is represented by a vector N X 1, such that $N > K + M$. We can assume that the information time series X_t is related to the factor and the actual series by the following equation:

$$X_t = \Gamma^f F_t + \Gamma^y Y_t + \upsilon_t \qquad (3)$$

where Γ^f is an N X K loading matrix of the factor while Γ^y is an N X M loading matrix of the observable variables. ν_t is an N X 1 vector of error terms which are normally distributed with mean zero. Equation 3 captures the idea that both Y_t and F_t, characterize variables that drive the dynamics of X_t. Although X_t in equation has contemporaneous relationship with independent variables, the equation can be modified without loss of generality and meaning to including lags of the factors.

Just like the unrestricted VAR, the FAVAR does not impose prior restriction on the relation between X_t, F_t and Y_t. Bernanke (2005) argues that imposing prior structural constraints in modelling the behaviour of the economy may result in potential gains but these gains must be weighed against biases that may result if those restrictions are wrong (which often is the case). The implication of this is that most structural models including SVAR and the recent DSGEs if wrongly specified might be ill-suited to study monetary policy dynamics.

We use the triangular orthogonalization of the variance-covarince matrix to identify our FAVAR system. This is achieved by estimating the reduced form FAVAR model, then computing the Cholesky factorization of the covariance matrix of the model (Lutkepohl, 1993). This ensures that shocks to the VAR system can be identified as shocks to the endogenous variables in each equation. The approach adopted in the literature is to place policy variables last in the ordering. The basis for this is the assumption that policy variables can influence non-policy variables contemporaneously as well as with a lag, while the non-policy variables themselves can only be influenced by the policy variables after a time-lag due.

The FAVAR can be estimated using two procedures. The first is to use the Principal Component Analysis (PCA) which is not parametric to recover a common space spanned by the factors in X_t. to extract the factors. The other approach is to use a single step Bayesian likelihood approach. Bernanke and Boivin (2003) use both procedures and find similar results and conclude that use of both methods in one analysis is redundant. We therefore use the two step process because of its superiority in handling data irregularities as it can take series of different frequencies and its computational simplicity. In the first step, the factors are estimated using the PCA methodology while the second step involves incorporating the estimated PCAs in the VAR model to generate the FAVAR model.

5.3 Principal Component Analysis

The PCA, owed to Hoteling (1993), is a data reduction methodology that performs ordinary correlations and extracts common components driving a group of series. Given NXP matrix of data X of rank order r, $X = UDV'$ where U and V are modelled as orthonormal matrices of the left and right singular vectors and D as a diagonal matrix containing the singular values. Vector Y can be generally modelled as $X = AB'$, where A is an n x r matrix, and B is a p x r matrix. Both matrices are of rank r. Matrix A are principal component score and B is a loading matrix. Let $\sum$ be a dispersion matrix of Y and performing Eigen Decomposition given by: $\sum = L\Lambda L'$, Where L is the PXP matrix of eigenvectors and Λ is the diagonal matrix with eigenvalues on the diagonal.

The eigenvectors are by construction orthogonal such that $L'L = LL'' = I_m$. We can write, $A = n^{B/2'} L\Lambda^{1-\alpha}$ and $B = n^{-B/2'} L'\Lambda^{\alpha}$. If we set $U = YLD^{-1}$, $V = L$ and $D = (n\Lambda)^{1/2}$ then $A = n^{B/2'} YLD^{-\alpha}$ and $B = n^{-B/2'} L'D^{\alpha}$, Where $0 \leq \alpha \leq 1$, is a factor which adjusts relative weighting of L and L' vectors and the terms involving β are scaling factors where $\beta \in \{0, \alpha\}$. Our interest is matrix A which is interpreted containing the weighted principal components scores which will be used in our second stage of estimation (FAVAR); and B is the weighted principal components loadings. The principal components A however have in them influence from policy variables, in this case policy rate, exchange and reserve money because they were jointly estimated. It will be improper to use these in the FAVAR model without extracting the influence of the policy variables. Since the influence of these policy variables is unknown upfront we follow Bernanke (2005) and estimate their coefficients by running a multiple regression of the format given in equation (4).

$$A = \psi_1 \hat{A}SM + \psi_i \sum_{i-1}^{3} PV + \varepsilon_t \quad \text{.........} \quad (4)$$

Where $\hat{A}SM$ is constructed by taking principal components for the slow moving variables which are not contemporaneously affected by the policy variables; and PV are policy variables. The final principal components to be included in the FAVAR is computed as:

$$\hat{F}_t = A - \psi_i \sum_{i-1}^{3} PV + \varepsilon_t \quad \text{.........} \quad (5)$$

The number of principal components can be as many as the information set. Inclusion in the FAVAR will depend on whether additional components change the results of the FAVAR. We now proceed to estimate a VAR in $\hat{F}_t$ and Y_t which we denote as FAVAR.

5.4 Data and Estimation

In line with our theoretical expose, the observed variables are presented in Table 8. Details of variable definition are provided in appendix I. The model is estimated using Quarterly data from 1990 to 2013. Malawi does not capture quarterly GDP statistics. We therefore follow several studies that have used univariate filters to interpolate and generate quarterly GDP using the Constant match average method[4] which assign the same value to all quarterly observations arising from a particular low frequency data point.

Table 2.1: Variables Entering the Estimation Model

Category	Variable	Data Source
Policy Instruments	Reserve Money (RM) Policy Rate (PR) Exchange Rate (ER)	Reserve Bank of Malawi
Intermediate Variables	Lending rate (LR) Broad Money (M2) Exchange rate (ER)	Reserve Bank of Malawi
Goal variables	Inflation rate (inf) Real GDP (GDP)	National Statistics Office-Malawi
Other	Factor (X_t)	Generated from the Principal Components Analysis Methodology

Choosing variables to include in Xt is not a simple issue. Although Stock and Watson (2002) argue that more data is always good, Boivin and NG (2005) counter that in practice this may mean using more of the same data since most series are related. Bernanke (2005) shows that the pre-screening of series is largely an ad hoc process. Malawi has undergone several structural changes. Since the VAR model cannot capture dummy variables directly, we follow Filmer and Pritchett (2001) to extract this information through the principal component

4 Alternative Univariate interpolation methods are explained in E-views User Guide I PP 154. Other advanced interpolation methods are discussed in Chow and Lin (1971) and Harvey and Pierse (1984) who use Kalman filters.

analysis. However, in order to place dummy variables appropriately, we follow Bai and Perron (2003) Multiple Break Point Test.

Tests for structural parameter instability and structural change date back to Chow (1960) who tested for regime change at a priori known dates using an F-statistic. To relax this requirement that the candidate break date is known prior, Quandt (1960) modified Chow framework to consider the F-statistics with the largest value over all possible break dates. More recently, Bai and Perron (2003) provide theoretical and computational results that further extend the Quandt-Andrews framework by allowing for multiple unknown breakpoints. Following Bai and Perron (2003), we use least squares to regress selected number of data extracted from our information set excluding the policy variables (independent variables)[5] on a constant as a dependent variable. The test allows for a maximum number of breaks, employs a trimming percentage of 15% and uses the 0.05 significance level for the sequential breaks.

The joint results for the suggested breaks are presented and explained in Appendix III. From the results, three structural breaks are determined namely 1993(Q3), 1997(Q1) and 2009(Q1). We however also include 2012(Q2) as another potential break to capture significant changes in monetary and exchange rate policies that took place following change of the political regime. We follow Filmer and Pritchett (2001)[6] and proceed to construct four dummy variables related to this period. These dummy variables, together with our information set of 15 variables are used to construct principal components. While developed countries use a large volume of information set e.g. Bernanke (2005), literature does not provide specific guidance for Low Income Countries in terms of how many variables can be included in the information set. This issue is in LICs is further complicated by challenges of data availability. The variables in the information set have been chosen based on their economic links to the monetary policy instruments[7].

5 These variables are Narrow money, Nonfood inflation, Food inflation, Treasury bill rate, Lending rates, Private sector credit, Index of industrial production, Deposit rates and Commercial bank holdings of net foreign assets.

6 Greenacre, Michael and Blasius, (2006) use Multiple Correspondence Analysis to extract common components where dummy variables need to be considered.

7 In this case we considered the economic links between the exchange rate, policy rate and money supply to each of the variables. For want of space and as standard practice with other FAVAR studies, we do not present these for all variables as is done with those that have been used to construct our FAVAR in Appendix 1.

A graphical exposition of FAVAR variables in Appendix II suggests that some of the variables could be trend stationary. Despite this, the models were estimated in levels using the ordinary least squares (OLS) method. The benefit in estimating the models in levels arises from the fact that the data would retain the desirable statistical properties and causal interrelationships that could be lost in the process of differencing. Bacchetta and Ballabriga (2000), Braun and Shioji (2004) adopt the same procedure.

We specify FAVAR Models based on the probable monetary policy instruments. The monetary policy shock is identified in the standard recursive manner, that is, by ordering the policy rate, exchange rate and the base money last and treating their innovations as policy shocks. The recursive ordering imposes the identifying assumption that the unobserved factors do not respond to monetary policy innovations within the period, in our case quarterly. Bernanke (2005) argues that we need not impose that assumption on the idiosyncratic components of the information variables. We instead define two categories of information variables: "slow-moving" and "fast-moving." Slow-moving variables are assumed not to respond contemporaneously to unanticipated changes in monetary policy e.g. Index of Industrial Production. In contrast, fast-moving variables are allowed to respond contemporaneously to policy shocks e.g. Private sector credit. Slow moving variables are therefore placed at the top while policy variables are ordered last in the model.

6.0 Empirical Findings

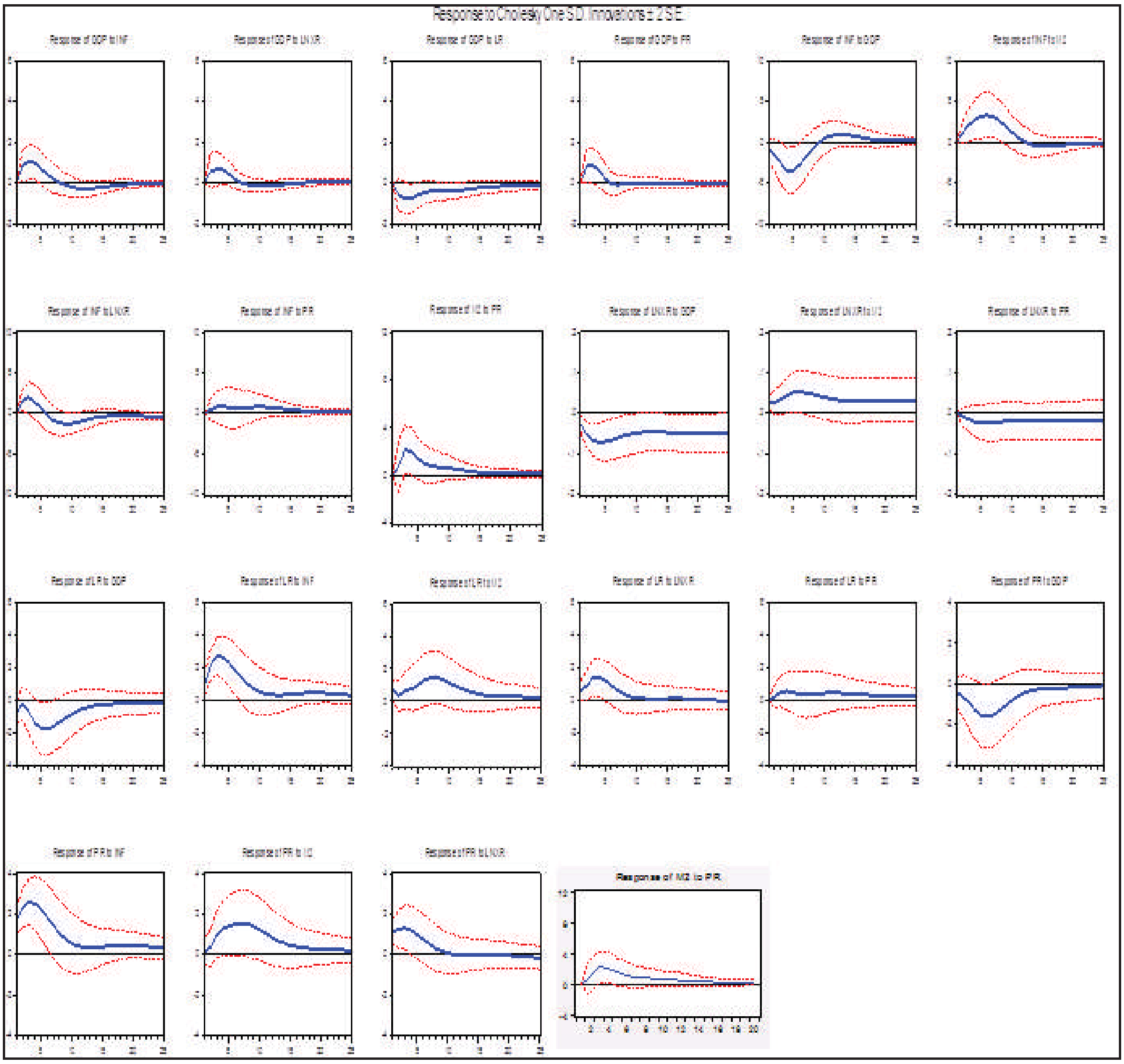
6.1 VAR Results

In order to infer the value added by the FAVAR to VAR analysis we first present impulse response result from an ordinary VAR (appendix IV)[8]. All models are estimated at lag 1 chosen based on Schwarz Information Criteria (appendix V). The results from the VAR impulse response functions are consistent with the ones reported by IMF REO (2010) for sub-Saharan African countries which show that GDP counter intuitively rises as policy rate is raised. Most of the other results are consistent with Mangani (2012) on Malawi and IMF REO 2010 and conform to economic expectations. However, two critical results motivate us to take the discussion further using the FAVAR. First is the price puzzle finding that prices

8 All diagnostics pertaining to the validity of the estimated VAR are presented in appendix iv

respond positively to an interest rate hike, although not statistically significant. Second is the liquidity puzzle that money supply increases when policy rate is increased. These, it has been argued in literature, (see Sims, 1992), may result from inability of the econometric models to capture precisely the whole set of information that the central bank takes into account when setting the policy rate.

Figure 2.8: Impulse Response Functions for Ordinary VAR



6.2 Factor Augmented VAR Results

Results from the impulse response from the FAVAR take account of only one factor. Although the number of components generated was equal to the number of variables in the information set i.e 18, successive addition of subsequent factors neither improved nor worsened results. Therefore all the information excluded in the conventional VAR was deemed to have been captured by the first factor.

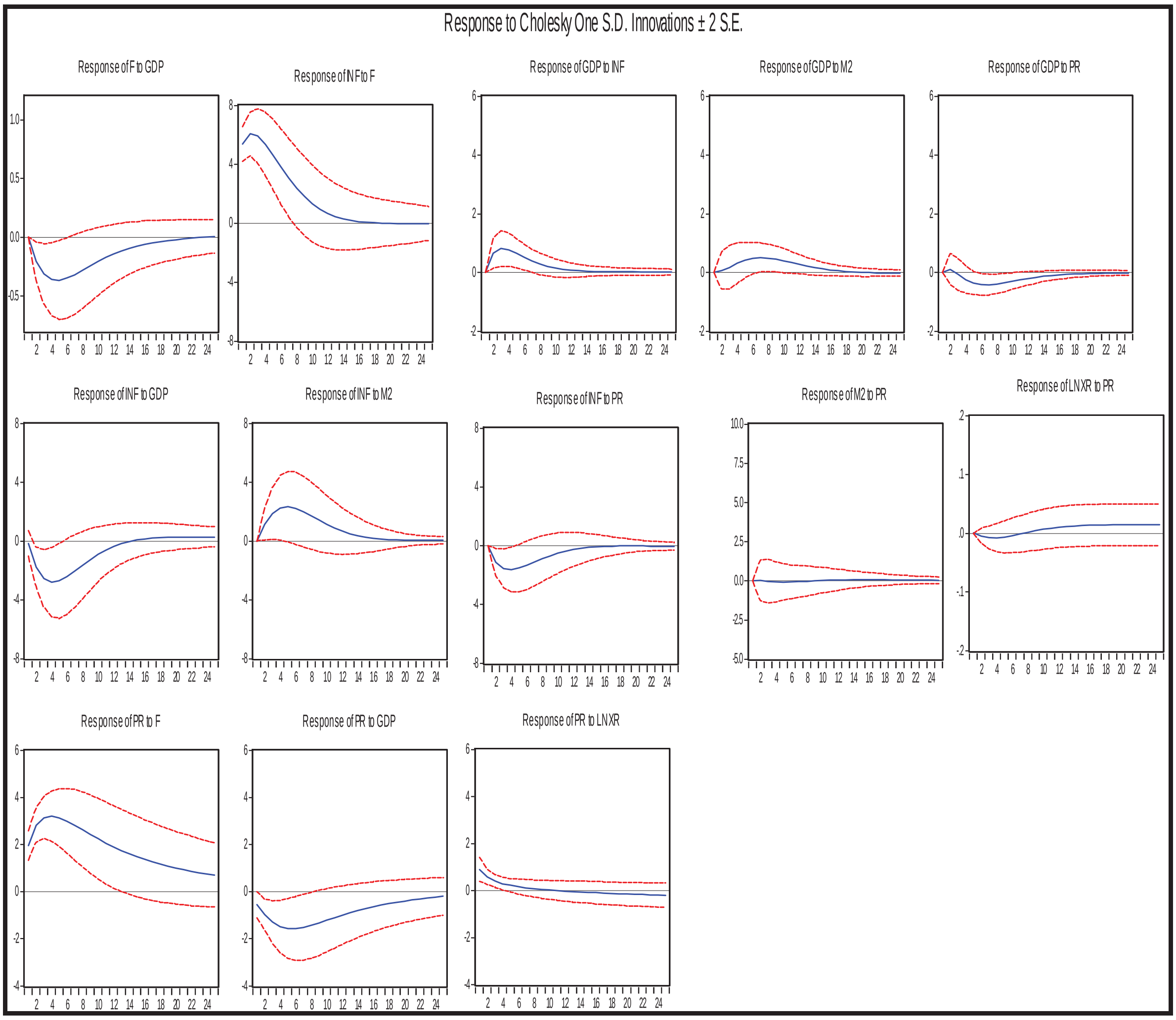
Strikingly different from the VAR results, the price puzzle completely disappears as the response of inflation turns out to be negative following one standard deviation innovation to policy rate. This finding which is in contrast to Mangani (2012) and IMF REO (2010) corroborates Mwautwa (2013) who using a Time Varying Parameter VAR do not find a price puzzle for Malawi and argues that it is the transmission mechanism of monetary policy that has been changing. Bernanke (2005) found a similar result using US data.

GDP negatively responds to an interest rate shock in the short-run, a finding that is consistent with New Keynesian thinking that with nominal rigidities monetary policy is able to influence real variables in the short-run (Gali, 2008). This finding contradicts IMF REO (2010) on sub-Saharan Africa. However, the response of GDP to inflation returns to steady state signifying the applicability of the classical long run neutrality of money. Furthermore, the liquidity puzzle found in the REO (2010) using a conventional VAR disappears in the FAVAR simply leaving money supply unresponsive to changes in policy rate. The important implication of this finding is that money supply creation could be exogenous.

We also find significant response of inflation arising from monetary policy innovations. When money supply expands, inflation picks up. A natural policy extension to this is that controlling the growth of money would reduce inflation. But money supply does not respond to changes in interest rate. Put differently, money supply is significant but the credit channel is impotent. This finding alludes to the role of fiscal dominance in inflation impulses in Malawi. Another issue is the apparent unresponsiveness of the exchange rate to changes in the policy rate. Theoretically, a rise in policy rate, through the uncovered interest parity condition is expected to lead to a surge in foreign inflows and hence exchange rate appreciation. However portfolio inflows are largely non-responsive to interest rate changes in Malawi.

The FAVAR therefore completely eliminates the price puzzle and partially resolves the liquidity puzzle, by leaving overall money supply unresponsive to changes in interest rate. The latter could result from netting off effects between private sector credit reduction and expansion in credit to government. Policy rate increases coincide with heightened fiscal financing requirements. Therefore as private sector credit contracts, following a rise in interest rate, the government financing requirements increase through higher interest rate payments thereby necessitating further recourse to domestic borrowing which eventually expands money supply. This may have an offsetting effect leaving the overall impact of policy rate innovations on money supply negligible. In this case, effectiveness of the policy rate as a monetary policy instrument will be pronounced only when fiscal borrowing does not play and offsetting role. A natural extension of inquiry into this question would be to examine the impact of policy rate innovations on private sector credit growth.

Figure 2.9: FAVAR Impulse Responses with One Factor



The finding of no price puzzle stands up to robustness checks (Figure 10) shows estimations over the defacto exchange rate peg period of 2004-2011) and alternative specifications including non-food price inflation. One can therefore conclude that the transmission of monetary policy is not divorced from the monetary and exchange rate policy frameworks within which the policies are implemented.

Figure 2.10: Impulse Responses for VAR

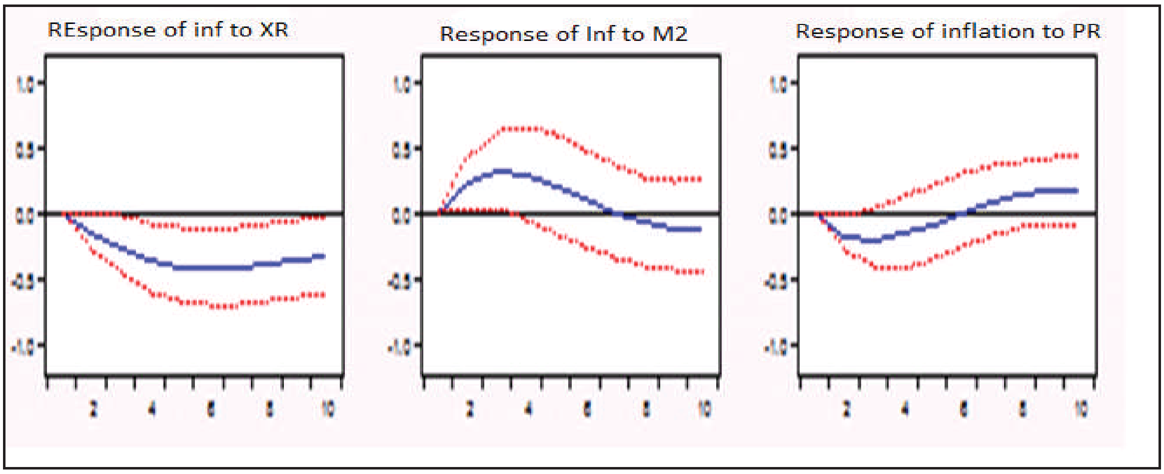
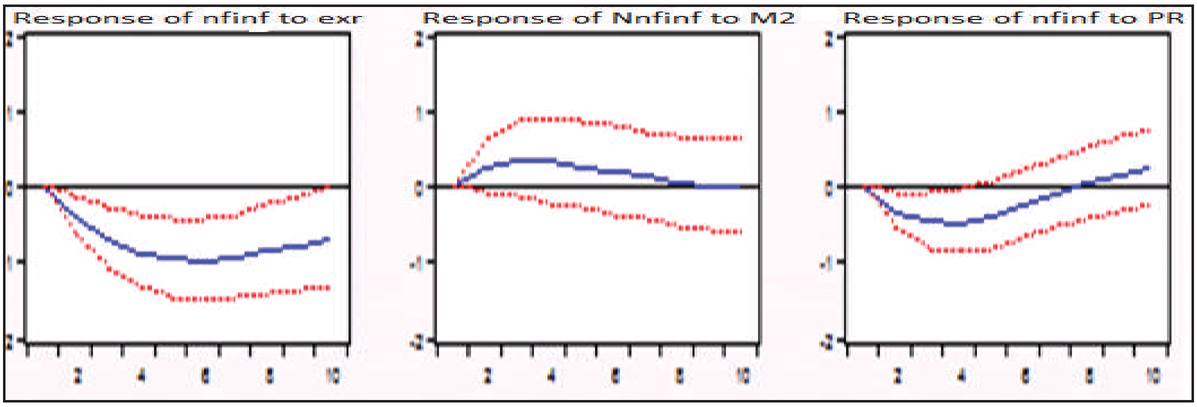


Figure 2.11: Impulse Responses for VAR with Non-food Inflation



7.0 Conclusion and Policy Implications

This paper set out to examine the effectiveness of monetary policy in Malawi using a two-step Factor Augmented Vector Autoregression Model where the first step involved extracting a common factor form a data set using the Principal Component Analysis. The findings show that inflation is responsive to both money and interest rates. The slippages in the transmission mechanism mean that institutional improvement, including central bank independence, as well as broader goods and money market infrastructure such as credit reference bureaus and legal enforcement of contracts could aid monetary policy effectiveness. In the short term, Monetary Authorities must rely on a vast number of instruments to implement monetary policy[9]. In this case, precise analysis of the trade-offs associated with each instrument is vital[10].

The finding that inflation strongly responds to money but the response marginally reduces with interest rates implies that elimination of fiscal dominance will further improve the efficiency of the monetary framework and builds the foundations for Inflation targeting in the future. Restoring fiscal sustainability is key; this leaves monetary policy to perform price stabilization rather than financing fiscal shortfalls. It is also observed that monetary and exchange rate policy reversals amplify business cycles and have contributed to divergent results on monetary policy effectiveness. Consistent and harmonized policy application is therefore vital to meaningful data generation process and hence efficiency of monetary policy transmission.

A flexible exchange rate is key to managing and dampening the effects of external shocks. Malawi should ensure that macreconomic fundamentals are market determined in order to avoid recurrence of the problems faced in 2011-2012. Following, the significance of exchange rate in the inflation process, it can be argued that inability for the country to successfully diversity the export base and reduce its import dependency will in the long-run result into higher equilibrium levels of interest rates in the economy. While in the short-term central bank accumulation of foreign exchange reserves is key to exchange rate and inflation management, in the long-run increasing the export base is the fundamental solution. Failure to build resilience through structural reform and economic diversification will result in the economy becoming increasingly vulnerable to external shocks. Further research should look at improved specification of the macroeconomic model for Malawi and examine various monetary policy rules within the DSGE framework.

9 This is evidenced by a recent move (September-October 2014) by the central bank where it deployed a mix of policy instruments which included changes in the LRR directives, Policy rate increase, changes in foreign exchange trading rules, rebalancing of the domestic and foreign debt portfolios among others to avert the depreciation of the kwacha. These unconventional monetary tools may also complicate the analysis of the effectiveness of the major policy tools

10 Technical capacitation is one of the key interventions in process.

Reference

Al-Mashat, R. and A. Billmeier. 2007. "The monetary transmission mechanism in Egypt". IMF Working Paper No WP/07/287. International Monetary Fund, Washington, D.C.

Bacchetta, P. and F. Ballabriga. 2000. "The impact of monetary policy and banks' balance sheets: Some international evidence". *Applied Financial Economics*, 10: 15–26.

Bernanke, B, Boivin, J. and Eliasz, P. (2003), Measuring the Effects of Monetary Policy, A Factor Augmented Vector Autoregressive, NBER Working Paper No. 10220, 2004.

Bernanke, B. and M. Gertler. 1995. "Inside the black box: the credit channel of monetary policy transmission". *Journal of Economic Perspectives*, 9(4): 27–48.

Bernanke, Ben, and Jean Boivin, "Monetary Policy in a Data-Rich Environment," *Journal of Monetary Economics*, L (2003), 525–546.

Boivin and Ng (2005) Understanding and Comparing Factor-Based Forecasts∗ Columbia University and NBER.

Braun, R. and E. Shioji. 2004. "Technology Shocks and Work Hours: Evidence from Japan". *Keizai Kenkyu*, 55(4): 289–98.

Calvo, G., 1983. "Staggered prices in a utility maximizing framework."*Journal of Monetary Economics* 12, 383-398

Canzoneri, M., Henderson, D., Rogo¤, K., 1983. "The information con-tent of the interest rate and the optimal monetary policy". *Quarterly Journal of Economics* 98, 545.566.

Cheng, K. 2006. "A VAR analysis of Kenya's monetary policy transmission mechanism: how does the Central Bank's REPO rate affect the economy?" IMF Working Paper No. WP/06/300. International Monetary Fund, Washington, D.C.

Chimobi, O. and O. Igwe. 2010. "Budget deficit, money supply and inflation in Nigeria". *European Journal of Economics, Finance*, 19: 52–60.

Coates, K. and E. Rivera. 2004. "Fiscal dominance and foreign debt: Five decades of Latin American experience". CEMLA Paper. Latin American Workshop, Banco de Portugal, Lisbon, Portugal.

De Bondt, G. 2000. Financial Structure and Monetary Transmission in Europe — A Cross- Country Study. Cheltenham: Edward Elgar.

Filmer, D. and l. Pritchett. "Estimating Wealth Effect without Expenditure DATA-Or Tears: An application to Educational Enrollments in States of India." *Demography*, 38, 115-32, 2001.

Friedman, M. and A. Schwartz. 1963. A Monetary History of the United States, 1867-1960. Princeton, New Jersey: Princeton University Press.

Gali (2008), Monetary Policy, Inflation, and the Business Cycle, Princeton University.

Greenacre, Michael and Blasius, Jörg (editors) (2006). Multiple Correspondence Analysis and Related Methods. London: Chapman & Hall/CRC.

Hotelling, H. (1933). Analysis of a complex of statistical variables into principal components. *Journal of Educational Psychology*, 24, 417-441, and 498-520.

Kasekende (2010, unpublished), "Rethinking monetary policy for the 21st century", Bank of Uganda working papers.

Lungu, M. etal, 2012, "Money Demand Function for Malawi, Implications for Monetary policy Conduct", Reserve Bank of Malawi Working papers.

Mangani, R. (2012), Effects of Monetary policy on prices in Malawi, African Economic Research Council Publications.

Mangani, R. (2013, unpublished), Effects of Monetary policy on prices in Malawi, Further Evidence from ARDL model; Paper presented at a Monetary and Exchange Rate Policy Conference, Mangochi Malawi.

Mwabutwa, C. (2013), Evolution of Monetary Policy Transmission Mechanism in Malawi", University of Pretoria, Department of Economic working papers.

Ngalawa H, 2009, *Dynamic effects of Monetary Policy in Malawi*, PhD Thesis, University of Pretoria.

Ocran, M. 2007. A Modelling of Ghana's Inflation Experience: 1960–2003. AERC Research Paper No. 169. African Economic Research Consortium, Nairobi.

Poole, W 1970, Optimal Choice of Monetary Policy Instruments in a Simple Stochastic Macro Model, *Quarterly Journal of Economics* 84: 197-216.

Sbordone, Argia M., Andrea Tambalotti, Krishna Rao, and Kieran Walsh, "Policy Analysis Using DSGE Models: An Introduction," Economic Policy Review, October 2010, 16 (2), 23–43.

Schwartz, A. J., 1981. *Understanding 1929-1933. In: K. Brunner, ed. The Great Depression Revisited*. Hingham, Mass.(Massachsette): Martinus Nijhoff Publishing, pp. 5-48.

Shawa, K.C (2012), " A macro-economic diagnosis of the Keynesian Propositions of the Money Demand Function in Malawi: An error-correction approach", International Journal of development and Sustainability, Vol. 1 No. 1, pp 31-46

Sims (1992), "Interpreting the Macroeconomic Time Series Facts: The Effects of Monetary Policy". European Economic Review, 36, 975-1011.

Sims, C. 1992. "Interpreting the macroeconomic time series facts: The effects of monetary policy". European Economic Review, 36: 975–1011.

Sims, C. 1998. "Comment on Glenn Rudebusch's 'Do measures of monetary policy in a VAR make sense?'". International Economic Review, 39: 933–41.

Sims, C. 2008. "Government and Central Bank balance sheets, inflation and monetary Policy". Princeton University Lecture Notes. Princetom University, Princeton, New Jersey.

Sims, C., J. Stock and M. Watson. 1990. "Inference in linear time series models with some unit roots". Econometrica, 58, 113–44.

Simwaka, K. etal, (2012) , *"Money Supply and Inflation in Malawi: An econometric Investigation"*, International Journal of Applied Economics and Finance, 6(3), 74-88

Soares, R. 2011, Assessing Monetary Policy in the Euro Area: A factor- Augmented VAR Approach, Working Papers 11/2011

Stock, J. and M. Watson. 1989. "Interpreting the evidence on money-income causality". Journal of Econometrics, 40: 161–82.

Stock, J. and M. Watson. 2001. "Vector autoregressions". Journal of Economic Perspectives, 15(4): 101–15.

Walsh, C. 2003. Monetary Theory and Policy. Cambridge, Massachusetts: The MIT Press.

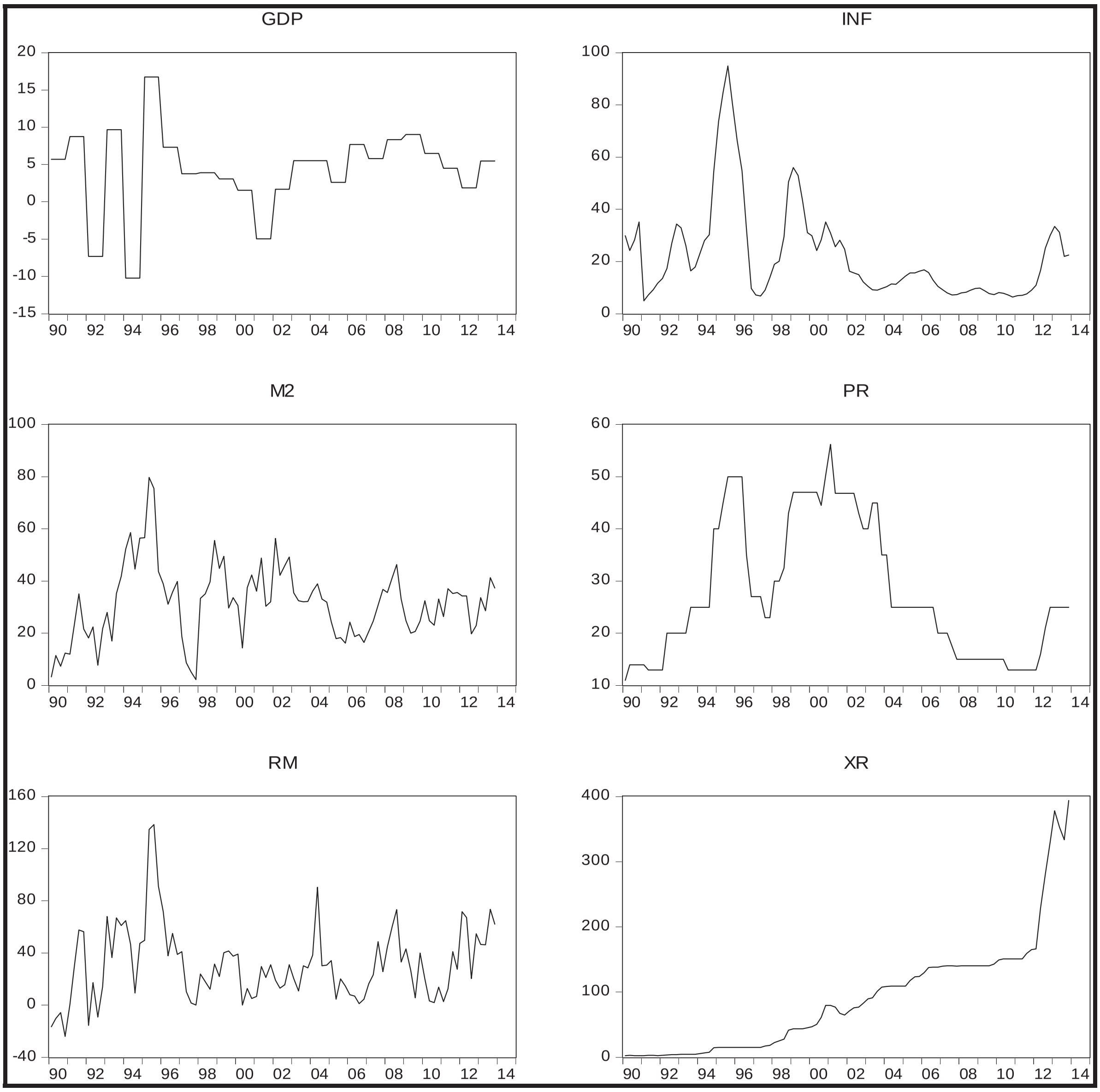
Appendices

Appendix I: Variable Definition

Variable	Description
Policy Rate (PR)	This a monetary policy instrument set by the Reserve Bank of Malawi. It is an indicator of monetary policy stance and is set based on developments in inflation, money market rate and prospects for real GDP growth.
Inflation (Inf)	Is the rate of change in overall level of domestic prices. It is made up of 50.8% food inflation and 49.2% non-food inflation
Exchange Rate (ER)	It is the official nominal Malawi kwacha per USD
Reserve Money (RM)	It calculated as the sum of currency in circulation, Vault cash and Commercial bank deposits with the Reserve bank of Malawi
Broad Money (M2)	It is the sum of currency outside banks, demand deposits, time and savings deposits
Read GDP	This is the real growth rate of the economy
Lending Rate (LR)	Average of maximum and minimum commercial banks' lending rates
Factor X_t	Constructed through PCA analysis from the following variables: Index of industrial production (IIP)*, Food Inflation (FINF), Nonfood Inflation (XINF), 91 day Treasury bill rate (TBR), Deposit Rate (DR), Liquidity Reserve Requirement(LRR), Fiscal Deficit,(Fisc), Narrow money (M1), Private sector credit (PSC), Net Credit to Government (NCG), Net Domestic Credit (NDC), Commercial Banks' Net Foreign Assets (CBNFA), Crude Oil Price (OILP)*, Commodity Price Index (COMPI)* and Agriculture Commodity Price Index (AGCOMPI)*; Dum1(1997Q1), Dum2(1993Q3), Dum3(2009Q3) and Dum4 (2012Q2).

Denotes Slow-moving variables, otherwise fast-moving

Appendix 2: Graphical Presentation of the Model Variables



Appendix 3: BAI Perron Multiple Break Point Test

Bai-Perron tests of L+1 vs. L sequentially determined breaks

Sample: 1990Q1 2013Q4

Sequential F-statistic determined breaks: 3

Break Test	F-statistic	Scaled F-statistic	Critical Value**
0 vs. 1 *	13.11715	118.0544	25.65
1 vs. 2 *	4.699240	42.29316	27.66
2 vs. 3 *	8.651752	77.86577	28.91
3 vs. 4	3.166299	28.49669	29.67

* Significant at the 0.05 level.

** Bai-Perron (2003) critical values.

Break dates:

	Sequential	Repartition
1	1997Q1	1993Q3
2	1993Q3	1997Q1
3	2009Q1	2009Q1

Suggested Causes of Breaks

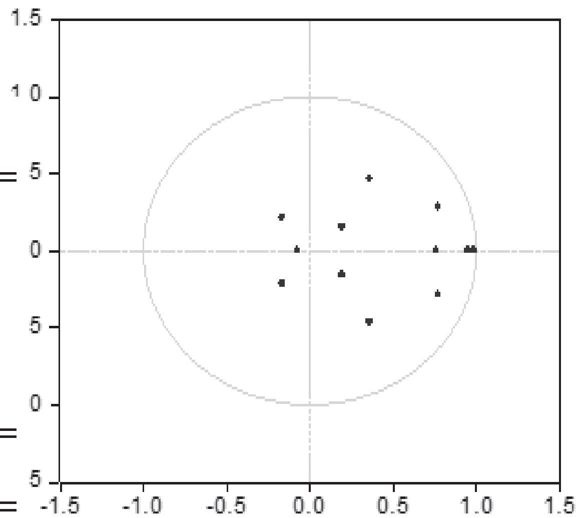
There was a big drought in 1992. In 1993, Malawi was undergoing political reforms from single party to plural political and the referendum was held in this year and this could be responsible for the structural break. In 2009, the country started experienced economic hardship following imprudent economic policies which included maintenance of an overvalued exchange rate.

Appendix 4: VAR Diagnostics

Jarque-Bera: VAR Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null: Residual are Multivariate normal

Component	Jarque-Bera	df	Prob.
1	61.97646	2	0.0000
2	112.3804	2	0.0000
3	0.328787	2	0.8484
4	32.08639	2	0.0000
5	11.44858	2	0.0033
6	9.453745	2	0.0089
Joint	227.6744	12	0.0000

Inverse Roots of AR Characteristic Polynomial

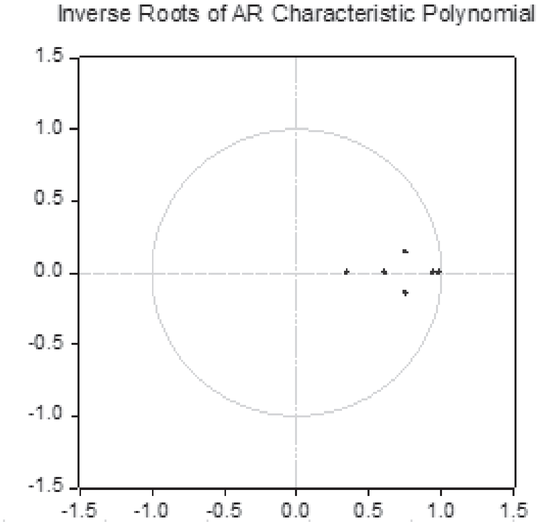


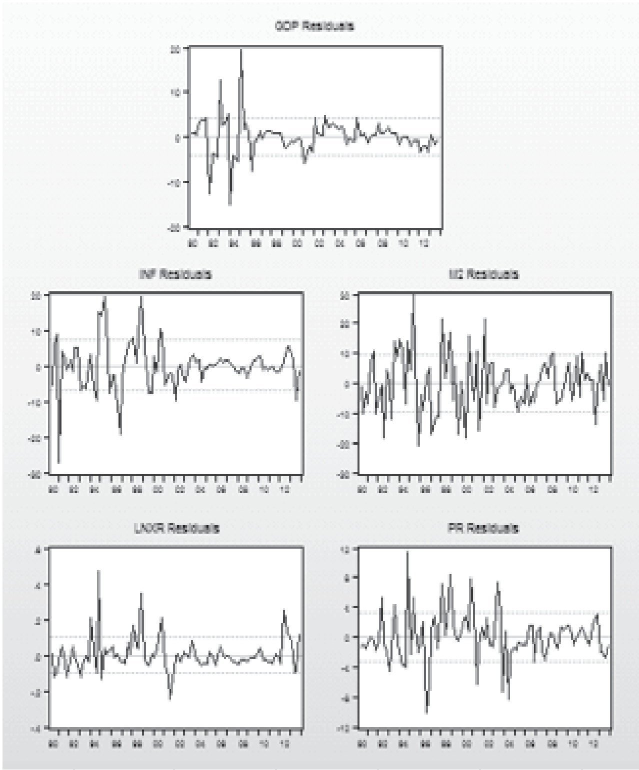
VAR Variance Decomposition for Inflation

Period	S.E.	GDP	INF	M2	LNXR	LR	PR	PR
1	5.978849	2.117839	97.88216	0.000000	0.000000	0.000000	0.000000	0.000000
2	9.787243	3.314364	91.86097	1.474871	2.622484	0.562948	0.164362	1.295268
3	12.55104	6.367363	85.12153	3.789548	3.854011	0.436706	0.430839	2.466896
4	14.39476	10.59313	77.98423	6.618087	3.851466	0.332088	0.621000	3.247441
5	15.54794	14.11698	71.52013	9.909431	3.418035	0.319430	0.715993	3.730819
6	16.26187	16.00231	66.36442	13.33541	3.157269	0.365019	0.775565	4.021151
7	16.72126	16.45421	62.79013	16.18927	3.279332	0.439714	0.847353	4.190916
8	17.03474	16.17464	60.65137	17.99829	3.691101	0.526560	0.958050	4.286871
9	17.26032	15.76391	59.52451	18.79527	4.196522	0.609796	1.109992	4.338741
10	17.42867	15.51714	58.94992	18.92872	4.647110	0.675313	1.281800	4.365188
11	17.55579	15.48956	58.59544	18.77352	4.980254	0.716566	1.444664	4.377618
12	17.65045	15.61702	58.29475	18.57749	5.195464	0.736167	1.579103	4.382699
13	17.71894	15.80610	58.00466	18.44781	5.320430	0.741779	1.679227	4.384104
14	17.76713	15.98346	57.74114	18.39850	5.387602	0.740980	1.748310	4.383710
15	17.80052	16.11266	57.52989	18.40246	5.423048	0.738613	1.793320	4.382408
16	17.82374	16.18893	57.38216	18.42685	5.443820	0.736696	1.821538	4.380596
17	17.84020	16.22475	57.29142	18.44956	5.459736	0.735498	1.839032	4.378458
18	17.85224	16.23641	57.24058	18.46179	5.476327	0.734672	1.850226	4.376097
19	17.86142	16.23654	57.21083	18.46361	5.497043	0.733949	1.858021	
20	17.86889	16.23237	57.18741	18.45846	5.524210	0.733374	1.864175	
19	17.66538	59.81396	13.15361	11.01466	10.31789	1.326293	4.373598	
20	17.67105	59.77571	13.16803	11.01037	10.31213	1.362726	4.371032	

Appendix 5: Factor Augmented VAR Diagnostics

Component	Jarque-Bera	df	Prob.
1	76.46715	2	0.0000
2	263.5456	2	0.0000
3	33.04707	2	0.0000
4	0.025832	2	0.9872
5	27.88409	2	0.0000
6	8.663688	2	0.0131
Joint	409.6334	12	0.0000





FAVAR Lag Order Selection Criteria Sample: 1990Q1 2014Q4 Included observations: 88					
LogL	LR	FPE	AIC	SC	HQ
-1518.918	NA	45352087	34.65722	34.82613	34.72527
-1006.271	943.7363	897.0385	23.82434	25.0061*	24.30069
-957.7100	82.77438	681.7536	23.53886	25.73468	24.42350
-911.3279	72.73560	553.9468	23.30291	26.51218	24.59584
-853.2446	83.16474	354.3121	22.80101	27.02375	24.50225
-787.2042	85.55230	196.4043	22.11828	27.35447	24.22781
-731.1803	64.93681	143.9405	21.66319	27.91283	24.18101*
-685.3774	46.84389	142.6943	21.44039	28.70350	24.36652
-624.3740	54.07118*	110.1200*	20.87214*	29.14869	24.20655

FAVAR VAriance Decomposition for Inflation

Period	S.E.	F	GDP	INF	M2	LNXR	PR
1	6.846816	61.59096	0.057023	38.35202	0.000000	0.000000	0.000000
2	9.923806	66.60070	3.171273	27.47529	1.316736	0.140736	1.295268
3	12.27455	66.75217	6.430140	20.85059	3.206601	0.293601	2.466896
4	14.04624	65.49381	8.934410	16.88876	5.012290	0.423285	3.247441
5	15.32559	64.04583	10.66889	14.49717	6.525069	0.532232	3.730819
6	16.20797	62.79641	11.79796	13.04768	7.710289	0.626506	4.021151
7	16.78926	61.83710	12.48989	12.17653	8.595168	0.710403	4.190916
8	17.15498	61.15286	12.88243	11.66380	9.227635	0.786405	4.286871
9	17.37466	60.69279	13.08098	11.37136	9.660296	0.855837	4.338741
10	17.50066	60.39882	13.16268	11.21081	9.943040	0.919452	4.365188
11	17.56985	60.21833	13.18114	11.12603	10.11908	0.977802	4.377618
12	17.60657	60.10929	13.17109	11.08240	10.22308	1.031440	4.382699
13	17.62592	60.04137	13.15300	11.05967	10.28088	1.080979	4.384104
14	17.63671	59.99459	13.13740	11.04673	10.31049	1.127077	4.383710
15	17.64370	59.95702	13.12849	11.03804	10.32367	1.170386	4.382408
16	17.64929	59.92224	13.12691	11.03111	10.32764	1.211504	4.380596
17	17.65455	59.88732	13.13163	11.02503	10.32661	1.250941	4.378458
18	17.65988	59.85126	13.14105	11.01955	10.32294	1.289102	4.376097
19	17.66538	59.81396	13.15361	11.01466	10.31789	1.326293	4.373598
20	17.67105	59.77571	13.16803	11.01037	10.31213	1.362726	4.371032

Appendix 6: Evolution of Exchanger Rate Policies

Exchange rate regime	*Period*	*Devaluation*
British pound sterling (GBP)	16 Nov 1965-18 Nov 1973	14% 20 Nov 1967
Basket of BPS and USD	19 Nov 1973-8 June 1975	
IMF Special Drawing Right (SDR)	9 June 1975-16 Jan 1984	15% 24 Apr 1982 12% 17 Sep 1983
Basket of seven currencies*	17 Jan 1984-6 Feb 1994	15% 2 Apr 1985;10 % 16 Aug 1986; 20% 7 Feb 1987; 15% 16 Jan 1988; 7% 24 Mar 1990; 15% 28 Mar 1992; 22% 11 Jul 1992.
Managed Float (Dutch Auction)	7 Feb 1994-End 1994	
Fixed band	End 1994-1st quarter 1997	
Crawling peg (unannounced)	2nd quarter 1997-End 1998	7% July 1997; 28% 21 Aug 1998; 23% 24 Aug 1998
Free float	End 1998-mid 2003	
Managed float	Aug 2003-End 2006	
Fixed in USD	2007-April 2012	10% Aug 2011
Free Float	May 2012-todate (June 2014)	50% 7 May 2012

*These currencies were: USD (27%), GBP (27%), Germany Deutschmark (7), South African Rand (ZAR, 18%), French Franc (7), Japanese yen (7) and the Dutch guilder (7). Figures in parentheses are baskets weights.

Chapter 3

Assessment of the Effectiveness of Monetary Policy in Mauritius

By S. Sharma and S. Chutoo

1.0 Introduction

The objective of the paper is fourfold. First we assess the current state of the monetary policy transmission mechanism in Mauritius by focusing on three different policy channels, the interest rate channel, the exchange rate channel and finally the monetary channel and find that the interest rate channel which is key to the current monetary policy framework has become quite weak in Mauritius. With the interest rate channel being weak for now and considering the fact that the Central Bank has only chosen to intervene in the FX market to limit foreign exchange volatility and not change its trend which is market determined, we choose to focus on the remaining monetary channel by estimating 2 money demand equations for both M1 and M2 and test for the stability of these two equations over time. We find that money demand is highly sensitive to changes in the opportunity cost of holding money and to the expected depreciation of the nominal effective exchange rate. The elasticity of income was also found to be stronger for M1 and statistically close to unity compared to M2.

Third, we also discuss ways in which the current transmission mechanism can be strengthened over time and how the short end of the curve can become more anchored to the policy rate. Finally, we discuss ways in which private agents' inflationary expectations can be well anchored by better focusing these expectations on policy objectives. We propose a framework revolving around a time varying inflation target with associated target bands which seeks at the margin to provide greater flexibility to monetary policy making by allowing it to also take shorter term growth concerns in mind while minimizing the impact that such moves could have on its credibility as a defender of price stability.

2.0 Monetary Policy in Mauritius

2.1 A Primer on Monetary Policy in Mauritius

The Bank of Mauritius Act 2004 stipulates that 'the primary objective of the Bank shall be to maintain price stability and to promote orderly and balanced economic development.' Following the financial liberalization of the early 1980s, the Bank moved towards a framework of direct monetary control, which revolved around ceilings for the expansion of credit by banks along with reserve requirements and interest rate guidelines issued to banks. By the mid-1990s, a more flexible exchange rate regime allowed the Bank to switch to a framework of indirect monetary control which essentially revolved around the Bank influencing the growth of money and market determined interest rates.

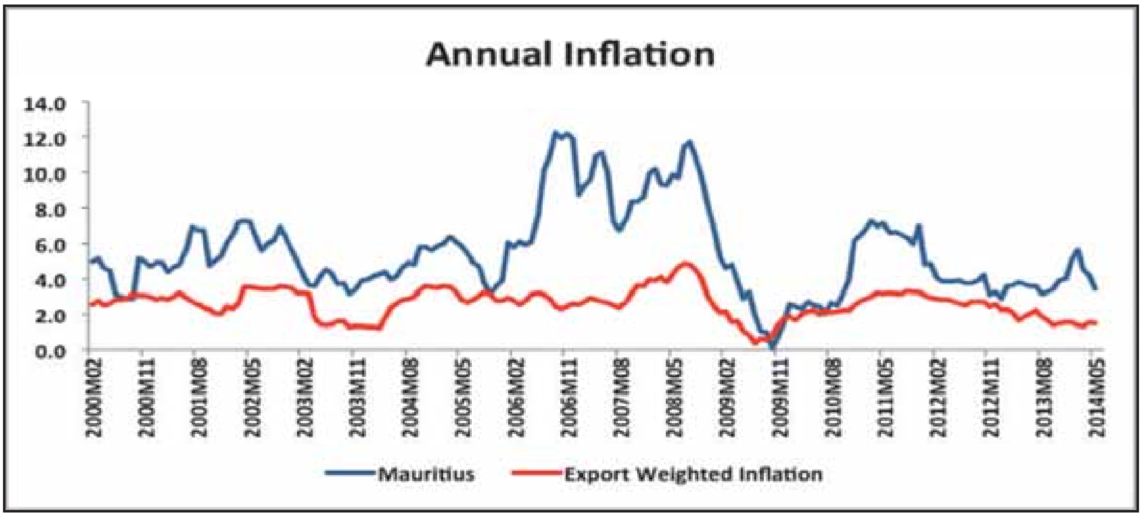
By the late 90s, the Bank introduced the Lombard Rate which replaced reserve money as the operating target while maintaining the money supply as an intermediate target. In December 2006, the Bank formally introduced the Key Repo Rate as its key monetary policy instrument while the Bank of Mauritius Act (2004) formally introduced the Monetary Policy Committee (from April 2007) as the main decision making body empowered with the setting of the Repo Rate. Meetings are typically held each quarter of the calendar year while the Monetary Policy Committee stands ready to meet in between regularly scheduled meetings should the need arise (Punchoo, 2004) & (Heerah-Pampusa, et al., 2006).

2.2 Review of the Current Monetary Policy Regime

The Monetary Policy Committee is currently made up of 8 voting members, 3 from the Bank – the Governor who is the chairman and his two deputies – and five external members. The Prime Minister nominates 2 members of the MPC, while 3 external members are nominated by the Finance Minister.

Compared to its main trading partners, inflation in Mauritius has remained well above the export weighted inflation rate over the years while wage growth has tended to remain above labor productivity growth (See Figure 1).

Figure 3.1: Inflation Comparison of Mauritius and main Trading Partners

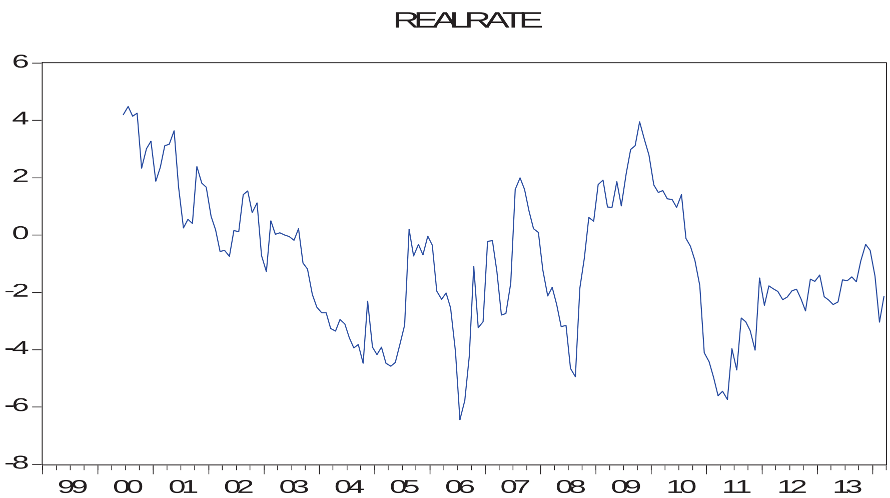


Source: Bank of Mauritius

The Bank of Mauritius favors a gradual move towards some form of inflation targeting in order to better anchor inflationary expectations, and over time reduce the inflation differential.

The Bank is supposed to ensure that the interbank rate remains within the repo corridor, which was initially set at +/-50bps – but has since been widened to +/-125bps (April 2008) – by regulating the supply of reserve money and through sterilization of excess liquidity by the issuance of bills and bonds with the BoM even issuing a 15 year Bond in 2014.

Figure 3.2: Real Interest Rate from the Interbank Rate.

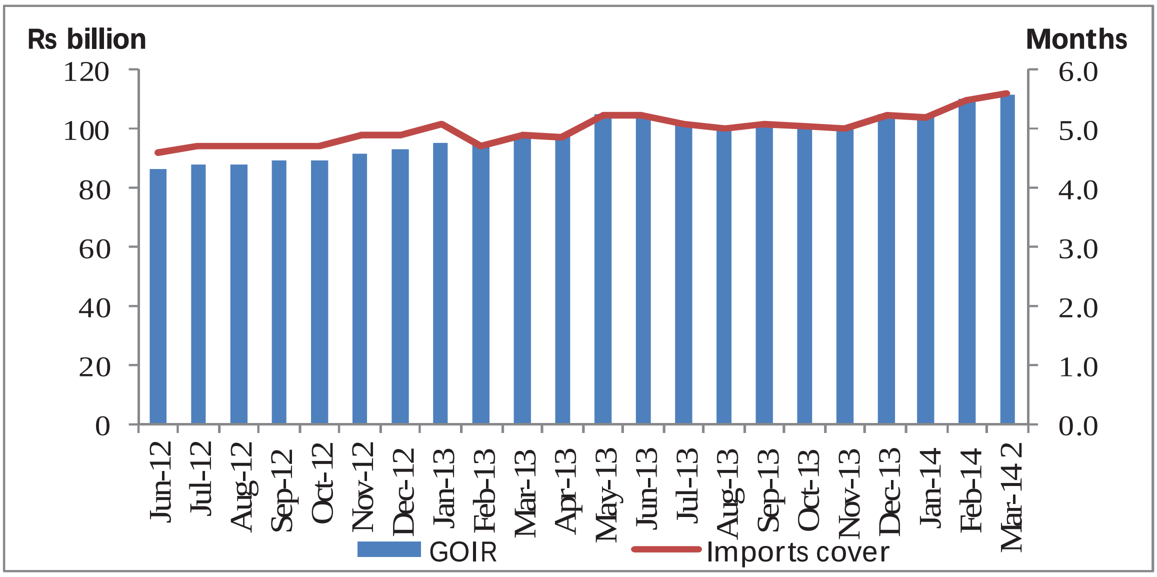


Source: Authors' Computations

Figure 2 clearly shows that over the past decade, real interest rates when using the interbank rate as proxy has remained largely in negative territory, highlighting the bias of the MPC over the years towards one of supporting output. Despite negative real interest rates being blamed by some MPC members for increasing risk-taking behavior by market players and financial stability risks, there has been little consensus on the idea of interest rate normalization amongst MPC members.

It should also be noted that over the past three years, excess liquidity in the system has continued to put pressure on short-term yields and the interbank rate, which has fallen below the lower band of the repo corridor. In many ways, the current rise in excess liquidity – well beyond the MUR 3Bn, which is typically accepted – is a function of not only falling corporate credit demand but of the rising recourse of the Government to external borrowing and of the placement of budget funds with commercial banks. In sum, greater coordination between the fiscal and monetary side remain key to a well-functioning monetary policy framework in Mauritius.[11]

Figure 3.3: Rising Foreign Reserves



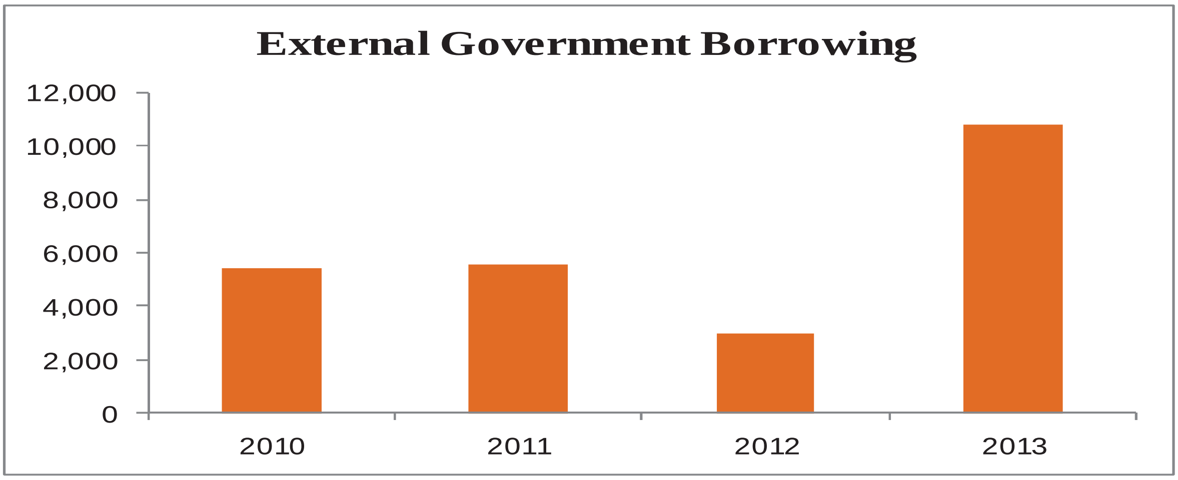
Source: Bank of Mauritius

Since June 2012, the Bank has engaged in *Operation Reserve Reconstitution* in order to build stronger buffers and bring the import cover to 6 months as shown in Figure 3. At the same time as more Rupees have entered the system, the Government

11 The above discussions follow from (Punchoo, 2004) and (Tsangarides, 2010)

has increasingly relied on foreign borrowings (see Figure 4) which has led to more Rupees entering the money market.

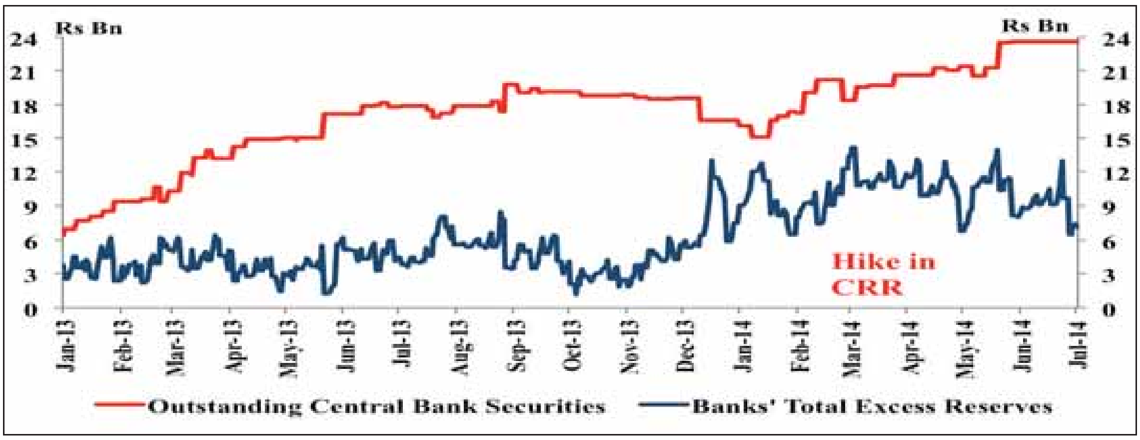
Figure 3.4: External Government Borrowings in MUR millions



Source: Bank of Mauritius

Despite sterilization efforts, the Bank has been unable to reverse the trend of rising excess liquidity. In addition, lower corporate credit demand has been driving down the overall growth in private sector credit. The supply of short term paper (1 year or less) has also been declining. In turn, rising excess liquidity in the system, as illustrated in Figure 5, despite various Cash Reserve Ratio increases have put downward pressure on short term market rates such as the interbank and Treasury bill /yields.

Figure 3.5: Excess Liquidity vs. Bank of Mauritius Outstanding Securities



Source: Bank of Mauritius

3.0 Literature Review

There have been very few empirical studies which have been published about the assessment of monetary policy in Mauritius over the past decade. Most quantitative studies relating to Mauritius have in fact been carried out by the International Monetary Fund, all within a working paper format. One of the most well-read working papers written by Porter and Yao developed a new macro-finance model for Mauritius investigating its experience with "inflation targeting lite" (Porter & Yao, 2005). An inflation targeting lite regime as defined by Stone is essentially one where a central bank which may face low credibility announces a broad inflation target but is not able to maintain inflation as its principal policy objective (Stone, 2003).

The low credibility is itself a function of perceived vulnerabilities to large economic shocks and to a still evolving institutional framework. The paper found that the credibility that the Bank of Mauritius had established with "inflation targeting lite" allowed it to gradually shift from exchange rate targeting towards inflation targeting. Sacerdoti et al. (2005) argued that the inflation targeting lite regime enabled the Bank of Mauritius to moderate inflationary expectations, which was associated with a reduction in overall inflation. The authors however emphasized that the Mauritian experience could only be taken so far in the sense that the experience came in a backdrop of relatively subdued inflation globally. Inflation targeting lite was described as a transition phase towards some more formal form of inflation targeting in the future (Stone, 2003). The Bank of Mauritius in fact gradually setup the infrastructure needed for a more formal targeting framework. For example, the Bank moved from the Lombard Rate towards the Key Repo Rate, setup a Monetary Policy Committee, worked on refining its forecasting models, and gradually improved its communication channels, specifically via post MPC press conferences (Tsangarides, 2010).

Tsangarides' 2010 Monetary Policy Transmission Mechanism in Mauritius using a VAR Analysis IMF Working Paper used both a recursive and structural VAR approach to assess the effectiveness of the transmission mechanism. Hefound that the overall transmission channel of an unexpected temporary increase in the repo rate was weak for both overall and core inflation. It also found that unexpected temporary shocks to the other two policy variables, the exchange rate and monetary channel resulted in statistically significant changes of the overall inflation rate. Nominal policy tools had a greater impact on inflation than on output. Tsangarides argued that more needed to be done to understand the transmission mechanism before formulating more concrete policy advice.

4.0 Empirical Assessment of the Monetary Policy Transmission Mechanism

4.1 Data Source

Quarterly data, and monthly where available, was obtained from the Bank of Mauritius' database. Given data availability, this study has restricted the sample to 1998Q2-2014Q1.

4.2 Structure of Transmission Mechanism

The monetary transmission mechanism outlines the dynamics of monetary policy on real economic activity and inflation (Gerlach & Smets, 1995). The process can be easily represented by three distinct channels namely, the interest rate, credit and exchange rate channels (Weber, et al., 2009).

Interest Rate Channel

The central bank can influence the real cost of borrowing by changing the nominal policy rate through the interest rate channel (Mishkin, 1995). Changes in policy rates are expected to be transmitted through the banking system to long term lending and deposit rates which in turn influence investment decisions and consumer and business spending.

Credit Channel

The credit channel can be further considered as the bank lending and the balance sheet channel according to Mishkin (Mishkin, 1995). The bank lending channel describes the impact of monetary policy on the supply of bank loans. A tightening monetary stance results in a fall in bank reserves which in turn affects the total amount of bank credit available. As a result, investment by bank-dependent borrowers drops. The balance sheet channel focuses on the effect of change in interest rates on corporate balance sheets. A hike in interest rates reduces the capitalized value of the firm's long-lived assets and thus worsens corporate balance sheets. Private sector investments fall owing to their devalued collateral against corporate loans.

Exchange Rate Channel

Exchange rates are commonly considered to be easily influenced by any change in short term interest rates in an open economy and/or through intervention in the foreign exchange markets. An increase in domestic nominal interest rate relative to its foreign counterpart should lead to a gradual appreciation in the domestic currency which in turn reduces the price of imports, thereby lowering inflation (Mishkin, 1995).

4.3 The Interest Rate Channel in Mauritius

4.3.1 Analysis of the Volatility of the Interbank Rate

Typically the transmission mechanism for a central bank, which targets inflation, works from the short end to the long end of the yield curve. Such a mechanism also fosters greater security market development. When policy signals are relatively unclear or are constrained, interbank rates tend to become more volatile over time, which prompts market players to use Treasury bill rates as a benchmark for pricing. In this situation, transmission tends to weaken and bond market developments tend to freeze up because of uncertainties surrounding the pricing of fixed income assets.

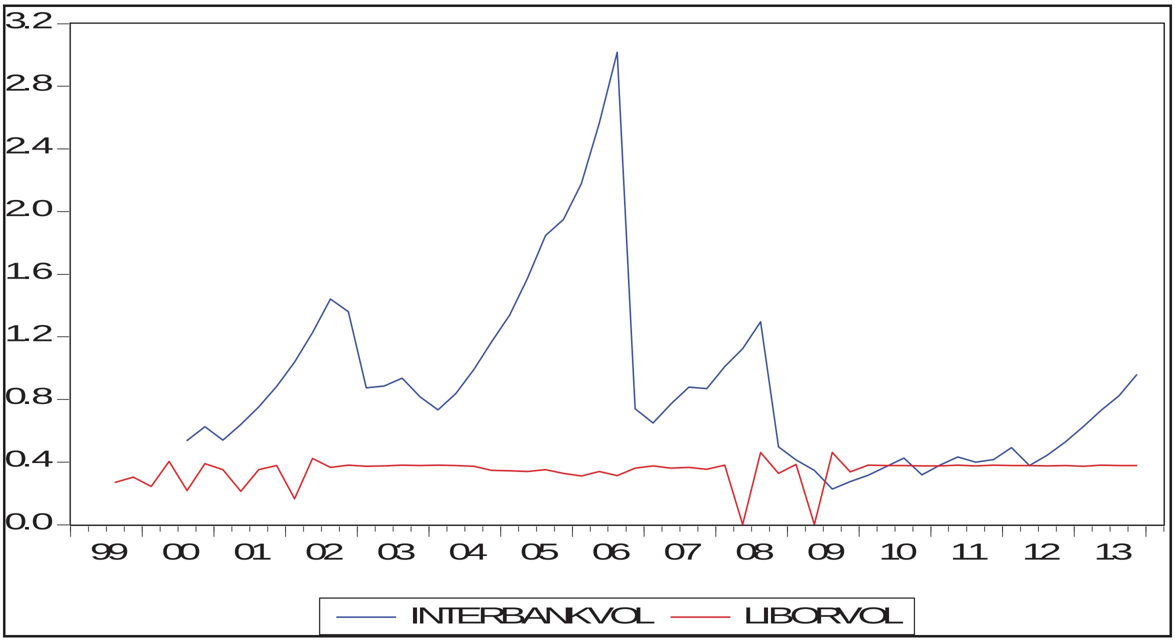
More than 20 years after the setup of a Secondary Market Cell, and 12 primary dealers later, Mauritius has yet to develop a well-functioning secondary bond market. This hampers the evolution of a modern transmission mechanism with transparent pricing and opportunities for commercial banks to better manage their liquidity[12]. In the case of Mauritius, a simple GARCH (1, 1) measure of volatility on the end of quarter interbank rate clearly showcases a high degree of instability when compared to the volatility of a benchmark US 3 month LIBOR.

While the introduction of the Repo rate as a key policy rate in December 2006 with an initial +/-50bps corridor helped to bring down interbank rate volatility, recent increases in the levels of excess liquidity in the system have once again seen a return to higher levels of interest rate volatility, particularly at the short end of the curve. Rising volatility becomes noticeable during the middle of 2012 at the same time as the launch of Operation Reserve Reconstitution as shown in Figure 6.

---

12 The need for policy makers to ensure adequate supply by issuing paper even if there is no need on the debt management side to do so will go a long way in getting a secondary market functioning.

Figure 3.6: Volatility of the Mauritian Interbank Rate vs. US LIBOR (1999Q1-2014Q1)



Source: Authors' Computations

4.3.2 *Econometric Relationship between Policy Rate and Interest Rates*

In order to provide further insight on the current effectiveness of the monetary policy transmission mechanism, one can also econometrically analyze (Bordon & Weber, 2010):

- Changes in the interbank rate from changes to the Policy Rate.
- Response of the Weighted Average Lending Rate to changes in the Policy Rate.
- Responses of the Weighted Average Lending Rate to changes in the interbank rate.
- Response of the Savings Deposit Rate to changes in the Policy Rate.
- Response of the Savings Rate to changes in the Interbank Rate.

Here we employ a basic econometric model of the form:

$$\Delta y_t = \beta_0 + \beta_1 \Delta y_{t-1} + \beta_2 \Delta y_{t-2} + \beta_3 \Delta x_{t-1} + \beta_4 \Delta x_{t-2} + \varepsilon_t \quad \text{.. (1)}$$

Using this model, the short term impact of the changes in x on y can be inferred by estimating the value of β_3 while the longer term effect can be measured by simply calculating the following:

$$\textit{Long Term Effect} = (\beta_3 + \beta_4 + \beta_5)/(1 - \beta_1 - \beta_2) \quad \text{... (2)}$$

4.3.3 Empirical Results

Table 3.1: Impact of the Policy Rate on Other Interest Rate Changes[13]

	Data Set	**ST Effect**	**LT Effect**	**R-Squared**
Response of Intbnk to Policy Rate	2006Q4 -2014Q1	0.72	1.41	0.13
Response of Lending Rate to Policy Rate	2006Q4 -2014Q1	0.40	0.75	0.57
Response of Lending Rate to Intbnk	2005Q4-2014Q1	0.10	0.11	0.11
Response of T-Bill Rate to Pol	2006Q4-2014Q1	0.00	0.00	0.02
Response of T-Bill to Intbnk	2000Q4-2014Q1	0.22	0.40	0.23
Response of Savings Rate to Policy Rate	2006Q4-2014Q1	0.66	0.98	0.69
Response of Savings Rate to Intbnk	2005Q4-2014Q1	0.13	0.14	0.17

Source: Authors' Computations

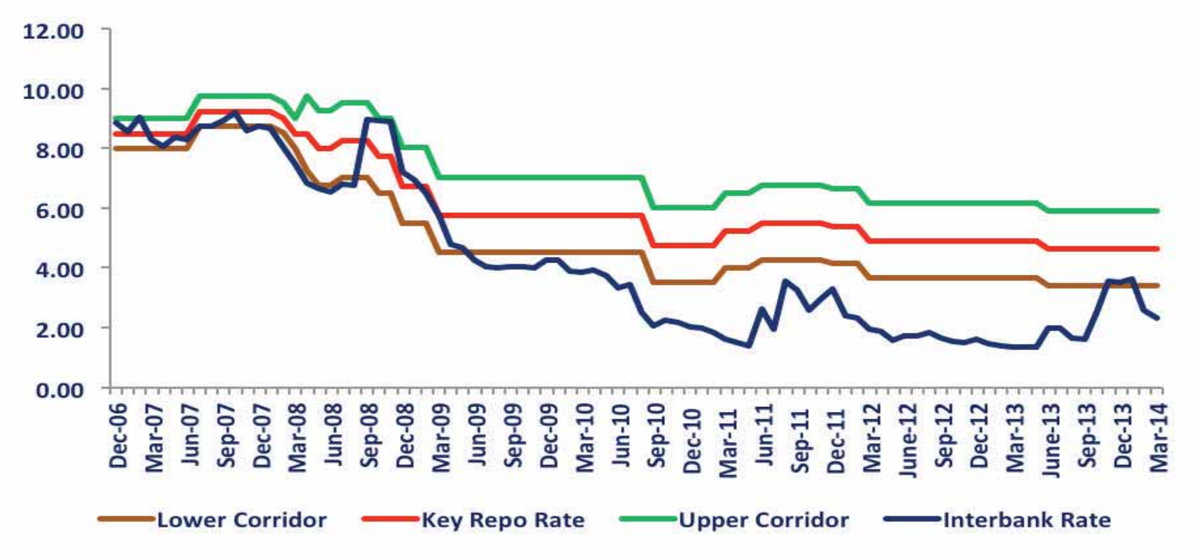
As shown in Table 1, the current policy rate, i.e. the Key Repo Rate only has a strong relationship to the weighted average lending rate to the private sector (a longer term proxy) and to the savings rate but has very weak relationships to other variables, which are market determined at the short end of the curve. The weighted average Treasury Bills rate has no statistically significant relationship to changes in the Repo Rate although the relationship appears to be stronger when changes in the interbank rate are considered. It should also be noted that while the relationship between the savings deposit rate and the policy rate is strong, continued divergence between the short end of the curve and this rate will result in pressure from banks to de-anchor the savings rate from the policy rate over time, with the argument that the current setup negatively impacts their cost of funds.

Some private banks have already started to adjust both their savings and lending rates despite the fact that the policy rate has remained constant during that same time period. Moral suasion which has been key to the influence of the Repo on both lending and savings rates cannot be sustained if market rates remain unanchored for long.[14]

13 Impact of a 100 basis point increase

14 The prime lending rate of each bank is different and is a function of the margin it feels it needs compared to its cost of funds and its assessment of risks. We are using the weighted Prime Lending Rate (PLR).

Figure 3.7: The Relationship between the Interbank Rate and the Key Policy Rate (December 2006-March 2014)



Source: Bank of Mauritius

The relationship between the Repo Rate and the Interbank Rate would appear strong from looking at the short and long term estimates, but considering the low Adjusted R Squared of the regression is difficult to draw many conclusions. As shown in Figure 7, since June 2009, the interbank rate has generally remained below the lower band of the Repo corridor.

4.4 Factors affecting Money Demand in Mauritius

4.4.1 The Money Demand Function

In the following section, we look to better analyze the factors which influence money demand in Mauritius using both M1 and M2 and look to assess the stability of this equation over time.

We use the following model used by Oomes and Ohnsorge (2005) which generally corresponds to a range of long term money demand theories.

$$\frac{M^d}{P} = f\left(Y, R^-\right) \quad (3)$$

where M^d is the demand for a particular monetary aggregate, P is the consumer price index, Y is a scale variable measuring the real level of economic activity, and R is a vector representing the rates of return on alternative assets (i.e., the opportunity cost of holding money). We use quarterly real GDP data from 1999Q1 to 2014Q1.

In order to measure the opportunity cost of holding Rupees, we use the one year Treasury Bills Rate as a proxy for the opportunity cost of holding money and secondly we also consider the nominal depreciation of the Nominal Effective Exchange Rate (NEER) over the past 12 months as a proxy for the expected depreciation of the currency. If a cointegrating relationship exists, it can be justifiable to use actual depreciation as a measure of expected depreciation as long as agents' forecast errors are stationary. Under rational expectations, errors would always be stationary while under backward-looking expectations, the forecast errors would always be stationary when the process being forecast is non-stationary in levels (see (Taylor, 1991) and (Choudhry, 1998)).

While inflation was also used as a variable in the model, it did not help to generate logical results as for example the T-Bill coefficient became statistically insignificant. Both the T-Bill rate and the depreciation of the NEER can be interpreted to be capturing the inflation variable which is often used in the modeling of money demand function. Hence, assuming money demand equals to money supply over the long term, the money demand equation can take the form:

$$m - p = \beta_0 + \beta_1 y + \beta_2 i + \beta_3 e \quad \text{..........} \quad (4)$$

Where m-p is the log of real money demand, y is real GDP, i is the 12 month T-Bill rate being used as a proxy for the savings deposit rate[15] and e is the depreciation of the NEER over the past 12 months. Real GDP and Real Money were deseasonalized and all variables were found to be I(1) in levels. The 2003 change in the methodology for the calculation of monetary statistics and the financial crisis were also incorporated in the model via the use of Dummy variables as exogenous factors. Both M1 and M2 were used as m in two separate equations. Considering the presence of interest rates and the depreciation variable in our model, it is obvious that the velocity of money will not be constant over time.

4.4.2 Calibration of the Money Demand Model

Cointegration tests ((Johansen, 1988) and (Johansen & Juselius, 1990)) on the above mentioned variables were then carried out. Assuming a linear intercept and

15 Data limitations in terms of a properly weighted time series made us use the 12 Month T-Bill Rate

no trend in the data, evidence was found for one cointegrating relationship for both M1 and M2 variables. Given the presence of a cointegrating relationship (Williams & Adedeji, 2004) and the need to model both short and longer term dynamics of the money demand equation, a Vector Error Correction Model with 1 cointegrating relationship and 1 lag was estimated for both M1 and M2 ((Adam, 1991) and (Mosweu, 2003)). Hence, the equations under a VECM can be summed up as follows:

$$(m-p)=c_t+\alpha(m-p)_{t-1}-\beta_2 y_{t-1}-\beta_3 i_{t-1}-\beta_4 e_{t-1} \\ +change\ in\ short\ term\ dynamics\ and\ dummies+\varepsilon_t \qquad \text{.............................. (5)}$$

Table 3.2: Long Term Money Demand Equation for Mauritius

		Cointegrating Parameter	GDP	Savings Rate	Depreciation
M1	Coef	-0.65	-0.80	0.017	0.005
	t-stats		-15.15	5.39	4.05
M2	Coef	-0.43	-0.50	0.013	0.004
	t-stats	-9.03	-11.61	5.02	4.22

Source: Authors' Computations

The Money Demand Equation for M2 can be written as follows:

D(M2_SA)=-0.43*(M2_SA(-1)-0.50*GDP_SA(-1)+0.013*RSTB(-1)+0.0042*DEPRECIATION(-1)-2.63)-0.17*D(M2_SA(-1))-0.16*D(GDP_SA(-1))+0.00068*D(RSTB(-1))+0.0012*D (DEPRECIATION(-1))-0.065+0.098*STATSDUMMY+0.032*FINCRISISDUMMY+ ERROR TERM .... (6)

The Money Demand Equation for M1 can be written as follows:

D(M1_SA)=-0.65*(M1_SA(-1)-0.81*GDP_SA(-1)+0.018*RSTB(-1)+0.0052*DEPRECIATION(-1)+2.42)-0.11*D(M1_SA(-1))-0.197*D(GDP_SA(-1))+0.0023*D(RSTB(-1))+0.00275*D (DEPRECIATION(-1))-0.21+0.298*STATSDUMMY+0.0298*FINCRISISDUMMY + ERROR TERM.. (7)

4.4.3 Stability of the Demand for Money

In terms of the stability of both M1 and M2 demand equations and after the imposition of 3 unit roots in the equation, we find that for either equation, all unit roots fall inside the unit circle indicating a certain degree of stability in the equations. We also tested the stability of the equation by looking at both the CUSUM Squared and N-step forecast tests. We find that the stability conditions for both M1 and M2 are satisfied. The results of the CUSUM Squared test are presented in Appendix 1.

4.4.4 Interpretation of Results obtained from the Money Demand Model

All long term variables in both M1 and M2 equations were statistically significant at the 5% level. Note that when adjusting for the negative sign of the cointegrating parameter, GDP's sign would be positive while those of Depreciation and the T-Bill Rates would turn as expected negative. Note that the parameters of the T-Bills and Depreciation variables are larger than they seem considering the way the data was imputed and should be multiplied by 100.

Interestingly, the income elasticity of money is only statistically not different from unity at the 5% level when looking at M1. Shocks in variables such as M1 could impact have a small impact on inflation in the short term. It would hence appear that interest rates currently have a statistically significant and a more than 1:1 impact on money demand in Mauritius, which can in turn have an impact on inflation. Money demand for both M1 and M2 however is heavily influenced by changes in the Treasury Bills rate and to a lesser extent by the expected depreciation of the Rupee. Indeed regarding the former variable, a 1% change in the opportunity cost of holding money has a 1.7% impact on M1 demand holding all other things equal.

The elasticity of income when M2 is used is below 1 at close to 0.5. Since M2 is made up of M1+ Savings Deposits + Time Deposits + Foreign Currency Deposits + Securities Other Than Shares, it is clear that in the case of Mauritius, components of money such as savings deposits and time deposits (largest shares) are relatively inelastic to changes in income. A 1% change in the opportunity cost of holding money has a 1.3% impact on M2 holding all other things equal. In terms of variance decomposition, it is clear that both the T-Bill and expected depreciation variables account for a fair share of money demand variability be it in M1 or M2 over time (see Appendix 2).

4.5 Empirical Analysis of the Transmission Process of Monetary Policy

4.5.1 VAR Model Specification

In this section, we examine the relationship between CPI, M1, BML, the NEER and various measures of short term interest rates such as the Repo, the Interbank Rate and the 3 Month T-Bill rate using Tsangarides (2010) suggested benchmark recursive VAR approach. Note that considering the limited sample size of the Repo Rate, the very short end of the curve, i.e. the 3 month T-Bill rate is being used as a proxy along with the interbank rate. Essentially we are testing to see whether market determined rates at the very short end, which the Bank is supposed to greatly influence, have a significant impact on inflation and growth.

The VAR model (Sims, 1980) assumes that the economy can be described by a structural equation of the form:

$$G(L)Y_t = C(L)X_t + \mu_t \text{ .... } (8)$$

G(L) and C(L) are (n x n) and (n x k) polynomials with the lag operator L while Y is an (n x 1) vector of endogenous variables, and X is a vector of exogenous variables. The equation ends with the usual vector of structural disturbances which are assumed to be uncorrelated.

Exogenous variables include US GDP and the Federal Reserve Fed Funds Rate. Furthermore, in order to account for potential structural breaks in the model, the following dummy variables[16] are used.

- Statistics Measurement Change Dummy in order to capture the new methodology in calculating monetary statistics from mid 2003.
- A Financial Crisis Dummy
- A Dummy which captures the December 2006 introduction of the Repo rate as a key policy rate.
- A Budget Dummy capturing the typical adjustment in prices of certain goods (e.g. tobacco and alcohol) during and one period after the announcement of the annual National Budget.

In sum, the basic model would take the form:

$$Y_t = A(L)Y_t + B(L)X_t + \varepsilon_t \text{ .... } (9)$$

Where:

$$E\left[\in_t \varepsilon_t^!\right] = \sum \text{ .... } (10)$$

In order to uncover the parameters in the structural form equation from a reduced form, one method is to place restrictions on contemporaneous structural parameters by using a Cholesky decomposition (orthogonalizing reduced form disturbances) which is essentially a recursive structure (Sims, 1980). Typically, the method revolves around the first variable responding only to its own shock, the

16 Dummy Variable Trap: Only statistically significant dummies are eventually kept and typically multicolleanarity (yikes spell this well) can easily be avoided because the econometric package being used will provide a warning which then can be tackled either by removing the intercept or by removing a dummy which was the preferred option in our case.

second responds to the first variable plus a shock on itself while the last variable in the system reacts immediately to all shocks. Disturbances however do not have contemporaneous effects on any other variable (Sims & Zha, 1998). Hence, in terms of the ordering of the endogenous variables, we assume the following (Bordon & Weber, 2010):

- Output is ordered before prices on the assumption that it adjusts more sluggishly. Prices also have immediate effects on output.[17]
- The money supply is ordered before the exchange rate and the short term market rate on the assumption that the exchange rate is impacted by all types of shocks.
- The short term rate or RSTB is assumed to be affected by output, prices and the amount of money in the system

4.5.2 *Identifying Cointegration Relationships*

Furthermore, as can be seen in Appendix 3, the correlation between the reduced form residuals is low which suggests that reduced form shocks are relatively orthogonal to each other. It can be assumed that the results from the ordering above are robust. We use monthly data from 1999M01 to 2014M03 where GDP variables are accordingly interpolated[18]. All data is deseasonalized. Secondly, we conduct ADF tests on each variable and find that all variables are integrated of order 1 at levels and are I(0) in first difference. Cointegration tests in Appendix 4 also suggest the presence of 2 cointegrating relationships assuming an intercept and no trend in the data.

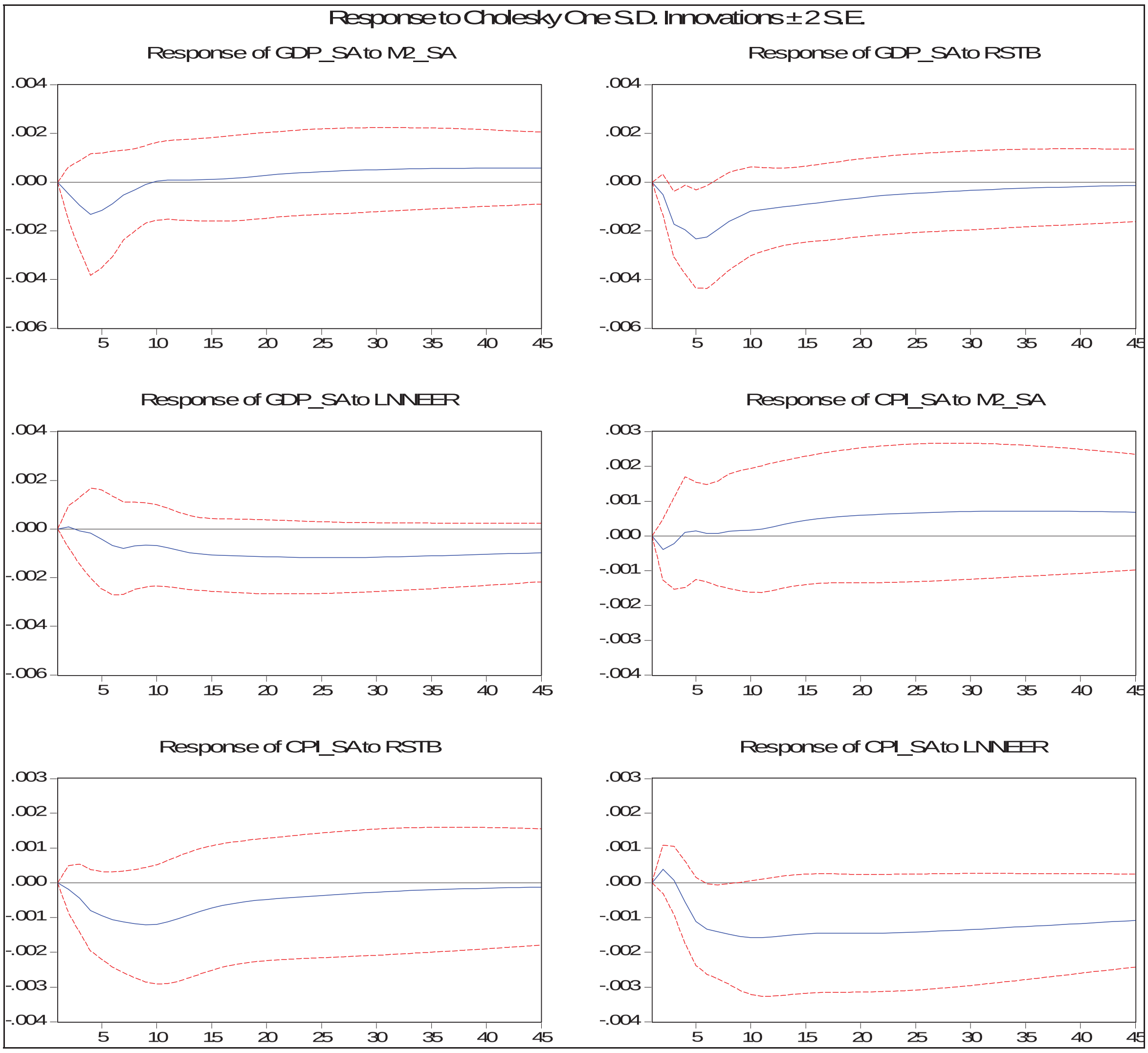
Despite the presence of cointegration relationships, we like the original authors (Tsangarides, 2010) choose not to be constrained by identification restrictions which would be complicated given our sample size. A restricted VAR can for example give economically inconsistent results especially when the sample size is limited. We hence proceed to estimating the VAR in levels. It has to be noted here that while our variables may indeed follow a unit root process, we would like to compare our findings to the earlier study conducted by Tsangarides (2010). Additionally, as demonstrated by Sims, Stock and Watson (Sims, et al., 1990), even if the system includes non-stationary variables, the OLS estimators would still be consistent when the model is estimated in levels. In terms of the choice of

17 There is no significant change in the results when prices are ordered before output.

18 Quarterly GDP is converted to monthly frequency.

the lag length, we rely on the standard information criteria focusing on choosing the lag where most standard criterions agree which in our case happens to be 4 lags.

Figure 3.8: Impulse Response Function with M2 as endogenous Variable



Source: Authors' Calculation

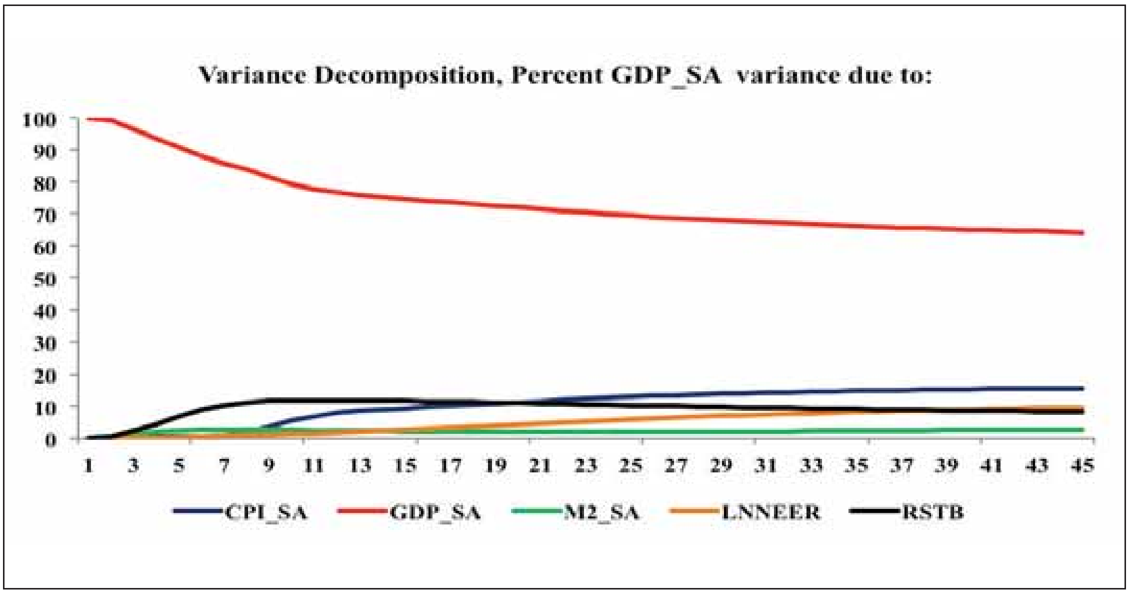
4.5.3 Test for Stability on the VAR Models

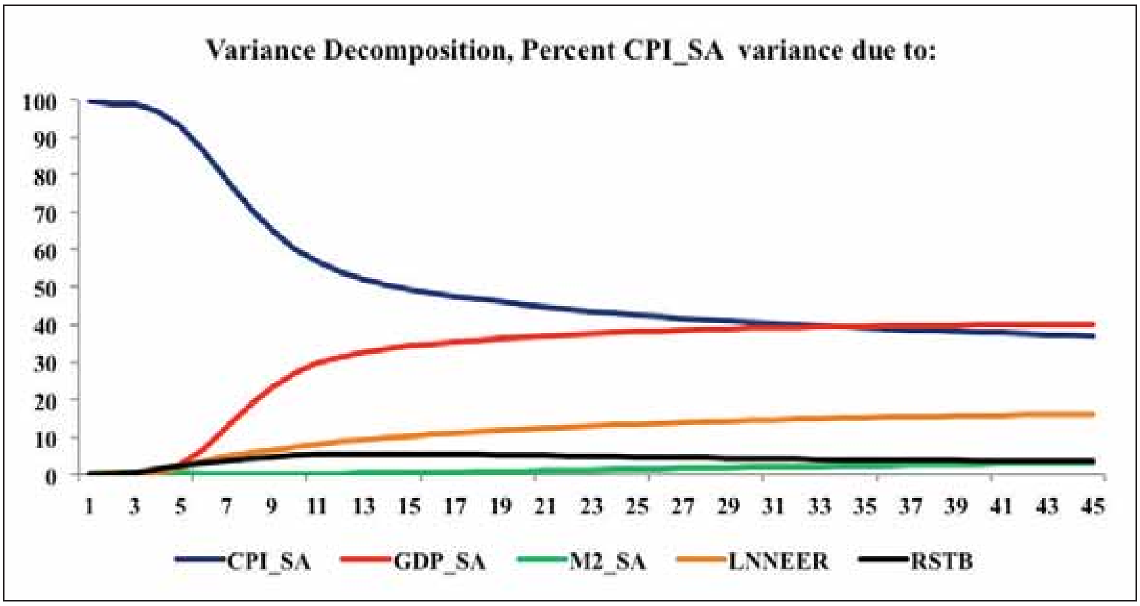
Two VAR models are constructed using M1 and M2 separately. Various stability tests were conducted on each VAR model such as the AR Roots Table showcased in Appendix 3. Our study indicates that the interbank rate and the Repo rate (the latter owing to its limited sample size was only tested as a check) were not found to be statistically significant at the 5% level, while the short term Government Treasury Bills Rate was more significant, but still not at the 5% level (Table 3.).

4.5.4 Empirical Results using the VAR models

While we provide all impulse responses in the appendices, we choose to focus on three main channels for monetary policy where a Central Bank can have direct or indirect influence, i.e the interest rate channel, the credit channel (where we focus on the monetary channel) and finally the exchange rate channel.

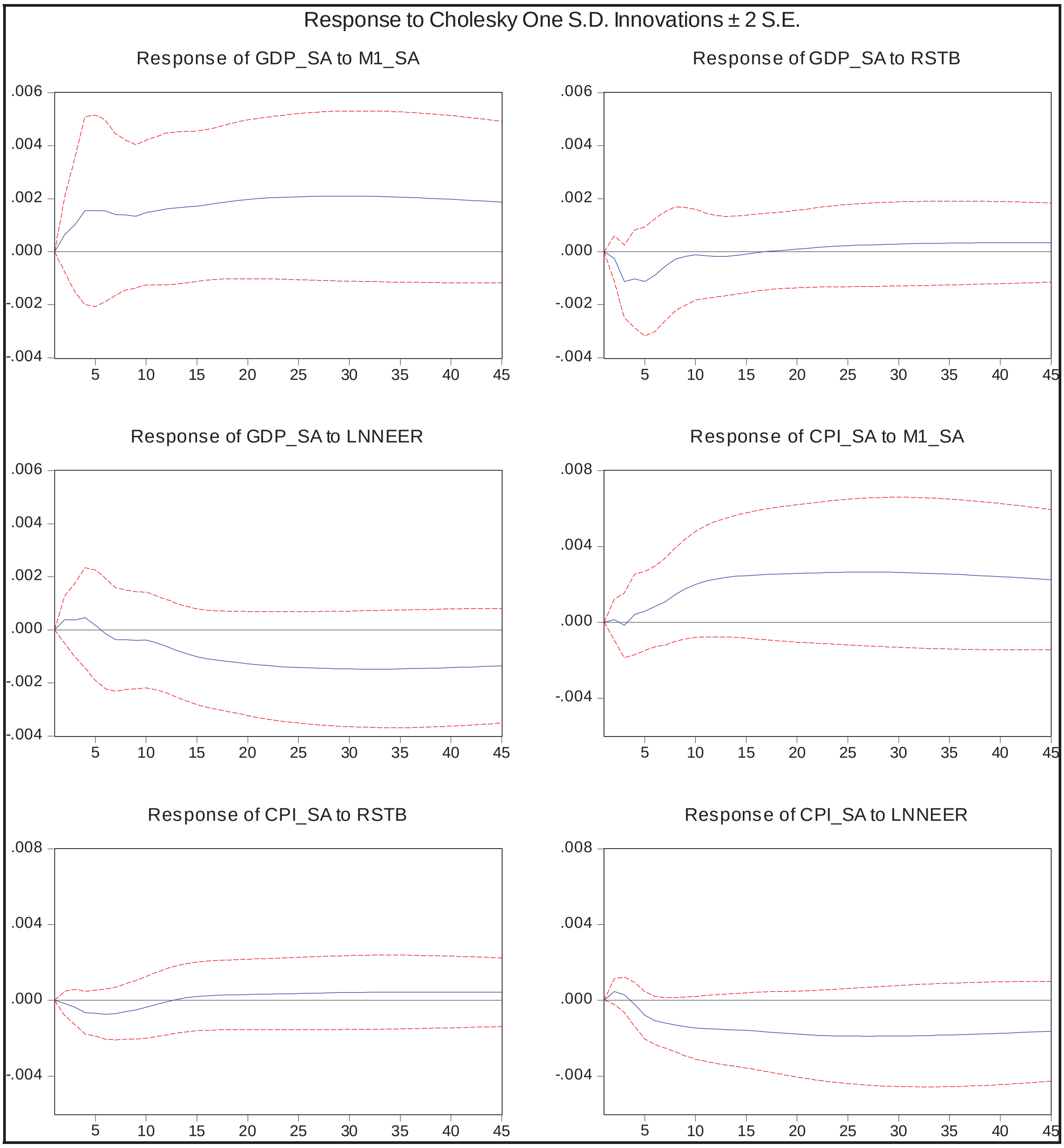
Figure 3.9: M2 and RSTB account for a very small percentage of inflation variability





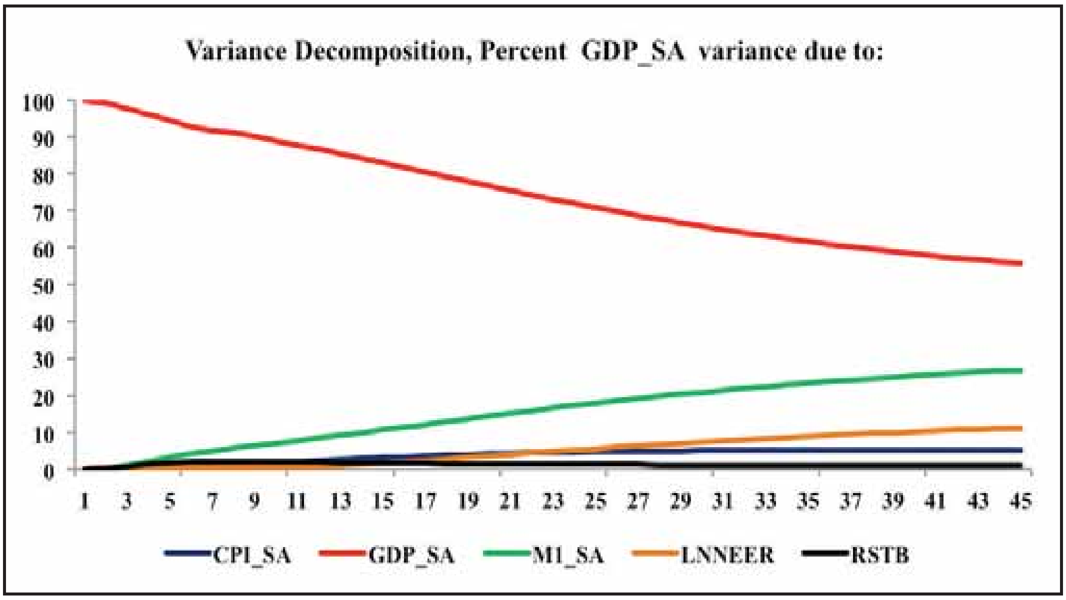
Source: Authors' Computations

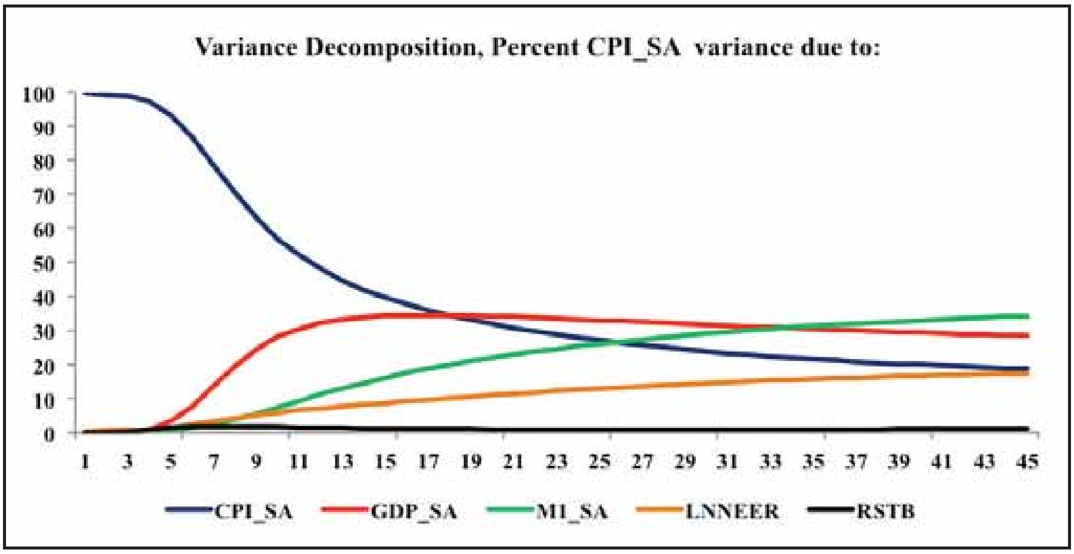
Figure 3.10: Impulse Response Functions with M1 as Endogenous Variable



Source: Authors' Computations

Figure 3.11: Variance Decomposition with M1





Source: Authors' Computations

4.5.5 Analysis of the Interest rate, Credit (monetary) and Exchange rate Channels using the VAR model results

(a) Interest Rate Channel

The strength of the interest rate channel is quite weak and is not statistically significant when it comes to influencing inflation. Short term rates only have a small and negative impact on both output and prices for the first 3-5 periods as shown in Figure 8. All measures of short term interest rates such as the interbank and three month T-Bill rate were tested and showed that the link while moving in the logical direction was not statistically strong. Indeed, the interest rate channel appeared to be quite weak in Mauritius.

(b) Credit Channel

M2 accounts for a small share of the total variability of inflation over time. This shall lead us to focus on certain sub components of the money supply rather than just on M2.[19]Indeed the direction of the shock is intuitive and is similar to that found in previous studies ((Kenny, et al., 1998); (Tsangarides, 2010); (Bordon & Weber, 2010)) not only in terms of the direction but also in terms of the degree of statistical significance which is not very strong. Unexpected shocks to M1, a subcomponent of M2 have a positive albeit small and statistically insignificant impact on CPI for the initial periods. In terms of the variance decomposition of both CPI and output, close to 33% of the variability of inflation over time can be explained by changes in M1. M1 appears to play a larger role in terms of its share of total inflation variability over time, when compared to M2 in the previous model.

(c) Exchange Rate Channel

A shock to the neer (appreciation) would be a negative on the CPI with the shock lasting for a very long period of time from the 5rd period (two quarters) onwards indicating the slow nature of the pass through in Mauritius. The results were however not always statistically significant for all periods (7th to 10th period only) while up to 20% of CPI variability could be explained by changes in the NEER over time. Where the full set of impulse responses is provided, there is no statistically significant change in the NEER to a shock on monetary aggregates although we can argue based on the money demand functions estimated before that expectations of depreciation of the currency does lead to changes in M2. We also do not see any statistically significant changes to the NEER from shocks to the short term market rate in the first model.

In the model where M1 is used, unexpected nominal appreciation lowers both output and inflation over time. The results were as before however were not statistically significant. In terms of output variability, only a small percentage of output growth variability can be explained by changes in the NEER over time. The degree of statistical significance was also weak when all periods are considered.

19 We will be defining Broad Money Liabilities as M2 for the sake of simplicity.

(d) GDP and CPI

GDP, which has a bi-directional causal relationship with CPI[20], can account for up to 40% of inflation's total variability over time. The response of CPI to an unexpected shock in GDP was also statistically significant. Output does not seem to respond much in terms of statistical significance to all policy variables over time with variance decomposition also confirming this weak link with both the NEER and the short term market rate each accounting for less than 15% of output variability over time.

4.6 Comments on Transmission Mechanism

The link between monetary aggregates and inflation is not very strong over time. The use of M1 rather than M2 did improve the model and the direction of the impulse was intuitive but the statistical significance was not strong for all periods. M1 did however account for a noticeable share of total variability of inflation over time. Hence, with the interest rate channel appearing to be quite weak, more focus (while the interest channel is being fixed) should be given to the understanding of both the monetary and exchange rate channels. For example, the Bank could informally and internally reconsider some form of monetary targeting with associated target bands since money demand shocks account for a fair share of inflation variability over time. The challenge right now is that the opportunity cost of holding capital, which has been shown to impact money demand cannot be fully influenced by the Bank in an environment of excess liquidity. It is clear that more research need to be done on the weak nature of the transmission mechanism in Mauritius and that in order to restore the credibility of the Bank of Mauritius, the interest rate channel must be fixed.

5.0 Policy Recommendations

5.1 The Current Monetary Regime

While the Bank of Mauritius Act (2004) provides the central bank with a dual mandate of price stability and economic development, consistent negative real rates point to a general growth bias in monetary policy making. While some may argue that price stability and a well functioning transmission mechanism

20 Granger Causality Tests showcased a bi-directional relationship between GDP and CPI when seasonally adjusted.

contributes to an orderly economic development over the longer term, the short term tradeoffs between growth and inflation have hindered monetary policy making in Mauritius. While both the Bank of Mauritius and the Finance Ministry are supposed to agree on an inflation target as per the act, there has been no movement in this direction so far. The lack of a quantifiable objective by the Monetary Policy Committee does not add to credibility and nor does it help in bringing about any form of consensus. A clear distinction must hence be made between the Bank of Mauritius' policy objective function and its reaction function and this must be communicated to the market as well.

5.2 Improving the Current Monetary Transmission Mechanism

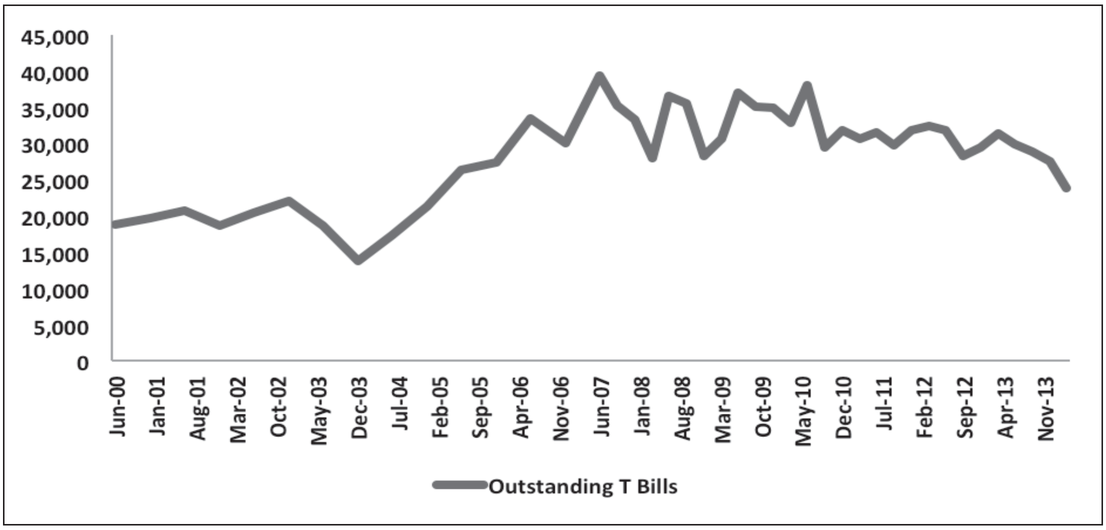
For now, it remains important for the Bank of Mauritius to improve the transmission mechanism of monetary policy by more firmly anchoring the interbank rate and the yield on short term Government paper closer to its key policy rate. The main goal of improving the liquidity management at the Bank would be to stabilize short term interest rates. The Bank in fact has an interest rate corridor of +/-125bps but as showcased before, short term market rates have consistently remained below the lower band of the corridor.

There is clearly a need to have greater coordination between the Ministry of Finance and the Bank of Mauritius when it comes to liquidity management. This can best be done by a formal weekly or bi-weekly committee, which would consider both the fiscal and monetary costs of how Government funds are managed. The Government should also restrain from depositing idle funds with commercial banks and place them with the Bank of Mauritius instead. Operation Reserve Re-Constitution was essentially characterized by some MUR 29 Billion of FX equivalent purchases. It remains important for the Bank and the Finance Ministry to formalize a cost sharing mechanism in order not to overburden the balance sheet of the Bank of Mauritius. The Bank should also use any sustainable decrease in the inflation rate to cut the key policy rate bringing it closer to the interbank rate. This would lessen the cost to the Bank and Finance Ministry.

Once these basic steps are taken, the Bank could then consider conducting regular reverse repo transactions after regular weekly or bi-weekly auctions set at the Key Policy Rate. The Bank should limit bill issuances for monetary policy purposes to the very short end of the curve and link its interest rate to the key policy rate and not to a market rate despite the potential higher costs as these would help anchor short term market rates to the policy rate over time.

The Bank would then provide overnight deposit standing facilities to any sound bank at a rate equal to the lower band of the corridor until rates converge towards the corridor. At the upper band of the corridor, the bank would stand ready to provide overnight lending facilities for whatever amount is required as long as the solvency of the banks meets regulatory requirements. The end of day Cash Reserve Ratio maintenance requirement should be set at a low level in order to allow banks to more efficiently manage their liquidity as long as their two week average CRR meets the current set target. The bank should rely much more on its open market operations in order to anchor short term market rates to the lower band of the repo corridor than on the CRR as an instrument for monetary policy. Over the medium term however, the transmission mechanism will not be fully effective until and unless the interbank rate is brought in line with the policy rate.

Figure 3.12: Outstanding T Bills in Millions



Source: Ministry of Finance

While it has often been argued that such operations would put added strains on the balance sheet of the Bank of Mauritius with losses more likely than not, these costs could be shared between the Treasury and the Bank of Mauritius (see Figure 13). The Bank could also be recapitalized. Under Section 10.5 of the Bank of Mauritius Act (2004), "the Minister shall cause to be transferred in full ownership to the Bank, negotiable interest-bearing securities issued from time to time by the Government at market rates for such an amount as, in the opinion of the Board, is necessary for the purpose of preserving the amount paid as capital of the Bank from any impairment.'[21] Furthermore subject to subsection (5), the balance of the General Reserve Fund which forms part of the total equity of the Bank and which is made up of a portion of the net profits of the bank each year shall be at least equal to the amount paid as capital of the Bank. While it is true that the Bank must also endeavor to bring the balance of the General Reserve Fund to an amount that is at least equivalent to its paid up share capital, the independence of the institution could be at risk.

Greater cost sharing could see a reduction in the need for the Bank of Mauritius to be more aggressive in sterilizing excess funds and run large losses. Another solution would be to link the equity of the bank as a fixed percentage of GDP where a greater share of profits would be kept than the current 85% of net profit distribution to the Government. Indeed, greater coordination between both the fiscal and the monetary side would go a long way in improving the transmission mechanism of monetary policy. The primary mandate of the Bank is not to be profitable or to be a source of income for the Government but to ensure that it can effectively fulfill its dual mandate of price stability and orderly economic development. At the same time, the fiscal side must in no circumstance indirectly influence the short end of the curve or the interbank rate by placing large sums of money within the commercial banking system. Indeed, on various occasions, the fiscal side has then used the falling interbank rate as an argument for cutting the Policy Rate so that it converges towards market determined rates, rates that the fiscal side has indirectly influenced.

It is also clear that the increasing reliance of the Government on external financing when coupled with the gradual increase in the duration of the total public debt portfolio has reduced the supply of short term paper and increased excess liquidity pressures at the short end especially from commercial banks. With greater coordination between the Bank and the Ministry of Finance likely in the coming months especially in the area of cost sharing, it remains important for the good of the transmission mechanism to bring short term market rates in line with the lower band of the corridor over the next 6 months and aim to bring the interbank rate towards the Repo rate itself.

One final impediment to the migration of the Bank of Mauritius towards a more formal inflation targeting regime would be the current lack of a secondary bond

21 See 2004 Bank of Mauritius Act. Minister in this case refers to the Honorable Minister of Finance.

market which would allow the Bank to influence the entire yield curve and from this longer term lending rates in a more structured manner than is currently done. In order for the secondary bond market to take off in Mauritius, policy makers must ensure that only committed primary dealers are given licenses and that an interbank repo market is developed for them in order to increase the convertibility of short term instruments to cash and vice versa. The interbank repo market is the oil of any secondary bond market. The Bank of Mauritius would then stand to offer such repo/reverse repo facilities to the market if the need arises as well while the lion's share of volumes would be done between dealers. Policy makers would thus need to ensure that the size of Government securities held by the Bank on its balance sheet is sizeable enough. In terms of issuance calendar of Government paper especially at the short end, the debt management committee must ensure that market makers have good visibility and are ensured of an adequate volume of short term issuances. While it appears that both the fiscal and the monetary side are working closer at getting the secondary bond market started, the lack of a proper interbank repo market in Mauritius will continue to constrain overall liquidity when the secondary bond market is launched.

6.0 Moving towards a Flexible Inflation Targeting Regime

6.1 Trade-off between Existing Monetary Policy and Credibility of Monetary Policy Regime

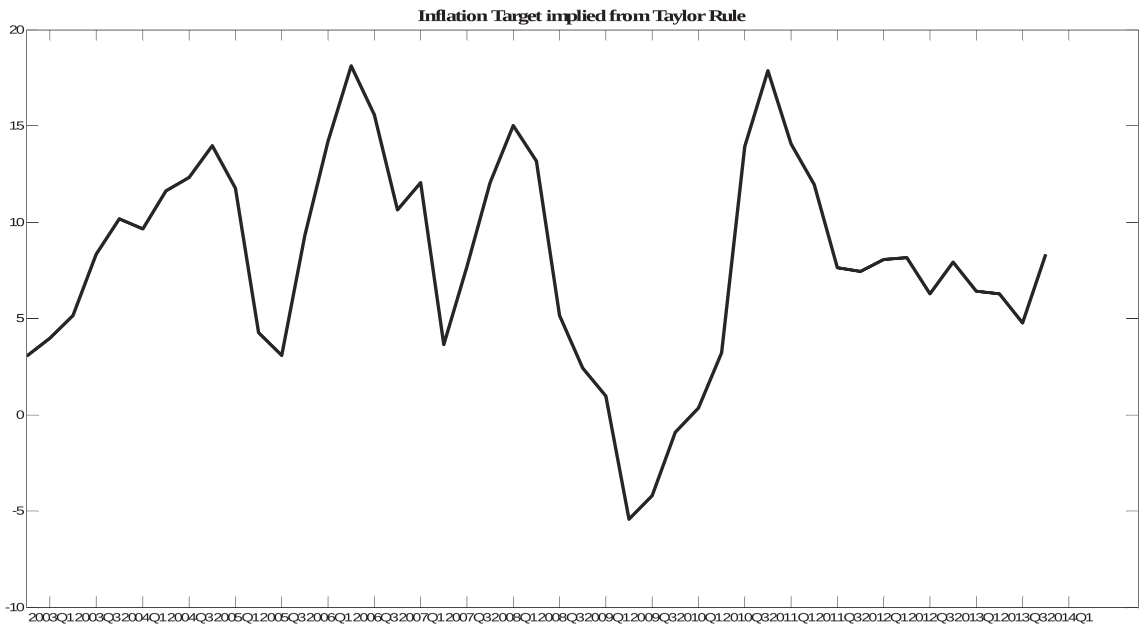
While it is traditional to model monetary policy as being governed by a known rule, growth concerns in the small and open economy that is Mauritius can sometimes lead to outcomes that do not reach broad based consensus. The lack of consensus could be a function of the lack of clear policy objectives but there may also be disagreement with the Finance Ministry regarding the definition of price stability and the objective function of the central bank. Core to the concerns of the fiscal side has remained growth. While it is important for central banks to focus on a clearly spelt out objective such as price stability, there may be frameworks in which the minimization of a central bank's loss function can lead to both lower inflation and output variability. It can be shown that target bands for inflation control imply an important nonlinearity that tend to increase in significance as these bands narrow leading to a honeymoon effect that facilitates inflation control over and above and beyond what happens from policy actions alone.[22]

22 See Page 153 (Tetlow, 2008)

A key purpose of monetary policy making is to anchor inflationary expectations towards the policy objectives. Indeed a credible central bank which uses its communication channel wisely can influence private agents' expectations towards a certain target. Our work on this topic is inspired by Tetlow (Tetlow, 2008). Monetary policy which can either be formulated as a solution to a dynamic optimization problem or formulated within a model that is more discretionary has been the subject of much debate in recent decades (Taylor, 1993). While discretionary monetary policy has been somewhat discredited in recent years, rules based approaches (from the optimization method) have sometimes appeared to be too strict. Is there however a way to optimize both commitment while maintaining a certain degree of flexibility?

Let us assume like in Tetlow (Tetlow, 2008) that the public has information about the broad objectives of Monetary Policy but no information about a specific target. Using a modified version of the Taylor Rule (Taylor, 1993) which fits the historical data rather well and is currently used in the Bank's GAPS model, we can infer the implied inflation target for each period.[23]

Figure 3.13: Implied Inflation Target from the Modified Taylor Rule



Source: Authors' Computations

23 Equilibrium Real Rates set at 1%.

As can be seen from Figure 14, it is obvious that with such large variations in the implied inflation target over time, there has either been a change in the equilibrium real interest rate, a change in the implicit inflation target or both between 2003Q1 and 2014Q1. While it is also possible that tactical concerns and some disturbance terms could help in explaining such movements, a time varying inflation target would certainly qualify as being a prime suspect.

6.2 Finding the Honeymoon Effect- Point Targets with Tolerance Bands

6.2.1 The Modified Interest Rate Reaction Function

Let us then consider that the inflation target for monetary policy is a random variable by assuming that monetary policy can be described by a simple interest rate reaction function of the form:[24]

$$R_t = \rho R_{t-1} + (1-\rho)\left[rr^{**} + \sum_{i=0}^{3} \frac{\pi_{t-1}}{4} + 0.5\left(\sum_{i=0}^{11} \frac{\pi_{t-i}}{12} - \pi_t^* \right) + 0.15(y_t) \right] \text{........ (11)}$$

The interest rate term represents the interbank rate since the latter is supposed to be in line with the Repo rate when the transmission mechanism is healthy, the inflation term is expressed as done in Tetlow, (Tetlow, 2008) as a 12 quarter moving average vs. a 4 quarter moving average on the hypothesis that longer lags on inflation outperform shorter lags. The ρ parameter is equal to 0.7 and helps to smooth out the interest rate path (Hunt, 2006). The chosen parameters for inflation and the output gap are taken from the working version of the Output Gaps model of the Bank of Mauritius. The equilibrium real interest rate is assumed to be equal to 1%. Y here signifies the output gap generated from the GAPS model via the Kalman filter.

To keep things simple, the model can be said to consist of four basic behavioral equations and several identities (see (Taylor, 1994); (Svensson, 1997) & (Ball, 1997)). The behavioral equations are:

- The IS Curve in order to simulate aggregate demand.
- A modified Phillips curve in order to simulate aggregate supply.
- Uncovered Interest Rate Parity
- The Monetary Policy Rule as showcased above.

[24] Source: (Tetlow, 2008) page 157

The parameters chosen for inflation and output gaps have been calibrated and are not only based on past data but on the premise that such parameters produce lower unconditional variances of output and inflation simultaneously without increasing the variability of the policy rate which again is modeled as the interbank rate. The parameterization of the reaction function is the solution to the problem that minimizes the Central Bank's loss function (Williams, 2003) which takes the form:

$$E_0 \sum_{i=1}^{\infty} \varphi \left[\tilde{\pi}_{t+i} - \pi^*_{t+i} \right]^2 + (1-\varphi) y^2_{t+i} \quad \text{.......} (12)$$

Where φ represents the degree of preference of the policy maker and in our case has been set at 0.75. This means that a greater weight in the loss function is given to inflation variability than to output gap variability. Considering the fact that a central bank's primary mandate is price stability, 0.75 would represent a relatively more hawkish than a dovish stance (Tetlow, 2008). It should also be noted that changes in φ have an obvious impact on the two main parameters of the reaction function.

6.2.2 Calibration of the Modified Interest Rate Reaction Function

It can be shown from Table 3[25] that the resulting parameters of the output gaps model on both output and inflation gaps have been tested on various different combinations of parameters and have yielded the lowest loss function after running model simulations. However, considering the fact that the gaps model is still very much work in progress, changes may still be brought in future years although it should be noted that changes in the parameters will not materially change the nature of the honeymoon effect.

Table 3.3: Summary of Main Combinations and Resulting Loss Function with φ =0.75

Rules	Loss Function Value
Taylor 0.5/0.15	3.40
Taylor 0.5/0.5	3.55
Taylor 1.5/1	3.82
Taylor 1.5/0.5	3.66

Source: Authors' Computations

25 Various combinations were tried out via 6 quarter ahead responses to changes to the Taylor (Taylor, 1994) parameters.

6.2.3 Treating the Inflation Target as a Bounded Random Walk

It should also be noted here that in the rest of the paper, the inflation target in the Reaction Function is time invariant. It is assumed that private agents know the rule but with a one period lag (Tetlow, 2008). The error term can either follow a random walk or more appropriately a bounded random walk. No policy making authority would allow the target rate of inflation to vary to negative or positive infinity which essentially justifies the use of a bounded random walk.

$$\pi_t^* = \pi_{t-1}^* + \mu_t \quad \text{......} (13)$$

In the case of a pure random walk, the error term would be normally distributed with zero mean and variance equal to the variance of inflationary expectations taken from the inflation surveys. Typically, 10 year ahead inflation expectations should be taken from survey data but such figures are unavailable for Mauritius. The standard deviation of the Bank's inflation expectations surveys stands at 0.6%.

$$\mu_t \sim N\left(0, \sigma^2\right) \quad \text{......} (14)$$

In the case of a bounded random walk process, innovations are bounded by the inflation target bands. The equation below simply showcases a truncated Gaussian with the inflation target bands being set at the upper and lower limits (Johnson, et al., 1994). Note that the inflation target bands are symmetric around a certain mid point. Inflation is hence a function of its past value and a bounded random walk.

$$u_t \sim \frac{1}{\sigma\sqrt{2\Pi}} \exp\left[\frac{-u^2}{2\sigma^2}\right] \left\{ \frac{1}{\sigma\sqrt{2\Pi}} \int_{\left(\underline{\pi}^* - \pi_{t-1}^*\right)}^{\left(\overline{\pi}^* - \pi_{t-1}^*\right)} \exp\left[-\frac{\left(t - \pi_{t-1}^*\right)^2}{2\sigma^2}\right] dt \right\}^{-1} \quad \text{......} (15)$$

For the purposes of this paper, we have assumed that the inflation target bands are set at +/- 1 but have also simulated various larger and smaller bands as a function of the standard deviation of inflationary expectations which has been estimated to be quite high for Mauritius vs the 0.25% used in the Tetlow, (Tetlow, 2008) study for the US. In the case of a fixed inflation target, the lower and upper bands would be equal to 0. Hence, pure inflation targeting is a special case of the truncated Gaussian. The smaller the bands, the closer we approach pure point inflation targeting. It should also be noted here that the modeling of the inflation target is independent of the Bank's gaps model. To recap, agents are assumed to know the process for the target rate of inflation but not the value of innovations.

6.2.4 Simulations and Sensitivity Testing for Credible Target Bands

Using model derived data; we perform 100,000 simulations with 46 periods on MATLAB[26] and generate a graph that showcases the relationship between shocks to the inflation target vs. the 4Q inflation rate that is 4 periods ahead. Given some initial π^*_{t-1}, a vector $E_{t-1}\left(\pi^*_{t+i} \middle| \pi^*_{t-1}, \sigma, \overline{\pi}^*\right)$ can be computed outside of the model. $E_{t-1}\pi^*_{t+j}$ is independent of the state variables of the system. We can then use a simple ARMA model to approximate this non linear path (Tetlow, 2008). While the form of the equation will remain constant, the historical shocks to the moving average errors are changed depending on the initial values of $E_{t-1}\left(\pi^*_t \middle| \sigma, \overline{\pi}^*\right)$ up to whatever MA lag has been chosen and which fits the data well. All observations are then sorted and ordered from minimum to maximum. We are trying to get the whole distribution of the target and the inflation rate. The matrix of sorted observations is then grouped with identical width and averaged across values. The average of sorted changes to inflation and to the inflation target is then plotted.

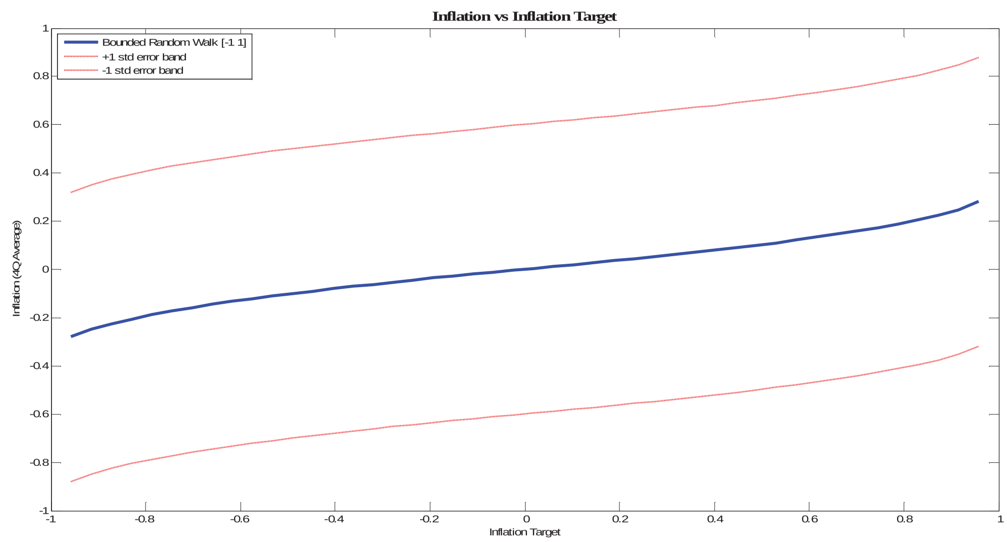
The X axis is bounded -1/+1 wherein we are looking at changes in the inflation target and its impact on inflation. For example suppose that the inflation target is increased by 0.5% within the band of +/- 1%, the resulting inflation rate would deviate by less than the increase of the inflation target for in this scenario, the bank is fully credible in bringing price stability within the band and keeps wage and price setting behavior well anchored. Should the inflation target be shocked by -50bps, inflation would also decline by an amount that is observationally smaller than the decline of the target.

Interestingly, the honeymoon effect remains the same when the target bands are reduced further. This honeymoon effect is only possible because the bounded Gaussian imposes a non-linearity in the relationship which would only work if the bank attaints credibility within a certain band. Decreasing the size of the band will however have diminishing returns to scale for as one keeps on reducing the size of the band, the relative honeymoon benefits dissipate. One can, for example,

[26] Quarterly data limited from 2003Q1 to 2014Q3 with Q2 and Q3 figures are model forecasts. The limited sample size in our presence vs the 200 periods used in the US study warrants that this section be treated as a discussion although the results are indeed quite logical despite the sample size.

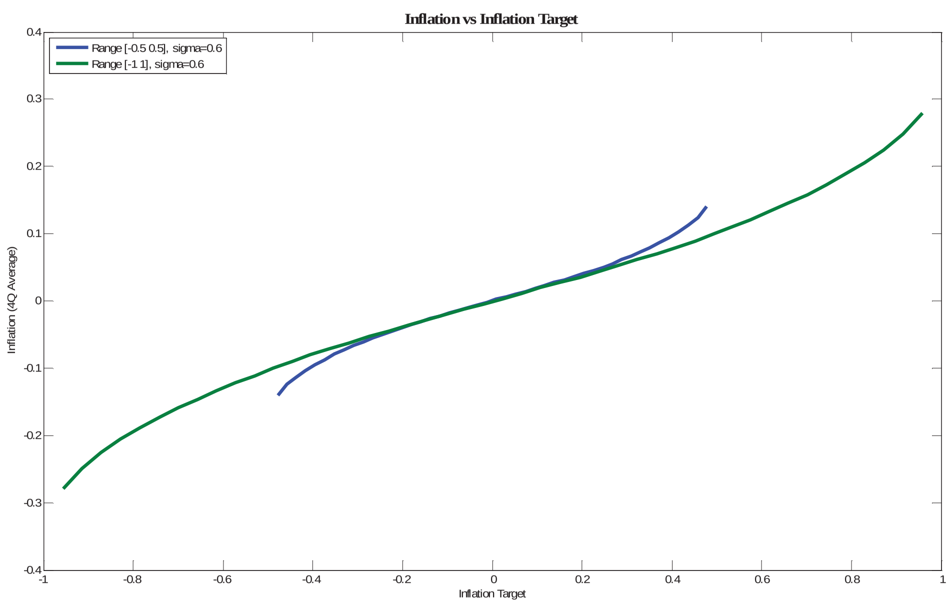
notice that for a large part of the range in terms of shocks to the inflation target, the resulting impact on inflation is observationally similar. In other words, why adopt a time invariant fixed inflation target with a band with is basically equal to zero when a time varying inflation target with a limited band can provide more flexibility in terms of improving the loss function of the bank via a honeymoon effect whist still maintaining adequate credibility?

Figure 3.14: Inflation vs Inflation Target in the Presence of Credible Target Bands



Source: Authors' Computations

Figure 3.15: What happens when the target bands are reduced?



Source: Authors' Computations

6.2.5 *The Current Optimal Inflation Target and Policy Rate*

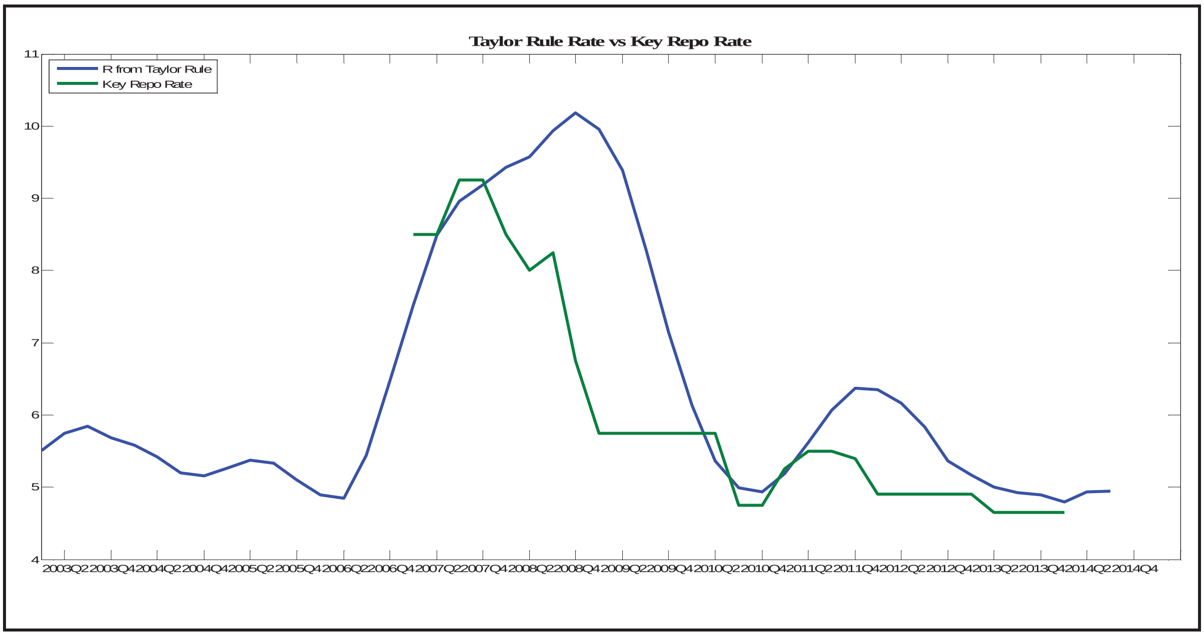
In terms of the time varying inflation target, it can be shown that at each period, the central bank would pick an interest rate with an implied inflation target that would ensure the lowest possible loss function via the modified Taylor rule (Taylor, 1994). Both Figure 16 and Figure 18 demonstrate the time varying nature of the bounded target inflation rate and the evolution of the interest rate as a response to changes in this optimal target value. Looking back at the optimal inflation target over the past decade, it can be seen that at each time t, the optimal target would vary anywhere between the +/-1 band depending on the loss function at that point in time. The optimal target inflation rate then would not always be set at the mid-point of the band.

What we have hence tried to argue here is that as long as a Central Bank attaints credibility within a well defined and symmetric band, it can at the margin substitute away from pure inflation control towards output stabilization. .As Tetlow, (Tetlow, 2008) argues, this occurs because private agents expect that the central bank will contain drift and keep the rate within a band which creates a non linearity in agents' expectations thereby limiting a wage-price spiral. Hence time invariant point targets are more desirable for a Central Bank than target ranges or comfort zones. Recall again that agents have not learnt the target rate but the anchoring of their expectations does provide more space to a Central Bank to pursue an easier policy regime than would have otherwise been possible.[27] Alternatively, the same honeymoon effect can also be obtained by a Central Bank setting a certain inflation target for a given period while also ensuring that it communicates effectively about a *range of inflation outcomes*[28] providing it the desired flexibility of time in achieving its objective while keeping output concerns in mind.

27 See Orphanides and Williams (Orphanides & Williams, 2005)

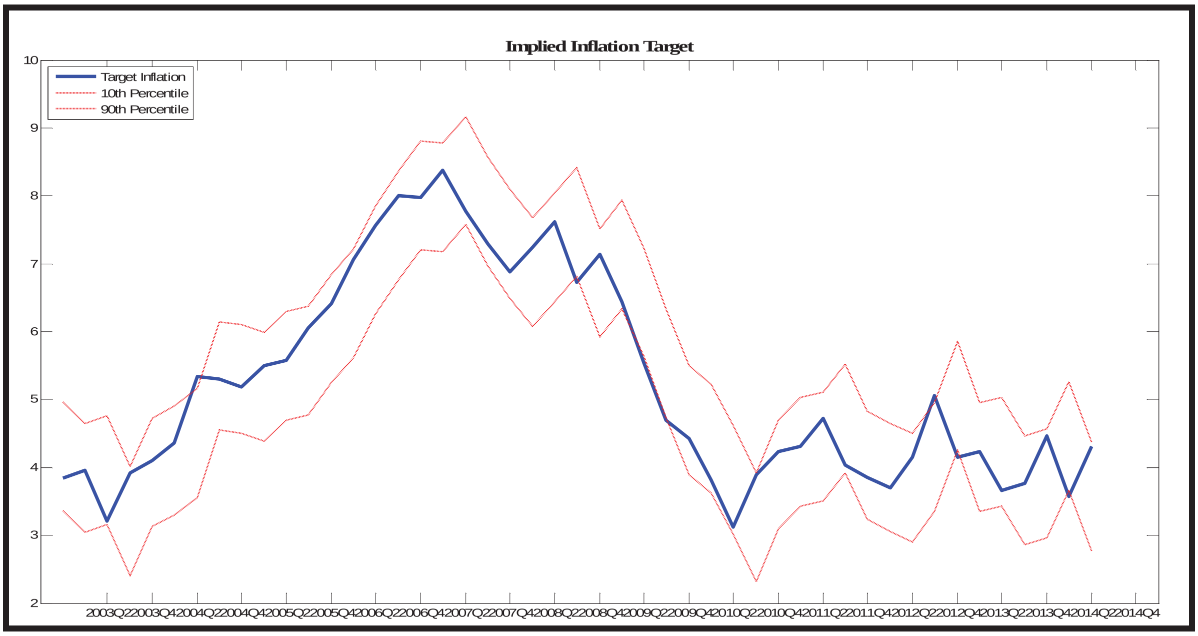
28 Unlike in the current setup where the Bank provides a point forecast 6 months and 1 year ahead.

Figure 3.16: The underlying Optimal Inflation Target and Policy Rate Response as per the Modified Taylor Rule



Source: Authors' Computations

Figure 3.17: The underlying Optimal Inflation Target and Policy Rate Response as per the Modified Taylor Rule



Source: Authors' Computations

We have also showcased that the current optimal implied inflation target is currently close to 4% which would be a good point forecast of inflation considering current inflationary trends with a 1%-1.5% inflation target band likely to lead to a honeymoon effect as long as communication is effective and last but not least, the interbank rate is brought in line with the policy rate. The greater the imposed band, the more linear the relationship between a target shock and changes in inflationary expectations shall be.

7.0 Concluding Remarks

Throughout this paper, it has been argued that a breakdown in the interest rate channel has weakened the monetary policy transmission mechanism in Mauritius wherein inflation's response to changes at the short end of the curve is not very statistically significant. Not only has excess liquidity in the system, a function of sub optimal coordination between both the fiscal and monetary sides negatively impacted the transmission mechanism but the lack of a formal framework at the MPC level in the form of a quantifiable, well defined and well understood objective has meant a lack of consensus at the Monetary Policy Committee meetings.

We have also found that while the demand equations for M1 and M2 are stable over time, the Bank still needed to have more influence over the opportunity cost of holding capital via a better functioning interest rate channel at the short end in order to better influence inflation. In sum, the short end of the curve can currently only indirectly influence inflation variability via the monetary channel. It has been argued that while the mechanical solutions to bring short-term market rates towards the policy rate were simple, a better cost sharing arrangement would increase the costs of non-coordination. Should inflationary trends improve in the coming months, it would be useful to use this opportunity to cut the Repo rate in order to reduce the cost of bringing the interbank in line with the Repo rate.

Finally, it has been argued that in an environment where consensus at the MPC level was hard to come by, a framework that would anchor expectations within a band with a time varying target could lead to a honeymoon effect and help achieve greater consensus at the MPC. A flexible inflation-targeting regime defined by medium term inflation forecasts and associated bands would go a long way in strengthening the monetary policy framework in Mauritius.

References

Adam, C., 1991. Financial innovation and the demand for £M3 in the UK 1975-86. *Oxford Bulletin of Economics and Statistics,* 53(4), pp. 401-424.

Ball, L., 1997. Efficient Rules for Monetary Policy. *NBER Working Paper,* Volume 5952.

Bordon, A. R. & Weber, A., 2010. The Transmission Mechanism in Armenia: New Evidence from a Regime Switching VAR Analysis. *IMF Working Paper,* November.

Choudhry, T., 1998. Another Visit to the Cagan Model of Money Demand: The Latest Russian Experience. *Journal of International Money and Finance,* 17(2), pp. 355-76.

Cízek, P., Härdle, W. & Weron, R., 2005. The Econometric Approach To Money Demand. *Humboldt University of Berlin.*

Debelle, G., 1999. Inflation Targeting and Output Stabilisation. *Research Discussion Paper, Reserve Bank of Australia,* June.

Duffy, J., n.d. Monetary Policy Rules.

Engle, R. F. & Granger, C. W., 1987. Co-integration and error correction:Representation, estimation, and testing. *Econometrica,* Volume 55, p. 251–276.

Gerlach, S. & Smets, F., 1995. The Monetary Transmission Mechanism: Evidence from G-7 Countries. *BIS Working Paper,* Issue 26.

Hamori, S., 2008. Empirical Analysis of the Money Demand Function in Sub-Saharan Africa. *Economics Bulletin,* 15(4), pp. 1-15.

Heerah-Pampusa, M., Khodabocus, W. & Morarjee, V., 2006. A Primer on Inflation. *Bank of Mauritius* .

Heerah-Pampusa, M., Khodabocus, W. & Morarjee, V., 2006. A Primer on Inflation. *Bank of Mauritius Occasional Paper,* Volume 1.

Horváth, R. & Matějů, J., 2011. How are Inflation Targets Set?. *Working Paper Series, Czech National Bank (CNB),* July.

Hunt, B., 2006. Simple Efficient Policy Rules and Inflation Control in Iceland. *Working Papers, Central Bank of Iceland,* August.Volume 30.

Ishioro, B. O., 2013. Monetary Transmission Mechanism in Nigeria: A Causality Test. *Mediterranean Journal of Social Sciences,* 4(13).

Johansen, S., 1988. Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control,* Volume 12, pp. 231-254.

Johansen, S. & Juselius, K., 1990. Maximum likelihood estimation and inference on Cointegration - with applications to the demand for money. *Oxford Bulletin of Economics and Statistics,* 52(2), pp. 169- 210.

Johnson, N. L., Kotz, S. & Balakrishnan, N., 1994. Continuous Univariate Distributions. *New York:Wiley,* 1(2).

Kamaan, C. K. & Nyamongo, E. M., 2014. The Effect of Monetary Policy on Economic Growth in Kenya. *International Journal of Business Commerce,* April.3(8).

Kenny, G., Meyler, A. & Quinn, T., 1998. Bayesian VAR Models for Forecasting Irish Inflation. *Central Bank of Ireland and Financial Services Authority of Ireland,* December.Issue 11360.

Mishkin, F., 1995. Symposium on the Monetary Transmission Mechanism. *Journal of Economic Perspectives,* Volume 9, pp. 49-72.

Mosweu, W., 2003. An approach to estimating the demand for narrow money in Botswana. *The Research Bulletin Gaborone: Bank of Botswana,* Volume 2, p. 21.

Mwabutwa, C., Bittencourt, M. & Viegi, N., 2013. Evolution of Monetary Policy Transmission Mechanism in Malawi: A TVP-VAR with Stochastic Volatility Approach. *ERSA working paper,* November.

Oomes, N. & Ohnsorge, F., 2005. Money Demand and Inflation in Dollarized Economies: The Case of Russia. *IMF Working Paper,* July, Volume 05, p. 144.

Orphanides, A. & Williams, J. C., 2005. Imperfect Knowledge, Inflation Expectations, and Monetary Policy.. *NBER Studies in Business Cycles,* Volume 32, p. 201–34.

Porter, N. & Yao, Y. J., 2005. Inflation Targeting Lite' in Small Open Economies: The Case of Mauritius. *IMF Working Paper,* August.

Punchoo, V., 2004. The Experience of Mauritius with the Lombard Rate: An Overview. *Paper to Stakeholders' Forum on Financial Sector Reforms,* 15 April.p. 1.

Sacerdoti, E., El-Masry, G., Khandelwal, P. & Yao, Y., 2005. Mauritius: Challenges of Sustained Growth. *Washington: International Monetary Fund.*

Sims, C., 1980. Macroeconomics and Reality. *Econometrica,* Volume 48, pp. 1-48.

Sims, C., 1992. Interpreting the macroeconomic times series facts: the effects of monetary policy. *European Economic Review,* 36(5), pp. 975-1000.

Sims, C. A., Stock, J. H. & Watson, M. W., 1990. Inference in Linear Time Series Models with Some Unit Roots.. *Econometrica,* Volume 58, pp. 113-44.

Sims, C. & Zha, 1998. Does Monetary Policy Generate Recessions?. *Federal Reserve Bank of Atlanta Working Paper,* Volume 12, p. 98.

Stone, M., 2003. Inflation Targeting Lite. IMF Working Paper 03/12 (Washington:International Monetary Fund).

Svensson, L., 1997. Inflation Forecast Targeting: Implementing and Monitoring Inflation Targets. *European Economic Review,* 41(6), p. 1111–1146.

Tandrayen-Ragoobur, V. & Chicooree, A., 2012. Exchange Rate Pass Through to Domestic Prices: Evidence from Mauritius. *Department of Economics and Statistics, University of Mauritius.*

Taylor, J., 1994. The Inflation/Output Variability Trade-off Revisited. *Federal Reserve Bank of Boston Conference,* Volume 38, p. 21–38.

Taylor, J. B., 1993. Discretion versus Policy Rules in Practice.. *Carnegie-Rochester Conference Series on Public Policy,* 39(1), p. 195–214.

Taylor, M., 1991. The Hyperinflation Model of Money Demand Revisited. *Journal of Money, Credit and Banking,* Volume 23, p. 327–51.

Tetlow, R. J., 2008. Inflation Targeting and Target Instability. *International Journal of Central Banking,* December.pp. 151-92.

Tsangarides, C., 2010. Monetary Policy Transmission in Mauritius Using a VAR Analysis. *IMF Working Paper,* February.

Tsheole, T., 2006. The Demand For Broad Money (M2) in Botswana. *Rhodes University,* September.

Uanguta, E. & Ikhide, S., 2002. Monetary Policy Transmission Mechanism in Namibia. *Bank of Namibia Working Paper,* November.

Weber, A. A., Gerke, R. & Worms, A., 2009. Has the Transmission Process in the Euro Area Changed? Evidence based on VAR Estimates. *BIS Working Paper,* Issue 276.

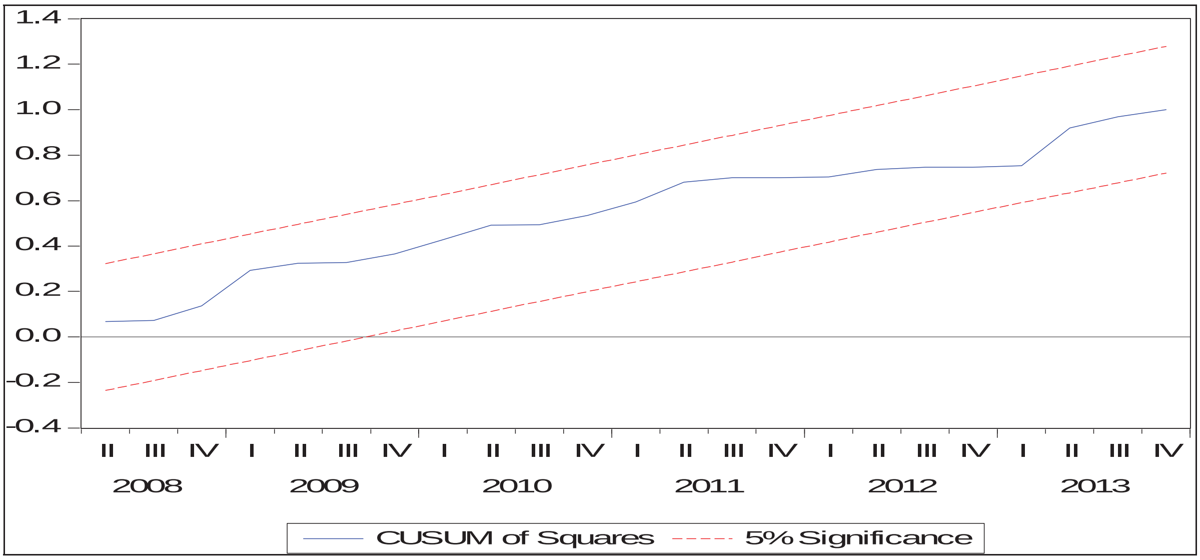
Williams, J. C., 2003. Simple Rules for Monetary Policy. *Economic Review (Federal Reserve Bank of San Francisco),* p. 112.

Williams, O. & Adedeji, O. S., 2004. Inflation Dynamics in the Dominican Republic. *IMF Working Paper.*

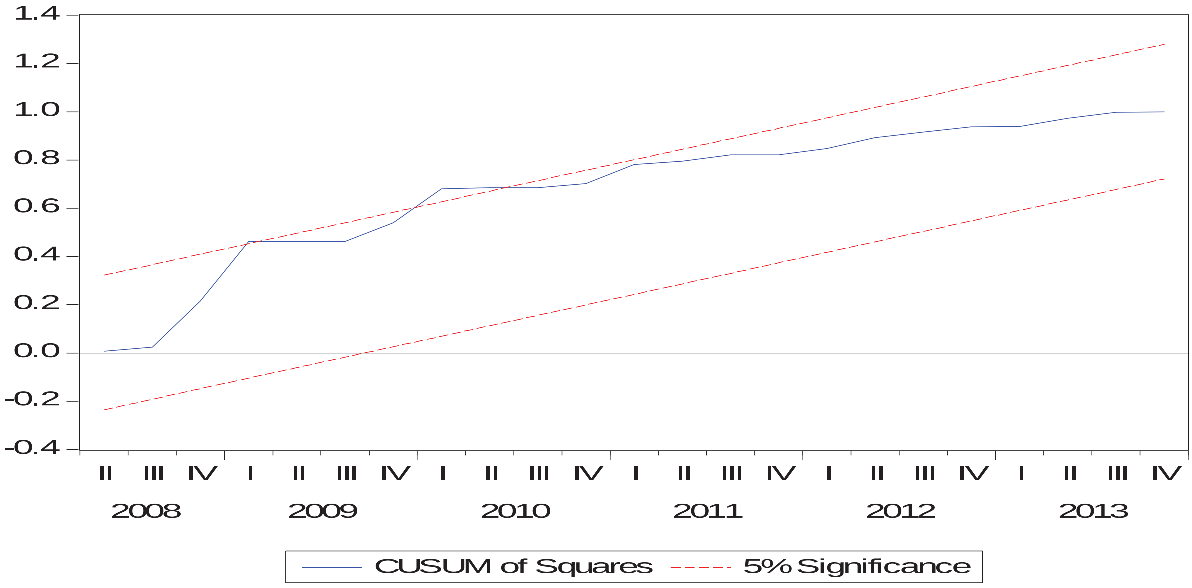
Appendices

Appendix 1: Stability of the Money Demand Function

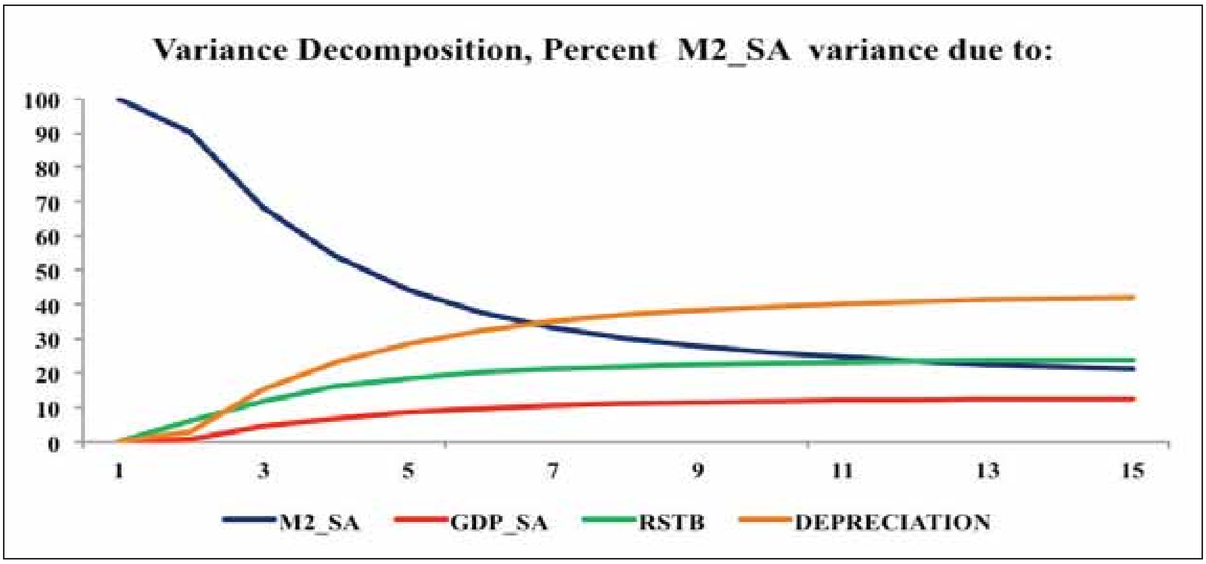
1(a) Stability Diagnostics for M1 (CUSUM of squares test)



1(b) Stability Diagnostics for M2 (CUSUM of squares test)

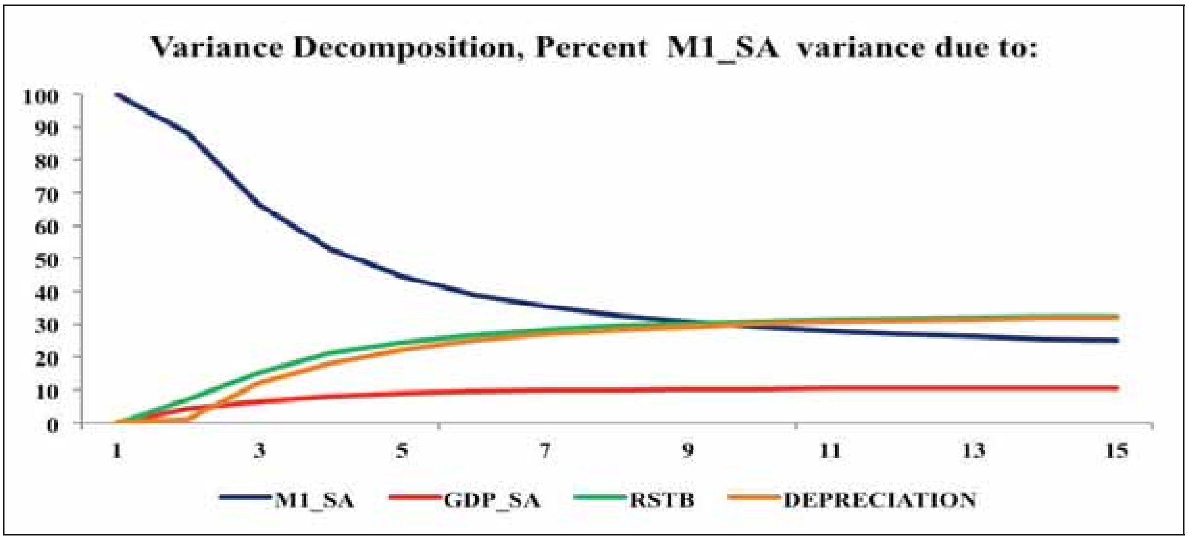


Appendix 2: Determinants of Money Demand Variability



Source: Authors' Computations

Variance Decomposition M1



Source: Authors' Computations

Appendix 3: VAR Diagnostic tests

Correlation of Residuals from VAR

		GDP_SA	M1_SA	LNNEER	RSTB
CPI_SA	1	CPI_SA	-0.0502	-0.0507	0.166
GDP_SA	-0.0276	1	0.144	0.0660	0.00666
M1_SA	-0.0502	0.144	1	-0.222	0.0314
LNNEER	-0.0507	0.0660	-0.222	1	-0.0361
RSTB	0.166	0.00666	0.0314	-0.0361	1

Roots of Characteristic Polynomial

Endogenous variables: GDP_SA CPI_SA M1_SA L RSTB LNNEER

Root	**Modulus**
0.974095	0.974095
0.948949	0.948949
0.839072	0.839072
0.757085 + 0.259623i	0.800363
0.757085 - 0.259623i	0.800363
0.519746 - 0.549111i	0.756081
0.519746 + 0.549111i	0.756081
-0.746546	0.746546
-0.329110 + 0.622970i	0.704560
-0.329110 - 0.622970i	0.704560
0.091439 - 0.630473i	0.637070
0.091439 + 0.630473i	0.637070
0.589598 + 0.212726i	0.626800
0.589598 - 0.212726i	0.626800
0.516957 - 0.148364i	0.537826
0.516957 + 0.148364i	0.537826
-0.450442 - 0.209588i	0.496815
-0.450442 + 0.209588i	0.496815
-0.244130 - 0.376671i	0.448866
-0.244130 + 0.376671i	0.448866

No root lies outside the unit circle.

VAR satisfies the stability condition.

	CPI_SA	GDP_SA	M2_SA	LNNEER	RSTB
CPI_SA	1	-0.0175	0.100	-0.0944	0.171
GDP_SA	-0.0175	1	0.0565	0.00263	-0.0361
M2_SA	0.100	0.0565	1	-0.213	0.0318
LNNEER	-0.0944	0.00263	-0.213	1	-0.0875
RSTB	0.171	-0.0361	0.0318	-0.0875	1

Correlation of Reduced Form Residuals

Roots of Characteristic Polynomial

Endogenous variables: GDP_SA CPI_SA M2_SA RSTB LNNEER

0.983266	0.983266
0.913550	0.913550
0.897806	0.897806
0.703809 - 0.354839i	0.788199
0.703809 + 0.354839i	0.788199
0.750704 - 0.228691i	0.784765
0.750704 + 0.228691i	0.784765
0.439941 - 0.556567i	0.709447
0.439941 + 0.556567i	0.709447
-0.694777	0.694777
-0.360502 - 0.592206i	0.693303
-0.360502 + 0.592206i	0.693303
0.089237 - 0.654594i	0.660649
0.089237 + 0.654594i	0.660649
-0.575349	0.575349
0.525050	0.525050
-0.447320	0.447320
-0.042109 - 0.439630i	0.441642
-0.042109 + 0.439630i	0.441642
0.209704	0.209704

No root lies outside the unit circle.

VAR satisfies the stability condition.

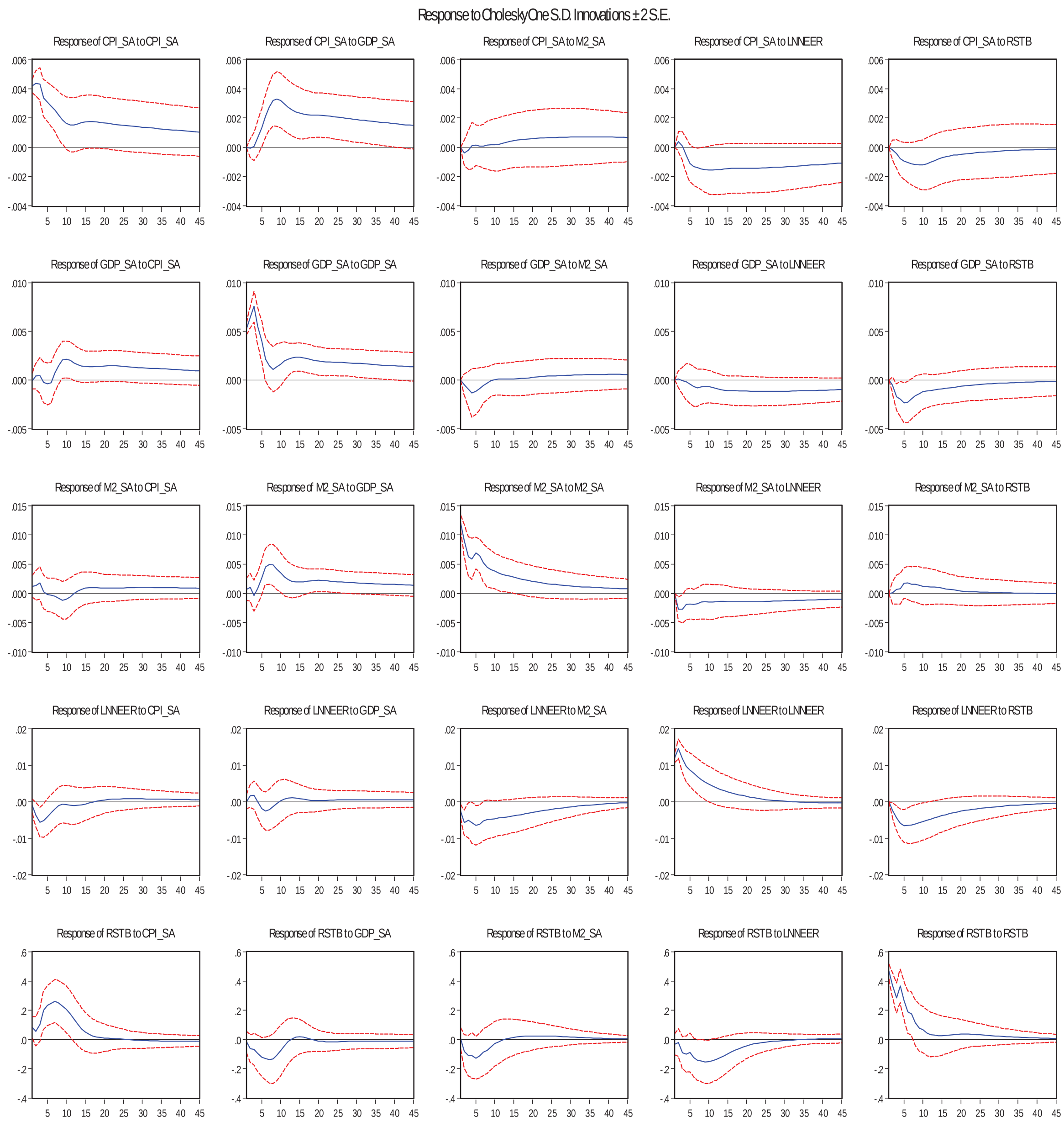
Appendix 4: Cointegration related Results

Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
Trace	1	2	2	2	2
Max-Eig	1	2	2	2	2

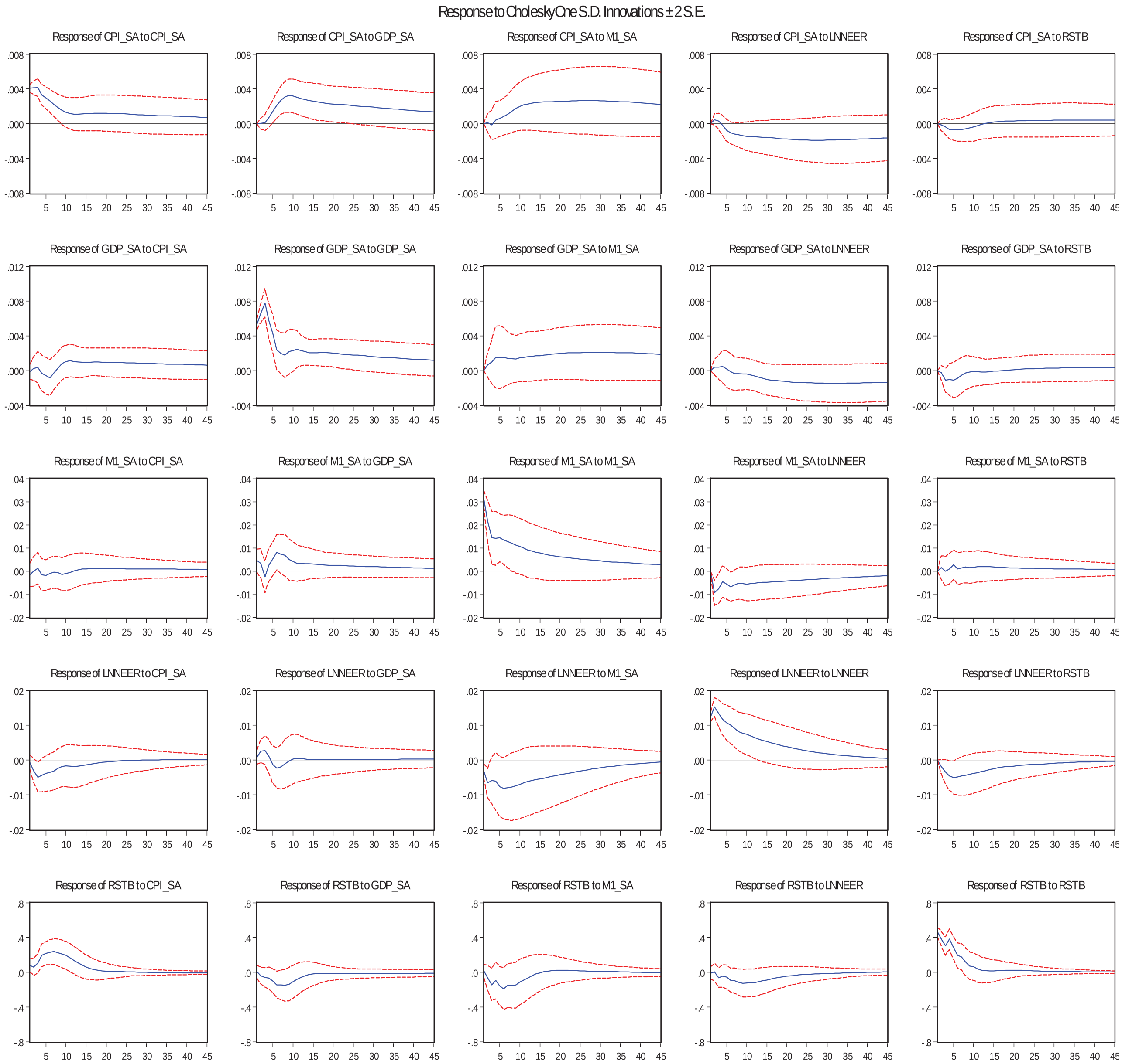
*Critical values based on MacKinnon-Haug-Michelis (1999)

Appendix 5: Impulse Response Functions

Impulse Response of Recursive VAR with M2 as Endogenous Variable



Impulse Response of Recursive VAR M1 as Endogenous Variable



Chapter 4

Rwanda's Monetary Policy Framework

By Joy Irankunda

1.0 Introduction

The National Bank of Rwanda (BNR) conducted monetary policy using direct instruments for a period of 26 years before adopting market based mechanisms in 1995, coupled with larger financial sector liberalizations and economic reforms. The National Bank of Rwanda (BNR) implements a monetary targeting regime using the broad monetary aggregate (M3) as an intermediate target to achieve the objective of price stability. In this framework, the transmission mechanism of monetary policy sets out from the quantity of monetary base (B) as an operational target and moves towards inflation through the money supply (M3). In formulating its monetary policy, BNR sets M3 growth targets in line with targets on inflation and economic growth and an estimated money demand in the economy.

The period 1990–2012 was first marked by the four year's war (1990–1994) that culminated in genocide, both of which led to the collapse of the Rwandan economy. It was also a period characterized by important economic reforms that enabled the country to make a progressive transition from a regulated to a market economy. Those reforms were carried out within a framework of successive economic stabilization programs; the Structural Adjustment Program-SAP (1990) and the ESAF-PRGF (1998) and the Policy Support Instrument that the country has been implementing since 2010 with the support of the IMF and World Bank.

The Government of Rwanda opted to liberalize the Rwandan economy and this was materialized through various measures. Price controls were abolished in 1991 and the privatization process of state-owned companies started in 1996. In connection with the monetary and exchange rate policy, measures of direct control were progressively replaced with market mechanisms. The direct control of credit was removed in 1992 and interest rates were fully liberalized in 1996. The BNR adopted indirect control instruments to conduct monetary policy such as, the required reserve ratio, the discount rate and the open market operations, and the BNR's policy rate was introduced in August 2005.

The reform of the exchange rate system began with the launch of the SAP in 1990. Residents were authorized to hold accounts in foreign currencies with commercial banks since 1990, while in 1995, the flexible exchange rate system was introduced and new exchange control regulations were put in place. The main features of these new regulations are: full liberalization of current and capital account operations, determination of the exchange rate by the market, introduction of foreign exchange bureaus, authorization of foreign direct investment in Rwanda and the transfer abroad of the returns on these investments.

Other measures were taken later to supplement these exchange control regulations: the right was granted to exporters to own and use their foreign currency export proceeds, and authorization was given to residents to withdraw money from their foreign currency accounts without providing any justification. For some operations, however, prior approval from the BNR was maintained – this concerned invisible operations (medical care, tourist trips, etc.) for which the purchase of foreign currency was subject to ceilings, and capital transfers abroad that were not related to current operations.

2.0 Monetary Policy Formulation and Implementation

2.1 Monetary Policy Framework

The National Bank of Rwanda is operating its monetary policy under a monetary targeting regime. In this framework, broad money (M3) is the intermediate target for regulating the money supply and reserve money is the operating target. In implementing this framework, the NBR continuously monitors on a daily basis the Reserve Money of the NBR (which must be kept below a specified ceiling) and the net foreign assets (which must be maintained above a designated floor). The authorities signal the policy stance by announcing the policy rate (key repo rate) during the quarterly meetings of the MPC. The existing framework also assumes a stable demand for money and money multiplier.

In this monetary aggregates target framework, the monetary transmission mechanism starts out from the quantity of reserve money and moves towards inflation. Broad money (M3) is determined in line with targets on inflation and economic growth assuming a stable money velocity. Reserve money target is determined in line with estimated M3, assuming stability of money multiplier. Broad money M3 is defined as the aggregation of currency out of the banking system and monetary deposits. Three levels of monetary aggregates exist in Rwanda. In addition to M3 which is the sum of M2 and foreign currency deposits, M1 includes currency out of the banking system and demand deposits, while M2 includes M1 and time & saving deposits.

As for the reserve money, it is defined as the aggregation of currency outside the central bank, banks reserves held at the central bank and nonbank deposits.

The objective of the monetary programing referred to in the introduction is to determine the level of broad money compatible with the desired economic growth and stable prices. This desired broad money level is derived by the relationship between money supply and nominal GDP as follows:

$$Y=V*M3 \Rightarrow M3=Y/V \qquad (1)$$

Whereby Y stands for nominal GDP, M3 stands for broad money supply and V stands for velocity.

From this level is derived the reserve money that will be targeted during the implementation of the monetary policy, based on the relationship between broad money and reserve money illustrated as follows:

$$M3=m*MB \qquad (2)$$

Whereby M3 stands for broad money supply; MB stands for monetary base or reserve money, and m for money multiplier. All the components of the reserve money come from the Central Bank balance sheet. Based on expected external budget and project support disbursements, as well as projected expenditures on the Government's accounts, weekly reserve money projections and estimates of the nature and stance of its intervention on the money market are made.

2.2 Monetary Policy Formulation

In its monetary program, the NBR in collaboration with IMF determine the reserve money target compatible with an estimated level of broad money M3, given a stable money multiplier. A monetary program is prepared to project the appropriate level of monetary expansion to meet the demand for money generated by economic activities. Hence, in the monetary program, the monetary base is used as an operating target for conducting monetary policy. The required monetary policy measures to maintain the projected targets are discussed at the Monetary Policy Implementation Committee (MPIC) meetings. The monetary management is based on indirect policy instruments, particularly through open market operations to inject or absorb liquidity to or from the market. The BNR uses its policy interest rate as instrument to influence these operations in order to maintain the expected target in the reserve money.

The primary objective of monetary policy is price stability as stipulated in the NBR Act 2007. The NBR also has other objectives such as (1) achieving and maintaining exchange stability, and (2) having a sound and vibrant financial system to encourage and promote sustainable economic development.

2.3 Liquidity Forecasting

The authorities use a short-term liquidity forecasting framework to guide their decision on the extent of liquidity to be injected/ mopped up to attain their operating target. In the weekly exercise, the NBR considers the main factors that will increase or decrease liquidity of the banking sector during the forecasting period – usually one month and 3 to 6 months. These factors include the government's cash flows for outlays and expenditures, issuance or maturing of the treasury bills, and/or purchases/sales of foreign exchange. These factors are combined with the deviation of actual from the targeted reserve money to derive a measure of liquidity overhang/ underhang. The authorities then take decision on the amount and the maturity composition of treasury bills to be issued or retired to close the liquidity gap.

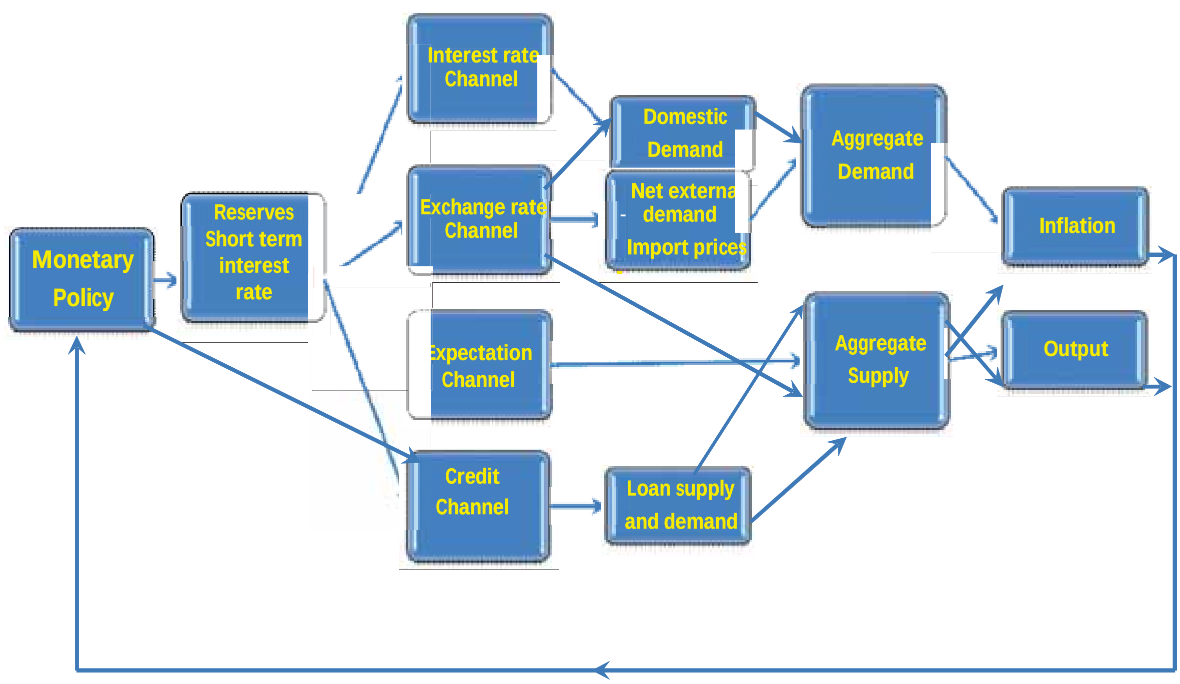
In the current monetary policy framework, open market operations conducted using Repo operations with treasury bills are the main policy instrument in Rwanda. The NBR also has other instruments to influence the liquidity conditions in the market. They include reserve requirements, rediscount window, and purchases/sales of foreign exchange. The reserve requirement is currently 5 percent as of end-2009. It is uniformly applied for all types of deposits, including those denominated in domestic and foreign currencies. The reserves are unremunerated and must be held in RWF (against both the domestic and foreign-currency denominated deposit liabilities). The reserves are calculated on a lagged averaging system, with a one-week lag and a one-week maintenance period. The reserve requirement is relatively low in comparison with several countries in the world and especially in EAC region.

Direction of monetary policy is contemplated and agreed upon during the quarterly MPC meeting. The MPC also decides on the level of discount rate during the meeting and announces it by a press release the same day. The press release also provides the rationale for the MPC's decision. The discount rate is currently tied to the central bank rate plus a margin (4 percent) as of mid-2008. Many banks would adjust their lending rates according to the prevailing discount rate. The National Bank of Rwanda also has another monetary instrument in the form of purchases/sales of foreign exchange. But, lately it does not use it for the sole purposes of influencing exchange rate or liquidity conditions in the market.

2.4 Monetary policy transmission mechanism

The process through which monetary policy decisions affect the economy in general and the price level in particular, is known as the transmission mechanism of monetary policy. Further, the individual links through which monetary policy impulses proceed are known as transmission channels. In Rwanda, the main channels of the monetary policy transmission are set out in a simplified form:

Rwanda's MTM



The process linking monetary policy decisions with the price level starts with a change in the official interest rates set by the NBR on its own operations. In these operations, the NBR bank provides funds to banks. The banking system demands money issued by the central bank (monetary base) to meet the public demand for currency, to clear interbank balances and to meet the requirements for minimum reserves that have to be deposited with the central bank.

Given its monopoly over the creation of the monetary base, the NBR can fully determine the interest rates on its operations. Since the NBR thereby affects the funding cost of liquidity for banks, commercial banks need to pass on these costs when lending to their customers. Through this process, the NBR can exert a dominant influence on money market conditions and thereby steer money market interest rates. Changes in money market rates, in turn, affect other interest rates.

Changes in the exchange rate will normally affect inflation in some ways:

- Exchange rate movements may directly affect the domestic price of imported goods. If the exchange rate appreciates, the price of imported goods tends to fall, thus helping to reduce inflation directly, insofar as these products are directly used in consumption;
- If these imports are used as inputs into the production process, lower prices for inputs might, over time, feed through into lower prices for final goods;
- Exchange rate developments may also have an effect via their impact on the competitiveness of domestically produced goods on international markets. If an appreciation in the exchange rate makes domestically produced goods less competitive in terms of their price on world markets, this tends to constrain external demand and thus reduce overall demand pressure in the economy. All other things being equal, an appreciation of the exchange rate would thus tend to reduce inflationary pressures. The strength of exchange rate effects depends on how open the economy is to international trade. Exchange rate effects are in general less important for a large, relatively closed currency area like the euro area than for a small open economy. Clearly, financial asset prices depend on many other factors in addition to monetary policy, and changes in the exchange rate are also often dominated by these factors.

2.5 Monetary Policy Implementation

In the first quarter of each year, the institutions involved in the economic management of the country namely the Ministry of Finance and Economic Planning and Central Bank jointly design an economic and financial program which ensures consistency in the evolution of the key indicators in the four macroeconomic accounts (National accounts, Fiscal, External and Monetary) to ensure the achievement of the ultimate target for the year of projection. This exercise is supported by the International Monetary Fund.

Within the program, BNR is in charge of two sectors, namely the balance of payments and the monetary sector through monetary programing. The monetary program sets quantitative targets on net foreign assets and reserve money, which the monetary policy seeks to implement. A set of policy instruments are at the disposal of the Central Bank to achieve these targets; those include the reserve requirements, money market operations, and foreign exchange sales or key repo rate.

2.5.1 Monetary Policy Instruments

Reserve Requirement

Reserve requirements are reserves that deposit taking institutions must hold at the Central bank without any remuneration. They were introduced in 1990 with two objectives, namely (1) to serve as a security buffer for depositors and (2) to enhance the ability of the monetary authority to control money supply while fulfilling their responsibility to maintain stable monetary conditions. As monetary policy instrument, reserve requirement ratio may be changed to inject or withdraw liquidity in the banking system, therefore discouraging banks from lending or encouraging them to do so.

The reserve requirement can be adjusted by changing the reserve base, the maintenance period or the required reserve ratio. On top of these three channels of managing liquidity through the reserve requirement adjustments, the central bank can also regulate banks' liquidity by determining which financial institutions are subject to reserve requirement.

Refinancing rate

The financing instrument is a facility offered by central banks to allow banks get the funds needed to finance their operations. This instrument existed previously, but was used to directly control the amount of credit to the economy and to favour certain sectors of activities, in order to achieve the set economic monetary and economic objectives. In so doing, quotas and interest rates were directly set. With the implementation of financial liberalization in 1995, only one refinancing rate was set by BNR, and commercial banks received reserves at predetermined rate and after providing collateral. Thus, the refinancing window operates as a collateralized loan, and commercial banks chose the maturity of refinancing which must be shorter than the residual maturity of the collateral and must be equal or less than seven days.

The refinancing instrument differs from the discount window whereby the ownership of the collateral is transferred to the central bank for its whole residual maturity and the refinancing is granted for a period of time corresponding to the maturity of the collateral involved in the transaction. The refinancing funds are offered as the last resort facility and institutions seeking to use the refinancing window must first fully exhaust all alternative market sources. It is in this context that the refinance rate is the highest of the money market rates.

Money market operations

When deemed necessary, and in order to keep reserve money close to the desired level, the central bank intervenes in the money market to mop up or inject liquidity from or in the banking system. During the period between August 1997 and August 2005, instruments that were used to intervene on the market were threefold:

- *Weekly tenders*

  Based on liquidity situation, the BNR launched weekly tenders, specifying required conditions but not disclosing the amount to inject or mop up. Commercial banks responding to tenders were the ones to decide the amount for bids and interest rates. The BNR, after estimating banks' liquidity and taking into account the objectives set regarding the money supply growth, determined the total amount of liquidity to mop up or inject and made market allocation based on offered interest rates.

- *Refinancing window*

  The refinancing rate has often been used during this period to supply liquidity to the banking system and as this rate was considered costly, banks used this facility as the last resort.

- *Treasury bills issuance*

  In line with provisions of the instruction no 05/98 signed on September 24th, 1998, BNR intervenes on the money market by issuing Treasury bills ranging from 4 to 52 weeks. In conjunction with the Ministry of Finance and Economic Planning, monetary authorities determine the public debt to issue and, before the beginning of every quarter, the Bank publishes for the Treasury a schedule indicating planned issues, the approximate amounts, dates, categories of bills and their maturities. Some issues are made to finance temporary Treasury deficits occurring when government expenditures exceed revenues. This way of financing government spending was a result of financial reforms that aimed at limiting the inflationist lending from the central bank by providing overdrafts, and incited the Treasury to use private savings, a resource allocation that should sensibly be done in order to avoid the crowding out effect.

Others are made for monetary policy purposes, to sterilize excess liquidity when treasury bills and other instruments fail to bring the reserve money to the targeted level. The issue of treasury bills for monetary policy purposes aims at sterilizing excess liquidity in the banking system for longer periods than the duration of other monetary policy instruments.

Foreign currency sales

Foreign currencies' sales are conducted as a tool to regulate liquidity in the banking system. With excess liquidity, the BNR sells foreign currency, mostly U.S. dollars, and consequently reduces the volume of the local currency in circulation.

Overnight operations

Since the last quarter of the year 2004, the Rwandan banking system was characterized by abundant liquidity although its levels exhibited a downward trend in the year 2008. Consequently, some of the monetary policy instruments were not in use until early 2009, namely refinance instrument and liquidity injection tenders. However, liquidity mop up instruments were developed to counteract prevailing liquidity conditions. It is in this regard that on top of the 7-day liquidity mop-up instrument, a standing facility called "Over-night operations" was introduced in August 2008, simultaneously with the interest rates corridor that regulated money market rates.

The corridor was set as follows: [5%-9%-12.5%], where the floor of the corridor was the rate offered for overnight deposits and the 7-day mop-up bids. The second wing of the interest rates corridor was the range of rates that the NBR could offer while injecting liquidity in the banking system, whereas the ceiling of this corridor was the minimum refinance rate that NBR could offer while providing last resort funds.

Repos operations

The NBR introduced the repo operations in August 2008 to smoothly manage liquidity, while ensuring the collateralization of traded instruments in order to minimize risk. Another advantage of repos operations is their features that can be tailored according to prevailing liquidity conditions, namely various maturities, various interest rates and amount offered by different banks.

Key repo rate

Accompanying repos operations was the 'Key repo rate', a bank rate that is set together with the interest rates corridor to guide interest rates, which are offered on the money market.

T-bonds

To boost the development of the financial system in Rwanda, a capital market was launched in January 2008. In order to initiate operations on this market, two 2-year Treasury bonds which matured in 2010 were issued in January and a 3-year treasury bond was issued in late February 2008.

2.5.2 Institutional Arrangements

Monetary Policy Committee

The National Bank of Rwanda seeks to meet low and stable inflation by setting an interest rate. The level of interest rates is decided by the Monetary Policy Committee (MPC). The MPC meets quarterly and when necessary. Decisions are made after analyzing the international and national economic developments. The MPC sets an interest rate it judges will enable the inflation objective to be met.

Monetary Policy Implementation Committee

The National Bank of Rwanda has established the Monetary Policy Implementation Committee (MPIC) composed of 17 members and the Governor is the Chairperson. The meetings of the Committee take place every Friday. The meetings are chaired by the Governor or the Vice Governor in the absence of the Governor. The Agenda is decided by the Chairperson and the working documents are distributed by the Committee's Secretary to members at least one day before the meeting. The decisions of the Committee are taken by consensus and implemented immediately.

Monetary Policy Technical Committee

The National Bank of Rwanda has established the Monetary Policy Technical Committee (MPTC) composed of 14 members and the Chief Economist is the Chairperson. Each member of the Committee is responsible for timely delivery, reliable statistical data and other information relating to his or her field. Each member must ensure that the information submitted to the Committee for consideration is updated regularly. On monthly basis, the Chairperson of the Committee is required to submit to the Management and to the Bank and the Monetary Policy Implementation Committee (MPIC) a report on the Committee's activities. The decisions are taken by consensus, unless one or more members require the decision to be subjected to a vote.

3.0 Empirical Analysis

This part focuses on the analysis of the money demand function, the monetary policy transmission mechanism and the stability of the money multiplier.

3.1 Estimation of the Money Demand Function

The demand for money function represents what motivates people to hold money balances. From estimated money demand equations, the monetary authority can decide which monetary policies to implement under the current economic conditions. A stable demand function for money has long been perceived as a prerequisite for the use of monetary aggregates in the conduct of monetary policy (Goldfeld and Sichel, 1990). The effectiveness and success of a monetary policy crucially depends on a stable money demand function. The stable money demand function ensures that the money supply would have predictable impacts on other economic variables such as inflation, interest rates, national income, and private investment.

3.1.1 Data

The empirical work used quarterly data for real money, real income, deposit rate, real exchange rate and inflation rate over the period 1999:Q1 to 2013:Q3. We first examine the time series properties of these variables with the Augmented Dickey-Fuller (ADF) and Phillips Perron (PP) stationarity tests. The results of the ADF and PP unit root test are presented in Table1.

Table 4.1: Results of Augmented Dickey Fuller test of stationarity

Variables	ADF Test Statistics (Absolute Value)	Critical Values			Order of integration
		1%	5%	10%	
RM3	2.32	4.12	3.48	3.17	I(1)
RGDP	1.39	4.13	3.49	3.17	I(1)
DEPRATE	2.17	4.12	3.48	3.17	I(1)
CPI	2.63	4.12	3.49	3.17	I(1)
RER	1.98	4.12	3.49	3.17	I(1)

Source: Author Computations

Table 4.2: Specification of the model

Variable	Description	Expected Sign
RM3	Real Money defined as the difference between log M3 and log CPI.	
LRGDP	Log of the Real Gross Domestic Product	Income affects positively the demand for money;
DEPRATE	Deposit rate (in percentage, p.a)	The increase in deposit rate is supposed to increase the return of money and negatively affect the volume of credit and hence money supply in general;
LRER	Log of Real Exchange Rate	

3.1.2 Cointegration test

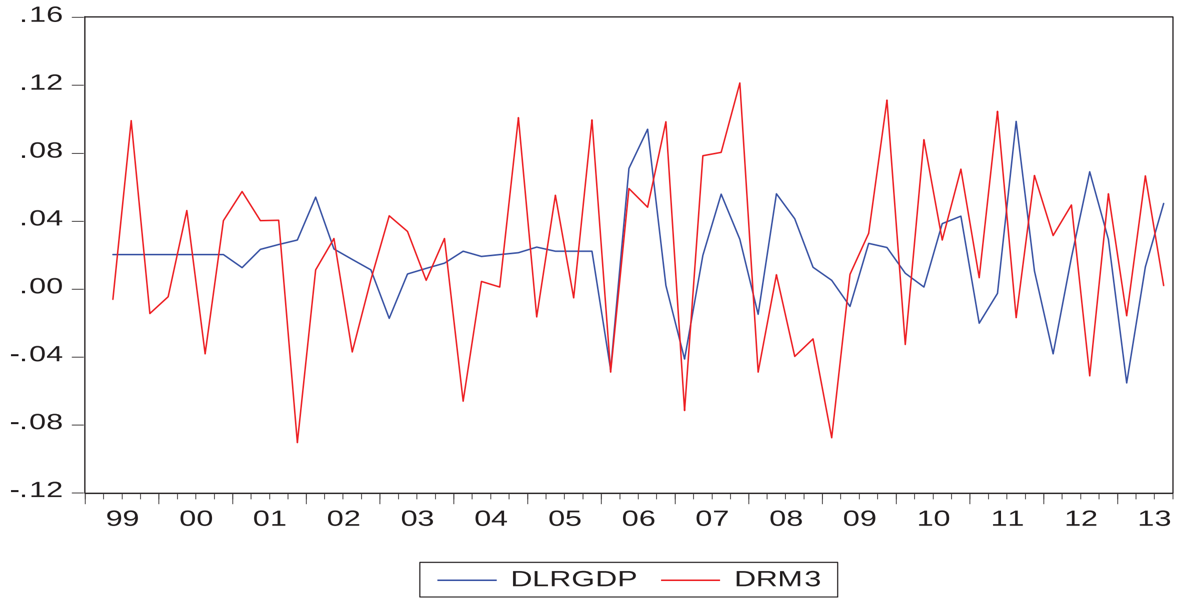
The estimated cointegrating relationship model is the following:

$$\left(m_t - p_t\right) = C_0 + C_1\left(m_{t-1} - p_{t-1}\right) + C_2 X_{t-1} + \varepsilon_t \quad (3)$$

Where m_t = the log (M_{3t}) is broad money; p_t = log $\left(P_t\right)$ is the consumer price index; X_t is a vector of explanatory variables relevant for explaining movements in money demand (such as scale variable, usually real income, and interest and exchange rates). The disturbances, denoted by ε_t, are assumed to be serially uncorrelated and distributed normally. In addition to the income (or scale) variable, we included in the money demand model the nominal exchange rate and several opportunity costs variables. The opportunity cost variables comprise the domestic deposit interest rate, which measures the return to bank deposits.

Stock and Watson (2007, p.658)suggest three ways to decide whether two (or more) variables can plausibly be modeled as cointegrated: (i) use expert knowledge and economic theory; (ii) graph the series and see whether they appear to move together in such a way that a linear combination of them is stationary; and (iii) perform statistical tests for cointegration.

Figure 4.1: Comparison between LRGDP and RM3 evolution



The figure plots real money, rm3, and the log of real income, LRGDP. The log of the real money stock grew rapidly, but experienced a decline for the period 2008-2010. The log of income, on the other hand, grew steadily over the entire sample period. However the graph shows that the real income and the real money are moving together showing a long run relationship.

Lag selection

The results that will guide us in selecting the lag order are reported in Table 3.

Table 4.3: Lag selection

VAR Lag Order Selection Criteria

Endogenous variables: RM3 LRGDP TBRATE LNER

Exogenous variables: C

Date: 08/09/14 Time: 20:04

Sample: 1999Q1 2013Q3

Included observations: 54

Lag	LogL	LR	FPE	AIC	SC	HQ
0	14.93222	NA	7.84e-06	-0.404897	-0.257565	-0.348077
1	288.6527	496.7519	5.62e-10	-9.950099	-9.213438*	-9.665998
2	307.2706	31.02991	5.15e-10	-10.04706	-8.721070	-9.535678
3	336.9449	45.06103*	3.19e-10*	-10.55352*	-8.638199	-9.814854*
4	347.2848	14.16948	4.13e-10	-10.34388	-7.839236	-9.377939
5	364.7311	21.32319	4.26e-10	-10.39745	-7.303472	-9.204223

* indicates lag order selected by the criterion

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

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Four test out of five gives the optimal lag length of 3. Next we test the existence of a long-run relationship between real money and the other variables.

3.1.3 Results of the VAR (3) estimation

Table 4.4: The estimated long-run money demand

	Parameter	Standard error	T-Stat
RM3			
LRGDP	0.48	0.16	-3.06
DEPRATE	0.17	0.03	-4.91
LRER	1.32	0.25	5.22
Constant	0.32		

Source: Own Computations

The results of the estimation show a significant positive relation between RGDP, DEPRATE and RER to the real money demanded. The income elasticity less than one per cent is a sign of modernization moving from liquid money to electronic money. In order to examine short-term dynamics of the model, we estimate an error-correction model associated with the above long-run money demand function. These results are reported in table below.

3.1.3 Interpretation of VEC estimation RESULTS

Table 4.5: VEC estimation RESULTS

	Coefficient	**t-stat**
ECT	-0.17	[-2.84]
$DRM3_{t-1}$	-0.10	[-0.78]
$DRM3_{t-2}$	0.30	[1.97]
$DRM3_{t-3}$	-0.04	[-0.31]
$DLRGDP_{\gamma-1}$	-0.27	[-0.83]
$DLRGDP_{\gamma-2}$	-0.33	[-1.40]
$DLRGDP_{\gamma-3}$	-0.60	[-1.69]
$DDEPRATE_{t-1}$	-0.01	[-1.00]
$DDEPRATE_{t-2}$	-0.01	[-1.07]
$DDEPRATE_{t-3}$	-0.03	[-2.76]
$DLRER_{t-1}$	-0.23	[-0.79]
$DLRER_{t-2}$	-0.17	[-0.52]
$DLRER_{t-3}$	-0.14	(-0.48)
Constant	0.04	[2.64]

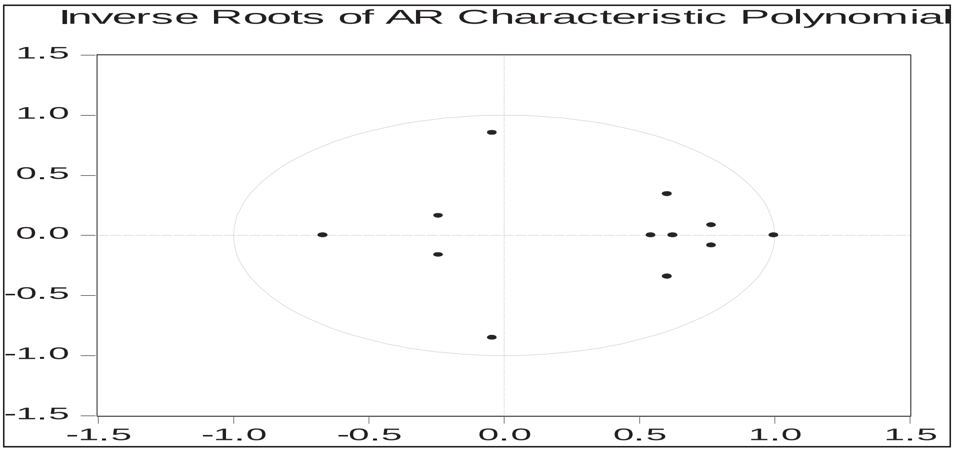
Source: Own Computations

The estimated coefficient of the error correction term is -0.17, which suggests that any disequilibrium would be substantially reduced withinone-year and a half time frame. The short-run income elasticity is not significant. Regarding the exchange rate, the results show that in short-run its effect is not significant. The deposit rate (3 quarters lagged) is significant meaning that over the short period the demand for money in Rwanda is driven by the level of the deposit rate. Finally, we need to examine the stability of the long-run coefficients.

3.1.5 Stability of money demand

Most of the roots lie inside the unit circle but in the recent period some roots lie at the border of the unit circle which implies increasing volatility in the money demand function.

Figure 4.2: Stability of the Money Demand Function



3.1.6 Money multiplier stability in Rwanda

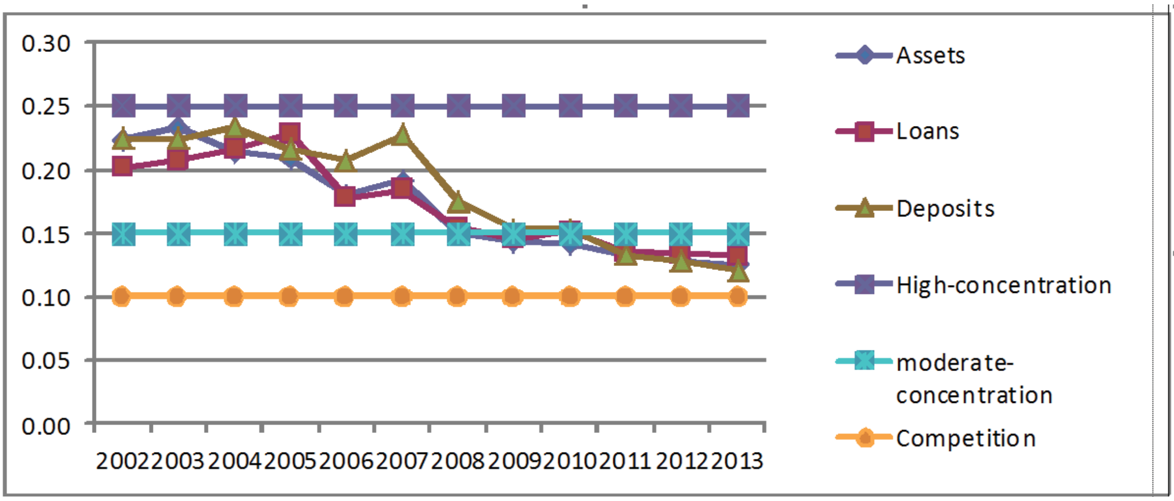
Before we test the existence of cointegrating relationship between Broad money (m) and reserve money (b) it is necessary to check if the two series are stationary or not. As indicated in the table5 below, m and b are I (1).

Table 4.6: ADF tests for unit roots

Variables	Levels	First differences
M	-2.98 (0.14)	-14.3(0.00)
B	0.52(0.98)	-14.7(0.00)

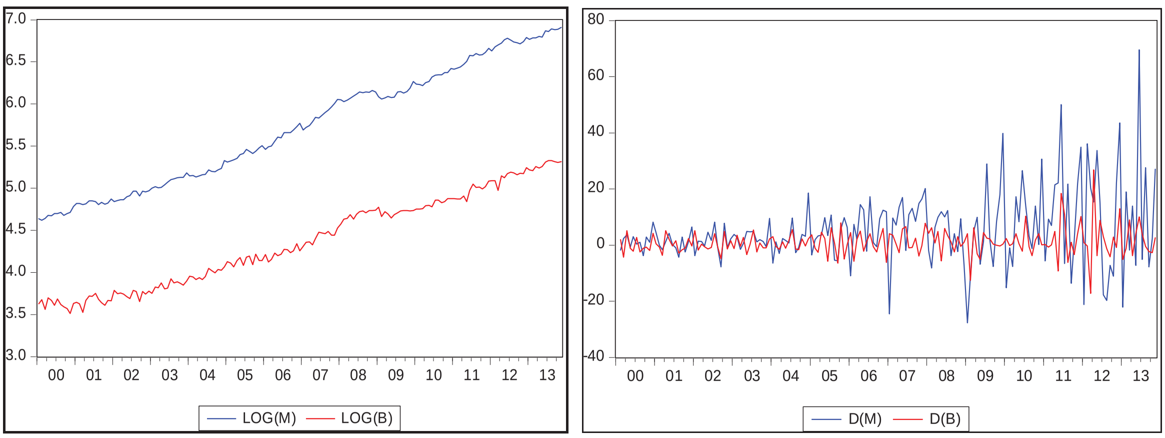
We then test for cointegration using Engle - Granger test. Results reported in table 7 indicate that the test fails to reject the null hypothesis of absence of cointegration between m and b indicating that there exists a long-run and time invariant relation between the two variables. However, considering recent development in financial sector and changes in monetary policy implementation, this assumption of time invariant developments have happened in the Rwandan banking sector. In 2010, one microfinance institution has been upgraded to a cooperative bank and three other microfinance institutions upgraded as microfinance banks. This led to significant increase of broad money. In addition, two regional banks entered the sector in 2010 and 2011. In addition, existing banks have significantly extended their networks out of Kigali to increase their market. This situation has led to an increase in the banking sector competition as indicated by the Herfindah Index (HI) constructed based on total deposits, total loans and total assets from 2002 to 2013. Development in HHI indicates that the competition in the Rwandan banking sector has been improving over time, from high concentration (between 2002 and 2009) to moderate concentration as new banks entered the sector and existing banks extending their networks.

Figure 4.3: Development Herfindah Index (HI) of the banking Sector



Source: Own calculation based on data from BNR

Figure 4.4: Development in m and b as well as their variations



On the monetary policy side, the National Bank of Rwanda introduced the use of the Key Repo rate in August 2008 to help banks in their liquidity management. However, since 2010, the key repo rate has become a tool to signal its monetary policy stance and it is reviewed regularly by the monetary policy committee. In addition, the bank has significantly developed its communication strategy with the banking sector and the public in such a way that since 2010 the interest rate pass through has been progressively improving. These developments may have caused a shift in the cointegrating vector. The following graph shows a possible structure break in 2010 to be confirmed using more elaborated statistic tests: the Chow test and the Gregory – Hansen test.

The results presented in table 7 show that the chow break point test (break period 2010:10) rejects the null hypothesis that the cointegrating vector is stable overtime because the test statistics are greater than critical value as indicated by the probability of F and Chi square tests which are less than 5%.

Table 4.7: Engle Granger cointegration test

	Value	Probability
Engle-Granger tau statistic	-3.92	0.011
Engle-Granger Z-statistic	-31.8	0.003
Chow Break point test (2010:10)		
F(2,163)	11.3	0.00
$\chi^2(2)$	22.6	0.00

This result is confirmed by the Gregory – Hansen test (table 8) which rejects the null of no cointegration against the alternative of cointegration with structural break at 5% level of significance. This test has the advantage compared to Chow test of structural stability as it allows for an endogenous regime change, where structure break time is not known a priori. We consider three cases: the model with regime shift, model with level shift with trend and model with regime shift. The interpretation of these results is that there exist a stable, but time varying long-run relationship between broad money (m) and reserve money b) in Rwanda.

Table 4.8: Gregory - Hansen cointegration test

Model / Break		$Z_t - stat$
Model with level shift 2010:11	ADF procedure	-5.9*
2010: 10	Phillips procedure	-8.6 *
Model with level shift with trend 2010:10	ADF procedure	-5.6*
2010: 10	Phillips procedure	-81*
Model with regime shift 2010:10	ADF procedure	-6.01*
2010:10	Phillips procedure	-8.6*

* significant at 5%. Critical value for the test at 5% of significance are -4.61 as reported in Gregory and Hansen (1996)

4.0 Monetary Transmission Mechanism in Rwanda

4.1 Specification, Data and Choice of Variables

We use a VAR analysis to examine the relationships between monetary policy variables and both output and prices in Rwanda. We first present results of Granger causality tests before estimating a reduce form VAR and identify monetary policy shocks through assumptions about variable ordering. VAR analysis has been used extensively to examine the effect of monetary policy on output and prices. The VAR methodology, a dynamic system of equations in which the current level of each variable depends on lagged values of that variable and of all other variables involved in the system, places minimal restrictions on description of how monetary shocks affect the economy. In this analysis it is useful to discriminate the transmission from instrument directly under the central bank's control to financial conditions and the impact of financial conditions on firms' and household's spending decisions (Christiano at al, 1999). The used unrestricted VAR is represented by:

$$Y_t = A(L)Y_{t-1} + B(L)Z_t + \varepsilon_t \quad \text{.......} \quad (4)$$

Where Y_t is a vector of endogenous variables and Z_t a vector of exogenous variables. Y_t Consists of real GDP (RGDP), the Consumer Price Index CPI, nominal exchange rate (NER), monetary aggregate (M3) and interest rate on bank loans (LENDING RATE). The vector Z_t consists of oil price and international price.

Given that the Rwandan economy doesn't have an impact on the global economy, these variables are treated as exogenous. A(L) corresponds to matrices of coefficients to be estimated, with lag lengths determined on basis of Schwartz and AIC criteria. Those criteria suggest that the number of lag is p=1. ε_t is a vector of innovations that may be contemporaneously correlated but are uncorrelated with their own lagged values with the right hand side variables. All data are expressed in natural logs, with exception of interest rate. The estimation is conducted on quarterly data from 2002:Q2 to 2013:Q3. We adopt the following order of endogenous variables:

$$RGDP_t = \left[RGDP_t, CPI_t, LEND\_RATE_t, M_{3t}, NER_t\right] \qquad (5)$$

To characterize relationships between output, prices and policy related variables, stationarity properties of the data are important. The Augmented Dickey-Fuller (ADF) test show that all variables are I(1).

As in most VAR models of the monetary transmission mechanism, we do not perform an explicit analysis of the economy's long-run behavior, because monetary transmission mechanism is a short-run phenomenon. Using the estimated VAR, we can analyze short-term dynamics based on variance decomposition and impulse response over the short to medium term (Favero, 2001).

4.2 Granger Causality Test

The results of the Granger Causality test are reported in Table 9. The results suggest that the monetary aggregate M3 has an impact on GDP and not on prices while the lending rate has an impact on CPI and not on GDP.

Table 4.9: Granger Causality Test Results

Hypotheses(H0)	Probability	Conclusion
LEND_RATE does not Granger Cause LRGDP	0.42	H0 is accepted
LM3 does not Granger Cause LRGDP	0.09	H0 is rejected
LNER does not Granger Cause LRGDP	0.51	H0 is accepted
LEND_RATE does not Granger Cause LCPI	0.09	H0 is rejected
LM3 does not Granger Cause LCPI	0.3	H0 is accepted
LNER does not Granger Cause LCPI	0.31	H0 is accepted

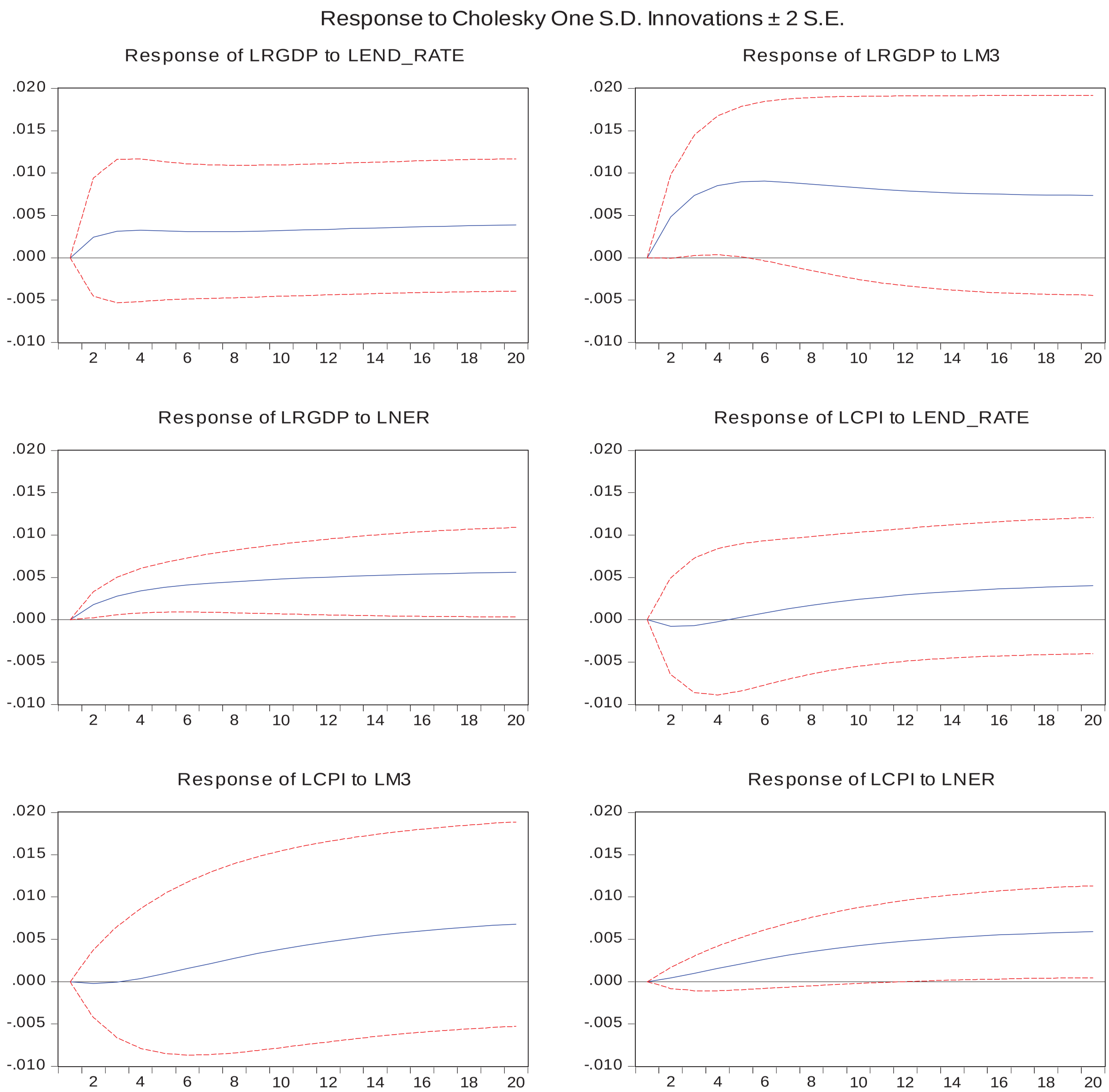
Source: Authors Computations

4.3 Impulse Responses

The results from the impulse response test are showing the following results:

- The impact of the change in lending rate on output is not significant
- A change in monetary aggregate M3 starts to impact on output after two quarters and this impact dies after seven quarters
- A change in nominal exchange rate starts to have an impact on output after one quarter and this impact last for a long period
- There is no impact of the lending rate on price change
- The impact of an exchange rate shock starts after 12 quarters

Figure 4.5: Impulse Response Functions



5.0 Challenges in Monetary Policy Implementation

The implementation of monetary policy faces major and persistent challenges. Imperfect knowledge of the production sector, coupled with unpredictable behavior of the main partners of the Bank, has been the major challenge in the implementation of monetary strategies. A large share of the real sector in Rwanda is attributable to informal activity, to the extent that the relevant ministerial department does not have the requisite information in order to inform policy.

The presence of excess liquidity hampers the development of the money markets, since most banks have had sufficient funds and have not been required to fully utilise money markets.

Another challenge for the BNR is the absence of the interest rate channel as part of the monetary transmission mechanism. The signal sent by the NBR through interest rate change does not translate into changes of banks' lending rates. The underlying causes for this are largely structural, and relate to the lack of competition between banks – due to factors such as high operational costs.

References

Chuku A. Chuku, measuring the effects of monetary policy innovations in nigeria: a structural vector autoregressive (svar) approach, African Journal of Accounting, Economics, Finance and Banking Research Vol. 5. No. 5. 2009.

Hamid R. Davoodi, Shiv Dixit & Gabor Pinter, Monetary Transmission Mechanism in the East African Community: An Empirical Investigation, February 2013.

Kevin C. Cheng, A VAR Analysis of Kenya's Monetary Policy Transmission Mechanism: How Does the Central Bank's REPO Rate Affect the Economy, December 2006.

Pascal Munyankindi, Gichondo Ananias and AmahoroAdha, the stability of money multiplier and monetary control in Rwanda, economic review n°003, November 2008.

Rusuhuzwa Kigabo Thomas, Munyankindi Pascal and Amahoro Adha, monetary transmission mechanisms in Rwanda, economic review N° 002, April 2008.

Saten Kumar, Don J. Webber and Scott Fargher, Money demand stability:A case study of Nigeria, February 2011.

Chapter 5

The Effectiveness of Monetary Policy in Swaziland

By Samuel N. Dlamini

1.0 Introduction

1.1 General Overview on Monetary Policy

The central bank in any country is responsible for the formulation and implementation of monetary policy. This can be done by basically influencing the monetary variables to achieve the ultimate macroeconomic goals of the nation. In general terms, monetary policy can be defined as the manipulation of monetary variables such as money supply, interest rates, and credit availability, to achieve the ultimate national macroeconomic objectives of price stability, low unemployment, stable exchange rate, and economic growth.

Faure (2005) defines monetary policy as "*the formulation and execution of policies by the central bank* (in the form of open market operations to render repo rate effective) aimed at guiding bank lending rates to levels where credit demand (and its counterpart: money) growth are at a level with aggregate supply elasticity, all of which are *premeditated on the attainment of low inflation (usually targeted) and high and sustainable economic output*". Central banks define monetary policy in various ways.

1.2 Review of Swaziland's Membership in COMESA

Swaziland is a founding member of COMESA[29], which aims to facilitate and promote regional integration through the development of trade, and natural and human resources for the benefit of all its members. The main objectives of COMESA include the creation of a free-trade area; the establishment of a customs union; free movement of capital and investment, supported by the adoption of a common investment area; a gradual establishment of a payment union based on the COMESA Clearing House and the eventual establishment of a monetary union; and the adoption of common visa arrangements, leading eventually to the free movement of persons.

1.3 Review of Swaziland's Membership in the CMA

Swaziland has, for a long time enjoyed fixed exchange rate parity with the South African rand through the Rand Monetary Area (RMA) agreement dating back to 1974 when the agreement was formalized. This monetary union worked well until 1986 when Swaziland renegotiated the agreement to its present form, the Common Monetary Area (CMA) Agreement. The major reason for the renegotiation was the severe depreciation of the rand, which led to an increase in domestic inflation. Since then the rand ceased to be legal tender in Swaziland, however, the Swazi lilangeni has been allowed to remain at par with the rand. Swaziland, in consequence, gave up its right to receive compensation from South Africa on account of the rand circulating in the country. The important part of the agreement then was that Swaziland had the liberty to de-link the lilangeni from the rand in future, should circumstances dictate such action. However, 16 years down the line, Swaziland has found it in the best interest to maintain the peg and the rand was reinstated as legal tender in Swaziland and accordingly compensation payment resumed.

The major departure of the new (CMA) agreement from the old (RMA) was the falling away of the maintenance of the one to one parity of the lilangeni to the rand giving Swaziland the latitude to pursue an independent exchange rate. The major features of the CMA are summarized below:

29 Other members are: Comoros, the Democratic Republic of the Congo, Burundi, Djibouti, Egypt, Malawi, Mauritius, Rwanda, Eritrea, Ethiopia, Kenya, Libya, Madagascar, Seychelles, Sudan, Uganda, Zambia, and Zimbabwe.

- Within the CMA, there are no restrictions on capital movements
- No exchange controls between members but generally common controls with the rest of the world
- Legal tender status of the rand in the entire region
- Compensation for the rand circulating in the smaller member countries
- Access of smaller member countries to the South African markets
- Freedom to issue national currencies
- Consultations

1.3.1 Dollarization in Swaziland economy

The adoption of the rand as legal tender in Swaziland does not rid the local unit from enjoying the same level of circulation in the economy. Unlike the dollarization that occurred in Zimbabwe where the local unit lost value to the level that it virtually did not circulate. The downside of dollarization is that the country gives up its right to influence its own monetary policy by adjusting the money supply. But Swaziland unlike Zimbabwe is still has to perform a balancing act for the circulation of currencies through the central bank lest the circulation be out of kilter and threaten the stability of the exchange peg.

1.4 Problem Statement

Like in other countries monetary policy is the most important instrument that significantly influences economic behaviour. So an appropriate monetary policy regime is vital for managing, safeguarding and maintaining macro-economic stability and ensuring that the environment is conducive for growth and development. Swaziland is part of the COMESA regional block therefore is crucial identify strengths, weakness and challenges of the existing monetary policy regime in Swaziland in order to design an appropriate monetary policy in sync with other regimes in COMESA in order to enhance monetary and financial integration.

1.5 Objectives of the Study

This study seeks to identify strengths, weakness, challenges of the existing monetary policy regime in Swaziland and its effectiveness in order to design an appropriate monetary policy to be implemented in the medium to long term.

1.6 Significance of the Study

The results of this study will provide important insights in designing alternative and appropriate regimes that will enhance the effectiveness of monetary policy in COMESA member states.

1.7 Structure of the Paper

The rest of this paper is organized as follows; Section 2 focuses on monetary policy framework in Swaziland, Section 3 covers the theory and empirical literature on monetary policy, Section 4 is the analytical framework, Section 5 is the presentation of results and Section 6 concludes the paper.

2.0 Monetary Policy Framework in Swaziland

2.1 Central Bank of Swaziland Monetary Policy Consultative Committee Organizational Structure

In November 2009, a Monetary Policy Consultative Committee (MPCC) was instituted for the first time in Swaziland, in line with the Central Bank of Swaziland Order of 1974 (as amended). In terms of the Order, members of the MPCC include the CBS Governor, Deputy Governor and five additional members, appointed by the Minister of Finance, who have recognized experience in monetary and financial matters. The appointed members of the MPCC serve for a term of three years. The role of the MPCC is to advice on matters relating to monetary policy of the Bank, to assist the bank in formulating its monetary policy and facilitate exchange of views on matters relating to the economic developments in the country. In a nutshell the MPCC has no decision-making powers but consultation, and not determine or formulate or implement, not only on monetary policy issues, but also any issue arising from the other objectives of the Bank. The Bank is expressly declared the sole legal determiner and public announcer of the rates for discounts, rediscounts and advances (interest rates as a monetary policy instrument). Prior to the establishment of the MPCC, the Bank's executive committee would convene and decide on monetary policy without external advices.

2.2 Central Bank Independence

Countries whose aim is to maintain an independent monetary policy have adopted inflation targeting as their monetary policy framework (Mishkin, 2000: Mishkin, 2003: Gosselin, 2006). Inflation targeting has become an increasingly popular monetary policy framework but Swaziland has not yet adopted this framework.

Central Bank independence relates to three areas in which the influence of the government must either be excluded or drastically curtailed; *independence in personal matters, financial independence, and independence with respect to policy* (Eijffinger and De Haan, 1996).

- *Personal independence:* refers to the influence the government has in appointment procedures. However, it is not feasible to exclude the government completely in appointments to an important public institution like the CB. The level of this influence may be discerned by such criteria such as government representation in the governing body of the CB and government influence in appointment procedures, terms of office, and dismissal of the governing board of the bank. The more influential the government is in appointing board members, the more likely it will be that the CB pursues the kinds of policies desired by the government (Eijffinger and De Haan, 1996).
- *Financial independence:* Direct access to Central Bank credits implies that the monetary policy is subordinated to fiscal policy whereas indirect access results if the Central Bank is cashier to the government or if it handles the management of government debt. The more independent the Central Bank is, the less the monetary authorities can be forced to finance deficits by creating money (Eijffinger and De Haan, 1996).
- *Policy independence:* refers to the total mandate of the Central Bank to formulation and execution of monetary policy without the interference of the government. Fischer (1995) defines Central Bank independence with respect to *goals and instruments.*

  (a) Independence with respect to goals: the scope the Central Bank has to exercise its own discretion.

  (b) Independence with respect to instruments: if it is free to choose the means by which to achieve its goals.

Based on the above stated requirements the Central Bank of Swaziland is far from being independent.

2.3 Formulation of Monetary Policy in Swaziland

The ultimate goal for the monetary policy in Swaziland is to maintain price stability to create an environment conducive to economic growth. The Bank has at its disposal a variety of monetary policy instruments to achieve price stability. However the country's membership to a CMA coupled with full economic integration and a fixed exchange regime precludes discretional monetary policy or independence.

Therefore Swaziland has no formal role in the formulation of the monetary and exchange rate policies that affect their countries. Given therefore the parity peg of the currencies of the Swaziland to the Rand and the free mobility of capital, the scope of monetary policies in Swaziland is limited and less independent to those of South Africa. The exchange rate peg has to be fully supported by well-coordinated monetary policy and discipline fiscal policies. Expansionary fiscal policy in these Swaziland tends to undermine the exchange rate peg by exerting pressure on external outflows reducing reserves and threatening the peg.

Despite the costs associated with the parity, the glaring one being that the country has limited scope to determine its monetary policy thus acting as a price taker of interest rates from South Africa, the benefits accruing from the parity far outweigh the costs. Hence the decision by the bank to maintain the parity is based on the fact that overall the parity has benefited the country. Worth noting is that based on domestic economic fundamentals Swaziland sometimes deviate from the SARB repo rate usually by 50 basis points. The monetary policy stance of deviating by 50n basis points had not resulted to major capital outflows.

2.3.1 *Direct and indirect instruments of the Central Bank of Swaziland*

Interest rate

The monetary authorities in the country basically use the discount rate as a monetary instrument to control inflation. It is clear that with the close cooperation, and inflation targeting policy by South Africa, interest rates in Swaziland track those prevalent in South Africa since inflation trends in Swaziland have always mirrored those prevailing in South Africa. Because of the nature of the CMA arrangement, the scope for independent interest rates is limited in Swaziland. Pronounced divergences in monetary conditions between Swaziland and South Africa could stimulate undesirable flows of private sector funds out of the domestic economy to South Africa. Thus Swazi interest rate levels conform broadly to those prevailing in South Africa. Prior to inflation targeting by SA, the policy of the Bank has been to fix the discount rate at 50 basis points below the SA repo rate to stimulate investment. Since 2001 the discount rate has been set at par with the South African repo rate until June 2008 when the CBS started deviating from the parity by keeping the discount rate again at 50 basis points below the SA repo rate after which parity was restored in March 2010.

Open market operations

Open market transactions occur when the Central Bank is involved in the buying and selling of securities in order to influence monetary aggregates. Such transactions involve mainly government securities which are sold when the intention is to diminish the quantity of money and bought when the authorities wish to expand the quantity of money. Open market operations have not been used in Swaziland as a monetary policy tool but as means to raise cash flow for immediate government obligations and to mop up the excess liquidity existing within the banking system. In the absence of adequate investment instruments, combined with persistent and continuous excess liquidity in the domestic banking system, banks have traditionally looked towards the South African markets to manage their liquidity. However, recently government introduced long-term dated papers which could help absorb the excess liquidity in the banking sector.

Exchange rate management

Given the parity of the domestic currency to the SA rand, Swaziland has no control over the fluctuations in the exchange rate against other currencies as they reflect developments in the SA economy. The lilangeni exchange rates quoted against other currencies by the Bank are therefore based on the exchange rate of the South African rand against those currencies. Whilst the current exchange rate system puts restrains on independent actions, this is compensated for by the benefits derived from membership in the CMA. This therefore suggests that so long as Swaziland benefits on balance from the membership, the need to alter the existing arrangement is minimized. The steady increase in Swaziland's exports to SA has doubtless been a result of the one to one exchange rate between the rand and lilangeni which guarantees certainty in cross border trade. The decision to maintain the parity status over the past years has been based on the premises that the benefit accruing to the country far outweighs the associated cost.

Money supply

Theoretical excessive money supply may increase inflation and deteriorate the current account balance which therefore propels the central bank to embark on a stringent monetary policy to counter the excess money supply. Consequently monetary policy always attempts to prevent excessive expansion of monetary aggregates, even when it does not specify a money supply target. However, the autonomy of monetary policy and the role of the monetary aggregates in policy formulation are significantly influenced by the exchange rate regime. Since a pegged exchange rate regime is used in Swaziland, and that the SA rand is legal tender in Swaziland making it to circulate freely within the country renders the Bank to have no explicit control over money supply. Nevertheless, the monetary base is an important indicator for monetary policy because it is the only monetary aggregate which is directly controlled by the Bank and at the same time it is the category which through the money multiplier, constraints the money supply in the economy. Consequently, changes in the monetary base indirectly influence economic activity, i.e. influencing inflation and if used effectively could affect interest rates.

Indirect instruments (liquidity and reserve requirements)

Basically the Bank has at its disposal two kinds of indirect instruments- namely liquidity and reserve requirements. The Central Bank can influence the quantity of money directly by changing either or both the required liquidity and reserve ratios. Both instruments are not directly used for monetary control purposes, but mainly for prudential reasons and to activate the domestic money market.

The Financial Institutions Order [1975] first imposed the reserve requirement in 1975 at 3.5 percent. The reserve requirement was aimed at encouraging banks to use balances previously held in South Africa. The cash reserve requirement peaked at 6 percent in 1976 and 1994 and was reduced to a low of 2.5 percent in August 2003 to date. Reserve account does not earn interest. However, before 1996, interest was paid on the amount by which the average daily balances with the Bank exceeded the required amount. Thereafter the Bank ceased to pay interest on reserves in excess of requirement in an effort to encourage inter-bank activity. Since banks continued to be highly liquid, in 2003 the Bank introduced a separate call account for banks which earns interest. The interest earned is the 3 months local Treasury bill rate less 2.7 percent.

The liquidity requirement is designed to ensure a prudent distribution of the individual banks' assets and not as a means to control monetary aggregates. It ensures that a reasonable proportion of any increase in deposit liabilities is placed in official hands, or otherwise employed in instruments recognized to represent priority uses for the available funds and to be readily convertible to primary liquidity in the event that an individual bank find itself called upon to accept a fall in its deposit liabilities. The liquidity requirement was last reduced in August 2003 from 15 percent to 13 percent in order to lessen the negative tax effect this has on banks' intermediation. However, thus far, the desired effects of increased domestic lending have not come forth, but instead banks have increased their investments in South African markets because of lack of investment avenues in the domestic markets where these funds can be invested. For that reason the liquidity ratio in most cases has been above the statutory requirement.

2.3.2 Monetary policy transmission channels

Interest rate channel

As noted above that to a large extend the Central Bank of Swaziland utilize the interest rate channel to influence activity in the economy. Literature provides a detailed description of the interest channel that entails the effect of financial market imperfections including how asymmetric information and costly enforcement of contracts generates agency problems in financial markets. Generally, due to intervention problems in credit markets two basic channels of monetary transmission have been established: *the bank lending channel and the balance-sheet channel* (Bernanke and Gertler, 1995).

Bank lending

In this case the commercial banks play a crucial role in the financial system because they deal with a variety of borrowers, especially small firms where the problems of symmetric information can be especially prominent. Commercial banks hold assets in the form of bank loans for which few substitutes exist. The deposits are the principal source of funds for lending especially for small firms who require bank loans for expansion purposes and investment.

If the Monetary Policy Committee decide to implement a contractionary policy this result to changes in the real interest rate on both short and long term bonds due to nominal price rigidities. Once firms realize that their real cost of borrowing over all periods has increased, they reduce their investment expenditures. In the same way, households facing higher real borrowing costs cut back on their purchases of houses, and other durable goods. Schematically, the effect of Central Bank of Swaziland's monetary policy in this channel is as follows:

Schematic diagram 1

$$Bank\,Rate(DiscountRate)\uparrow \rightarrow bank\,deposits\downarrow \rightarrow bank\,loans\downarrow \rightarrow Investment\downarrow \rightarrow Y$$

Worth noting is that Swaziland's interest rate levels conform broadly to those prevailing in South Africa.

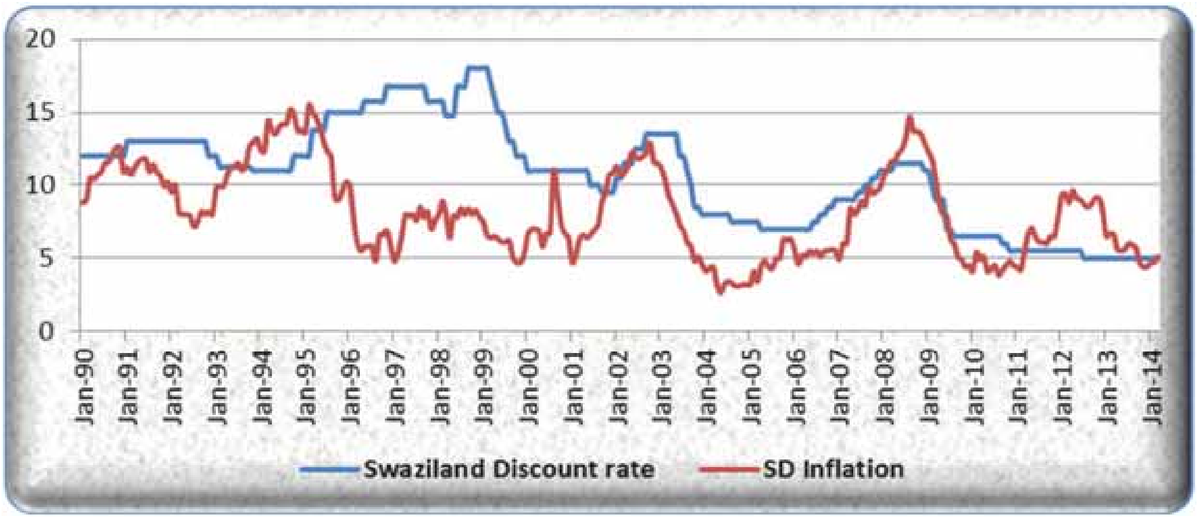
2.3.3 Credibility of the monetary policy

The credibility of monetary policy in Swaziland can be assessed by exploring the relationship between the discount rate and inflation. Theoretically an increase in the discount rate increases the cost of borrowing of commercial banks from the central bank and commercial banks react by transferring the risk to the borrowers by increasing the prime rate and in the process lower the demand for money in the economy resulting an economy the relieved of price pressures. The central bank therefore reduces inflation by increasing the discount rate such that an increase in inflation or rather signs of inflationary pressures; necessitate an increase in the discount rate.

Trend Analysis of interest rate and inflation

The relationship between the discount rate and inflation was tenuous before the introduction of inflation targeting in South Africa 1999. After 1999 the introduction inflation targeting South Africa brought credibility in monetary policy as the discount rate moved more in response to the taming inflationary pressures.

Figure 5.1: Inflation and Discount Rate



Source: Central bank Swaziland

Monetary policy deviation's analysis

Deviation in monetary policy were observed prior to 1999 was due to the fact that South Africa from which Swaziland transfers monetary policy by virtue of the fixed exchange rate that exist between the two countries was not pursuing inflation targeting. There was a huge deviation in trend of the discount rate and inflation which variables ought to move in tandem for credibility of monetary policy. On implementation of inflation targeting in South Africa in 1999 credibility of monetary policy was restored locally as seen by the close correlation of inflation and the discount rate post 1999.

2.4 Coordination of the Monetary Policy and Fiscal Policy in Swaziland

According to literature (see Hallet and Libich, 2008) monetary and fiscal policies are related to each other despite the fact that these two sets of policies may sometimes vary in terms of scope, transmission mechanisms and time involved in influencing the macroeconomic variables. These policies have significant impact on the level and composition of savings, investment, output and employment as well as the viability of external account. Theory on monetary policy indicates that it is concerned with the changes in the supply of money and credit. This refers to policy measures undertaken by the government or the central bank to influence the availability, cost and use of money and credit with the help of monetary instruments to achieve set objectives. Fiscal policy is refers to government's programmes for public spending and its resource mobilization strategy for meeting these expenditures.

As noted earlier on, the Central Bank of Swaziland's operational targets are in line with the SARB: to ensure that inflation rate trends within the range of 3 – 6 percent. Even though Swaziland's inflation in the past decade was trending slightly above the other CMA countries, the monetary authority managed to maintain a single digit for inflation.

On the fiscal side, despite the fact that Swaziland maintained low fiscal deficit/GDP ratios for the better part of the review period, it is worth noting that this was sustained mainly by the inflows of SACU receipts otherwise fiscal discipline is lacking. This is evident by the high deficit/GDP ratio in the year 2010 as the country experienced a drastically fall in SACU receipts. This hike in fiscal deficit was largely attributed to high government spending particularly on wage bill against a significant decline in SACU revenue.

In the past ten years the International Monetary Fund (IMF) had cautioned the CMA countries including Swaziland to reduce their wage bills and privatize government parastatals. Swaziland's wage bill is 13 percent of GDP and this equates to about 37 percent of the recurrent expenditure above the accepted threshold of 35 percent.

The above analysis depicts that the two policies are not well coordinated. Worth mentioning is that the government's wage bill is set to increase as more people are likely to be employed in 2014 and beyond.

In a nutshell there is a need for Swaziland to establish a coordination mechanism to ensure that the two policies are complimenting each other.

3.0 Theory and Empirical Literature on Monetary Policy

3.1 Theoretical Background of Monetary Policy

Monetary theory can be described as a set of ideas about how monetary policy should be conducted within an economy. Monetary theory suggests that different monetary policies can benefit nations depending on their unique set of resources and limitations. It is based on core ideas about how factors like the size of the money supply, price levels and benchmark interest rates affect the economy.

The conduct of monetary policy varies in accordance with the exchange rate policy pursued by the monetary authorities where inflation targeting is associated with flexible exchange rates to the fixed exchange rate where monetary policy reflects the partner pegged to.

Monetary policy according to Balfoussia et al, (2011) can be based on the New-Keynesian Phillips curve, the "Expectational" or "Forward-looking" aggregate demand equation and the Standard formulation of Taylor's interest rules.

The New-Keynesian Phillips curve relates inflation to expected future inflation and to the deviation of output from the potential level that could have been attained under flexible prices. The rigidities in prices assumption generates efficacy in monetary policy as an increase in the supply of money would result in no corresponding increase in prices and the extra money would help boost production. Monetary policy should therefore dwell on anchoring inflation expectations and at managing the output gap.

The forward-looking/expectational aggregate demand postulates that changes in the interest rate brought about by monetary policy effect the real short-term interest rate, altering the optimal path of consumption.

Standards formulation of Taylor's interest rules is a manner of conducting monetary policy which states monetary policy authority should move the nominal interest rate in response to a divergence of the actual inflation rate from its target or of output from its flexible-price natural level.

The neoclassical theories of the rational expectations school is of the view that the rational-expectations school held that only unanticipated changes in monetary policy should have real effects.

Underlying the theory of monetary policy are the velocity of money, the demand for money and the money multiplier. The efficacy of monetary policy hinges on the behaviour of the velocity of money, the demand for money and money multiplier which factors all give a measurement of the demand for money. Higgins and Faust (1981) view velocity as a measure of how much money firms and households desire to hold relative to the level of income. Thus the monetary authorities can influence growth of income by the use of monetary targets if the growth in the demand for money accompanying a given growth of income can be predicted. The proposition that the velocity of money is stable was the cornerstone of the original quantity theory of money, which emphasized the role of money supply in the economy. The Keynesian revolution disputed the stability in the velocity of money as evidenced by the liquidity trap, when agents' demand for money falls. A shift in the Liquidity Money curve resulting from an expansionary monetary policy when interest rates are at their lowest doesn't increases output under the Investment-Savings-Liquidity-Money model.

3.2 Empirical Literature Review

Generally in monetary policy theory, interest rates are postulated to be negatively related to money supply. Worth noting is that this assumption may not hold across all economic environments, therefore general conclusion on this assumption should be viewed with caution.

Mitchell-Innes (2006) concluded that economic agents only place their long-run faith in monetary policy if the short-run dynamics of monetary framework work efficiently and in a timely manner. He notes that empirical studies conducted in both developing and developed countries have yielded inconsistent results. Although a majority of studies find a positive long-run relationship between nominal interest rates and expected inflation, very few have been able to establish the one-for-one relationship hypothesised by Fischer (1930). Fischer proposed that nominal interest rates should be directly related to expected inflation, he did not empirically prove a one-for-one relation.

Nagel and Parker (2003) found that in most studies they examine, monetary policy measured either as changes in a monetary aggregate or as changes in the federal funds interest rate, have substantial short-run effects on real variables such as output and employment.

3.2.1 *Review of empirical studies on inflation/consumer price index*

Zavkiev (2005) estimated a model for inflation in Tajikistan using the Johansen cointegration approach and single equation error correction model. The study provides evidence that in the long-run prices are determined by exchange rate, money, real output and interest rates in Tajikistan while in the short-run variation was largely informed by values of money growth and inflation, and current and past values of output growth and interest rate changes. The results reveals that by controlling excessive money growth and stabilizing excessive exchange rate fluctuations Tajikistan's monetary policy could be effective in controlling inflation.

Dlamini (2008) investigated the relationship between inflation and its determinants for the South African economy. The study used data covering the period 1970:1-2006:4. The long-run impact of the determinants on inflation was identified by means of the Johansen cointegration model and the short-run dynamics by the Vector Error Correction Model (VECM). The long-run results identify two cointegrating equations linking inflation and its determinants, money supply and exchange rate. Dlamini (2008) also concluded that an increase in bank credit (used as a proxy for money supply) during the period 1970:1-2006:4 had a negative impact on inflation in South Africa.

Other studies where the Johansen cointegration and the Vector Error Correction Models (VECM) were utilized to capture the variation in inflation are: Maddala and Kim (1998), Calza *et al,* (2001a), Chakraborty and Basu (2002) and Bashir *et al* (2011).

3.2.2 *Review of empirical studies on money demand*

Valadkhani (2002) estimated money demand for New Zealand and concluded that existence of a stable demand for money is very important for the conduct of monetary policy both before and after adopting inflation targeting. Valadkhani (2002) utilized Johansen cointegration technique and quarterly data for the period 1988:1-2002:2 to determine the long-run relationship of the demand for M3. The study provides evidence in the case of New Zealand that the demand for money is cointegrated with real income, the expected rate of inflation, the spread between interest on money and on non-money assets, and the real effective (trade weighted index) exchange rate.

Bashier and Dahlan (2011), estimated the demand for money function for different countries including Jordan. This research is an attempt to examine the money demand function and its stability in Jordan over the period 1975-2009. The study employed CUSUM and CUSUMSQ tests in conjunction with Johansen-Juselius (1990) Cointegration analysis of a multivariate system of equations to establish the existence of a long run relationship between the determinants. The study also used the Augmented Dickey-Fuller (ADF) unit root tests proposed by Dickey-Fuller (1981) to determine the order of integration of the series. In addition the study applied an impulse response functions (IRFs) and variance decomposition (VDC) to explore the impact of the determinant factors on money demand. The results show that all series data are integrated of order one I(1). The Johansen-Juselius Cointegration test provides evidence that the determinant factors are cointegrated. The results also provide evidence that there was a positive relationship between money aggregates and the level of income. The study also established that the relationship between interest rate and exchange rate depreciation was negative. The stability tests results also show that M2 money demand in Jordan was stable.

Gaurisankar and Kwie-Jurgens (2012) estimated a money demand function by assessing the stability between real money demand (RM2) and its determinants, namely real gross domestic product (RGDP), real exchange rate (RER) and real lending rate (RLR). The study used data for the period 1981-2010. The study provides evidence that in the long run real broad money growth is positively linked to RGDP growth. The results also depict that real demand for money responds inversely to RER changes and RLR. The short-run results suggest that to a large extend real money demand variation is driven by RGDP growth and RER changes. Stability tests results depict that a lack of stability exist in the coefficients. The paper concludes that in the case of Suriname monetary targeting interest rate policy may be ineffective since this coefficient was statistically insignificant on real money demand. The short and long run results demonstrated that income-related fiscal policy measures, exchange rate targeting and money demand management are more effective in ensuring macroeconomic stability in Suriname.

4.0 Analytical Framework and Econometric

4.1 Data Sources

Secondary data is used in this study sourced from the Central Statistics Office, Central Bank of Swaziland websites, World Bank and IMF Statistics. A quantitative approach is also used in line with previous researchers. This study uses monthly data from January 1990 to December 2012.

4.2 Methodology

The empirical literature summarized above suggests several approaches that are used to determine the relationship between two or more variables. For an example, the Engle-Granger co integration approach is widely used to establish the relationship between inflation and several macroeconomic variables. Due to several limitations of the Engle-Granger approach, researchers have shifted to the Johansen co integration technique in recent years.

In line with the literature reviewed above, this study use a similar approaches to those used by Gaurisankar and Kwie-Jurgens (2012), Bashier and Dahlan (2011), Dlamini (2008) and Bashir *et al* (2011) who employed a Johansen (1988) and Juselius (1990) cointegration approach to achieve their objectives. This approach is supported by Maddala and Kim (1998) and Aziakpono (2006) who indicate that a VAR model assuming that the errors are white noise. According to Brooks and Tsolacos (1999) the advantage of using the Johansen cointegration procedure compared to other models when examining the long-term relationship is that it is able to capture more than one cointegrating vector and permits the identification of all cointegration vectors within a given set of variables as well as better asymptotic properties yielding more robust results. Chakraborty and Basu (2002) noted that this approach has proved to be dynamic because it minimise any loss of efficiency, and hence provides a robust model for the long-run. In addition, this approach is ideal for long-run testing because of its flexibility in capturing structural breaks for unpredicted timing which result from monetary policy changes, transformation of institutional arrangements and severe economic crises Chakraborty and Basu (2002).

The Johansen cointegrating test is based on the following hypothesis

The *"trace"* statistic

H_0 : the number of distinct cointegrating vectors is less than or equal to r
H_1 : the number of distinct cointegrating vectors is greater than r

The *"max"* statistic

H_0 : the number of distinct cointegrating vectors is equal to r
H_1 : the number of distinct cointegrating vectors is equal to r+1

The short-run dynamics is analysed using the vector error correction model (Brooks and Tsolacos, 1999). The vector error correction model VECM framework restricts the long-run behaviour of the endogenous variables to converge at their cointegrating relationships and allow for short-run adjustment dynamics. Also the VECM permits for the testing of the weak exogeneity to establish whether the dependent variable is endogenous or not. The results obtained from the VECM indicate how each variable adjusts itself in response to a random shock.

After exploring the effect of monetary policy in a consumer price index model the study further provides an analysis on the demand for money in Swaziland.

The study also use the VAR variance decomposition, VAR impulse response function and Structural Vector Autoregression (SVAR) to explore sources of shocks. Analyses of the SVAR are based on the matrix below:

Figure 5.2: Structural Autoregression Matrix

$$\begin{bmatrix} 1 & a_{12} & a_{13} & a_{14} \\ 0 & 1 & a_{23} & a_{24} \\ 0 & 0 & 1 & a_{34} \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} e_{1t} \\ e_{2t} \\ e_{3t} \\ e_{4t} \end{bmatrix} = \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \varepsilon_{4t} \end{bmatrix}$$

$$e_{1t} = \varepsilon_{1t} - a_{12}e_{2t} - a_{13}e_{3t} - a_{14}e_{4t}$$
$$e_{2t} = \varepsilon_{2t} - a_{23}e_{3t} - a_{24}e_{4t}$$
$$e_{3t} = \varepsilon_{3t} - a_{34}e_{4t}$$
$$e_{4t} = \varepsilon_{4t}$$

4.2.1 Swaziland consumer price index model pecification

MODEL A:CPISD = $\alpha + \beta\ CPISA_t + \beta CU_t + \beta\ DSC_t + \beta\ M2_t + \beta\ OIL_t + \beta\ ULC_t + \beta\ LZAR_t + \varepsilon$

V ariables	Description
LCPISD	Log of consumer price index for Swaziland
LCPISA	Log of consumer price index for South Africa
LCU	Log capacity utilization
DSC	Discount rate
LM2	Log of money supply M2
LOIL	Log of oil price
LULC	Log of unit labour cost
LZAR	Log of exchange rate
E	Residuals.

4.2.2 Money demand function

MODEL B: $RM_t = \alpha + \beta CPISD_t + + \beta DSC + \beta\ LRER_t + \beta LRGDP_t + \varepsilon$

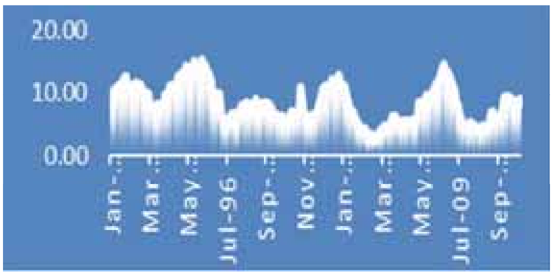
Variables	Description
LRM_t	the log of Real base money or log of real narrow/broad money (LRM2) as proxy for real money demand
LCPISD	the log Consumer Price Index
DSC	Discount rate as proxy for opportunity cost for holding money
LRER	Log of real exchange rate as proxy for opportunity cost for holding money (is the lilangeni exchange rate against the US dollar)
LRGDP	Log of real gross domestic product as proxy for real income
ε	Residuals.

Worth noting is that, the problem of working with time series data in a regression is the possibility of some data displaying non stationary. Therefore it is imperative to perform a set of tests in order to determine the existence of unit roots in the variables to work with. α= is a constant representing long-term equilibrium ε = error term.

5.0 Empirical Results and Analyses

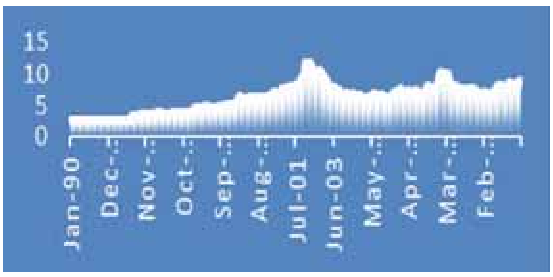
5.1 Graphical Presentation of the Variables to be used

CPISD

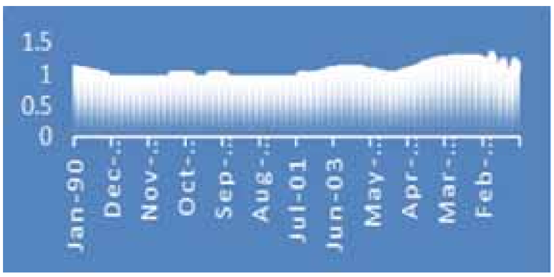


CPISA

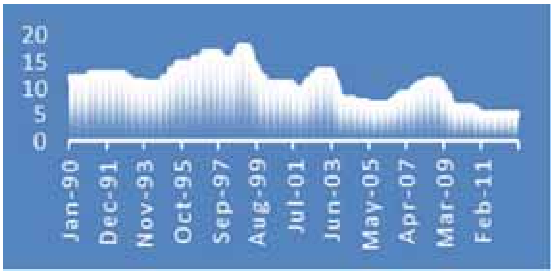
ZAR



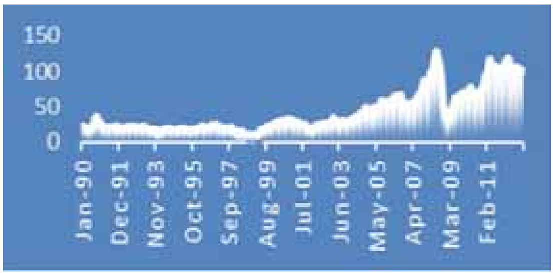
CU



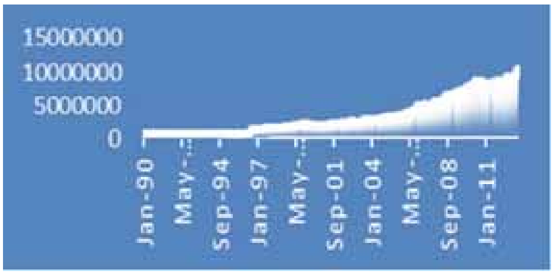
DSC



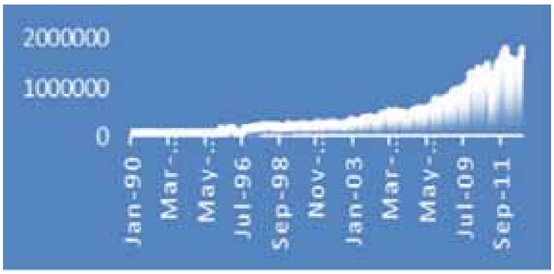
OIL



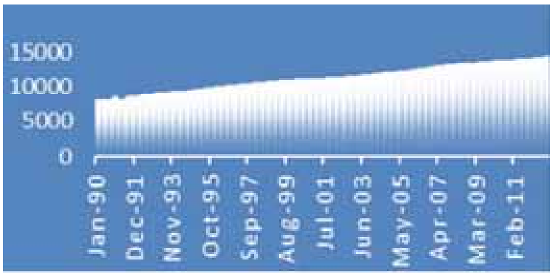
M2



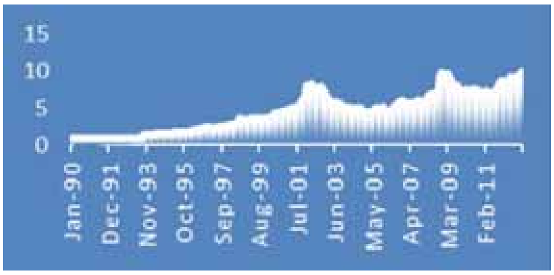
RM



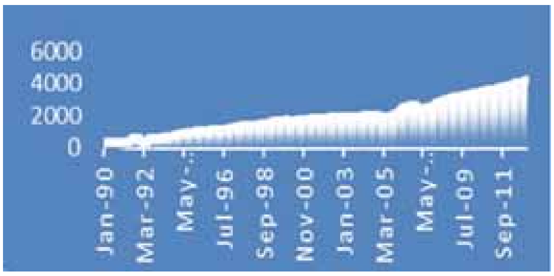
RGDP



RER



ULC



5.1.2 Test for stationarity

The Phillip Perron tests (PP) is used to test for unit roots. This approach was selected on basis that in Eviews it select the lag length for the unit root automatically, thus eliminating errors that are associated with the ADF approach. All series used in this study were not stationary at their levels but became stationary after being differenced once and this implies that they are I(1). Table 5.1 below presents the results. Legible

Table 5.1: Phillips-Perron Test

Variable	Level test	1st Defference test
CPISD	8.533282	-7.301675***
CPISA	9.471388	-15.86006***
CU	-2.558544	-24.27580***
DSC	-0.951984	-15.80634***
M2	7.296602	-19.65478***
Oil	-0.459825	-68.80410***
RGDP	12.26680	-5.046241***
RER	1.961660	-12.91227***
RM	5.377971	-20.47204***
ULC	4.546483	-9.818581***
ZAR	-0.206025	-63.55625***

Note: All variables became stationary after being differenced once.
*** Shows that the variable is stationary at first difference
ADF also produced the same results as PP therefore not presented.

MODELA[30]: $CPISD=\alpha+\beta LCPISA_t+\beta LCU_t+\beta DSC_t+\beta LM2_t+\beta LOIL_t+\beta LULC_t+\beta LZAR_t+\varepsilon$

5.2 CPISD Model Analyses

5.2.1 *VAR lag order selected using information criteria*

Before estimating the model, it is important to identify the appropriate lag order and deterministic trend assumption for the vector auto regression (VAR) order before the actual long-run estimation is done. Since the series are monthly, the selection of the lag length was drawn from a maximum of 8 lags. Table 5.2 shows the results of the lag length selection for the (VAR) by different information criteria.

30 All variables are in logarithm form except for the discount rate

Table 5.2: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	934.8849	NA	1.37e-13	-6.917051	-6.809858	-6.873997
1	4486.911	6865.483	6.79e-25	-32.94709	-31.98235*	-32.55961*
2	4576.197	167.2456	5.62e-25	-33.13580	-31.31351	-32.40388
3	4646.684	127.8235	5.37e-25*	-33.18421*	-30.50437	-32.10786
4	4697.510	89.13503	5.96e-25	-33.08590	-29.54851	-31.66511
5	4747.793	85.18143	6.67e-25	-32.98353	-28.58859	-31.21832
6	4808.766	99.64855	6.92e-25	-32.96094	-27.70845	-30.85129
7	4867.648	92.71836	7.33e-25	-32.92275	-26.81271	-30.46867
8	4937.407	105.6794*	7.21e-25	-32.96573	-25.99814	-30.16721

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

From the table above, it can be noted that different information criteria selected different appropriate lags. Lags 1, 3 and 8 were selected by the information criteria. Literature suggests that the Akaike information criterion and Schwarz information criterion provide credible results on the lag length. So in this case suggested lag length are 1 and 3 depicted by the stars (*) for the Akaike information criterion and Schwarz information criterion explored. Worth noting is that results obtained using lag length 1 make economic sense so the analysis provided below is based on lag length 1.

5.3 Cointegration Test and Analysis

Using the lag length one and assumption 3 the results obtained for the cointegration test are presented in Table 5.3 below:

Table 5.3: Unrestricted Cointegration (Trace and Maximum Eigenvalue)

Model 1: Using lag length 1 assumption 3 (Optimal Model)					Model 2: Using lag length 3 assumption 3				
Unrestricted Cointegration Rank Test (Trace)					Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05		Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**	No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.209816	162.6109	159.5297	0.0336	None *	0.159767	166.1279	159.5297	0.0207
At most 1	0.101158	98.08679	125.6154	0.6612	At most 1	0.144569	118.7793	125.6154	0.1211
Unrestricted Cointegration Rank Test (Max)					Unrestricted Cointegration Rank Test (Max)				
Hypothesized		Max	0.05		Hypothesized		Max	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**	No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.209816	64.52412	52.36261	0.0019	None	0.159767	47.34860	52.36261	0.1492
At most 1	0.101158	29.22146	46.23142	0.8223	At most 1	0.144569	42.47270	46.23142	0.1198
Trace test indicates 1 cointegrating eqn(s) at the 0.05 level Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level									

Table 5.3 above show that for the trace test, there is one cointegrating vector and this is confirmed by the critical value 125.6154 which is greater than the trace statistics 98.08679 above and this is further confirmed by the p-value which is greater than 5 percent meaning that we fail to reject the null hypothesis. The maximum-eigenvalue test also suggest that there is one cointegrating vector; the critical value 46.23142 is greater than the max-eigen statistic 29.22146. According to Harries (1995), the trace presents better results relative to the max-eigenvalue test in terms of Skewness and the Kurtosis test, but in this case both the trace and max-eigenvalue tests suggest that there is one cointegrating equations at 0.05 level.

Table 5.4: Normalized Cointegrating Coefficients[31]

LCPISD	LCPISA	LCU	DSC	LM2	LOIL	LULC	LZAR
1.000000	-0.964468	0.318190	0.026039	0.737812	0.322463	-0.238412	0.572066
	[-1.64474]	[0.79430]	[2.43916]	[3.17832]	[3.84881]	[- 0.77449]	[4.12003]

Since the long-run results suggest an existence of one cointegrating equation, then one can conclude that a stable long-run equilibrium relationship is present. The results are normalized on the LCPISD. Due to the normalization process, the signs are reversed to enable proper interpretation.

The LM2, LOIL and LZAR have the expected signs and are statistically significant according to the *t* values shown. In this case a one percent increase in the LM2 leads to a 0.74 percent increase in LCPISD in the long run. Also a one percent increase in the LOIL result to a 0.32 percent increase in the LCPISD in the long run. Since fuel is inputs cost (for manufacturers) their price increases will filter through to other components in the CPI basket in the long-run. As a result of a unit currency depreciation, LCPISD increase by 0.57 percent.

The normalized cointegration equation results show LCPISA entered long-run with an opposite sign from what we expected and it is only significant at 10 percent level. Also the discount rate is positive in this case and this implies that its

31 With reversed signs

effectiveness in the long-run is not significant. To a large extend Swaziland CPI is driven by money supply, oil prices and exchange rate.

5.4 Short-run Dynamics Analysis

5.4.1 Speed of adjustment to equilibrium

The error correction model results in Table 5.5 suggest that CPISA, DSC and ULC turn to adjust very fast in a case of a shock.

Table 5.5: Error Correction Model Results

Error Correction:	D(LCPISD)	D(LCPISA)	D(LCU)	D(DSC)	D(LM2)	D(LOIL)	D(LULC)	D(LZAR)
CointEq1	-0.002793	-0.010713	0.001221	-0.002601	0.016272	0.048946	-0.015082	0.003425
	(0.00369)	(0.00165)	(0.00890)	(0.14750)	(0.01230)	(0.03669)	(0.00471)	(0.01261)
	[-0.75631]	[-6.47738]	[0.13710]	[-0.01764]	[1.32249]	[1.33400]	[-3.20312]	[0.27172]

The result implies that when there is a shock LCPISD, LCPISA and LULC will adjust to bring back the system into the long-run equilibrium.

5.4.2 Vector error correction model results

A system of equations was used to capture casual effect of the explanatory variables in the both in the long and short-run. A summary of results is shown below:

Table 5.6: System Equation

D(LCPISD)) = C(1)*(LCPISD(-1) + 0.964468366602*LCPISA(
-1)) - 0.0260392425249*DSC(-1) - 0.31818988697*LCU(-1) -
0.737812290412*LM2(-1) - 0.322463325901*LOG(OIL(-1)) +
0.238411507769*LOG(ULC(-1)) - 0.572065855179*LOG(ZAR(-1)) +
2.5121929297) + C(2)*D(LOG(CPISD(-1))) + C(3)*D(LOG(CPISA(-1)))
+ C(5)*D(DSC(-1)) + C(6)*D(LOG(M2(-1))) +
C(7)*D(LOG(OIL(-1))) + C(8)*D(LOG(ULC(-1))) + C(9)*D(LOG(ZAR(-1)))
+ C(10)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.002793	0.003693	-0.756307	0.4501
C(2)	0.158865	0.057654	2.755474	0.0063
C(3)	-0.596237	0.135242	-4.408684	0.0000
C(4)	0.042019	0.024606	1.707642	0.0889
C(5)	0.000482	0.001582	0.304477	0.7610
C(6)	0.007920	0.017975	0.440637	0.6598
C(7)	0.008500	0.006456	1.316625	0.1891
C(8)	-0.033791	0.044121	-0.765877	0.4444
C(9)	-0.008498	0.017795	-0.477553	0.6334
C(10)	0.004274	0.001162	3.679767	0.0003

R-squared	0.145106	Mean dependent var	0.006528
Adjusted R-squared	0.115961	S.D. dependent var	0.010796
S.E. of regression	0.010151	Akaike info criterion	-6.306690
Sum squared resid	0.027203	Schwarz criterion	-6.174824
Log likelihood	874.0165	Hannan-Quinn criter.	-6.253762
F-statistic	4.978894	Durbin-Watson stat	1.948050
Prob(F-statistic)	0.000003		

The C(1) represent the error correction term. Since the p-value result is more than 5 percent this does not provide evidence of long-run causality from the explanatory variables. So our error correction is not significant. The join causality of the explanatory variable to LCPISD is based on the null hypothesis that C(3)= C(4)= C(5)= C(6)= C(7)= C(8)= C(9)= 0. So if the Wald Test Chi-square p-value is less than 5 percent, the null hypothesis is rejected.

The results for the short-run depicts that the discount is significant and the sign is negative but since this rate is always matched with the SARB repo rate it is difficult to conclude on its effectiveness on inflation.

Also LCPISA was statistically significant in the short-run depicting that its increase leads to an increase in LCPISD in the short-run, which is consistent with other empirical studies (due to imported inflation).

Table 5.7: Wald Test Results

Test Statistic	Value	df	Probability
F-statistic	4.456826	(7, 264)	0.0001
Chi-square	31.19778	7	0.0001

In this case the p-value of the Chi-square is 0.0001 less than 5 percent, so the null hypothesis of zero joint causality is rejected. This implies that the explanatory variable in the model can jointly cause LCPISD in the short run.

5.5 Variance Decomposition Analysis

It is interesting to note that a significant percentage of the variation in LCPISD is accounted for by its own innovations in the tenth period. As shown in Table 5.8 below, the error variance in the last period for LCPISD is 66.23 percent in the 12^{th} period.

Table 5.8: Variance Decomposition[32]

Period	S.E.	L(CPISD)	L(CPISA)	L(CU)	DSC	L(M2)	L(OIL)	L(ULC)	L(ZAR)
1	0.010017	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.013200	93.05366	5.644651	0.629375	0.002712	0.096303	0.542586	0.001749	0.028967
3	0.015757	89.20112	8.414150	0.591160	0.129640	0.131661	1.475017	0.026111	0.031136
4	0.017802	85.71981	10.69232	0.589889	0.157213	0.339776	2.326511	0.047227	0.127254
5	0.019521	82.82448	12.35772	0.573048	0.153527	0.611894	3.112271	0.052545	0.314518
6	0.021010	80.18379	13.66126	0.551430	0.135926	0.995964	3.843757	0.048284	0.579593
7	0.022336	77.69699	14.70256	0.526743	0.120683	1.470028	4.532165	0.042777	0.908054
8	0.023543	75.29751	15.54487	0.499736	0.116230	2.033049	5.180488	0.042439	1.285677
9	0.024662	72.95753	16.22938	0.471630	0.126542	2.675431	5.789113	0.050985	1.699392
10	0.025714	70.66695	16.78398	0.443343	0.152921	3.388426	6.357555	0.070037	2.136782
11	0.026714	68.42488	17.22996	0.415740	0.195171	4.162289	6.885478	0.099839	2.586650
12	0.027673	66.23487	17.58418	0.389527	0.252213	4.987259	7.373058	0.139751	3.039142

[32] See also Appendix A

The results also show that LCPISA explains 17.58 percent of the variation in LCPISD after last period. The capacity utilization, the discount rate, money supply, unit labour cost and exchange rate seem to be too insignificant explaining less than 10 percent of the variation in LCPISD. Exchange rate depreciation explains 3.04 percent of the variation which implies the week effect of currency substitution. Finally, oil prices explains 7.37 percent of the variations in LCPISD.

5.5.1 Impulse Response Function for the Consumer Price Index Model[33]

The effects of unanticipated shocks on LCPISD, LCU, DSC, LM2, LOIL, LULC and LZAR is examined by using the Cholesky decomposition proposed by Sims (1980). The impulse response function is ideal to trace out the responsiveness of the dependent variable in the VAR to shocks in each of the explanatory variables and to itself (Brooks, 2002).

The response of inflation to its own innovations starts at a high level and declines steadily, but does not fall to zero, instead becoming constant over time. In the case of cross innovation, inflation responds rapidly to innovation of the South African consumer price index (LCPISA), capacity utilization LCU, Central Bank of Swaziland discount rate (DSC) and exchange rate (LZAR). With regard to innovation of LCPISA to LCPISD the results portrays a hike which does not last for more than 3 months then remain constant overtime and not decline to settle at zero. This indicates that the South African CPI is an important variable that explain the variation in LCPISD and this is consistent with the long-run findings and empirical literature for other studies. Innovation of LCU to CPISD is significant after one month and it increase for a short period and remain constant overtime slightly above zero. In reaction to changes in the discount rate (DSC), LCPISD increase steadily for short period then reach a constant state after 6 months, never settle at zero. This does not last for more than 3 months then remain constant overtime and not decline to settle at zero. Innovation of LCPISA to LOIL depicts a steady positive hike which is maintained through 12 months. Worth noting is that even though pump fuel prices do not hike like in South Africa a larger part of the cost in absorbed by the government (through its subsidy). The results on innovation to exchange rate suggest that a negative shock on the USDZAR that leads to a depreciation of the Lilangeni is followed

33 See Appendix B

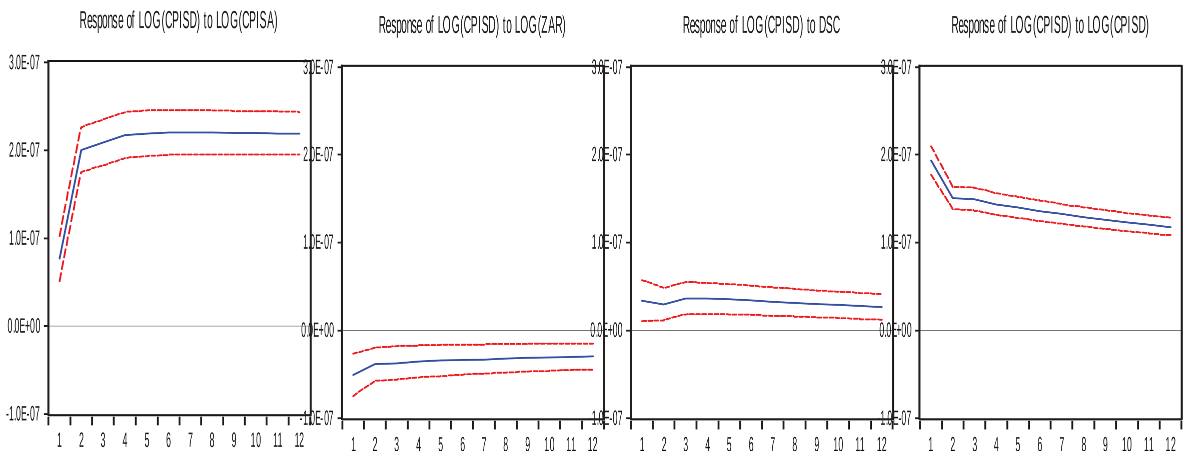
by an increase in inflation while an appreciation of the Lilangeni reduces inflation. The increase in a case of negative shock is likely to takes more than twelve before it declines.

The results show that overall LCPISD responds significantly to innovation in LCPISA, LCU, DSC and LOIL and (LZAR).

5.5.2 Structural Vector Autoregression Model[34]

Based on theory and understanding of the Swaziland economy a further analysis was done to capture the source of LCPISD volatility. A Structural Vector Autoregression (SVAR) impulse response was conducted to ascertain deviations from equilibrium from shocks. The SVAR approach requires the inclusion key variables[35] and ordering to test the impact. Based on the matrix presented under methodology the results below were obtained:

Figure 5.4: Summary of SVAR impulse responses vs. Theoretical Expectations



Response of LCPISD to an increase in the LCPISA

An increase in the LCPISA is statistically significant for up to 12 months. This is consistent with the fact that a shock that leads to an increase in LCPISA has a lag period of about a month before prices start to adjust upward in the Swaziland economy and this last for 12 months. The extreme of the graph occurs at the two month when the Central Bank of Swaziland also adjust its

34 Refer to Appendix F for matrix results

35 Variables are: LCPISA, LZAR, DSC and LCPISD

discount rate to control inflation then it remains constant for the remaining period of the year.

Response of LCPISD to an increase in the LZAR

A shock that result to a depreciation of the local currency does not suddenly results to a hike in LCPISD. Although the demand of the exporting industry is affected, its impact is insignificant overtime. As noted in the first chapter of this study the economy benefits largely from the CMA arrangement (one to one peg with the South African Rand).

Response of LCPISD to an increase in the DSC

In the short-run an increase in discount rate leads to a slight decline in inflation in line with SARB policy stance. As noted above it is difficult to conclude on the impact of the discount rate under the existing CMA arrangement, therefore even when using the SVAR it is not clear whether it is effective or not especially because a hike in SA inflation is usually followed by an increase in Swaziland inflation.

5.6 Diagnostic Test

Table 5.9: Model specification test

Diagnostic Test	H_0	Jarque-Bera	Probability
Normality Test	Residuals is normally distributed	153.2240	0.000000
Diagnostic Test	**H_0**	**F- Statistics**	**Chi-square**
ARCH Test	No ARCH effect	1.201057	0.2724
Diagnostic Test	**H_0**	**F- Statistics**	**Chi-square**
LM Test-Serial Correlation	No serial correlation	1.410395	0.2267

The normality test p-value is less than 5 percent and this implies that residuals are not normally distributed. For the ARCH test the results suggest that the model do not suffer from ARCH effect so we conclude that the model is correctly specified. Lastly, the model does not suffer from serial correlation. According to literature as long as the residuals do not suffer from ARCH effect and Serial correlation the model is considered to be credible even if the residuals are not normally distributed. So in this case the conclusion is that the model is correctly specified and it can be used for forecasting Swaziland CPI.

5.7 Money Demand Function

MODEL B[36]: $RM_t = \alpha + \beta CPISD_t + + \beta DSC + \beta\ LRER_t + \beta LRGDP_t + \varepsilon$

5.7.1 *VAR lag order selected using information criteria*

Table 5.10 shows the results of the lag length selection for the (VAR) by different information criteria.

Table 5.10: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	192.0863	NA	1.70e-07	-1.396166	-1.329170	-1.369258
1	2962.314	5416.416	2.16e-16	-21.88294	-21.48097*	-21.72149*
2	3000.233	72.72570	1.96e-16	-21.97935	-21.24240	-21.68336
3	3024.473	45.58434	1.97e-16	-21.97368	-20.90174	-21.54314
4	3049.681	46.46588	1.97e-16	-21.97523	-20.56831	-21.41015
5	3073.667	43.31855	1.99e-16	-21.96767	-20.22577	-21.26804
6	3094.409	36.68481	2.06e-16	-21.93589	-19.85901	-21.10171
7	3122.748	49.06459	2.01e-16	-21.96080	-19.54895	-20.99209
8	3152.978	51.21013*	1.94e-16*	-21.99983*	-19.25300	-20.89657

* indicates lag order selected by the criterion

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

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

As shown above the information criteria suggest two lags. The two lag lengths were explored as suggested by the Akaike information criterion and Schwarz information criterion and the robust was lag length 8.

5.8 Long–run Cointegration Equation Analysis

Table 5.11 below show the results of lag length eight and one using assumption 3 for the cointegration test.

36 All variables are in logarithm form except for the discount rate

Table 5.11: Cointegration test

Using lag length 8 assumption 3 (Optimal Model)					Using lag length 1 assumption 3				
Unrestricted Cointegration Rank Test (Trace)					Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05		Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**	No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.153582	74.02166	69.81889	0.0222	None	0.132564	62.38134	69.81889	0.1696
At most 1	0.041909	29.50165	47.85613	0.7440	At most 1	0.041868	23.41498	47.85613	0.9540
Unrestricted Cointegration Rank Test (Max)					Unrestricted Cointegration Rank Test (Max)				
Hypothesized		Max	0.05		Hypothesized		Max	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**	No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.153582	44.52001	33.87687	0.0019	None *	0.132564	38.96636	33.87687	0.0113
At most 1	0.041909	11.43100	27.58434	0.9531	At most 1	0.041868	11.71883	27.58434	0.9434
Trace test indicates 1 cointegrating eqn(s) at the 0.05 level Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level									

Using lag length eight the results for the trace test indicate that there is one cointegrating equation at 5 percent significance level. This is confirmed by critical value 47.85613 which is greater than the trace statistics 29.50165. This means that the whole structure of the demand for money is cointegrated with the discount rate, consumer price index, real gross domestic product and real exchange rate. Also, it means that there is a static linear combination between money demand, discount rate, consumer price index, real gross domestic product and real exchange rate, despite that every variable is nonstationary in levels. In addition, these results provide evidence that there is a long-run equilibrium relationship between these variables, which means that they do not diverge away from each other. The max-eigenvalue test also indicate that there is one cointegrating equation at the 5 percent significant level. As noted above there is evidence from empirical studies that the trace test produce credible results, therefore it is safe to conclude that there is one cointegrating equation based on the trace results. The results for lag length one do not make economic sense so the analyses below is based on lag length eight.

Table 5.12: Normalized cointegrating coefficients

Normalized cointegrating coefficients (standard error in parentheses)				
LOG(RM)	DSC	LOG(CPISD)	LOG(RER)	LOG(RGDP)
1.000000	0.012618	3.718443	-0.938234	-1.941899
	[1.65104]	[7.57066]	[-10.2775]	[-1.50490]

The normalized cointegration equation above show positive relationship between money demand, the discount rate and consumer price index has a positive effect on the money demand. On the other hand, the real exchange rate, and real gross domestic product has a negative impact on the money demand. Worth noting is that we expected the discount rate to be negative and real gross domestic product to enter the long-run with a positive signs. The results suggest that the discount rate is not effective in controlling money supply in the long-run.

5.9 Short-run Money Demand Dynamics

5.9.1 Error correction model

Table 5.13: Error Correction Estimates Analysis

Error Correction:	D(LRM))	D(DSC)	D(LCPISD)	D(LRER))	D(LRGDP)
CointEq1	-0.132123	0.219532	0.014903	-0.033850	-0.003405
	(0.04300)	(0.24852)	(0.00611)	(0.02399)	(0.00076)
	[-3.07294]	[0.88335]	[2.43855]	[-1.41100]	[-4.45459]

In the short-run, real economic growth and real depreciation of the local currency can induce deviations from the long-run equilibrium relationship. The LRM coefficient results in the ECM is negative which suggest that for any deviation it will move back to equilibrium. The results show that LRM, LCPISD, LRGDP adjust accordingly in the short-run to bring the economy to equilibrium. The results are consistent with other studies.

The discount rate is not adjusting in this case which is likely to imply that its effect on money demand is affected by the SA currency that circulates in the economy.

5.9.2 System equation

The system equation and the VECM results for this section are presented in Appendix C. The C (1) coefficient is negative 0.132123 and its p-value is 0.0024 which is less than 5 percent, therefore the evidence that the explanatory variable jointly cause variation in money demand in the long-run.

The join causality of the explanatory variable to LRM in the short-run is based on the null hypothesis that:

C(10)=C(11)=C(12)=C(13)=C(14)=C(15)=C(16)=C(17)=C(18)=C(19)=C(20)=C(21)=C(22)=C(23)=C(24)=C(25)=C(26)=C(27)=C(28)=C(29)=C(30)=C(31)=C(32)=C(33)=C(34)=C(35)=C(36)=C(37)=C(38)=C(39)=C(40)=C(41)=0.

The Wald test results are provided below:

Table 5.14: Wald Test Results the Money Demand Model

Test Statistic	Value	df	Probability
F-statistic	2.107187	(32, 225)	0.0009
Chi-square	67.42999	32	0.0003

The p-value of the Chi-square is 0.0003 less than 5 percent, so the null hypothesis of zero joint causality is rejected. This implies that the explanatory variables in the model jointly cause RM in the short run.

5.10 Variance Decomposition

Table 5.15 below show that 100 percent of the variation in LRM emanates from its own innovations in the first period and 86.57 percent in the tenth period. The innovation from the other variable is very low in period twelve.

Table 5.15: Variance decomposition of LRM[37]

Period	S.E.	LRM	LCPISD	DSC	LRER	LRGDP)
1	0.072521	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.088256	99.50802	0.198473	0.014972	0.152476	0.126057
3	0.099749	99.25290	0.399220	0.021921	0.127514	0.198448
4	0.108023	98.76143	0.680725	0.040174	0.286593	0.231080
5	0.114524	97.95583	1.010717	0.069092	0.726522	0.237840
6	0.119897	96.83623	1.382521	0.109203	1.440177	0.231868
7	0.124531	95.44940	1.784927	0.159750	2.385238	0.220687
8	0.128661	93.85673	2.208215	0.219850	3.506885	0.208321
9	0.132431	92.12068	2.643645	0.288521	4.750399	0.196755
10	0.135936	90.29788	3.083889	0.364789	6.066590	0.186855
11	0.139233	88.43621	3.523070	0.447734	7.414112	0.178878
12	0.142361	86.57404	3.956687	0.536514	8.759981	0.172776

5.11 Impulse Response Function

The response of real base money to its own innovations starts at a high level and declines steadily, but does not fall to zero, instead becoming constant over time[38]. In the case of cross innovation, LRM responds rapidly to innovation of the South

37 Also refer to Appendix D

38 See Appendix E

African consumer price index (LCPISA) and LRER. In reaction to changes in the discount rate (DSC), LRM respond negative after the eight month. Based on the results and the inconsistence of the model the SVAR was not used in this case (see diagnostics test results below).

5.12 Diagnostic Test

Table 5.16: Model specification test

Diagnostic Test	**H_0**	**Jarque-Bera**	**Probability**
Normality Test	Residuals is normally distributed	26.05962	0.000002
Diagnostic Test	**H_0**	**F- Statistics**	**Chi-square**
ARCH Test	No ARCH effect	14.73085	0.0002
Diagnostic Test	**H_0**	**F- Statistics**	**Chi-square**
LM Test-Serial Correlation	No serial correlation	0.336957	0.5266

The normality test p-value is less than 5 percent and this implies that residuals are not normally distributed. The model also suffers from ARCH effect. This implies that the model is not credible for forecasting Swaziland money demand. The LM test depicts that the model does not suffer from serial correlation. Worth noting is that in the case of Swaziland money demand may be driven by a number of factors that are outside the jurisdiction of the Monetary Policy Authorities. Therefore, there is a need to consider other factors that are likely to contribute to money demand in Swaziland such as the circulation of the South African currency in Swaziland.

6.0 Conclusion and Recommendations

This study assess the strengths, weakness, challenges of the existing monetary policy regime in Swaziland and its effectiveness in order to help in designing appropriate monetary policy for the medium to long term in COMESA member states. The Johansen (1988) and Johansen and Juselius (1990) cointegration approach was used to capture the long-run dynamics of CPI dynamics and vector error correction model (Brooks and Tsolacos, 1999) to explore the short-run dynamics. Both theoretical and empirical analysis was done to establish the basis of our decisions and for the selection of variables. The study provides evidence of the effectiveness of monetary policy in the short-run even though it seems to benefit from the SARB monetary policy stance. Based on the results this study concludes that to a large extend Swaziland CPI in the long-run is driven by money supply, oil prices and exchange rate. The short-run system equation provides evidence that Swaziland's CPI is largely driven by imported inflation from South Africa its major trading partner.

The variance decomposition results suggest that inflation react to its own innovations starts at a high level and declines steadily, but does not fall to zero, instead becoming constant over time. In the case of cross innovation, inflation responds rapidly to innovation of the South African consumer price index (LCPISA), capacity utilization LCU, Central Bank of Swaziland discount rate (DSC) and exchange rate (LZAR). The SVAR impulse response function results show that overall LCPISD is affected by LCPISA. The results also depicts that the discount rate is effective to control LCPISD when it is consistent with the SARB repo rate or the deviation is not more than 50 basis points.

The Money Demand Function results suggest that there is a long-run cointegration. The results also show that the discount rate is not effective in controlling money supply in the long-run. The money supply model is not robust for forecasting because its fails the diagnostic test especially ARCH Test.

The inefficiency of monetary tool[39] in the short-run is likely to emanate from the following: the fact that the SA currency circulate together with the local currency, may causes distortions in demand for money in Swaziland; Central Bank of Swaziland deviation in setting the discount rate may cause unexpected demand patterns for money in Swaziland; and the sensitivity of money demand to external shocks outside the jurisdiction of Central Bank of Swaziland.

6.1 Recommendations

The Central Bank of Swaziland should continue aligning its monetary policy to the SARB monetary stance and inflation target

Further study can be done on the second model (Money Demand Function) taking into consideration other variables not included in this model especially those that influence money demand in South Africa.

[39] The discount rate

Appendices

Appendix A: VAR Variance Decomposition for CPISD Model Results

Table A1: Variance decomposition of LCPISA

Period	S.E.	LCPISD	LCPISA	LCU	DSC	LM2	LOIL	LULC	LZAR
1	0.004584	0.112662	99.88734	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.007139	0.360973	94.45227	0.000456	3.210991	0.014978	1.123844	0.082349	0.754135
3	0.009234	0.473623	90.82543	0.000387	4.387779	0.227154	2.076396	0.159637	1.849591
4	0.010992	0.569883	87.94941	0.000952	4.886177	0.534661	2.964953	0.176241	2.917725
5	0.012520	0.666134	85.42440	0.003119	5.025135	0.962429	3.837133	0.157146	3.924508
6	0.013887	0.770712	83.05176	0.007453	4.979670	1.483064	4.704401	0.129514	4.873429
7	0.015138	0.887306	80.73769	0.014819	4.836554	2.085969	5.560391	0.111406	5.765860
8	0.016302	1.016964	78.45107	0.025747	4.641030	2.757244	6.394845	0.112288	6.600811
9	0.017398	1.159821	76.18599	0.040682	4.418829	3.484513	7.198541	0.136151	7.375475
10	0.018441	1.315234	73.94822	0.059849	4.185176	4.256187	7.964402	0.183784	8.087147
11	0.019440	1.482140	71.74753	0.083302	3.949558	5.061761	8.687589	0.254146	8.733972
12	0.020402	1.659173	69.59431	0.110927	3.718033	5.891920	9.365178	0.345181	9.315278

Table A2: Variance decomposition of LCU

Period	S.E.	LCPISD	LCPISA	LCU	DSC	LM2	LOIL	LULC	LZAR
1	0.023934	0.001376	0.468368	99.53026	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.029646	0.845421	0.322811	97.37715	0.012128	0.161987	0.038996	0.173839	1.067671
3	0.033976	1.004677	0.365972	96.43575	0.015414	0.155267	0.090920	0.449332	1.482667
4	0.037120	1.274131	0.370478	95.58659	0.055001	0.191855	0.121083	0.763883	1.636981
5	0.039565	1.529218	0.374933	94.75866	0.118169	0.350436	0.133142	1.082854	1.652590
6	0.041514	1.793429	0.375171	93.91004	0.206930	0.584009	0.138591	1.384394	1.607438
7	0.043103	2.060284	0.374309	93.00855	0.316412	0.893167	0.142850	1.664480	1.539944
8	0.044423	2.327534	0.373903	92.05974	0.442632	1.257326	0.148823	1.921312	1.468727
9	0.045535	2.593421	0.374618	91.07027	0.581985	1.663071	0.158392	2.155279	1.402964
10	0.046484	2.856308	0.376812	90.05257	0.730844	2.096878	0.173134	2.366866	1.346592
11	0.047305	3.115100	0.380575	89.01904	0.885895	2.547436	0.194493	2.556689	1.300771
12	0.048021	3.368929	0.385894	87.98161	1.044048	3.005215	0.223742	2.725413	1.265153

Table A3: Variance decomposition of DSC

Period	S.E.	LCPISD	LCPISA	LCU	DSC	LM2	LOIL	LULC	LZAR
1	0.401062	0.002969	2.307967	0.000827	97.68824	0.000000	0.000000	0.000000	0.000000
2	0.589571	0.305529	3.965977	0.009763	94.96598	0.009505	0.067184	1.73E-06	0.676062
3	0.738625	0.610259	4.569168	0.050157	93.32665	0.044397	0.276114	0.009579	1.113673
4	0.860793	0.953984	4.790684	0.126824	92.01114	0.096396	0.611677	0.050162	1.359130
5	0.964783	1.337809	4.831137	0.235310	90.76348	0.166240	1.047400	0.136137	1.482491
6	1.055802	1.763520	4.769240	0.371715	89.49075	0.250169	1.549487	0.272907	1.532216
7	1.137077	2.228045	4.645143	0.530572	88.16774	0.345235	2.085758	0.460857	1.536648
8	1.210714	2.726808	4.482015	0.706954	86.79553	0.448799	2.629833	0.697689	1.512377
9	1.278146	3.254094	4.295462	0.896241	85.38425	0.558683	3.161777	0.979740	1.469757
10	1.340395	3.803789	4.096688	1.094322	83.94641	0.673149	3.667405	1.302579	1.415661
11	1.398214	4.369694	3.894050	1.297574	82.49439	0.790804	4.137224	1.661340	1.354926
12	1.452178	4.945785	3.693832	1.502859	81.03952	0.910542	4.565422	2.050936	1.291107

Table A4: Variance decomposition of LM2

Period	S.E.	LCPISD	LCPISA	LCU	DSC	LM2	LOIL	LULC	LZAR
1	0.033896	0.055174	0.088098	0.037523	0.844814	98.97439	0.000000	0.000000	0.000000
2	0.041250	0.050012	0.569131	0.675822	1.261633	97.24455	0.038319	0.157397	0.003130
3	0.048240	0.037618	0.801931	0.601217	1.190795	97.01046	0.140464	0.171001	0.046513
4	0.053844	0.030998	1.184307	0.604131	1.141892	96.50645	0.284028	0.158388	0.089806
5	0.058731	0.031962	1.565596	0.569819	1.060099	96.02336	0.465067	0.134980	0.149119
6	0.063079	0.036895	1.985964	0.537550	0.980135	95.44989	0.674177	0.118421	0.216965
7	0.067017	0.046663	2.424076	0.504673	0.903692	94.80591	0.906271	0.115726	0.292989
8	0.070636	0.060276	2.876904	0.473842	0.833864	94.09614	1.155241	0.129047	0.374689
9	0.073998	0.077480	3.337590	0.445436	0.771182	93.33376	1.416175	0.158115	0.460260
10	0.077146	0.097829	3.801246	0.419608	0.715539	92.53169	1.684636	0.201495	0.547959
11	0.080115	0.120949	4.263640	0.396274	0.666445	91.70221	1.956921	0.257267	0.636294
12	0.082930	0.146467	4.721363	0.375254	0.623252	90.85633	2.229947	0.323391	0.723993

Table A5: Variance decomposition of LOIL

Period	S.E.	LCPISD	LCPISA	LCU	DSC	LM2	LOIL	LULC	LZAR
1	0.098765	0.103452	5.364474	0.378902	4.830489	0.106581	89.21610	0.000000	0.000000
2	0.145210	0.220538	6.495777	0.510700	4.534500	0.114252	87.54080	0.362808	0.220627
3	0.175715	0.383140	6.827217	0.596963	4.542994	0.223087	86.13688	0.852158	0.437561
4	0.196832	0.573451	6.821278	0.646676	4.800960	0.397550	84.84141	1.281201	0.637477
5	0.212054	0.779792	6.661956	0.675031	5.218125	0.636061	83.57067	1.622016	0.836345
6	0.223426	0.988728	6.445467	0.686795	5.743777	0.930390	82.27379	1.890605	1.040447
7	0.232206	1.189424	6.217024	0.686430	6.341243	1.272526	80.93267	2.109394	1.251290
8	0.239201	1.373012	5.997976	0.677317	6.983804	1.654180	79.54950	2.296504	1.467702
9	0.244940	1.533335	5.797117	0.662440	7.650621	2.067121	78.13711	2.464855	1.687401
10	0.249780	1.666789	5.616885	0.644419	8.325191	2.503602	76.71210	2.623368	1.907650
11	0.253968	1.772080	5.456561	0.625552	8.994317	2.956531	75.29107	2.778247	2.125639
12	0.257674	1.849804	5.314032	0.607807	9.647515	3.419633	73.88862	2.933899	2.338692

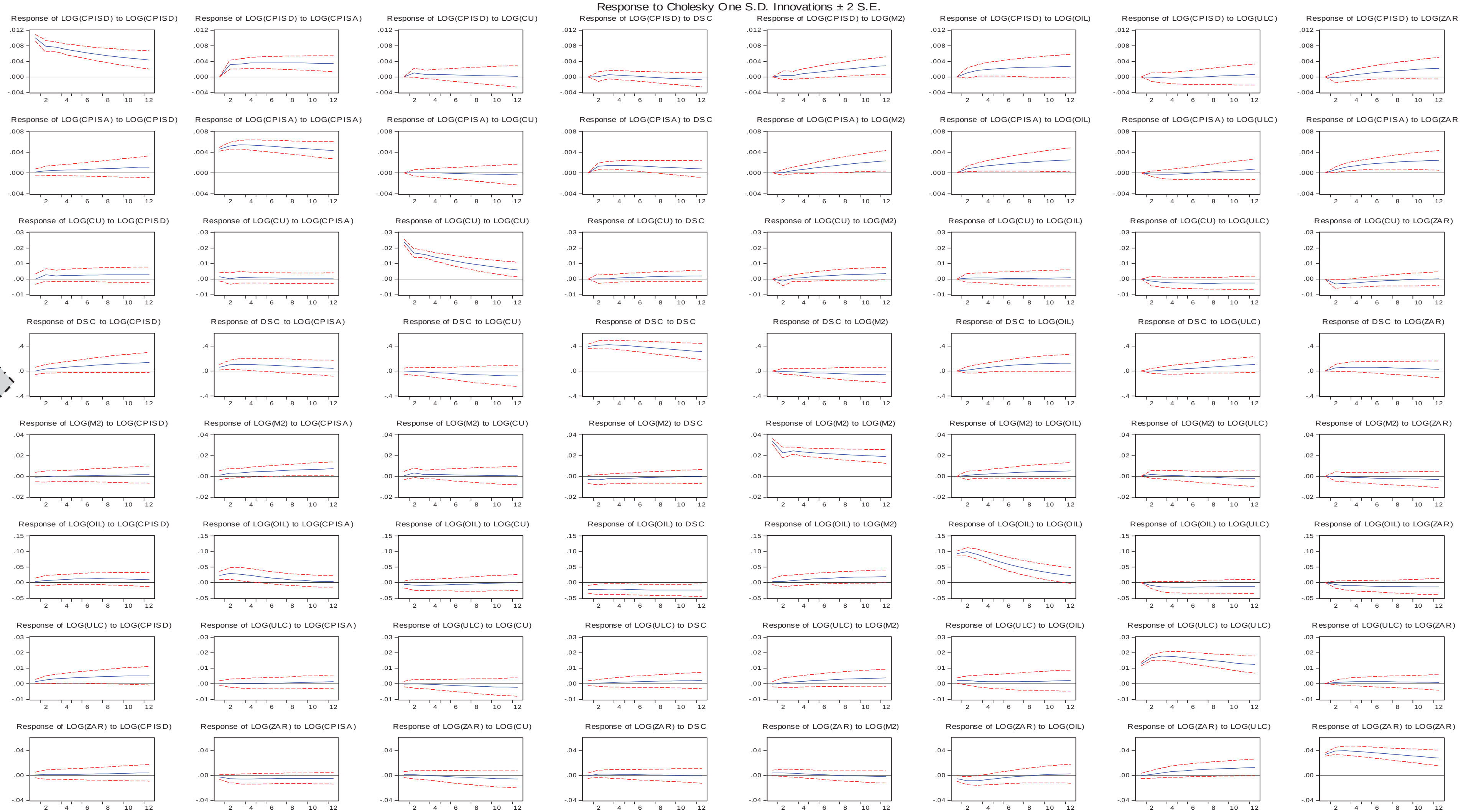
Table A6: Variance decomposition of LULC

Period	S.E.	LCPISD	LCPISA	LCU	DSC	LM2	LOIL	LULC	LZAR
1	0.012820	1.209457	0.099179	0.024834	0.059195	0.048647	2.508832	96.04986	0.000000
2	0.021233	1.760357	0.058828	0.009542	0.058842	0.090995	1.765495	96.11892	0.137023
3	0.027857	2.260889	0.039401	0.014124	0.090750	0.202958	1.370539	95.77327	0.248064
4	0.033187	2.743005	0.030462	0.039653	0.138804	0.376274	1.150826	95.19826	0.322718
5	0.037586	3.220058	0.027448	0.086443	0.198500	0.583747	1.025043	94.48763	0.371131
6	0.041306	3.695413	0.029339	0.153535	0.267809	0.819144	0.955256	93.67791	0.401591
7	0.044514	4.167697	0.036651	0.237678	0.344380	1.075914	0.922682	92.79508	0.419914
8	0.047327	4.635040	0.050173	0.335559	0.426045	1.349505	0.917478	91.85649	0.429713
9	0.049827	5.095242	0.070650	0.443852	0.510698	1.636259	0.934153	90.87580	0.433345
10	0.052075	5.546355	0.098633	0.559556	0.596458	1.933262	0.969419	89.86390	0.432412
11	0.054116	5.986719	0.134464	0.680022	0.681695	2.238213	1.021103	88.82971	0.428072
12	0.055983	6.414990	0.178288	0.802970	0.765045	2.549303	1.087601	87.78060	0.421201

Table B7: Variance decomposition of LZAR

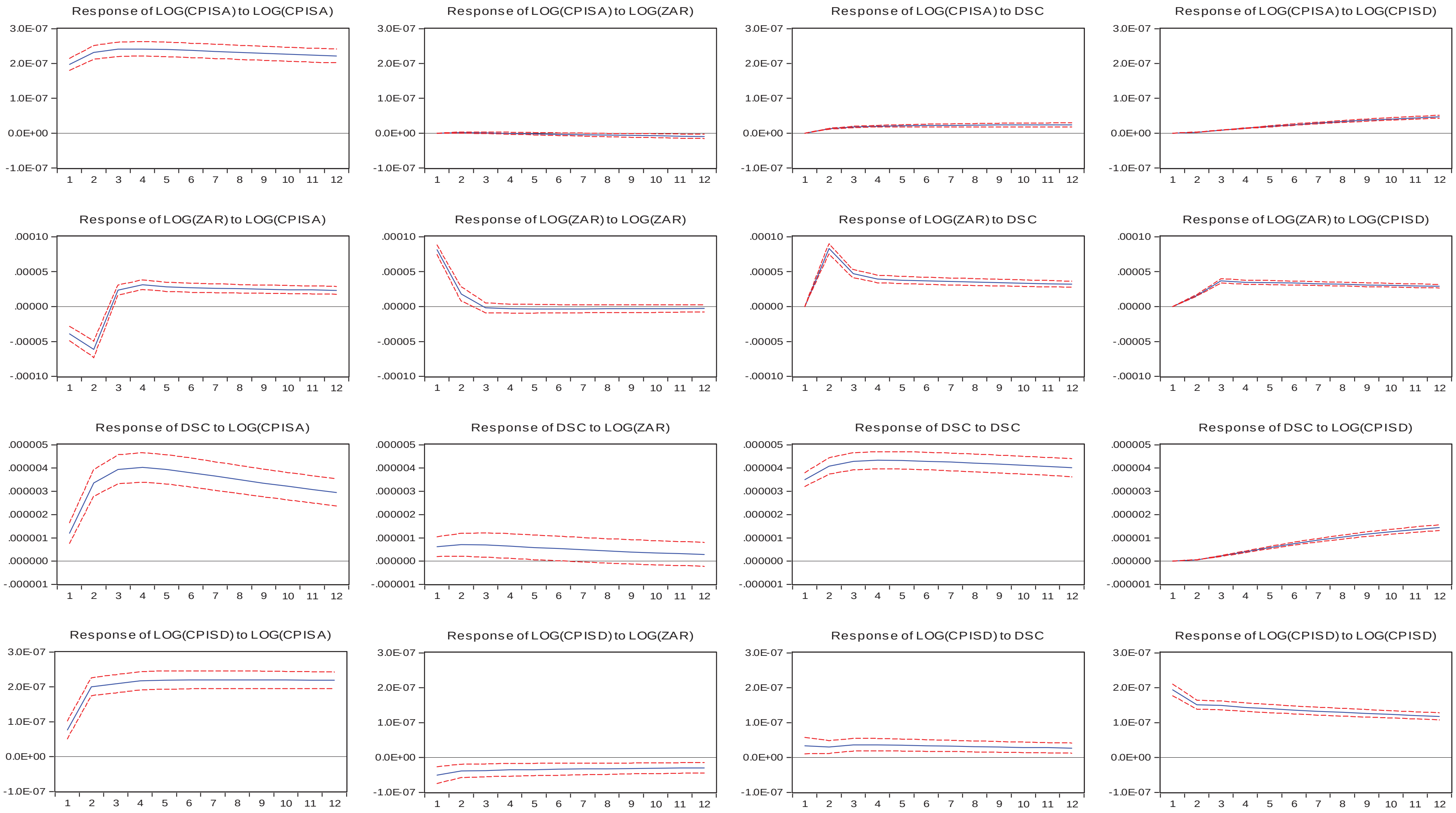
Period	S.E.	LCPISD	LCPISA	LCU	DSC	LM2	LOIL	LULC	LZAR
1	0.034306	0.052051	0.432748	0.146457	0.009556	1.369506	1.995940	0.035851	95.95789
2	0.053376	0.093434	1.080970	0.098286	0.212956	1.140102	3.378349	0.111448	93.88445
3	0.067588	0.114741	1.367480	0.064911	0.251359	0.972976	3.593349	0.440975	93.19421
4	0.078745	0.137066	1.506402	0.051572	0.249788	0.822280	3.337587	0.907774	92.98753
5	0.087902	0.162890	1.567391	0.065959	0.235313	0.699628	2.957838	1.439630	92.87135
6	0.095674	0.194233	1.591396	0.109442	0.217314	0.601872	2.589620	2.006904	92.68922
7	0.102437	0.232100	1.599729	0.180392	0.198808	0.526391	2.278672	2.599128	92.38478
8	0.108431	0.277021	1.603321	0.275560	0.181158	0.470071	2.034112	3.212983	91.94578
9	0.113817	0.329174	1.607780	0.391166	0.165284	0.429959	1.850848	3.846698	91.37909
10	0.118708	0.388415	1.615895	0.523298	0.151944	0.403383	1.719008	4.498251	90.69981
11	0.123187	0.454334	1.628985	0.668199	0.141782	0.387984	1.627936	5.164936	89.92584
12	0.127314	0.526303	1.647554	0.822391	0.135328	0.381715	1.567831	5.843458	89.07542

Appendix B (I) : VAR Impulse Response Function for CPISD Model



Appendix B (II): Structural VAR Selected Variables Results

Response to Cholesky One S.D. Innov ations ± 2 S.E.



Appendix C: System Equation Results for Money Demand Function

D1: System equation

```
D(LOG(RM)) = C(1)*( LOG(RM(-1)) - 0.0126182259792*DSC(-1) -
    3.71844309338*LOG(CPISD(-1)) + 0.938234343978*LOG(RER(-1)) +
    1.94189870433*LOG(RGDP(-1)) - 13.3166568994 ) + C(2)
    *D(LOG(RM(-1))) + C(3)*D(LOG(RM(-2))) + C(4)*D(LOG(RM(-3))) + C(5)
    *D(LOG(RM(-4))) + C(6)*D(LOG(RM(-5))) + C(7)*D(LOG(RM(-6))) + C(8)
    *D(LOG(RM(-7))) + C(9)*D(LOG(RM(-8))) + C(10)*D(DSC(-1)) + C(11)
    *D(DSC(-2)) + C(12)*D(DSC(-3)) + C(13)*D(DSC(-4)) + C(14)*D(DSC(
    -5)) + C(15)*D(DSC(-6)) + C(16)*D(DSC(-7)) + C(17)*D(DSC(-8)) +
    C(18)*D(LOG(CPISD(-1))) + C(19)*D(LOG(CPISD(-2))) + C(20)
    *D(LOG(CPISD(-3))) + C(21)*D(LOG(CPISD(-4))) + C(22)
    *D(LOG(CPISD(-5))) + C(23)*D(LOG(CPISD(-6))) + C(24)
    *D(LOG(CPISD(-7))) + C(25)*D(LOG(CPISD(-8))) + C(26)*D(LOG(RER(
    -1))) + C(27)*D(LOG(RER(-2))) + C(28)*D(LOG(RER(-3))) + C(29)
    *D(LOG(RER(-4))) + C(30)*D(LOG(RER(-5))) + C(31)*D(LOG(RER(-6)))
    + C(32)*D(LOG(RER(-7))) + C(33)*D(LOG(RER(-8))) + C(34)
    *D(LOG(RGDP(-1))) + C(35)*D(LOG(RGDP(-2))) + C(36)
    *D(LOG(RGDP(-3))) + C(37)*D(LOG(RGDP(-4))) + C(38)
    *D(LOG(RGDP(-5))) + C(39)*D(LOG(RGDP(-6))) + C(40)
    *D(LOG(RGDP(-7))) + C(41)*D(LOG(RGDP(-8))) + C(42)
```

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.132123	0.042996	-3.072942	0.0024
C(2)	-0.141722	0.072703	-1.949341	0.0525
C(3)	-0.073006	0.069750	-1.046683	0.2964
C(4)	0.010399	0.068708	0.151356	0.8798
C(5)	0.000891	0.066806	0.013340	0.9894
C(6)	-0.011146	0.065721	-0.169597	0.8655
C(7)	-0.073879	0.063551	-1.162525	0.2463
C(8)	-0.136742	0.061524	-2.222571	0.0272
C(9)	0.008772	0.060636	0.144661	0.8851
C(10)	-0.001782	0.011425	-0.155963	0.8762
C(11)	-0.018710	0.011227	-1.666526	0.0970
C(12)	0.010249	0.011363	0.901912	0.3681
C(13)	0.007479	0.011747	0.636672	0.5250

C(14)	0.004621	0.011710	0.394617	0.6935
C(15)	0.010330	0.011372	0.908377	0.3647
C(16)	-0.017193	0.011132	-1.544477	0.1239
C(17)	-0.006433	0.011217	-0.573485	0.5669
C(18)	0.859310	0.479281	1.792915	0.0743
C(19)	-0.850174	0.461497	-1.842209	0.0668
C(20)	1.037634	0.440749	2.354251	0.0194
C(21)	0.837478	0.441138	1.898447	0.0589
C(22)	-1.766117	0.441621	-3.999168	0.0001
C(23)	0.311702	0.463162	0.672987	0.5016
C(24)	-0.215642	0.477394	-0.451706	0.6519
C(25)	0.739494	0.480142	1.540156	0.1249
C(26)	0.146888	0.122475	1.199332	0.2317
C(27)	0.087696	0.127036	0.690321	0.4907
C(28)	-0.231638	0.124266	-1.864043	0.0636
C(29)	0.236875	0.125076	1.893846	0.0595
C(30)	0.057138	0.127917	0.446685	0.6555
C(31)	-0.068229	0.127463	-0.535285	0.5930
C(32)	-0.350835	0.130817	-2.681875	0.0079
C(33)	0.266253	0.130733	2.036619	0.0429
C(34)	-3.209848	3.700662	-0.867371	0.3867
C(35)	-1.768659	3.742627	-0.472572	0.6370
C(36)	3.122657	3.801530	0.821421	0.4123
C(37)	-1.613177	3.822225	-0.422052	0.6734
C(38)	-6.385759	3.808590	-1.676673	0.0950
C(39)	-0.764242	3.790848	-0.201602	0.8404
C(40)	-1.576763	3.699452	-0.426215	0.6704
C(41)	0.824897	3.550555	0.232329	0.8165
C(42)	0.031574	0.016354	1.930658	0.0548

R-squared	0.346347	Mean dependent var	0.011129
Adjusted R-squared	0.227237	S.D. dependent var	0.075010
S.E. of regression	0.065939	Akaike info criterion	-2.456710
Sum squared resid	0.978294	Schwarz criterion	-1.892424
Log likelihood	369.9708	Hannan-Quinn criter.	-2.230040
F-statistic	2.907794	Durbin-Watson stat	2.016310
Prob(F-statistic)	0.000000		

Appendix D: Variance Decomposition for Money Demand Function

Table D1: Variance decomposition of LCPISD

Period	S.E.	LRM	LCPISD	DSC	LRER	LRGDP
1	0.010682	0.825223	99.17478	0.000000	0.000000	0.000000
2	0.014060	0.518427	98.97473	0.212524	0.208573	0.085744
3	0.016697	0.615353	98.70074	0.234502	0.225730	0.223671
4	0.018828	0.721984	98.50988	0.222855	0.193929	0.351353
5	0.020636	0.858035	98.30962	0.200864	0.162286	0.469198
6	0.022210	0.997194	98.10207	0.177656	0.141592	0.581485
7	0.023605	1.133123	97.88419	0.157545	0.132394	0.692745
8	0.024857	1.261240	97.65758	0.142744	0.132392	0.806046
9	0.025992	1.379224	97.42412	0.134422	0.138843	0.923394
10	0.027031	1.485915	97.18556	0.133156	0.149299	1.046074
11	0.027987	1.580928	96.94322	0.139169	0.161784	1.174901
12	0.028872	1.664380	96.69799	0.152464	0.174793	1.310371

Table D2: Variance decomposition of DSC

Period	S.E.	LRM	LCPISD	DSC	LRER	LRGDP
1	0.404467	0.238472	0.124008	99.63752	0.000000	0.000000
2	0.606938	0.431542	0.541717	98.05159	0.723254	0.251900
3	0.762303	0.838997	0.675945	96.83582	1.149879	0.499354
4	0.888974	1.303706	0.756542	95.94648	1.298593	0.694678
5	0.996446	1.817552	0.810294	95.22049	1.303152	0.848511
6	1.090114	2.354693	0.847716	94.57783	1.245469	0.974288
7	1.173339	2.899532	0.873535	93.97994	1.166525	1.080469
8	1.248320	3.440508	0.890450	93.41196	1.084901	1.172180
9	1.316572	3.969797	0.900282	92.86895	1.008356	1.252618
10	1.379180	4.482264	0.904383	92.34985	0.939599	1.323904
11	1.436954	4.974752	0.903821	91.85482	0.879073	1.387536
12	1.490519	5.445524	0.899465	91.38411	0.826269	1.444631

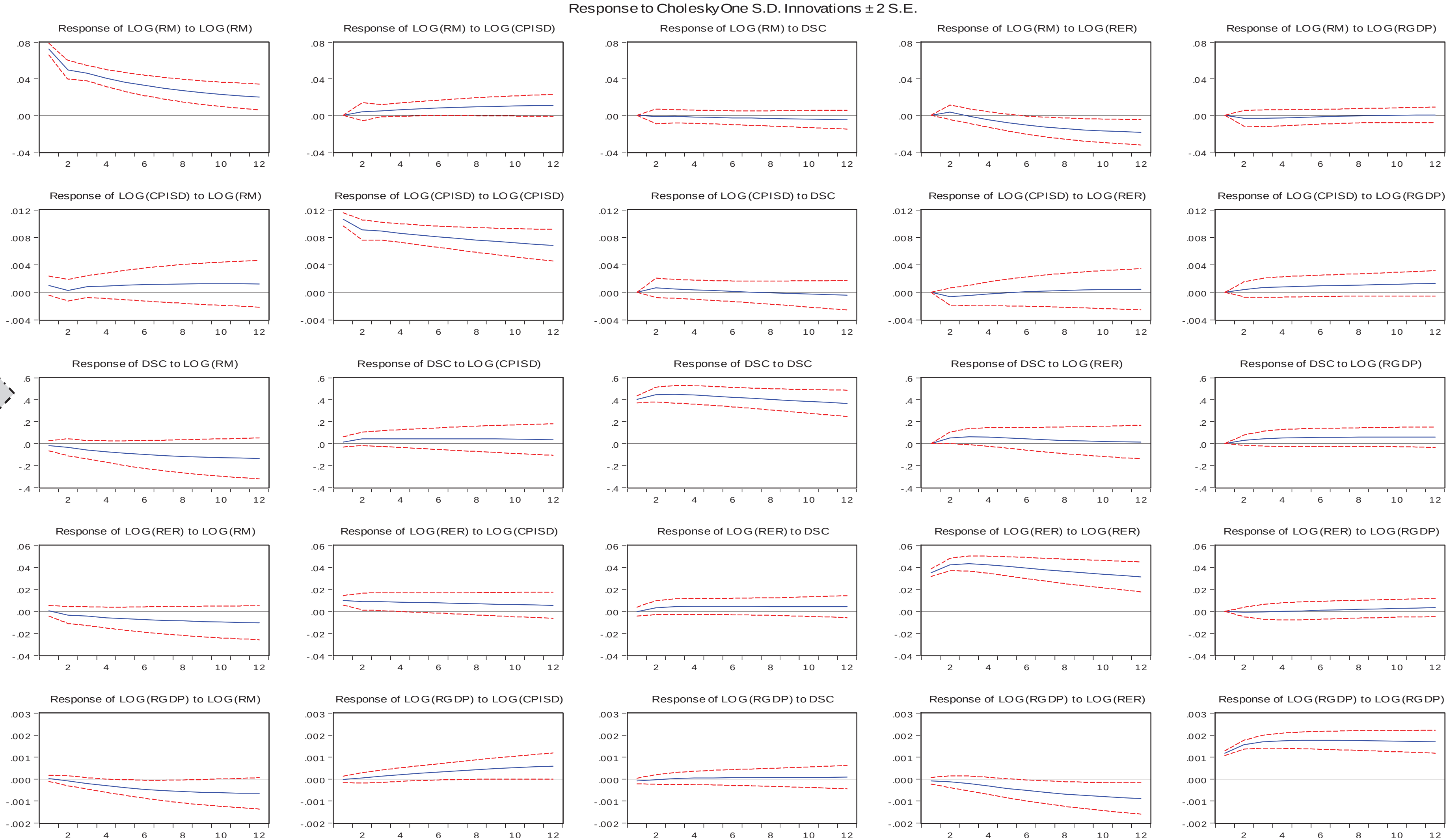
Table D3: Variance decomposition of LRER

Period	S.E.	LRM	LCPISD	DSC	LRER	LRGDP
1	0.036537	0.015914	7.583396	0.004398	92.39629	0.000000
2	0.056958	0.363990	5.507322	0.329804	93.78425	0.014629
3	0.072435	0.603157	4.873426	0.542210	93.96680	0.014403
4	0.084695	0.897126	4.555896	0.673635	93.86263	0.010708
5	0.094758	1.211677	4.360905	0.760482	93.65659	0.010342
6	0.103266	1.545891	4.221143	0.823135	93.39326	0.016569
7	0.110618	1.894667	4.109469	0.872290	93.09294	0.030632
8	0.117079	2.254154	4.013503	0.913565	92.76596	0.052820
9	0.122831	2.620977	3.927095	0.950097	92.41883	0.083001
10	0.128003	2.992331	3.847027	0.983737	92.05605	0.120854
11	0.132691	3.365910	3.771551	1.015632	91.68092	0.165983
12	0.136969	3.739836	3.699700	1.046531	91.29597	0.217966

Table D4: Variance decomposition of LRGDP

Period	S.E.	LRM	LCPISD	DSC	LRER	LRGDP
1	0.001186	0.064162	0.022236	0.546815	0.469437	98.89735
2	0.001973	0.189009	0.067056	0.208711	0.585961	98.94926
3	0.002624	0.675274	0.268723	0.126615	0.965537	97.96385
4	0.003189	1.369576	0.572750	0.108263	1.615764	96.33365
5	0.003699	2.150262	0.943166	0.106848	2.488313	94.31141
6	0.004169	2.937368	1.355036	0.109955	3.504486	92.09316
7	0.004611	3.682498	1.791343	0.114180	4.589810	89.82217
8	0.005030	4.360260	2.240858	0.118583	5.688011	87.59229
9	0.005429	4.960104	2.696362	0.122900	6.761887	85.45875
10	0.005811	5.480387	3.153326	0.127044	7.789291	83.44995
11	0.006176	5.924427	3.608982	0.130975	8.758560	81.57706
12	0.006527	6.298049	4.061688	0.134658	9.664841	79.84076

Appendix E: Impulse Response Function Money Demand Model



Appendix F: SVAR Matrix Results for LCPISA LZAR DSC and LCPISD

Structural VAR Estimates				
Model: Ae = Bu where E[uu']=I				
Restriction Type: short-run pattern matrix				
A =				
1	C(1)	C(2)	C(4)	
0	1	C(3)	C(5)	
0	0	1	C(6)	
0	0	0	1	
B =				
C(7)	0	0	0	
0	C(8)	0	0	
0	0	C(9)	0	
0	0	0	C(10)	
	Coefficient	Std. Error	z-Statistic	Prob.
C(1)	6.00E-09	1.50E-08	0.400817	0.6886
C(2)	-0.008232	0.001945	-4.232693	0.0000
C(3)	-404.9425	8066.200	-0.050202	0.9600
C(4)	-0.279980	0.049759	-5.626749	0.0000
C(5)	339410.3	205295.5	1.653276	0.0983
C(6)	0.005332	1.581469	0.003372	0.9973
C(7)	1.90E-07	8.37E-09	22.75961	0.0000
C(8)	0.790030	0.034712	22.75961	0.0000
C(9)	6.09E-06	2.67E-07	22.75961	0.0000
C(10)	2.39E-07	1.05E-08	22.75961	0.0000
Log likelihood	9657.975			
Estimated A matrix:				
1.000000	6.00E-09	-0.008232	-0.279980	
0.000000	1.000000	-404.9425	339410.3	
0.000000	0.000000	1.000000	0.005332	
0.000000	0.000000	0.000000	1.000000	
Estimated B matrix:				
1.90E-07	0.000000	0.000000	0.000000	
0.000000	0.790030	0.000000	0.000000	
0.000000	0.000000	6.09E-06	0.000000	
0.000000	0.000000	0.000000	2.39E-07	

References

Ahmed F, Raza H, Adnan Hussain A, Lal I., 2013. Determinant of Inflation in Pakistan: An Econometrics Analysis, Using Johansen Co Integration Approach. *www.iiste.org/Journals/index.php/EJBM/article/download/ 9452/9657* [Accessed 16 May 2014]

Asari Fh, Baharuddin NS, Jusoh N, Mohamad Z, Shamsudin N And Jusoff K., 2011. A Vector Error Correction Model (VECM) Approach in Explaining the Relationship Between Interest Rate and Inflation Towards Exchange Rate Volatility in Malaysia. [Available] *http://www.idosi.org/wasj/wasj12(BES)11/8.pdf* [Accessed 16 May 2014].

Aziakpono, M. J. 2006. Financial integration amongst the SACU countries: evidence from interest rate pass-through analysis. Studies in Economics and Econometrics. 30(2): 1-23.

Balfoussia H, Brissimis S a nd Delis M, D., 2011. The theoretical framework of monetary policy revisited. [Available] *http://mpra.ub.uni-muenchen.de /32236/1/the_theoretical_framework _of_monetary_policy4.pdf* [Accessed 16 May 2014].

BASHIER A., AND DAHLAN A., 2011. The Money Demand Function for Jordan: An Empirical Investigation. [Available] *http://ijbssnet.com/ journals/Vol._2_ No._5_[Special_Issue_-_March_2011]/10.pdf* [Accessed 17 May 2014]

Barnarke, B. S. and Gertler, M., 1995. Inside the black box: the credit channel of monetary policy transmission. Journal of Economic Perspectives,9,4: 27-48.

Bashir F, Nawaz S, Yasin K, Khursheed U, Khan J, Qureshi M J 2011. Determinants of Inflation in Pakistan: An Econometric Analysis Using Johansen Co-Integration Approach. Australian Journal of Business and Management Research [Online]. Available: *http://www.ajbmr.com/articlepdf/ajbmrv01n0509.pdf* [Accessed: 18 March 2014].

Brooks, C., 2002. Introductory econometrics for finance. Cambridge: Cambridge University Press.

Brooks and Tsolacos., 1999. The impact of economic and financial factors on the UK property market. Journal of Property Research. 16 (2) 139-152.

Calza, A., Gartner, C. and Sousa, J., 2001a. Modelling the demand for loans to private sector in euro area. [Online]. Available: *http://www.ecomot.net/ conferences.* [Accessed 7 May 2014]

Chakraborty, C. and Basu, P., 2002. Foreign direct investment and growth in India: a cointegration approach. Applied Econometrics. 34, 9: 1061-1073.

Dickey, D.A. and Fuller, W.A. (1981).Distribution of the estimators for autoregressive time series with a unit root. Econometrica49, 1057-72.

Dlamini SN., 2008. Bank Credit Extension to the Private Sector and Inflation in South Africa. [Available] *http://eprints.ru.ac.za/2002/1/DLAMINI-MCom-TR09-70.pdf*

Eijffinger, S and De Haan, J. 1996. *The Political Economy of Central Bank Independence.* Special Papers in International Economics, No. 19 May. International Finance Section.

Faure, A. P., 2005. Money, interest and monetary policy. Cape Town: Quoin Institute (Pty) Limited.

Faure, A. P., 2006. Money, interest and monetary policy. Cape Town: Quoin Institute (Pty) Limited.

Gaurisankar S and Kwie-Jurgens NA. 2012. The money demand function in Suriname. [Available]. *http://www.cbvs.sr/ccmf/index_files/ ccmf_papers /The%20money%20demand%20function%20in%20Suriname_Gaurisankar%20&%20Ong%20A%20Kwie.pdf* [Accessed 18 May 2014].

Gosselin, M.A., 2006. *Central bank performance under Inflation targeting.* U.S. - Mexico Division International Department. Bank of Canada.

Higgins B and Faust J (1981); Velocity Behaviour of the New Monetary Aggregates, Reserve bank of Kansas City

Hallett Ajh And Libich J 2008 Monetary and Fiscal Policy Interaction with various degrees and types of commitment *http://ideas.repec.org/f/pli244.html*

Harris, R., 1995. Using co integration analysis in econometric modelling. London: Prentice Hall.

Johansen, S., 1988. Statistical analysis of cointegration vectors. Journal of Economic Dynamics and Control. 12: 231-54.

Johansen, S. and Juselius, K., 1990. The full information maximum likelihood procedure for inference on cointegration – with applications to the demand for money. Oxford Bulletin of Economics and Statistics. 52: 169-210.

Koop, G., Pesaran, M.H., Potter, S.M., 1996. Impulse response analysis in nonlinear multivariate models. Journal of Econometrics. 74: 119-147.

Maddala G.S. and Kim, I.M. 1998. Unit roots, cointegration and structural change. Cambridge University Press.

Mishkin, F.S., 2003. The Economics of Money Banking and Financial Markets.Columbia University.

Mishkin, F.S., and Savatano, M.A., 2000. *Monetary Policy Strategies for Latin America.* Columbia University. [Online]. Available:

http://www2.gsb.columbia.edu/faculty/fmishkin/PDFpapers/99LASE.pdf. [Accessed 8 April 2014].

Mitchell-Innes A. H M., (2006); The Relationship between Interest Rates and Inflation in South Africa: Revisiting Fischer Hypothesis

Nagel A and Parker J., (2003); Empirical Macroeconomics: The Effect of Monetary Policy, Department of Economics Reed College 2003

Valadkhani A. 2002. Long- and Short-Run Determinants of the Demand for Money in New Zealand: a Cointegration Analysis.[Available] *http://ro.uow.edu.au/cgi/viewcontent.cgi?article=1420&context=commpapers* [Accessed 6 May 2014]

Zavkiev, Z., 2005. Estimating a Model of Inflation in Tajikistan. CAMA Working Paper. 26/2005. [Online]. Available: *http://cama.anu.edu.au*. [Accessed: 17 March 2014].

Chapter 6

The Effectiveness of Monetary Policy in Uganda

By Adam Mugume

1.0 Introduction

In the early 1990s, Uganda moved from reliance on credit or interest rate controls toward reliance on money market operations in view of the increasing inefficiency of the former in a context where the financial market was increasing becoming integrated both domestically and internationally. In addition, allowing market forces to distribute financial resources was associated with increased economic efficiency and growth.

In the mid-1990s and the early 2000s, large inflows of donor funds contributed to excess liquidity since the government would typically sell those funds to the central bank, and spend the local currency. Inflows of donor funds also contributed to pressures for an appreciation of the currency. In response, the central bank undertook large-scale sterilization operations. However, these operations sometimes resulted in high interest rate volatility and high volatility in bank reserves. The volatility in reserves caused banks to seek a larger cushion above the required level of reserves, which has in general limited the impact of changes in the level of reserve requirements.

Despite the long-run relationship between money growth and inflation, in the short-term, the reliability of targeting credit aggregates or the monetary base to manage the central bank's balance sheet depends on the stability of their relationship to the ultimate target of monetary policy, regardless of the size or stage of development of the markets. Therefore, reliance on a monetary program for the conduct of monetary policy, in particular the implementation of a monetary framework anchored on base money targeting, should not be overly rigid and it should be accompanied by close monitoring of macroeconomic indicators to gauge the appropriateness of correcting a deviation from the initial assumptions. Quantitative variables became less reliable guides for monetary policy because of increased sophistication of markets and, more broadly, a reduced role of the banking system in financial intermediation. Conversely, price information from markets can be expected to have become reliable. Therefore, the BoU needed to rely on interest rates as the operating target of monetary policy. Quantitative variables however were retained as information variables.

The growing awareness of the weaknesses regarding reserve money targeting accompanied by increased volatility in risk appetite and short-term capital flows following the global crisis led the BOU to seek alternative monetary policy framework, the ITL effective from July 2011. In particular, the Bank of Uganda (BOU) had to make a choice between continuing with a money-growth rule, as reflected in the reserve money programme, and exercising discretion over interest rates. The consequence of this is that the monetary base became demand-determined. Banks demand whatever quantity of reserves they require to support their intended lending and deposit-holding and the BOU is obliged to supply this on demand if the current level of interest rates is to remain undisturbed. Furthermore, since banks' demand for these reserves stems from clients' liquidity needs and these in turn depend upon the state of the economy, the money supply becomes endogenous. In terms of the quantity theory, causality is therefore reversed. It could do one or the other but, of course, not both.

In particular, the main reason for abandoning money supply as an intermediate target under the reserve money programme monetary policy framework was because innovations in the financial market made the relationship between money supply and prices highly unstable. Money supply was no longer a reliable indicator of monetary conditions in the short run, although persistent growth in money supply is always a formula for inflation. Under the ITL framework, economic growth and the exchange rate stability are supplementary objectives without prejudice to price stability. Under the ITL framework, a policy interest rate, the Central Bank Rate (CBR), is employed as the operating target of monetary policy.

The BOU sets the CBR at a level consistent with the desired monetary policy stance and supplies and/or constrains liquidity conditions in the interbank money market to steer the 7-day interbank money market rate to be within the range of the CBR. Moreover, by far the most visible and obvious power of many modern central banks is to influence market interest rates towards influencing interest rate formation in the economy via the short term interest rates without directly aiming its effects at the quantity of money. The quantity of money is used as one of inflationary indicators among many others by most central banks. However, in most low income countries, especially those dependent on the International Financial Institutions, either for policy advice or financial resources, targeting monetary aggregates has remained the basis of conducting monetary policy, even when the underlying factors that had made this approach relevant have changed. The transformation of the macroeconomic landscape in Uganda, as elsewhere in Africa, has so altered conditions that the redesign of the monetary framework is both pressing and meaningful. This transformation is not just in terms of economic conditions but also of perceptions of the scope and limits of monetary policy.

When implementing monetary policy, the BOU's key objective is to limit the volatility in interbank rates caused by the variability of liquidity conditions. A more stable interbank rate fosters the transparency of monetary policy. If the variability of interbank rates spills over along the yield curve, then this may set rates serving as the operating target into motion as well. As a result, monetary policy will lose some of its transparency, as the change in the operating interest rate level is also influenced by variations in the liquidity situation existing at any given moment. However, it is also important that the BOU should not take over the task of managing individual banks' liquidity, and hence it should not impede the deepening of the interbank market and the increase in its efficiency.

The rest of this paper proceeds as follows: section 2 provides a review of the evolution of Uganda's monetary policy frameworks; section 3 presents an assessment of the ITL framework; section 4 describes Monetary Policy Transmission Mechanisms in Uganda; while section 5 concludes.

2.0 Evolution, Performance and Challenges of the Existing Monetary Policy Regime

2.1 Institutional Aspects

Before 1993, responsibility for monetary policy formulation was vested in the Ministry of Finance. The BoU functioned like a department under the Ministry of Finance and conducted monetary policy mainly through direct instruments, such as ceilings on commercial bank credit and administered interest rates. However, the financial reforms in the late 1980s brought some liberalization of exchange controls on both current and capital transactions. The liberalization of capital controls and the establishment of an interbank foreign exchange market were completed in 1994. The crawling-peg regime was replaced with a more flexible exchange regime, although limited intervention continues.

The constitution of Uganda of 1995, Articles 161 and 162 give the BoU operational independence in the conduct of monetary policy. In particular, Article 162 of the Constitution of Uganda stipulates that in performing its functions, the Bank of Uganda shall conform to this Constitution but shall not be subject to the direction or control of any person or authority. It further gives the functions of the Bank as: to promote and maintain the stability of the value of the currency of Uganda; regulate the currency system in the interest of the economic progress of Uganda; encourage and promote economic development and the efficient utilization of the resources of Uganda through effective and efficient operation of a banking and credit system. Furthermore, the 1993 BoU Act 4(1)- stipulates that the Bank shall formulate and implement monetary policy directed to economic objectives of achieving and maintaining economic stability.

The Bank of Uganda Act, 1993, Chapter 51, 2(4), prescribes that the primary objective of the BOU's monetary policy will be to achieve and maintain economic stability. The secondary objectives include supporting growth and development. Therefore, under the law, the BOU is required to resolve any short-run conflicts between the objective of price stability and developments in the real economy as well as it can, taking into consideration the interests of the country as a whole and giving priority to long-run price stability. The specific interpretation of the meaning of price stability is left to the BOU.

The BOU has decided to render its mandate operational by employing a quantitative definition of price stability, as opposed to a short-term inflation target. A definition of price stability, by its very nature, is valid for an extended period of time while a short-term inflation target may be changed often due to shocks to the economy. The importance of this distinction lies in the implied emphasis on a medium to long-term horizon. A quantitative definition of price stability thus represents a more reliable and therefore a more credible commitment to monetary stability than an inflation target which can be adjusted over time in potentially discretionary and unpredictable ways. Hence, the quantitative definition of price stability is a central component of the BOU's monetary policy framework. It reflects the BOU's conviction that, even for a credible central bank, the additional commitment to monetary stability reflected in a quantitative definition of price stability provides a valuable contribution to anchoring long-term inflation expectations and strengthening market confidence.

Even though price stability was not established as the BoU's sole primary objective, the BoU has increasingly focused on this objective, and has declared its commitment to achieving this goal since 1993. The BOU defines price stability as a rise in the core consumer price index (CPI) of less than 5 percent per annum. It is recognised that the CPI probably overstates actual inflation to some extent[40]. Consequently, price stability is equated with a positive measured inflation rate. Deflation, that is a persistent downward trend in the price level, is clearly stated to be inconsistent with price stability. The BOU's policy on inflation is based on a medium to long-term orientation. Its approach is based on the recognition that economic fluctuations are dampened by an unequivocal commitment to long-run price stability. First of all, low inflation and firmly anchored inflation expectations in themselves ensure that deviations in output from normal levels remain limited. Second, the more firmly long-term inflation expectations are anchored at a low level, the more successful the central bank can be in its contribution to preventing cyclical swings in economic activity. Third, the BOU's approach accords strong recognition to the insight that, in the long run, public perception of its policy is determined by deeds, not words.

A high level of credibility based on its past policy record is a prerequisite for a successful monetary policy within its current framework. Therefore, overly ambitious efforts at short-run stabilisation of the real economy could easily become counterproductive and must be avoided. However, while it would react decisively to an inflation rate persistently above 5 per cent, there are situations in which the BOU permits temporary deviations from this mark. In a small open economy, exceptional situations with sharp exchange rate fluctuations can arise, causing inflation to temporarily move outside the price stability range. Abrupt price increases for imported goods such as oil, or adjustments to certain tax rates, may also result in inflation rates that temporarily exceed the definition of price stability. It is neither possible nor necessary for the central bank to prevent this.

Although several economic variables influence monetary policy decisions, the BoU has only one policy instrument. Therefore, monetary policy can do only one thing. This point is worth emphasizing, especially when thinking about what

40 For example, see Lebow, Roberts, and Stockton (1992); Wynne and Sigalla (1994); and Shapiro and Wilcox (1996a)

monetary policy is not. The BoU has no ability to set spending or taxation priorities. Nor does it have the ability to directly regulate product markets, although it does play a role in the regulation and oversight of parts of the financial system. As important and powerful as monetary policy is, it is much more limited than say fiscal policy in terms of available policy instruments.

In addition, the BOU recognises that in the long run, monetary policy is about the value of money – that is, prices. Over long horizons, the size of the economy and its average rate of growth are driven by developments on the supply side – such as the availability of land and labour, the extent of accumulation of real capital, technology, and the efficiency with which we use all those factors. Monetary policy cannot directly influence the supply capacity of the economy; however, in the short term, monetary policy changes can affect the real economy, because they affect aggregate demand. If inflation forecasts are indicating rising inflation, in the near term, monetary policy has to be tightened now and this could require slower growth in aggregate demand. By the same token, if as a result of some shock demand falls below potential supply capacity, the resulting downward pressure on inflation provide scope for monetary policy to be easier for a time, which could help to limit the cyclical weakness in economic activity.

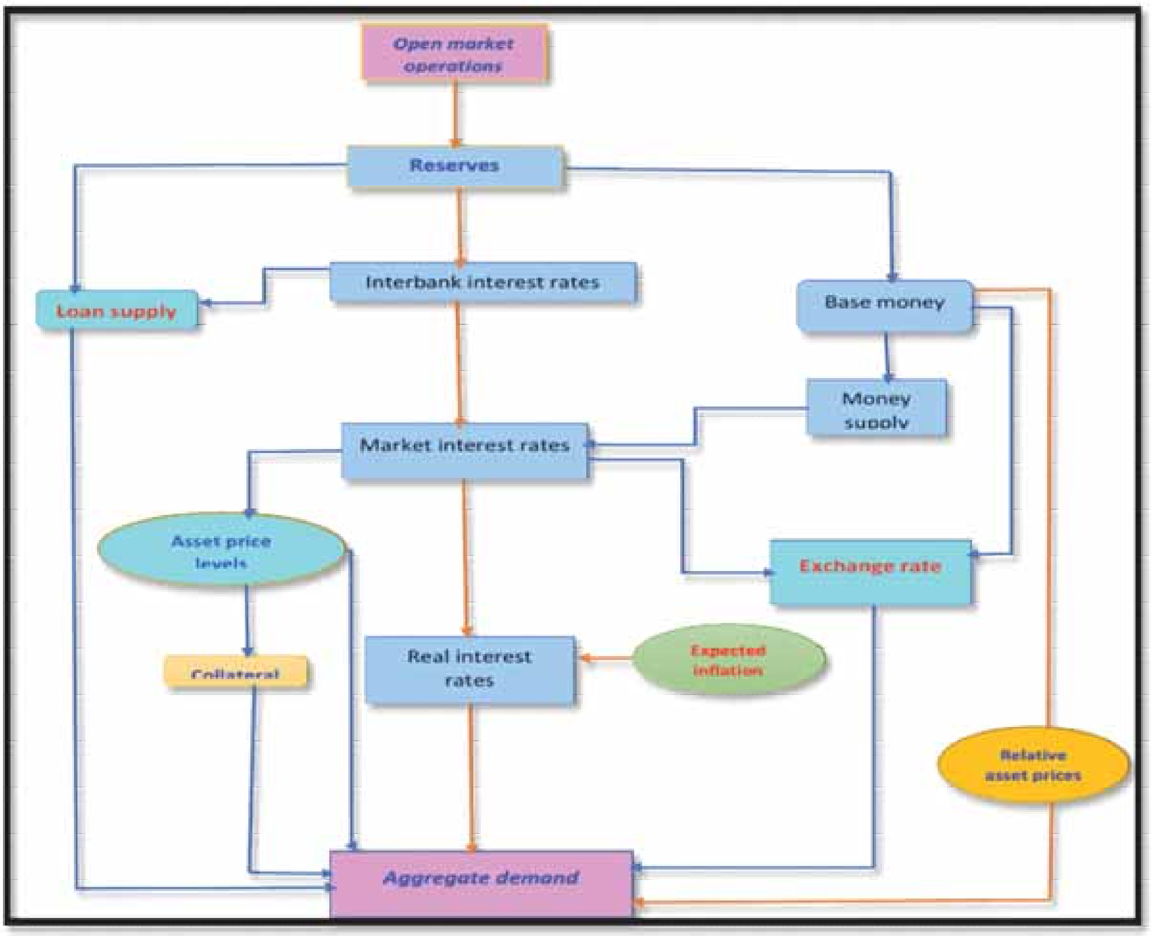
The BoU's monetary policy focus in ensuring stable prices recognizes its powers, but also the limits regarding its influence over the rest of the economy. Over long horizons, the size of the economy and its average rate of growth are driven by developments on the supply side. Monetary policy determines inflation and other nominal variables but is incapable of systematically influencing real variables. In contrast, in the shorter term, monetary policy does influence real variables and relative prices, so appropriate management can cushion the volatility of output and employment when shocks occur making it a powerful policy instrument in macroeconomic management. When faced with price shocks or troubled financial markets, this same power can, however, involve short-term tradeoffs for monetary policy, in particular between the volatility of inflation and output.

In part, reflecting the focused mandate of the BoU, inflation has averaged about 7 percent between 1994 and 2013. The conduct of monetary policy is through the Monetary Policy Committee (MPC). Between July 2011 and June 2014, MPC met monthly and chaired by Governor (since August 2014, the MPC has met every other month). The Financial Markets Operations Committee (FMOC), which meets daily implements MPC's decisions, monitors financial markets, and takes appropriate actions. The BoU uses varied instruments which include: Open

Market Operations using government securities and Repurchase Agreements. Others include Cash Reserve Requirements which are not remunerated but uniform across all deposits at 8 percent.

To address liquidity shortage of commercial banks, the BoU offers two types of standing facilities: rediscounting of treasury bills and bonds at the rediscount rate and borrowing from BoU at the Bank Rate. The determination of the rediscount rate is based on the CBR plus 3 percentage points. Eligible instruments are limited to treasury bills and bonds with 91 days or less to maturity. The bank rate is currently set at 1 percentage point above the rediscount rate. Automatic access to the BoU credit is limited to 25 percent of reserve requirements for a maximum of 5 days, beyond which borrowings need the BoU's approval and eligible collateral is treasury bills or any other eligible instruments with 91 days or less to maturity. The BoU's operational monetary policy transmission mechanism is summarized below (Figure 1).

Figure 6.1: A snapshot of Uganda's monetary policy transmission mechanism



Transmission of monetary policy then works as follows: The BoU chooses the short term nominal interest rate in each period which we express in annualised terms. Due to some form of nominal price rigidities, control over the nominal rate gives the BoU control over current and expected future real rates, at least for some horizon. It is this leverage over the time path of short term real interest rates that allows the BoU to influence aggregate spending that in turn translates into movements in output and inflation.

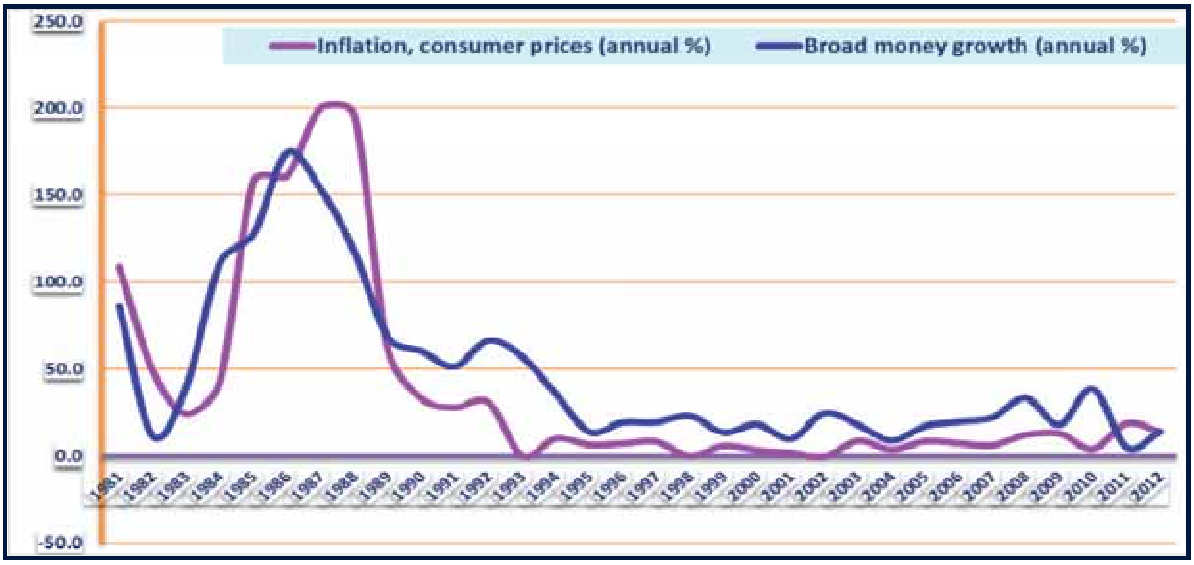
2.2 An overview of the Conduct of Monetary Policy in Uganda

The process of implementing monetary policy in Uganda has undergone fundamental changes since the 1980s. These changes began with the structural reforms in the 1980s and the early 1990s aimed at increasing the role of market forces in resource allocation and creating a stable macroeconomic environment. The liberalization of the foreign exchange market in 1993 and the capital account in 1995 represented two major steps in the reform process. Uganda experienced a bout of hyperinflation in the second half of the 1980s and early 1990s, but a major stabilization effort brought inflation under control. Following the structural reforms and the associated monetary policy rationalisation, the economy experienced macroeconomic stability, evidenced by stable inflation, which average 6.9 per cent between 1993 and 2013 in contrast to an average inflation of 91.1 per cent during 1983-1992. Stabilization efforts led to a strong growth performance in the early 1990s. In the early-to mid-1990s, liberalization measures resulted in rapid economic growth, which averaged 7.3 per cent per year.

Growth slowed in the late 1990s but the momentum picked up again, with real GDP growth rising to reach a high average of 7.7 per cent between 2001 and 2008. Since then, growth has slowed down, reaching 2.8 per cent in 2012, largely as a result of tighter monetary and fiscal policies and spillovers from the global economic crisis. At the same time inflation fell sharply through the course of 2012, with CPI inflation falling from 27 per cent at the end on 2011 to 5.3 per cent at end-2012, and core inflation falling from 29.1 per cent to 4.6 per cent over the same period.

The monetary policy framework and strategy of the BOU during 1993-2011 period was aimed at using monetary targets to achieve the desired objective of price stability. The BOU used open market operations to manage bank reserves and currency in circulation. Adjustments in the components of base money influenced interest rates, the level of credit and money supply through the money multiplier process, and ultimately the price level. This process relied on a stable and consistent relationship between monetary aggregates and the price level. As shown in Figure 2, there was a strong justification for monetary policy's reliance on monetary aggregates to control inflation. Inflation in the late 1980s was largely due to monetisation of fiscal deficits as shown by the strong link between inflation and broad money growth in the late 1980s and early 1990s and as soon as this link was broken, inflation decelerated sharply.

Figure 6.2: Inflation developments, 1981-2012



Source: Bank of Uganda.

Indeed, the post-Independence monetary frameworks in Uganda and in Africa as a whole were largely geared towards the (cheap) financing of government activities, the extension of subsidized credit to favoured sectors and an active pursuit of an exchange rate target (more often reflecting the interests of powerful urban consumers at the expense of producers), rather than to the control of inflation. Moreover, weak fiscal control – informed to a degree by the same orthodoxy – meant that monetary policy was conducted in an environment of substantial fiscal dominance, so that even basic macroeconomic policy coherence was achieved only by recourse to progressively tighter controls on the capital account and other policies that repressed the development of domestic financial markets. This cocktail of fiscal dominance and the overburdening of monetary policy with multiple objectives led to the inevitable outcome that Uganda's monetary regime neither delivered low inflation nor posted sustained gains on the other policy objectives. Moreover, persistent fiscal imbalances, in the absence of a strong nominal anchor, resulted in the government resorting to the inflation tax –

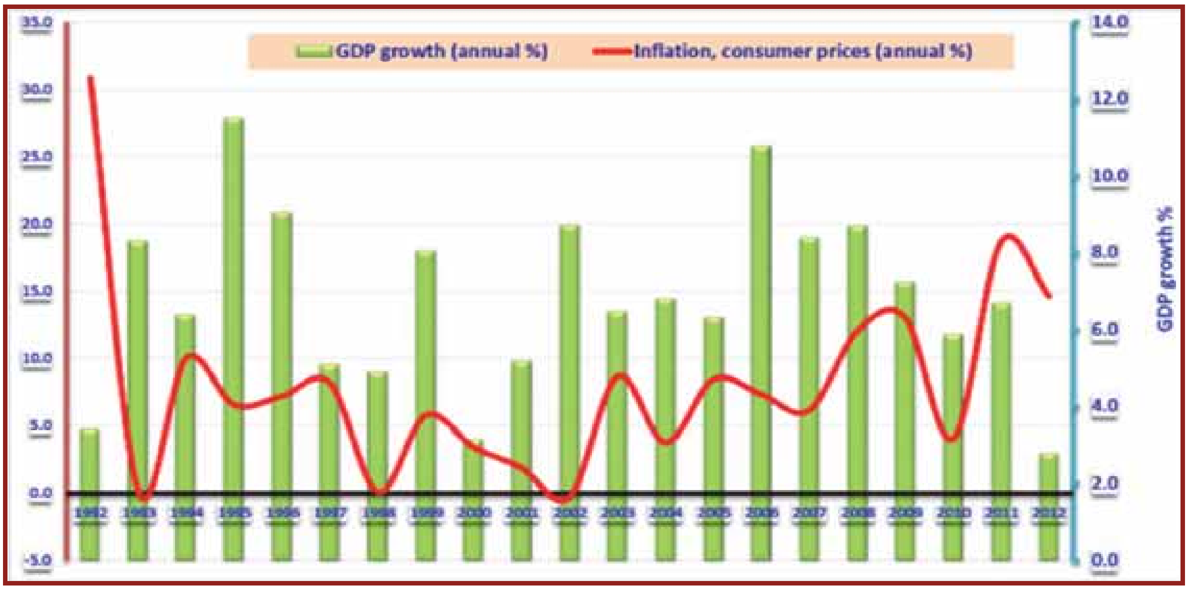
the issuing/printing of money to pay for goods and services that leads to more inflation and is thus inconsistent with price stability.

By the early 1990s, however, the evident failure of an (over) activist monetary policy encouraged moves to dismantle control regimes, liberalize foreign exchange markets and establish more robust fiscal regimes (in the context of IMF-supported stabilization programmes). As a consequence, systems of financial repression were dismantled, a flexible exchange rate regime was introduced and these gradually opened up the space for a genuinely independent central bank. These reforms also resulted in macroeconomic stability as well as changes in the structure of the economy and integration in the global financial system. Uganda undertook other financial sector reforms, which among other things empowered the BOU to independently conduct monetary policy without due interference from the Treasury. Since the mid-1990s, the BOU has effectively controlled liquidity through its use of open market operations and reserve requirements as well as, through its intervention in the foreign exchange market. The high aid inflows during this period and seasonality in the foreign exchange earnings necessitated the periodic intervention by the BOU to avoid sharp fluctuations in the exchange rate. This intervention also helped to support the objective of price stability.

Inflation has largely remained subdued since 1993 although with periodic spouts due to the nature of food prices, while growth slowed down in the late 1990s and early 2000s. The decline in international coffee prices was the principal cause of the slowdown in growth in the late 1990s and most of 2000s. The economy began to rebound in late 1999—largely due to a revival of domestic investment, particularly private sector investment—but it was growing at a slower rate than in the early 1990s. Gross fixed capital formation as a percentage of GDP averaged 13 per cent in 1982 to 1999 and 22 per cent between 2000 and 2013 while private sector gross fixed capital formation as percentage of GDP averaged 8.6 per cent in 1982 to 1999 and 16.4 per cent between 2000 and 2013.

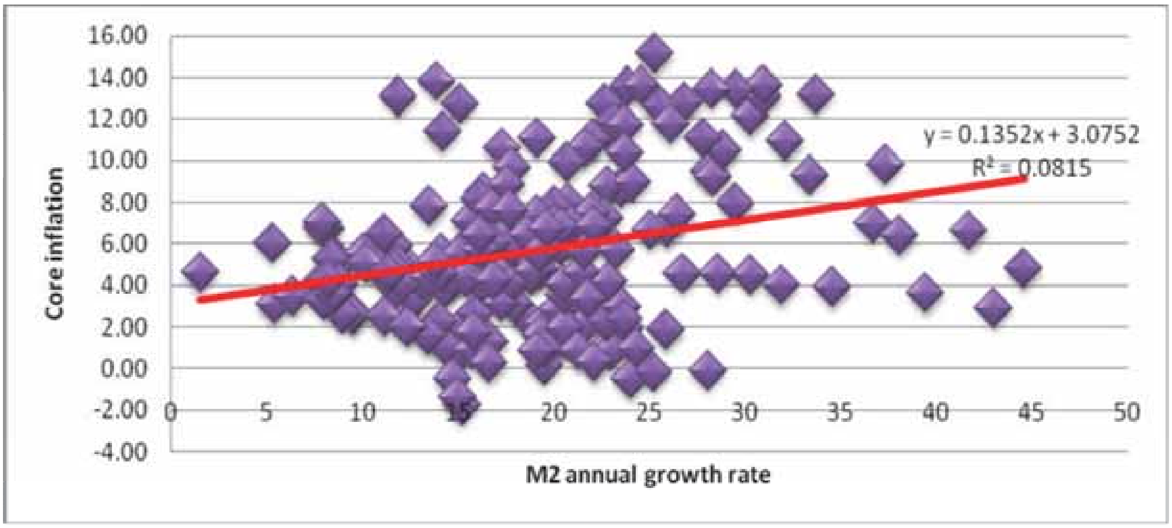
Inflation rose slightly as growth picked up strongly between 2006 and mid-2011 (Figure 3a), reflecting sustained increases in international commodity prices and growing excess demand. Both the inflation and economic growth averaged 10 per cent between 2006 and 2011. Inflation picked up again towards the end of 2011, reflecting in part the spillover of the global economic and financial crisis, a surge in international commodity prices, especially oil prices and drought that affected food production.

Figure 6.3a: Inflation-output trade-off



2.3 An Assessment of the Monetary Targeting Framework

Figure 6.3b: Inflation and money supply.



The impact of monetary policy on the real economy has been a contentious area in macroeconomics (see Bernanke and Gertler, 1995). The quest for 'what is inside the black box' conventionally posits whether changing monetary policy stance has an impact on real economic variables, and, if so, how large these effects are. The efficacy of monetary policy depends on the ability of policymakers to make an accurate assessment of the timing and the effect of the policy on economic activities and prices. Therefore, to shove monetary policy with the appropriate force and in the right direction policymakers need to have a clear understanding of the propagation mechanism of the monetary policy shocks and the relative importance of the various channels in affecting the real sectors of the economy. Monetary targeting has become less effective as a tool for controlling inflation-as evidenced in Figure 3b, the link between core inflation and monetary supply growth is to the best weak. The efficacy of monetary targeting depends on a stable and predictable demand for money and money multiplier. Both money demand and the multiplier have become more volatile, weakening the link between monetary aggregates and inflation.

Monetary quantities are always likely to be of some significance for the central bank. For example, they are especially important in countries where measured interest rates contain little useful information on monetary conditions – because the financial markets are highly illiquid or market forces are not allowed to operate. In this case, data on stocks of liquidity may be the only firm financial information available. For this, if for no other reason, the levels of cash balances held in the economy will be a crucial data source for general economic surveillance and for policy analysis.

The analytical background for money targeting is as follows. Starting from the quantity identity, one gets the average money growth, $\Delta\overline{m}$, and average inflation, $\Delta\overline{p}_{,}$ which fulfil the identity:

$$\Delta\overline{m}_t + \Delta\overline{v}_t \equiv \Delta\overline{p}_t + \Delta\overline{y}_t \qquad (1)$$

Where *p, m, y and v* are the (logs of the) price level, the money stock, real income and the income velocity of money, respectively, and the bars denote long-run average values. Taking the velocity trend and the long-run average rate of real output growth to be exogenous, it follows from (1) that trend inflation can be pinned down by controlling the trend rate of money growth:

$$\Delta\overline{p}_t = \Delta\overline{m}_t + \Delta\overline{v}_t - \Delta\overline{y}_t \qquad (2)$$

Based on this reasoning, the BOU derives the target for average money growth in year *t*, Δm_t^* from the sum of the (maximum) rise in prices it is willing to tolerate, Δp_t^*, the predicted growth in potential output, $E_{t-1}\Delta y_t^*$ and the expected trend rate of change in velocity, $E_{t-1}\Delta v_t^*$:

$$\Delta\overline{m}_t^{\bullet} = \Delta\overline{p}_t^{\bullet} + E_{t-1}\left(\Delta y_t^{\bullet}\right) - E_{t-1}\left(\Delta v_t^{\bullet}\right) \qquad (3)$$

where the deltas now represent year-on-year changes, and E_{t-1} denotes expectations at the end of year *t-1*. The target rate for average (year-on-year) money growth is then translated into a target rate for money growth in the course of the year.

While this basic relationship might be uncontested over medium to longer-term horizons, they might not strictly apply over the shorter term. On a month-to-month or quarter-to-quarter basis and even beyond, the basic relationship between the money stock and the overall domestic price level is often obscured by a variety of other factors. Any attempt to strictly tie money growth to its desired path in the short-term could have contributed to the disturbing volatility in interest and exchange rates in the recent past, thus imposing unnecessary adjustment costs on the economy. Moreover, the implementation of the reserve money programme tries to exploit the presumed relationship between the money base, the quantity of broader money supply. The assumption is that BoU exogenously controls the money base in order to control broader monetary aggregates. Manipulation of the monetary base leads to further changes in broader monetary aggregates via the money multiplier. An exogenous money supply not only misrepresents how monetary policy is actually implemented but it also becomes highly restrictive and even confusing when trying to reconcile traditional approaches with current operating procedures and the institutional settlement framework surrounding or underpinning the implementation process.

This framework is configured rather conventionally around a broad-money anchor, with reserve money functioning as the operational target. The money targeting framework cannot be relied on to guide monetary policy in a situation where the economy is developing, and financial markets are deepening and becoming globally integrated. Moreover, as a communication tool, base money cannot serve to communicate the stance of monetary policy to the public. In particular, its effectiveness is premised on two big "*ifs*". The biggest "if" is that there must be a strong and reliable relationship between the goal variable (inflation) and the targeted aggregate (M2). If there are large swings in velocity, so that the relationship between the monetary aggregate and the goal variable is weak, then monetary aggregate targeting will not work. The second "*if*" is that the base money (operational target) must be well controlled by the central bank and it must have a stable and predictable link with M2-money multiplier should be stable and predictable.

As evident in Figures 4a and 4b, money velocity has been steadily declining although with marked year-on-year variation. This trend fall in velocity – which increases the inflation consistent growth rate of broad money - has been accompanied by an increase in the money multiplier which, for a given target growth rate of broad money, reduces the inflation consistent growth rate of reserve money. More significantly, however, both have been relatively volatile which makes prediction difficult. Mistakes in forecasting velocity and the multiplier (and, indeed, errors in forecasting real output) are transmitted to the real economy via swings in the liquidity conditions facing banks, causing them to maintain a more liquid asset book which adversely affects the cost and quantity of their long-term lending. Setting aside the challenges in controlling reserve money itself, predicting velocity and the multiplier is becoming increasingly difficult.

The trends in Figures 4a and 4b could be an indication that the relationships between the base money and broader monetary aggregates and between the monetary aggregates and monetary policy goals weakened. Moreover, it increasingly became apparent that, over time horizons that mattered importantly for monetary policy, different monetary aggregates exhibited widely disparate growth rates. Hence it was difficult to know which specific measure of money presented the appropriate benchmark to which to respond to. More fundamentally, changes in conditions affecting the public's holding of deposits—the introduction of new electronic technologies that made possible new ways for both households and firms to manage their money holdings, and the increasing integration of the global financial system, which enabled large deposit holders to substitute more easily across national boundaries in the deposits and alternative instruments they held in their portfolios—destabilized what had at least appeared to be long-standing regularities in the demand for money. At the same time, standard statistical exercises that for years had shown a reasonably stable relationship of money growth to inflation (stable enough to be reliable for policy purposes) no longer did so.

Figure 6.4a: Money velocity trend in Uganda

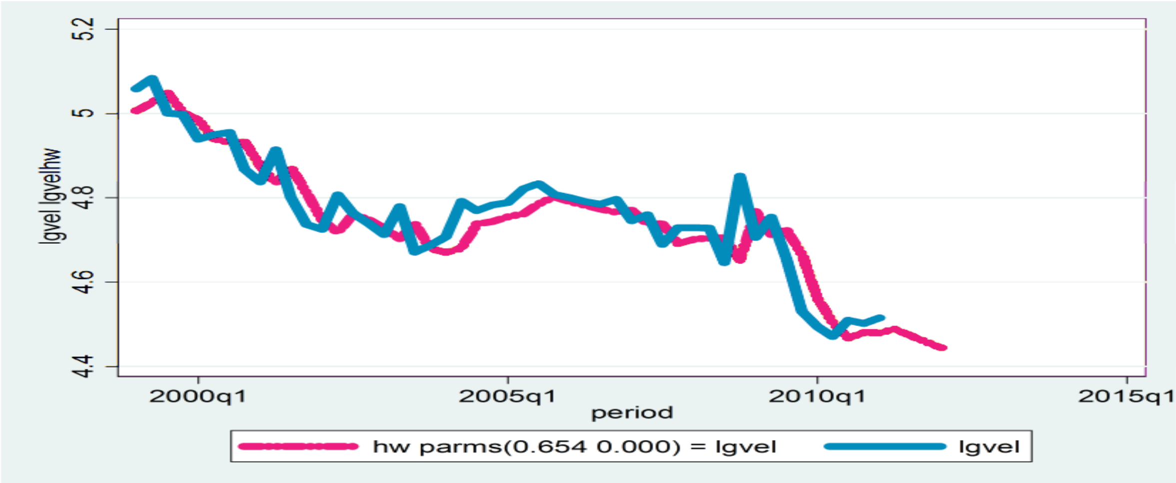
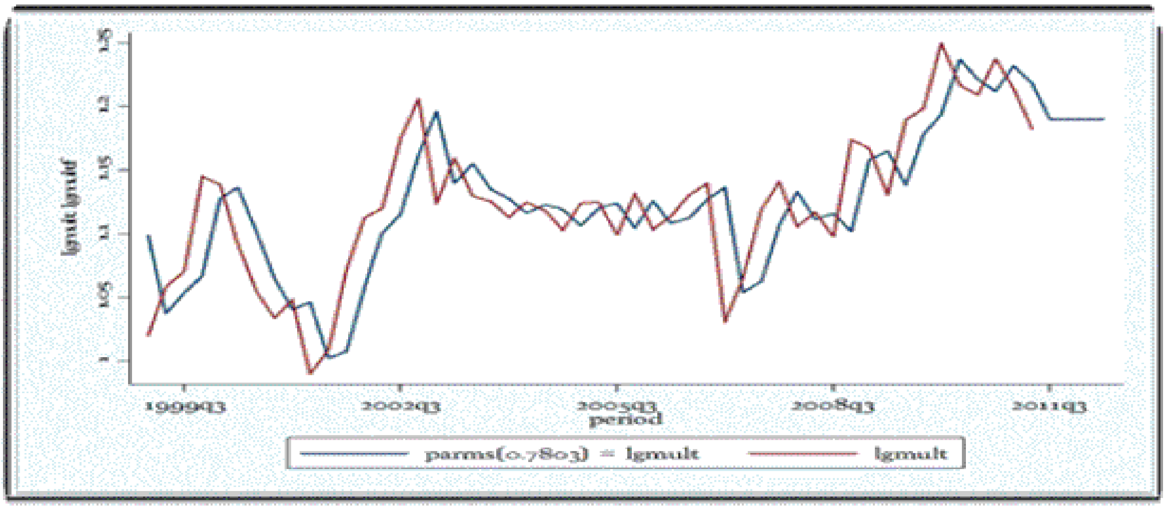


Figure 6.4b: Money Multiplier trend in Uganda



The concern on the efficacy of the money-targeting approach was increasing difficulty and the consequences of these prediction errors can be seen if we use the reserve money growth identity to decompose, *ex post*, the inflation error.

$$\pi - \pi^* = \left(\hat{B} - \hat{B}^*\right) + \left(\hat{Y}^P - \hat{Y}\right) + \left(\hat{V} - \hat{V}^P\right) + \left(\hat{k} - \hat{k}^P\right) \qquad (4)$$

Table 1 summarises the inflation decomposition to the various components as specified in the monetary aggregates targeting. Evidence points to the fact that inflation deviations from the annual targets has been largely due to the residual not because of monetary aggregates growth as argued by the monetary aggregates targeting. Money multiplier and money velocity have also been quite volatile with large prediction errors. Both M_2 and M_3 annual growth averages have been 23.3 and 22.3 percent, respectively between 2006/7 and 2011/12 but M3 and M2 velocities have declined by 20 per cent and 19 percent, respectively suggesting that broad money increases have been partly offset by the decline in velocity-leading to velocity crowding-out - rather than increase in nominal GDP.

One the major causes of the velocity decline is the increase in competitiveness within the banking sector that has led to higher credit. The resulting fall in the overall cost of financial intermediation for households and companies induced a substitution towards bank credit from alternative forms of finance, increasing the money supply for a given level of nominal spending. In particular, reforms in Uganda have both increased the monetary intensity of economic activity (thereby exogenously raising money demand) and supported a step-decline in inflation expectations. Failure to recognize this means excessive monetary restraint and excessively high domestic interest rates.

Table 6.1: Monetary Targeting and Prediction Errors

	Inflation error	Excess money growth	Prediction error in real GDP growth rate	Velocity deviation	Money multiplier deviation	Residual
2001/02	2.3	-4.5	-2.1	-0.7	-6.5	16.1
2002/03	-0.4	-9.0	0.0	-1.3	-24.1	33.9
2003/04	-0.8	9.0	-1.4	4.5	10.0	-23.0
2004/05	4.5	1.5	0.6	18.7	-2.6	-13.7
2005/06	2.1	0.7	-4.4	-13.2	-4.2	23.1
2006/07	2.2	2.8	-2.2	1.4	-0.2	0.3
2007/08	2.8	13.2	-1.8	-13.8	-14.6	19.7
2008/09	2.1	3.8	-1.3	-0.6	2.6	-2.5
2009/10	-3.8	-3.1	-0.9	-2.9	-6.4	9.4
2010/11	-1.0	5.2	-1.6	-0.9	-5.1	1.4
2011/12	17.5	-18.7	0.8	-0.9	-4.9	41.3
2012/13	-0.7	-7.6	-1.1	-0.8	-2.8	11.7

3.0 Inflation Targeting Lite Regime

The level of the CBR is set so that inflation will be close to the target within a period of about two years at the same time as inflation and the real economy should not show excessive fluctuations. The BoU also conducts monetary policy by buying and selling government securities in the secondary market thereby influencing the entire spectrum of the interest rates. This allows the BoU to influence aggregate spending that in turn translates into movements in output and inflation.

The key ingredient in monetary policy decision-making involves evaluating the future projection for inflation. This exercise makes it possible to evaluate the consistency between current monetary policy and expected price trends. Given the lag involved in inflationary pressures in Uganda's current, stable macroeconomic environment, the future of the business cycle and the main cost determinants must be evaluated before making monetary policy decisions. If inflation forecasts are indicating rising inflation, in the near term, monetary policy has to be tightened now and this could require a slower growth in aggregate demand and vice versa. But BOU's conduct of monetary policy aims at ensuring that the period of slower growth is not any longer than necessary.

Prior to October 2009, the BOU adhered closely to its money targets. Shocks to money demand thus generated substantial movements in interbank rates that did not signal policy intentions and which were often temporary and, as a result, had little effect on lending rates or other aspects of the transmission mechanism (Figure 5). Since October 2009 the BOU has allowed for more flexibility in daily money market operations in order to smooth short-term money market rates. This immediately reduced the volatility of interbank rates. In July 2011 the BOU officially launched the ITL regime and introduced the CBR to target the interbank rate. These changes to the policy framework and operations set the stage for changes in short-term interest rates (specifically the CBR) to have a larger impact on the economy.

Figure 6.5: Interbank interest rates trend

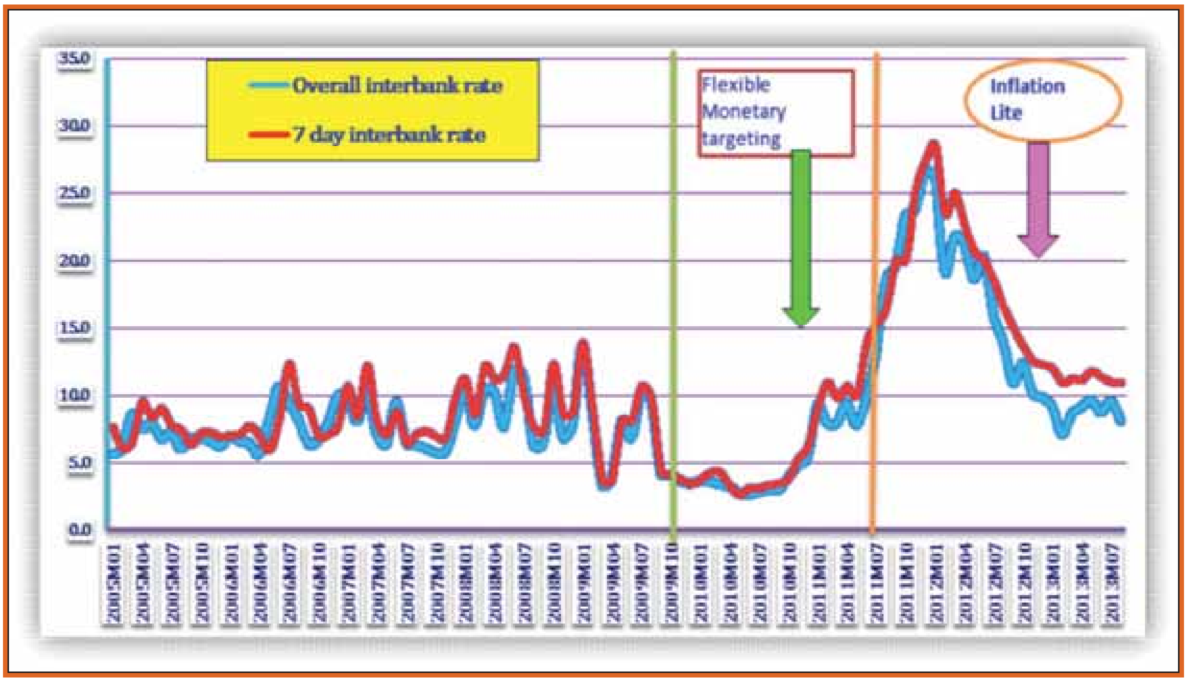
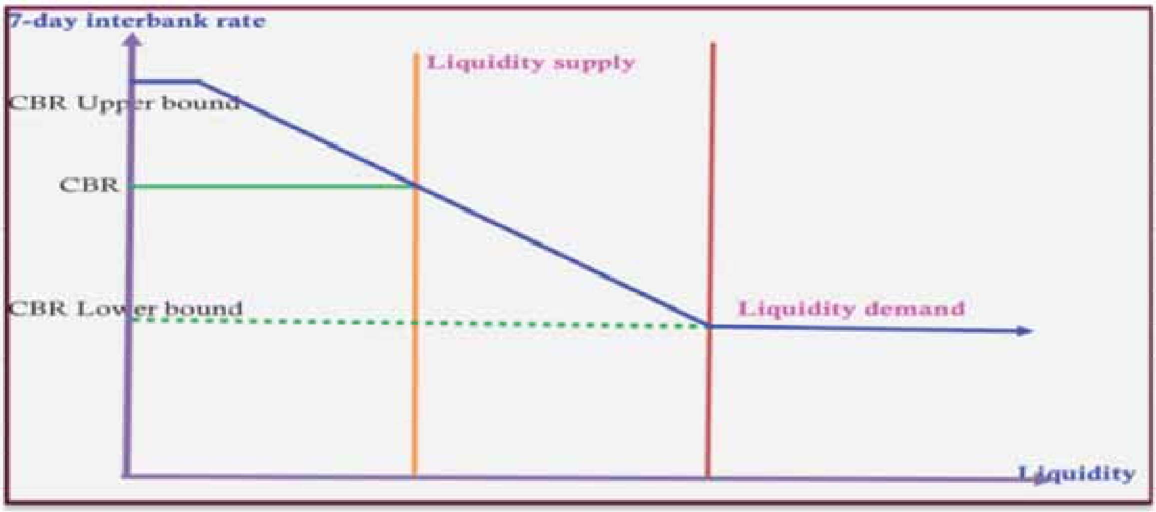


Figure 6.6: The corridor approach



There are four reasons underlying the decision. First, the relationship between base money and inflation and economic growth become increasingly unstable and even experiencing a reverse causality due to unstable money demand as well as uncertainty of money multiplier and money velocity behaviours. This instability limited reserve money programme usefulness as an indicator of the appropriate stance of monetary policy. For instance, money/income ratios had grown over time as a result of financial development and successful macroeconomic stabilisation: such changes were hard to predict since they tended to occur discontinuously. Demand for the shilling also often varied because of exchange rate developments and as a result, monetary growth was erratic and deviations from targets were not providing a useful guide for setting monetary policy.

Second, the signalling of monetary policy to the market and public had been hindered not only because of the difficulty in understanding base money for the public in general, but also due to perceptions of dual nominal anchor, i.e. the base money target and inflation target. Third, the monetary policy response tended to be backward-looking and more difficult to implement, considering a time lag between instrument and inflation target. Fourth, base money was more difficult to control due to the dominant role and unpredictable behaviour of currency demand. The main operating principle guiding the new policy is to control the supply of settlement balances of banks and motivate the banking system to target zero balances at the BoU, through an active inter-bank trading or transfer of balances at the BoU. This is aimed at engendering symmetric treatment of deficits and surpluses in the settlements accounts, so that for any bank, the cost of an overdraft at the Central Bank would be equal to the opportunity cost of holding a surplus with the Bank.

In particular, the shift from reserve money programme to ITL monetary policy framework resulted in designing the BOU's interventions in domestic money market to cope with the liquidity needs resulting from common shocks so that the interbank money market copes with the redistribution necessary to deal with idiosyncratic shocks, with the objective of stabilising 7-day interbank rates around the CBR. The monetary policy operational framework adopted in June 2011 is corridor system (Figure 6). The CBR is in the middle of the corridor, and to keep the 7-day interbank rate close to the CBR, the BOU adjusts liquidity supply so that the 7-day interbank rate on average remains within the bands. For the approach to be effective, the amount of liquidity supplied must be equal to what banks need for clearing purposes, in practice, an amount somewhat larger than zero. Then, if a bank runs a reserve balance deficit, there will be one or more banks with a liquidity surplus. The deficit bank wants to avoid using the BOU's lending facility and seeks to borrow the necessary amount of liquidity in the market (because it is cheaper). Similarly, any surplus bank wants to avoid using the BOU's repo facility and seeks to lend the money in the market (because it is more profitable). Hence both the deficit and the surplus bank have strong incentives to trade liquidity for a short duration. The point is that when the interbank rate is different from the interest rates on the BOU's refinancing facilities, the banks seek to avoid using these facilities-the "hot-potato problem"-if there is excess liquidity, no one wants to keep it, but pass it on (as a loan) to someone else. This approach can be effective only if BOU's focus is only on stabilising the interbank rate around the CBR.

Monetary policy implementation is about steering the short end of the yield curve, which, together with adequate communication, impacts on medium and long-term interest rates via the expectations hypothesis of the term structure of interest rates. By the BoU setting its policy rate and providing liquidity according to the implied liquidity needs of the financial sector, it steers the short term money market rates. The BoU actions anchor economic agents' expectations about the future path of other interest rates in the economy and subsequently, the monetary policy stance is transmitted through the money market yield curve and ultimately affecting other segments of the economy (Woodford, 2003). The CBR is the standard reference rate for the money market, which also serves as the benchmark for the pricing of government securities and determines interest rates charged by the commercial banks. In this regard, the interbank money market plays a crucial role for credit market conditions and interest rates and, hence, for the effectiveness of monetary policy and its transmission to the overall economy.

The ITL framework relies on the central bank interest rate to signal the policy stance taking into account the inflation forecasts and deviations from target. Obtaining sound inflation forecasts and communicating well with markets on interest rate decisions are therefore key ingredients to the framework. The role of the forecast is to inform the policymaking process. It provides a coherent view of the current state of the economy and the most likely trajectory expected to prevail during the policy horizon. The analysis is grounded on economic theory and facts while providing a view on alternative risk scenarios.

The BoU is tasked to establish a strong commitment to price stability (i.e. low and stable inflation). Given this commitment, and as far as possible in view of the uncertainties about the structure of the economy and external influences, the BoU tries to dampen cyclical output fluctuations, but only subject to the condition that inflation and inflation expectations are contained. The approach combines the advantages of credible rules-based behaviour (fostering predictability and credibility, avoiding the dangers of time-inconsistent behaviour) with those of discretion (flexibility in view of unforeseen shocks). The dual mandate notwithstanding, there is an asymmetry between inflation and output as goals for monetary policy. For inflation, the central bank can set a level (mean) and a stabilisation goal (variance). For output, at best, a stabilisation goal is feasible, as normal output is determined by the potential of the real economy. This point is firmly based on economic theory and structure.

The BOU’s policy framework is, in many respects, remarkably close to the views and principles expressed today by leading exponents of the international debate. While some important elements in the new framework are similar to the ideas and principles of inflation targeting, these ideas and principles have been adopted in a moderate and flexible form. To distinguish its concept from the ‘narrow’ inflation targeting approach and to stress the continuity of its policy, the BOU uses the term ‘Inflation Targeting ‘Lite’ to characterise the new framework.

The main features of the BOU’s framework are:

- Priority given to long-term price stability as a firm nominal anchor, with an explicit quantitative definition of what is meant by price stability.
- A medium-term orientation in the pursuit of this objective, giving scope for short-run flexibility to dampen real economic fluctuations.
- A forward-looking approach in the pursuit of its objectives, through the use of an inflation forecast as its main indicator.
- Flexible implementation of monetary policy, through the announcement of a target range for the 7 day interbank rate as an operational target.
- Transparency and accountability as central principles of a successful policy concept.

Beyond this, a clear communication of what the central bank can and cannot achieve increases the transparency of monetary policy and thereby augments its effectiveness. Moreover, it enhances the quality of public debates about monetary policy, including those relating to the potential for short-run stabilisation. Finally, the well-known existence of lags in the transmission of monetary policy impulses dictates that monetary policy must be forward-looking. In quarterly reviews of its monetary policy, the BOU publishes a forecast of inflation for the 1 to 2 following years. This inflation forecast plays an important role as the main indicator when making monetary policy decisions. If the inflation forecast indicates a move outside the price stability range, monetary policy needs to be reviewed. If the inflation forecast indicates a danger of deflation, it will consider relaxing it. The BOU, however, does not react in a mechanical way to the inflation forecast, but always takes into account the general economic situation in determining its policy reaction.

The published inflation forecast is based on the assumption that the BOU's chosen reference interest rate, the 7 day interbank rate, will remain constant over the forecasting period. The forecast is also based on an outlook scenario for the world economy. The inflation forecast is therefore conditional. It indicates the future course of prices under the assumption of specific economic conditions and an unchanged domestic monetary policy environment. For internal purposes, however, unconditional forecasts based on endogenous short-term interest rates are also investigated by the BOU. The two-year horizon corresponds to the time usually estimated to be necessary for a complete transmission of monetary policy impulses in Uganda. Forecasts over such a horizon are obviously subject to great uncertainties. The forecasts are based on a variety of indicators and the information provided by forecasting models including a small scale model of the Ugandan economy, different types of VAR and SVAR models as well as a Forecasting and Policy Analysis System (FPAS).

The analysis of money and credit indicators, especially with regard to the medium to longer-term inflation perspectives play a crucial role in the monetary policy decisions. Credit and money aggregates are important variables in the forecasting models which are employed to assess the price dynamic around the tail end of the inflation forecast horizon. In addition, as technical inflation forecasts beyond a three-year horizon are likely to be insufficiently reliable for practical use, the BOU carefully monitor the development of money and credit aggregates, as well as the exchange rate developments, and investigate their quality as potential indicators of inflation risks.

In this framework the main monetary policy instrument is the repurchase agreement (repo). The operational framework rests in steering of the interest rate at which the banks can finance the deficit or invest the surplus in their payment flows for 7 days, i.e. the 7-day interbank interest rate. The fact that the BoU can influence the interest rate on the interbank money market is mainly due to its ability to determine the terms for and scope of borrowing and lending at the BoU.

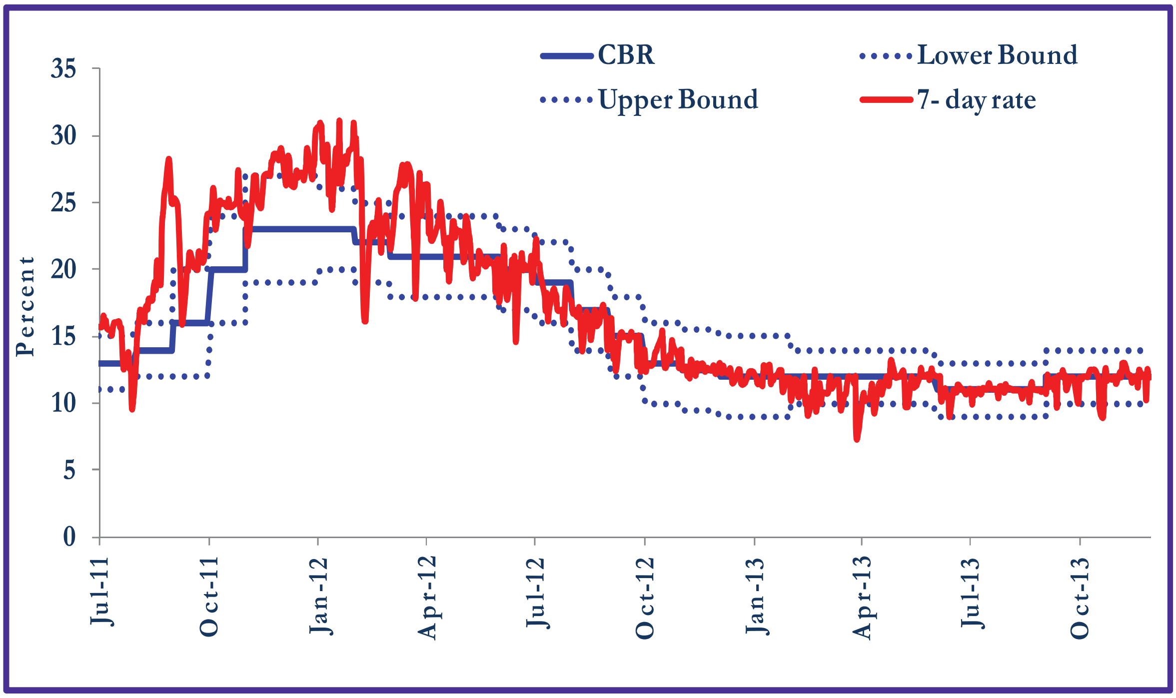
The mechanisms can be described as follows: The BoU influences the commercial banks' balance on their deposit accounts at the BoU by buying or selling securities. If the BoU wants the 7-day interbank rate to decline, it issues reverse repos. This is often described as providing the market with liquidity via open market operations. This increases commercial banks' total balance at the BoU and therefore results in the 7-day interbank rate to decline. BoU issues repos until the 7-day interbank is close to the CBR.

Through the steering mechanism, the BoU aims to keep the market rates at the short end of the yield curve, the 7-day rate, close to the Central Bank Rate (CBR). The 7-day rate in turn affects the interest rates faced by the general public, and thereby activity and prices in the economy. So, the CBR expresses the level at which the BoU wants the 7-day rate to lie. Interest rates with a slightly longer duration, for instance 3 months, are determined in the financial markets, partly by expectations of what the CBR will be on average during this period. Banks' lending rates to households and companies and interest rates on securities with different durations are affected therefore by both the actual and expected CBR.

In the slightly longer term there is greater uncertainty and it may be difficult to form an opinion of the future CBR. The long-term inflation expectations then play an important role. Here the central bank can mainly have an effect by conducting a credible monetary policy. Long-term interest rates are also affected by the economic outlook and by long-term growth. In this system, the 7-day interest rate is affected by how much the banks as a whole invest in the repos, i.e. how much liquidity the BoU is offering. One alternative would therefore be to describe the system according to its capacity to influence the quantity of money. The way this system is designed enables the BoU to quantify and steer towards a target for the 'monetary base', which includes the banks' balance on their accounts at the BoU. The resulting interest rate changes have an effect on inflation and output via many different channels.

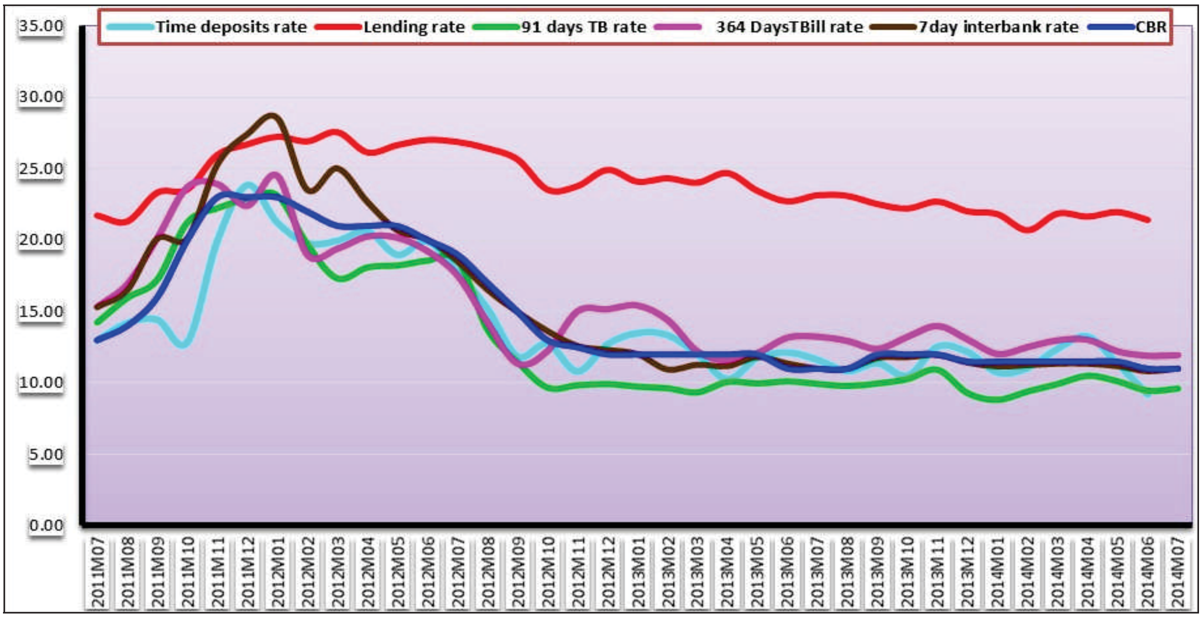
To judge the performance of this monetary policy framework so far, the first reflection should be whether the CBR has closely tracked (a) the 7-day interbank rates and (b) subsequently other interest rates since the main monetary policy instrument is the interest rate. Looking at Figure 7, it is clearly evident that the 7-day interbank rate has oscillated around the upper bound of the CBR and occasionally above the upper bound of the CBR. In the period to April 2012, because of the exchange rate depreciation concerns, BoU could not supply the required liquidity to bring the 7-day interbank rates around the CBR. From mid-2012 onwards, the 7 day rate has generally trended within the bands of the CBR. The trend of the 7-day rate is consistent with the monetary policy stance in the period since July 2011.

Figure 6.7: CBR and the 7-day interbank rate



As evident in Figure 8, trends in other interest interests, with exception of lending interest rates since the mid-2012, indicate response to the CBR. The changes in CBR implicitly means changes in the BoU's supply of funds to the interbank money market, which results in changes in the interbank interest rates. This in turn affects interest rates paid by commercial banks on deposits and those charged on loans, albeit to varying degrees. Commercial banks decisions regarding the interest rates paid on loans and deposits will eventually have an impact on the expenditure and investment behaviour of borrowers and deposit holders and thus real economic activity. Although, the time span is still short to warrant any meaningful causal analysis between the CBR and other macroeconomic aggregates, between June 2011 and March 2012, the correlation coefficients between the CBR and overall interbank rates, interest rates on loans and time-deposits, and 364-day Treasury bill yields were 0.91, 0.7, 0.89, and 0.85, respectively.

Figure 6.8: The link between Interest rates and CBR



The ultimate target of monetary policy is to bring down inflation and stabilize it around the 5 per cent in the medium term. In large part due to tight policy stance, core inflation has come down gradually, from a pick of 30.8 per cent in October 2011, to 3.3 per cent in May 2014 as shown in Figure 9.

Figure 6.9: CBR and Core Inflation

4.0 The Monetary Transmission Mechanism

4.1 Theoretical Aspects

The inability of monetary policy to boost economic activity in the long run, the importance of expectations, the benefits of price stability, and the time-inconsistency problem are the reasons that a credible commitment to a nominal anchor – i.e., stabilization of a nominal variable such as the inflation rate – is crucial to successful monetary policy outcomes. An institutional commitment to price stability via establishing a nominal anchor provides a counterbalance to the time-inconsistency problem because it makes it clear that the central bank must focus on the long-run and thus resist the temptation to pursue short-run expansionary policies that are inconsistent with the nominal anchor. Commitment to a nominal anchor can also encourage the government to be more fiscally responsible, which also supports price stability.

Commitment to a nominal anchor also leads to policy actions that promote price stability, which helps promote economic efficiency and growth. A credible commitment to a nominal anchor helps stabilize inflation expectations, which reduce the likelihood of "inflation scares," in which expected inflation and interest rates shoot up (Goodfriend, 1993). Inflation scares lead to bad economic outcomes because the rise in inflation expectations leads not only to higher actual inflation but also to monetary policy tightening to get inflation back under control that often results in large declines in economic activity. A credible commitment to a nominal anchor is therefore a crucial element in the successful management of expectations (Goodfriend and King, 1997; Clarida, Gali, and Gertler, 1999; Woodford, 2003). A successful commitment to a nominal anchor has been found to produce not only more-stable inflation but lower volatility of output fluctuations (Fatás, Mihov, and Rose, 2007; Mishkin and Schmidt-Hebbel, 2002, 2007).

Commitment to a nominal anchor can also help stabilize output and employment. Specifically, to counter a contractionary demand shock, the monetary authorities response is to reduce the short-run nominal interest rate; however, the effectiveness of such a policy action may be hindered if long-run inflation expectations are not firmly anchored. For example, if the private sector becomes less certain about the longer-run inflation outlook, then an increase in the inflation risk premium could boost longer-term interest rates by more than the increase in expected inflation. The higher inflation risk premium would place upward pressure on the real costs of long-term financing for households and businesses (whose debt contracts are almost always expressed in nominal terms) and hence might partially offset the direct monetary stimulus. Thus, a central bank commitment that firmly anchors long-run inflation expectations can make an important contribution to the effectiveness of its actions aimed at stabilizing economic activity in the face of adverse demand shocks.

One type of commitment that has received enormous attention in the literature is the Taylor rule (Taylor, 1993), which describes monetary policy as setting a policy rate in response to the deviation of inflation from its desired level or target (the inflation gap) and the deviation of output from its natural rate level (the output gap). Taylor (1993) emphasized that a rule of this type had desirable properties and in particular would stabilize inflation only if the coefficient on the inflation gap exceeded unity. This conclusion came to be known as the "Taylor principle" (Woodford, 2001) and can be described most simply by saying that stabilizing monetary policy must involve raising the nominal interest rate by more than the rise in inflation. In other words, inflation will remain under control only if real interest rates rise in response to a rise in inflation. Although, the Taylor principle now seems pretty obvious, estimates of Taylor rules, such as those by Clarida, Gali, and Gertler (1998), indicate that during the late 1960s and 1970s many central banks violated the Taylor principle, resulting in the "Great Inflation" that so many countries experienced during this period.

There is a large range of alternative reaction functions (that is, ways of adjusting interest rates in response to economic developments) that central banks can consider when setting monetary policy, of which the Taylor rule is just one. Ideally, the central bank would like to use the "optimal" reaction function – the one that most consistently produces interest rate outcomes consistent with keeping inflation within the target range. The relative merit of the different rules available is at the heart of recent international research in monetary policy. Many academics and central bankers have compared different policy rules and have identified strengths and weaknesses in each of them (Drew and Hunt, 2000). Often the Taylor rule is one of the options considered in this type of research. The research suggests that the Taylor rule usually does not provide the best way of deciding where to set interest rates for a given model of how the economy works. Usually there is another formula for setting interest rates that takes into account a broader set of information that is more helpful in controlling inflation rates and dampening economic fluctuations.

In identifying the optimal reaction function, the central bank needs to use a model of the economy as the best reaction function may depend on how different parts of the economy are related. However no one knows for certain which model is the right one to use in the analysis. In addition, the structure of the economy (and hence how it should be modelled) changes over time. This brings us to the issue of robustness. Because the merit of a particular rule for setting policy depends on the way the economy works, and because no one has complete understanding of how the economy works, it would be desirable to have a rule that performs well across a range of different conceptions of what drives economic activity and inflationary pressures and it seems that the Taylor rule goes some way to fulfil this robustness criterion (Levin, Wieland and Williams, 1999, 2001 and Taylor, 1999).

The original Taylor rule was backward-looking yet it is widely held that monetary policy needs to be forward looking to be most effective. Due to the lags inherent in monetary policy – evidence for Uganda suggests that monetary policy can take up to two years to have its full impact – central banks must think about where the economy is going in the future. When the central bank is forward-looking, it is more likely to be effective in preventing inflationary or deflationary pressures. On the other hand, its inputs are data on the recent state of the economy. Therefore, it is arguable that this makes the Taylor rule less useful for monetary policy purposes, given that it does not anticipate the future state of the economy.

The extent to which this is a problem depends on the length of the monetary transmission mechanism and the extent to which the current output gap and inflation provide a reliable guide to the future state of the economy. For example, the longer the monetary transmission lags is, the more forward looking monetary policy should be (Batini and Nelson, 2001, and Ha, 2000). Moreover, although the output gap at the time monetary policy is being formulated might be a guide to the future state of the economy (at the time when monetary policy decisions taken today have their full effect on the economy), monetary policy is more likely to be effective if it is based on a more extensive forecast of the future state of the economy – i.e. by reference to more than just the current output gap. The inability to forecast the future state of the economy with the current output gap and inflation helps to explain the limitations of the Taylor rule in some models. One way to limit the criticism that the Taylor rule is backward looking is to use forecasts of inflation and the output gap in the Taylor rule, so as to make the Taylor rule forward-looking. However, this would remove an advantage of the Taylor rule – that its inputs are based on relatively hard data – and would require the specification of a model of how the economy works so that inflation can be forecast.

It is worth noting that the rate of inflation and the level of the output gap both tend to be quite persistent. If inflation is low now, then it is likely to be low in the next quarter and the quarter after that. Similarly, if the output gap is positive now, then it is likely to remain positive for some time. This inertia means that current inflation and the output gap may not necessarily be bad predictors of future inflation and the output gap. In addition, it is difficult to find variables other than current inflation that contain information about future inflation. Therefore, using forecasts of inflation and the output gap may not make a big difference to the advice of the Taylor rule.

4.2 Monetary transmission using Structural Vector Autoregressive Approach

Empirically evaluating the efficacy of monetary transmission channels provides central banks with pertinent insight for better decision-making. Monetary transmission—the process through which monetary policy action is transmitted into the economy—remains a central matter of debate in macroeconomics. Unless policymakers know more about how monetary policy decisions influence macroeconomic variables such as aggregate output, employment, and consumer prices through the different channels of monetary transmission, they will always be facing greater uncertainty about the timing and effectiveness of policy actions and consequently in maintaining macro-financial stability.

The functioning of monetary transmission channels varies across countries due to differences in the extent of financial intermediation, the level of development of domestic capital markets, the degree of central bank autonomy, and each country's specific structural economic conditions. While there is ample theoretical and empirical literature on how monetary shocks affect macroeconomic aggregates in developed and emerging economies with well-functioning financial markets, the evidence in the context of SSA is quite limited. Accordingly, gathering evidence on the efficacy of monetary policy transmission remains a priority, especially in the aftermath of the global financial crisis, which has disrupted some channels of monetary transmission.

The transmission mechanism can be assessed through the impact of a change in the monetary policy rate on money market rates and commercial banks' interest rates (the interest rate channel) and on volumes of loans and bank deposits (the bank lending and money channels). The articulation of these two channels matters because loans supply hinges on the speed and size of the pass-through from policy interest rates to money market rates and bank interest rates. The pass-through from the central bank interest rate to commercial bank interest rates is expected to be positive, whereas the pass-through to lending and deposits volumes is expected to be negative because of the arbitrage with bonds. Their results highlight a positive pass-through to lending and deposit rates while banking volumes do not react. The impulse response results suggest that there is effective pass-through from the monetary policy rate to other interest rates, consistent with the existing literature.

Using a standard identification scheme and imposing minimal empirically-binding theoretical constraints on how monetary policy actions affect the real economy, we uncover plausible impulse response functions to structural shocks. We use three-month T-bill rate as the policy rate instead of the central bank policy rate. This is because CBR dates to July 2011 and the 91-day Treasury bill rate was used as reference rate for most of the period after financial sector liberalization.

4.2.1 Empirical methodology

The empirical analysis of the impact of monetary policy actions on economic activity is conducted using a SVAR framework. To determine the effects of monetary policy, we need to identify how macroeconomic variables respond to specific shocks and ascertain whether the propagation of monetary policy shocks evolves over time. The VAR approach pioneered by Sims (1980) provides an ideal instrument for forecasting exercises as well as policy analysis, especially in view of the problems induced by data constraints and structural changes. In a seminal paper, Blanchard and Quah (1989) utilized the VAR approach to analyze the source of business cycle fluctuations in the United States and illustrated the role of orthogonality restriction for the structural shocks using a bivariate model for the unemployment rate and the output growth where a demand shock cannot have long-run effects on the level of output. Along the same lines, there is a bourgeoning empirical literature using different VAR methods to investigate the impact of monetary policy actions on macroeconomic variables in advanced and developing countries.

The SVAR approach allows for contemporaneous feedback between variables, while imposing the minimal structural restrictions. An analysis of long-run, short-run, and contemporaneous relationships between monetary aggregates and key macroeconomic variables requires restrictions on the correlation structure of the residuals. In other words, identification focuses on the errors of the system that are interpreted as linear combinations of exogenous shocks presenting the effect of a unit shock of one variable on another variable. Different approaches can be taken to this task. One approach is the Cholesky decomposition together with the assumption that the contemporaneous relationships between the variables have a recursive structure, which results in a temporal ordering of the variables. Another approach uses the information given by the history of the variables through impulse response functions. A third possibility is to adopt restrictions according to the economic theory to identify the structural components of the error terms.

The SVAR framework helps model the relations between deviations of the variables from the respective expected values. The aim is to obtain the structural (orthogonal) components of the error term and to evaluate the implied impulse response functions of different models. For the validity of this approach, the variables need to be stationary.

Contemporaneous interactions considered in the SVAR model occur between deviations by Bernanke and Mihov (1998) in identifying monetary policy shocks in the case of the U.S. economy. Notwithstanding its many advantages, the SVAR framework is also subject to limitations. A widely recognized problem is that the estimation results are sensitive to the identifying assumptions; this sensitivity can lead to substantial variations in the estimated effects of monetary policy shocks and in their relative importance over the sample period. A popular restriction, used to identify monetary policy shocks, is that monetary policy has no instantaneous impact on output and inflation. While the assumption is appealing given the broadly held view that the effects of monetary policy take a considerable time to be felt, its use has been associated with a number of puzzles. For example, the price puzzle is the tendency of prices to increase temporarily after surprise interest rate hikes (Sims, 1992), while the exchange rate puzzle is the tendency of exchange rates to depreciate temporarily after a contractionary monetary policy shock (Grilli and Roubini, 1993).

The orthogonality assumption of the underlying shocks is somewhat restrictive because of the low dimension of many SVAR models. There are various approaches used in the VAR literature to identify orthogonal disturbances, but the most common methodology is the Cholesky decomposition, which assigns all correlations between orthogonal errors to the equation that is earliest in the ordering. The Cholesky decomposition presumes that a shock to a variable does not contemporaneously affect the variables that precede it in the ordering, but does affect them with a lag. Accordingly, given the sensitivity of the Cholesky approach to the ordering of variables, we use a model-based identification strategy to estimate the impact of the shocks. The restrictions applied in the SVAR to identify a monetary shock are that a contractionary shock increases interest rates, appreciates the exchange rate, and reduces output, inflation and the money supply.

Clarida and Gali (1994) use a long-run restriction—that a nominal shock would not affect the real exchange rate as an identifying strategy—in a three variable VAR, where all the variables are measured in differences so that all shocks are permanent. In this paper, we construct the confidence intervals by using the standard errors and the bootstrap procedure with higher accuracy as in Kilian (1998), through which the residuals are being resampled and a new equation is fit with the resampled residuals. The equation with the coefficients obtained by bootstrapping is used to determine the confidence intervals for impulse response functions from the SVAR model. Since short run or long-run identifying restrictions can be specified within pattern matrices, we employ a long-run identification scheme in terms of the *C* matrix, where the response of a specific variable to a specific structural shock is zero over the long run.

4.2.3 The benchmark SVAR Specification

The benchmark SVAR model that we use to analyze the effects of a monetary policy shock has the following representation:

$$Y_t = C + \sum_{k=1}^{n} A_t Y_{t-k} + \sum_{k=1}^{n} B_t X_{t-k} + u_t \quad \text{.......... (5)}$$

Where C is a vector of constant terms, Y_t is the vector of endogenous variables, and $X_t i$ is a vector of exogenous variables. A_t and B_t represent a matrix of coefficients, while u_t is a vector of innovations. Throughout this paper, the vector of exogenous variables contains the price of crude oil (*oilp*), trading partners' GDP proxied by the US real GDP (y_t^{US}), and the one year London Interbank Overnight interest rate (LIBOR):

$$X_t' = \left[oilp_t \ \mathrm{y}_t^{\mathrm{US}} \ libor_t \right] \quad \text{.......... (6)}$$

These exogenous variables are included in the empirical model to control for the changes in economic conditions in the global economy. The foreign variables are treated as exogenous in our empirical model. First, we consider a four-variable SVAR model of the joint dynamics of the following endogenous variables: real GDP (y_t), consumer prices (p_t), a broad measure of domestic credit (psc_t), and the domestic interest rate ($tb91_t$):

$$Y_t^{'} = \left[y_t \, p_t \, psc_t tb91_t exch_t \right] \quad \text{.......... (7)}$$

Since monetary developments have played an important role, the inclusion of a monetary aggregate could be helpful in identifying the channels of monetary transmission. Second, in addition to the main policy variables, we examine the effect of the exchange rate ($exch_t$) in the block of endogenous variables.

The SVAR isolates structural shocks by imposing restrictions on the long-run behaviour of the variables in the model, and these long-run restrictions are derived directly from the underlying economic models. We estimate the SVAR equations with only the CPI, as well as including both the CPI and the exchange rate. Accordingly, the vector of endogenous variables in our model can be written as:

$$Y_t^{'} = \left[y_t \, p_t \, psc_t tb91_t exch_t \right] \quad \text{.......... (8)}$$

In both cases, a monetary shock is identified through a contemporaneous, recursive system in which innovations are assumed to be orthogonal and the variables ordered as in Equation [3] and Equation [4], as outlined by Sims (1980), Sims and Zha (1998) and Christiano, Eichenbaum, and Evans (1999). The structural representation of the VAR describes the effects of exogenous shocks by the means of impulse response analysis according to:

$$\Omega Y_t^{'} = \Omega A(L) Y_t + B(L) X_t + \varepsilon_t \quad \text{.......... (9)}$$

where the matrix Ω denotes the contemporaneous relationship between the variables and $\Omega \varepsilon_t = u_t$, where ε_t denotes the vector of structural shocks, defined as a shock to a variable that is orthogonal to other shocks in the economy. Pre-multiplying with Ω^{-1} presents the relationship between the reduced form errors u_t and the structural shocks ε_t. For the purposes of our study, we denote the structural shocks $\left[\varepsilon^{y} \varepsilon^{p} \varepsilon^{psc} \varepsilon^{tb91} \varepsilon^{exch} \right]^{'}$ and base our identifying restrictions on the above-mentioned economic models and particular economic reasoning.

The identification of the relevant structural parameters, given the estimation of the reduced form, is the most traditional problem in econometrics and requires the imposition of some restrictions on the elements of Ω and *B*. A structural model is then identified by (i) assuming orthogonality of the structural disturbances; (ii) imposing that macroeconomic variables do not simultaneously react to monetary variables, while the simultaneous feedback in the other direction is allowed, and (iii) imposing restrictions on the monetary block of the model reflecting the operational procedures implemented by the monetary policy maker. According to Bagliano et al. (1998), in models estimated on monthly data, restrictions (ii) are consistent with a wide spectrum of alternative theoretical structures and imply a minimal assumption on the lag of the impact of monetary policy on macroeconomic variables, whereas restrictions (iii) are based on institutional analysis.

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ w_{21} & 1 & 0 & 0 & 0 \\ w_{31} & w_{32} & 1 & w_{34} & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} \times Y_t = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ w_{21} & 1 & 0 & 0 & 0 \\ w_{31} & w_{32} & 1 & w_{34} & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} A(L)Y_t + \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} (L)X_t + \begin{bmatrix} \varepsilon^{y} \\ \varepsilon^{p} \\ \varepsilon^{psc} \\ \varepsilon^{tb91} \\ \varepsilon^{exch} \end{bmatrix}$$

$$\begin{bmatrix} u^{y} \\ u^{p} \\ u^{psc} \\ u^{tb91} \\ u^{exch} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ w_{21} & 1 & 0 & 0 & 0 \\ w_{31} & w_{32} & 1 & w_{34} & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} \varepsilon^{y} \\ \varepsilon^{p} \\ \varepsilon^{psc} \\ \varepsilon^{tb91} \\ \varepsilon^{exch} \end{bmatrix} \quad \text{..........} (10)$$

We use a structural vector autoregressive (SVAR) framework with external variables as exogenous variables to control for external influence. These exogenous variables are assumed to have both contemporaneous and lag impact on the endogenous variables without any feedback effect. Further, in view of the limited number of variables which can be considered in the SVAR without losing degrees of freedom, each of the channels of transmission is examined only one at a time. This involves estimating a baseline SVAR model, which is augmented by the variables representing a particular channel of transmission each time separately.

The procedure for operating a straightforward SVAR involves a number of discrete steps. Firstly, we determine the order of integration of the variables. The next step involves estimating the reduced form VAR, ensuring that enough lags are incorporated to ensure no serial correlation from the residuals. An important aspect in specification of the VAR is the determination of the lag order of the autoregressive lag polynomial since all inference in the VAR model depends on the correct model specification. In several contributions, the effect of lag length selection has been demonstrated. Lutkepohl (1993) indicates that selecting a higher order lag length than the true lag causes an increase in the mean square forecast errors of the VAR and that underfitting the lag length often generates autocorrelated errors.

Braun and Miinik (1993) show that impulse response functions and variance decompositions are inconsistently derived from the estimated VAR when the lag length differs from the true lag length. Johansen (1991) and Gonzalo (1994) point out that VAR order selection may affect proper inference on cointegrating vector and rank. After the reduced form VAR is estimated we then impose sufficient restrictions to identify the structural parameters of the model. We use information criterion to determine the optimal lag length, p . The information criterion seeks to measure the closeness of an estimated model to the true data-generating process over the domain of the regresand(y). There are various other test procedures for the determination of the lag length and commonly used ones are: Akaike, the Schwartz and the Hannan-Quinn information criteria. Using Schwartz Criterion results, we obtain an optimal lag length of two for our VARmodel.

As further specification tests, a visual inspection of the univariate correlation functions for each variable indicates no sign of autocorrelation. Univariate and multivariate normality tests are performed on the residuals of each equation. Results of this analysis are presented in appendix. The joint Jarque-Bera test for residuals normality is not rejected at the 5% level. Moreover, the multivariate test shows that for the system as a whole normality is significantly accepted as well. Overall this is rather good evidence of a proper specification of the model in terms of the residuals.

Prior to analysing monetary policy identification issues, we perform several specification tests on the benchmark VAR. This is a preliminary but important step in the empirical analysis, since the reduced form of the system must be well specified (i.e. its residuals must be homoscedastic innovations and it must have constant parameters) to be validly used as a statistical framework for the formulation and testing of alternative structural hypotheses (Spanos (1990) and Hendry (1996) emphasize this point). We first look at the residuals from estimation of the five-variable system over the whole sample. Residuals from all equations generally seem not to exceed the ± 2 standard error bands, showing no serious departures from normality and homoscedasticity.

Since it has often been noticed that VAR systems estimated may display parameter instability in at least some equations (Bernanke and Mihov, 1995), we formally analyse the stability issue, using Quandt-Andrews structural break test.The Quandt-Andrews Breakpoint Test tests for one or more unknown structural breakpoints in the sample for a specified equation. The idea behind the Quandt-Andrews test is that a single Chow Breakpoint Test is performed at every observation between two dates, or observations, τ_1 and τ_2. The k test statistics from those Chow tests are then summarized into one test statistic for a test against the null hypothesis of no breakpoints between τ_1 and τ_2.

By default the test tests whether there is a structural change in all of the original equation parameters. From each individual Chow Breakpoint Test two statistics are retained, the Likelihood Ratio *F*-statistic and the Wald *F*-statistic. The Likelihood Ratio *F*-statistic is based on the comparison of the restricted and unrestricted sums of squared residuals. The Wald *F*-statistic is computed from a standard Wald test of the restriction that the coefficients on the equation parameters are the same in all subsamples. The individual test statistics are summarized into three different statistics; the Sup or Maximum statistic, the Exp Statistic, and the Ave statistic (see Andrews, 1993 and Andrews and Ploberger, 1994). The Maximum statistic is simply the maximum of the individual Chow *F*-statistics:

$$\text{MaxF} = \max_{\tau_1 \le \tau \le \tau_2} \left(F(\tau) \right)$$

The Exp statistic takes the form:

$$\text{ExpF} = 1\text{n}\left(\frac{1}{k} \sum_{\tau=\tau_1}^{\tau_2} \exp\left(\frac{1}{2} F(\tau) \right) \right)$$

The Ave statistic is the simple average of the individual *F*-statistics:

$$\text{AveF} = \frac{1}{k} \sum_{\tau=\tau_1}^{\tau_2} F(\tau)$$

The distribution of these test statistics is non-standard. Andrews (1993) developed their true distribution, and Hansen (1997) provided approximate asymptotic *p*-values. The test results are reported below and all three of the summary statistic measures fail to reject the null hypothesis of no structural breaks within the 127 possible dates tested.

Null Hypothesis: No breakpoints within trimmed data

Varying regressors: All equation variables

Statistic	Value	Prob.
Maximum LR F-statistic (1998M04)	5.156025	1.0000
Exp LR F-statistic	1.303673	1.0000
Ave LR F-statistic	1.952189	1.0000

Note: probabilities calculated using Hansen's (1997) method

Overall, the diagnostic tests yield no evidence of mis-specification, likely attributable to parameter instability.

4.2.2 Empirical results

The pass-through process from the BOU's policy rate is important for monetary policy, both from the point of view of price stability and from the financial stability perspective. Even if there are additional market and demand factors that affect the determination of commercial banks interest rates, as for example banking competition, size of banks, level of development of financial markets, and even aspects affecting each single customer or credit transaction, interbank interest rates are one of the main drivers of the rates charged by banks on loans. The BOU's policy rate affect the interbank rates, which are the basis of the process of defining the cost of money lent by banks to their customers, therefore they have effects on the behaviour of borrowers and consequently on the real economy. On the other hand, prices set by banks influence their profitability. It is clear that banks play an important role in the transmission of monetary policy, especially in a low income country like Uganda, where borrowers rely more heavily on the banking systems to raise funds.

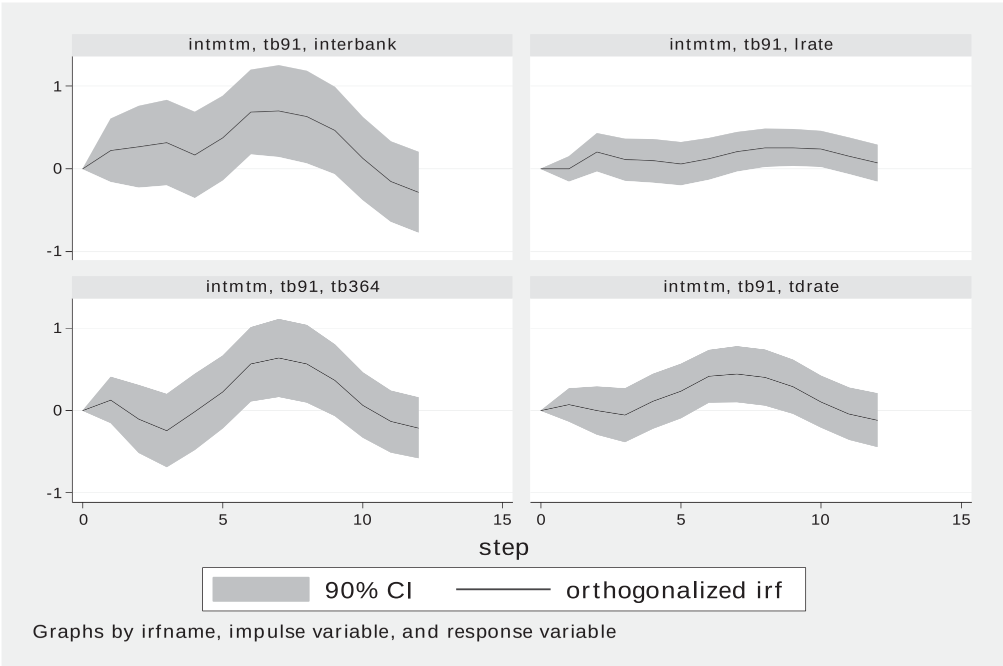
The price of bank loans is a key factor in determining final demand and consequently inflation in an economy. While the central bank policy rate has decreased, the cost of financing the real economy has continued to remain high and sticky downwards. In the short run, lending rates are sticky and so the degree of pass-through is less than one; in the long run the degree of pass-through is higher and, in some cases it may be complete. The adjustment of retail rates to changes in money market rates does need some time and does not occur instantaneously, as the immediate pass-through is smaller than the long-term pass-through. The transmission of monetary policy is also influenced by banks' characteristics, by the size of banks and their liability structure. The effect of monetary policy may be smaller when banks are constrained by regulatory requirements; even if monetary policy is eased, bank cannot expand credits since they can hardly raise new equity.

The size and the dynamics of the effect are highly dependent on the initial level and distribution of capital among banks. Intuitively, the reason is that the capital requirement affects bank behaviour more when bank equity is low. Adapting to changes in official interest rates may be delayed due to the presence of agency costs and customer switching costs. The heterogeneities in the degree of pass-through are related to the presence of structural breaks and discrete economic events. Heterogeneity in adjustments is also found to be linked to menu costs and key financial ratios under managerial control. This last aspect is of particular interest for the purposes of our analysis: it shows that under normal financial conditions short-run stickiness is higher for those rates on loans with higher credit risk. But when there is a high-volatility scenario, the pass-through increases considerably for all interest. Monetary policy becomes less effective as borrowers' net worth decreases: the effectiveness of expansionary monetary policy can also be weakened by the deterioration of borrowers' balance sheets, contributing to the long economic stagnation.

As expressed in Equation [10], output (y_t) and consumer prices (p_t) respond to shocks to domestic credit (psc_t), interest rates ($tb91_t$), and the exchange rate ($exch_t$). For example, in the case of a supply shock to output—the second equation in the above matrix, we allow consumer prices to respond contemporaneously. Similarly, the third equation can be interpreted as a short-run credit demand equation, with credit demand allowed to respond contemporaneously to shocks to output, consumer prices, and short-term interest. While the forth equation can be interpreted as the monetary policy reaction function, the last equation suggest that short-term interest rates and the exchange rate do not respond contemporaneously to other variables. All the variables are expressed in annual growth rate except for interest rates. To assess the overall dynamic impact of monetary policy shocks on real GDP and consumer price inflation, we estimate impulse response functions within the 90 per cent confidence intervals.

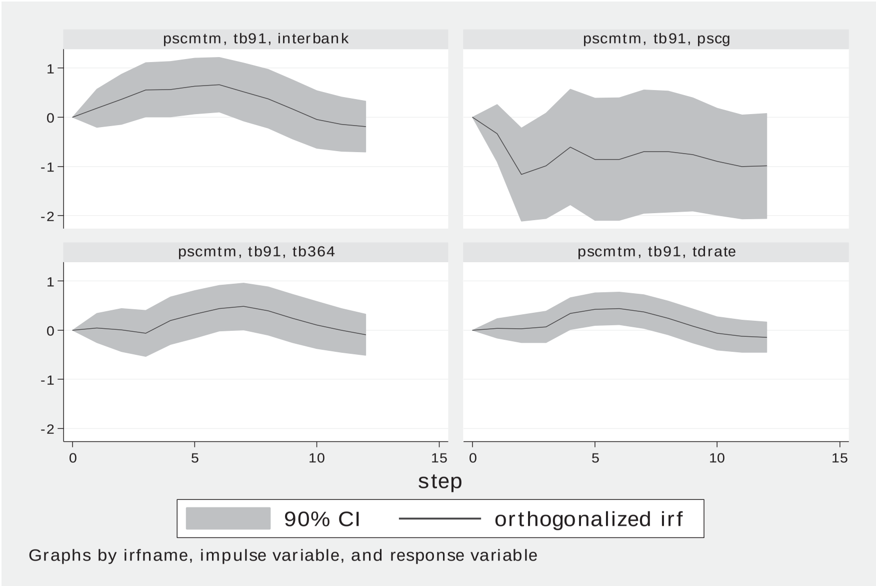
We first investigate whether monetary policy actions are transmitted to money market interest rates and other interest rates. The impulse responses are in Figure 10 and they indicate that monetary policy shocks are transmitted to interbank interest rates, yields on treasury bills time deposit and lending interest rates. The impact is at maximum after one year and half and dissipates after two years. As expected, the impact on interbank interest rates is immediate. The impact of monetary policy shocks on lending interest rates appears weaker, which reflect a variety factors that affect lending interest rates beyond the monetary policy.

Figure 6.10: Impulse responses for interest rates



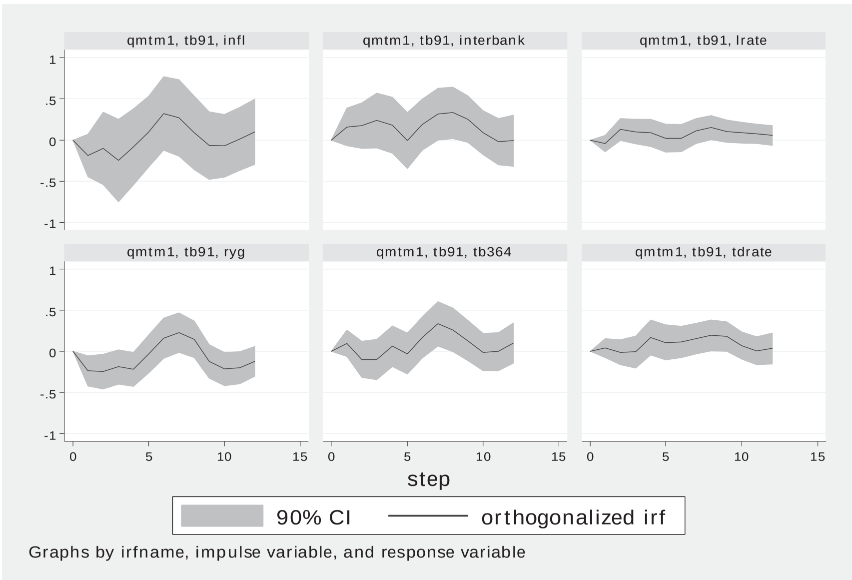
As an alternative formulation, we use private sector credit growth instead of the lending interest rates. The Impulse responses are in Figure 11. The impulse responses shows contraction of private sector growth in response to monetary policy tightening.

Figure 6.11: Impulse responses with private sector credit growth



In terms of the impulse responses for the full model as specified in equation 10, the impulse responses are in Figure 12. The impulse responses suggest that monetary tightening indeed cause a contraction in economic activities and also induce a reduction in inflation. On the other hand, contractionary monetary policy shocks lead a decline in bank lending and consumer price inflation, with the effect dissipating much more quickly. The contraction in economic activity and the decline in inflation are within a year.

Figure 6.12: Impulse responses with inflation and real GDP growth



4.3 Challenges to Monetary Policy Implementation

One of the main constraints of monetary policy transmission is underdeveloped domestic financial markets. The banking sector has expanded significantly over the past decade, but domestic financial markets remain shallow and constrained by structural impediments. Measured by the ratio of broad money to GDP, for example, the domestic money market is illiquid and, on average, compares unfavorably with those of other developing countries. As a result, the underdeveloped state of the domestic financial market has a bearing on not only interest rate and credit pass-through, but also all other channels of monetary policy transmission.

Uganda has ample scope to strengthen the effectiveness of monetary policy transmission mechanisms. Improved access to credit, as illustrated by the sustained increase in credit-to-GDP ratios over the past decade, appears to have contributed to the greater responsiveness of output to changes in interest rates. Likewise, the larger role of bank credit in financing economic activity implies a greater scope for bank lending effects. Nevertheless, there are still structural impediments, such as insufficient information on the credit quality of potential borrowers. The establishment of the credit bureau could help alleviate the problem of asymmetric information that tends to lead to higher financing premiums and limits financial deepening. Furthermore, the financial infrastructure in Uganda remains dominated by the banking sector. Therefore, the development of domestic debt markets in the form of corporate and sovereign—conventional as well as Islamic-bond issuance could be highly successful in accelerating policy reforms.

Fairly soon after the adoption of ITL, it was clearly evident that it is quite demanding to strike a balance between different monetary policy considerations in a small open economy. When the CBR was raised to restrain a pronounced rise in domestic inflation, it strongly impacted the exchange rate. The subsequent unsterilized BOU intervention in the FX market meant liquidity build-up, which, if prolonged, could weaken the monetary policy transmission mechanism. For ITL to remain effective, banks should remain in perpetual liquidity deficit so that CBR continues to be benchmark rate. In this case, the BoU would meet the permanently growing demand for liquidity by commercial banks through the outright repurchase of securities. The frequency of these operations should be naturally lower, and from the monetary-policy aspect they should not be applied in order to influence the dynamics of market interest rates. Furthermore, should the Government get more donor funds or oil receipts, the resulting base money expansion through the BoU's purchase of foreign exchange and accumulation of foreign exchange reserves will feed back into the money supply and this liquidity has to be sterilized if the interest rates channel is to remain effective. Otherwise, the resulting excess liquidity build-up will render CBR ineffective.

There are also structural impediments to monetary policy effectiveness. For instance, often, the effectiveness of money market operations has been limited by structural problem such as banks' own credit limits, lumpy and unpredictable liquidity injection by the Treasury, market size and developing financial intermediaries. It is therefore necessary to strengthen the BoU's liquidity management techniques emphasizing the mechanisms by which the BoU determines the scope of its interventions in order to maintain an appropriate level of liquidity in the economy.

5.0 Conclusions

The purpose of this study is to assess the effectiveness of monetary policy under the two monetary policy frameworks. There have been several significant changes in Uganda since the 1990s in the design and conduct of monetary policy. Broadly, there have been two significant changes in how Uganda conducts monetary policy: first, the move from fixed exchange rate regime to more flexibility, which allowed greater monetary independence. Second is the focus on price stability as the monetary policy primary objective. In most of the 1990s, monetary policy analysis worked on the assumption that the money supply was exogenously determined by the actions of the central bank in controlling the monetary base. Because banks must maintain a minimum level of reserve assets, the supply of base money restricted their deposit-holding to some multiple of this base, giving the BoU considerable leverage over monetary conditions. In the 1980s and early 1990s, this approach helped to anchor inflation, largely because inflation was due to monetisation of the fiscal deficits.

From 1993 until the introduction of ITL, BoU has sought to achieve the multiple objectives of monetary policy primarily through control of monetary aggregates at levels that are adequate to support the targeted rate of economic growth but avoid internal and external macroeconomic disequilibrium. The structure of Uganda's banking system has been undergoing rapid and fundamental changes since 1993 and this has had an impact on the conduct of monetary policy.

The BoU uses a mix of rules-based instruments and money market operations involving reliance on money market operations conducted in the interbank market, supplemented with reserve requirements that can be met on average over the period, and standing facilities. Overall the implementation of the ITL has yielded remarkable results. The greatest attributes of the ITL monetary policy framework are the fact that it is forward looking and manages inflation expectations through communication of the monetary policy stance. As a basis for setting CBR, a modified Taylor rule framework is useful. In this case, four issues need to be addressed. First, the formulation must be able to allow BoU to consider how far inflation forecasts will be away from the target so that the BoU can explicitly decide what policy actions to take now. Second, since exchange rate stability is cardinal, the BoU has to incorporate stabilisation of the exchange rate so as to determine its monetary policy actions. Third, it should provide positive real interest rate. Lastly, that rate which the BoU will decide on must be effectively rate which is transmitted to the short end, and in time, the longer end of the market yield curve.

This study employs structural vector autoregression to investigate the monetary policy transmission mechanism in Uganda. Structural analysis of the Monetary Transmission Mechanisms (MTM) is captured by the impulse response functions (IRFs), which are used to identify the dynamic interrelationships between policy variables/instruments and policy goals (e.g. inflation and output). The results indicate that monetary policy has been effectively transmitted to the whole spectrum of interest rates and to economic activity and inflation.

Overall, the BOU's monetary policy stance remains generally conditioned by the growth-inflation balance, the outlook for growth-inflation in a forward-looking context and an assessment of macroeconomic risks. Essentially, monetary policy aims at attaining strong growth in a non-inflationary manner. But at times growth in excess of potential growth could trigger inflation putting the sustainability of the very growth path to risk. Hence, monetary policy tends to perform a careful balancing act. In this context, the role of monetary policy has also come to the fore: the question being, to what extent has monetary policy played a role in the growth slowdown in recent past? Policy trade-offs are difficult. Raising policy rates may prevent excessive and inflationary currency depreciation and may sustain the financing of the current account deficit, but this undermines growth.

In conclusion, the efficacy of the monetary policy depends on the ability of the BoU to make an accurate assessment of the timing and the effect of the policy on economic activities and prices. Therefore, the BoU needs to have a clear understanding of the propagation mechanism of monetary policy shocks and the relative importance of the various channels in affecting the real sectors of the economy. In addition, in choosing an appropriate monetary policy framework in a changing economic and financial environment, the BoU needs to examine further the issues related to the ability to forecast inflation reasonably well over the medium term, the nature of transmission mechanism of monetary and exchange rate policies on inflation, the role of financial innovation and the stability of money demand, the nature of the trade-off between the attainment of inflation and other macroeconomic objectives, and the nature of shocks affecting the economy in the near term.

References

Aaron Drew & Benjamin Hunt, 1999. "Efficient simple policy rules and the implications of potential output uncertainty,"*Reserve Bank of New Zealand Discussion Paper Series G99/5, Reserve Bank of New Zealand*

AbebeAemro Selassie, Benedict Clements, ShamsuddinTareq, Jan KeesMartjn, and Gabriel Di Bella. 2006. 'Designing Monetary and Fiscal Policy in Low-Income Countries'. *Occasional Paper No. 250. International Monetary Fund, Washington DC*

Aksoy Y. and Leon-Ledesma (2005), "Interest Rates and Output In The Long Run", *European Central Bank Working Paper Series, No:434.*

Andrew Levin & Volker Wieland & John C. Williams, 2001. "The performance of forecast-based monetary policy rules under model uncertainty,"*Finance and Economics Discussion Series 2001-39, Board of Governors of the Federal Reserve System (U.S.)*

Andrew T.. Levin & Volker Wieland & John Williams, 1999. "Robustness of Simple Monetary Policy Rules under Model Uncertainty,"NBER Chapters, in: *Monetary Policy Rules, pages 263-318 National Bureau of Economic Research, Inc*

Antonio Fatás&IlianMihov& Andrew K. Rose, 2007. "Quantitative Goals for Monetary Policy,"Journal of Money, Credit and Banking, Blackwell Publishing, vol. 39(5), pages 1163-1176, 08.

Athanasios Orphanides, 2001. "Monetary policy rules, macroeconomic stability and inflation: a view from the trenches,"*Finance and Economics Discussion Series 2001-62, Board of Governors of the Federal Reserve System (U.S.).*

Ball L (2000), "Policy Rules and External Shocks" *NBER Working Paper No. 7910.*

Batini, Nicoletta, Peter Breuer, KalpanaKochhar and Skott Roger (2006) "Inflation Targeting and the IMF" *IMF Staff Paper, Washington DC, March.*

Benhabib J, Schmitt-Grohe and Uribe (2003), "Backward-Looking Interest Rate Rules, Interest Rate smoothing, and Macroeconomic Instability", *Journal of Money Credit and Banking Vol.35, No:6.*

Bernanke, Ben S., Thomas Laubach, Adam S. Posen and Frederic S. Mishkin (1999) Inflation Targeting: Lessons from the International Experience. Princeton, NJ: *Princeton University Press.*

Bernanke, B., and I. Mihov, 1998, "Measuring Monetary Policy," *NBER Working Paper*, No. 5145 (Cambridge, MA: National Bureau for Economic Research).

Berument, Hakan and HakanTasci (2004) "Monetary Policy Rules in Practice: Evidence from Turkey" *International Journal of Finance and Economics, 9:33-38.*

Berument, Hakan and KamuranMalatyali (2000) "The Implicit Reaction Function of the Central Bank of the Republic of Turkey" Applied Economics Letters, 7:425-430.

Batini, N and Nelson, E (2000). “When the Bubble Bursts: Monetary Policy Rules and Foreign Exchange Market Behavior”. Mimeo.

Blanchard, O., and D. Quah, 1989, “The Dynamic Effects of Aggregate Demand and Supply Disturbances,” *American Economic Review*, Vol. 79, pp. 655–673.

Blejer M., Leone A., Rabanal, P. and Schwartz, G. 2002. Inflation Targeting in the Context of IMF-supported Adjustment Programs, *IMF Staff Papers, Volume 49, No 3, International Monetary Fund, Washington DC*

Boratav, Korkut, OktarTürel and ErincYeldan (1995) "The Turkish Economy in 1981-92: A Balance Sheet, Problems and Prospects" *METU Studies in Development 22(1): 1-36.*

Borio, C. E. V., (1997), "The implementation of Monetary Policy in Industrial

Brainard W (1967), Uncertainty and Effectiveness of Policy, *American Economic Review, Vol 57, 411-425.*

Buiter, W. (2006) "Rethinking Inflation Targeting and Central Bank Independence" *paper presented at the Turkish Economic Association Conference, Ankara, September*

Calvo, G A (1983) 'Staggered Price in a Utility Maximizing Framework', *Journal of Monetary Economics, 12, 383-98*

Caplin A and Leahy J (1996), "Monetary Policy as a Search Process", *American Economic Review, 86(4), 689-702.*

Casares M and B T McCallum (2000) 'An optimization IS-LM framework with endogenous investment', *NBER wp no. 7908.*

CBRT (December 2005), "The General Framework of Inflation Targeting Regime and Monetary and Exchange Policy in 2006" *available on line at: www.tcmb.gov.tr.*

Christiano, L., M. Eichenbaum, and Evans, 1999, “Monetary Policy Shocks: What Have We Learned and to What End?,” in *Handbook of Macroeconomics*, edited by B. Taylor and M.Woodford, pp. 651–748 (New York: Elsevier).

Clarida, Richard &Galí, Jordi &Gertler, Mark, 1998 "Monetary Policy Rules and Macroeconomic Stability: Evidence and Some Theory,"*CEPR Discussion Papers 1908, C.E.P.R. Discussion Papers*

Clarida R., J. Gali and M. Gertler (1999): "The Science of Monetary Policy: A New Keynesian Perspective" *Journal of Economic Literature, Vol. 37, No. 4. pp. 1661-1707.*

Clarida, R, J Gali and M Gertler (1999) 'The Science of Monetary Policy: A New Keynesian

Conway P (2000), "Monetary Policy in an Uncertain World" *Bank of New Zealand Bulletin, Vol 63, No.3*

Crotty, James (2007) "If Financial Market Competition is so Intense, Why are Financial Firm Profits so High? Reflections on the Current 'Golden Age' of Finance" Paper presented at the Conference on "Financialization: in retrospect and prospect" *University of Manchester, February.*

Cukierman A (1996), " Why Does the Fed Smooth Interest Rates" in Beleongia (ed), Monetary Policy on the 75th Anniversary of Federal Reserve System, KluverAcedamic Publishers, Massachusetts

David H. Romer, 2000. "Keynesian Macroeconomics without the LM Curve,"*Journal of Economic Perspectives, American Economic Association, vol. 14(2), pages 149-169, Spring*

Drew A. and Plantier C.L. (2000), "Interest Rate Smoothing in New Zealand and Other Dollar Bloc Countries" , *Reserve Bank of New Zealand Discussion Paper Serious No:2000/10.*

Epstein, G. and E. Yeldan (2008) "Inflation Targeting, Employment Creation and Economic Development: assessing the Impacts and Policy Alternatives" *International Review of Applied Economics, 22(2): 131-144.*

Epstein, Gerald (Ed) (2005) Financialization and the Global Economy, *Edward Elgar Press*

Frederic Mishkin& Klaus Schmidt-Hebbel, 2002 "A Decade of Inflation Targeting in the World: What Do We Know and What Do We Need to Know?,"*Central Banking, Analysis, and Economic Policies Book Series, Central Bank of Chile*

Frederic S. Mishkin& Klaus Schmidt-Hebbel, 2007 "Does Inflation Targeting Make a Difference?," *NBER Working Papers 12876, National Bureau of Economic Research, Inc.*

Friedman, B. M., (1999), "The Future of Monetary Policy: The Central Bank as an Army with Only a Signal Corps?" *International Finance, 2:3.*

Friedman, B. M., (2000), "The role of interest rates in Federal Reserve Policymaking", *National Bureau of Economic Research, Working Papers 8047*

Fuhrer, J (2006) 'Intrinsic and inherited inflation persistence', *International Journal of Central Banking, 2, 3, 49-86.*

Fuhrer, J, Y K Kodrzycki, J Sneddon Little and G P Olivei (2009) 'The Phillips curve in historical context', in Fuhrer, J, Y K Kodrzycki, J Sneddon Little and G P Olivei (eds), Understanding inflation and the implications of monetary policy, *MIT.*

Gauti B. Eggertsson& Michael Woodford, 2003 "Optimal Monetary Policy in a Liquidity Trap,"*NBER Working Papers 9968, National Bureau of Economic Research, Inc*

Goodhard (1998), "Central Bankers and Uncertainty", *Keynes Lecture to the British Academy*.

Grabel, Ilene (1995) "Speculation-Led Economic Development: A Post-Keynesian Interpretation of Financial Liberalization Programmes in The Third World" *International Review of Applied Economics 9(2): 127-149*.

Greenspan A (2003), " Monetary Policy Under Uncertainty", Speech at a symposium sponsored by the Federal Reserve Bank of Kansas City, Jackson Hole, Wyoming.

Hebbel S. and Werner A. (2002), "Inflation Targeting in Brazil, Chile and Mexico: Performance, Credibility, and the Exchange Rate" *Central bank of Chile, Discussion Paper*.

Iris BiefangFrisancho-Mariscal& Peter Howells, 2010 "Interest rate pass-through and risk,"*Discussion Papers 1016, University of the West of England, Department of Economics*

Judd J. P. and Rudebusch D.G (1998), "Taylor's Rule and the Fed: 1970-1997", *FRB of San Francisco Economic Review No: 3*.

Karasoy, Almila, KursatKunter and Vuslat Us (2006) "Monetary Transmission Mechanism in Turkey Under Free Float Using A Small-Scale Macroeconomic Model" *Central Bank of the Republic of Turkey, Ankara, mimeo*.

Kilian, L., 1998, “Small Sample Confidence Intervals for Impulse Response Functions,” *The Review of Economics and Statistics*, Vol. 80, pp. 218–230.

Kozicki S (1999), "How Useful are Taylor Rules for Monetary Policy ? *Federal. Reserve Bank of Kansas City Economic Review, vol. 84, 5-33*

Krippner (2006), "The Financialization of the American Economy", *Socio-Economic Review,No: 3, 173-208*

Krugman, Paul, “It’s Baaack: Japan’s Slump and the Return of the Liquidity Trap,” BrookingsPapers on Economic Activity 1998:

Lars E.O. Svensson, 2000. "The Zero Bound in an Open Economy: A Foolproof Way of Escaping from a Liquidity Trap," *NBER Working Papers 7957, National Bureau of Economic Research, Inc.*

Lowe P and Ellis L (1998), "The Smoothing of Official Interest Rates", In Lowe P. (ed). *Monetary Policy and Inflation Targeting, Sydney: Reserve Bank of Australia*.

Marvin Goodfriend& Robert King, 1997 "The New Neoclassical Synthesis and the Role of Monetary Policy,"NBER Chapters, in: *NBER Macroeconomics Annual 1997, Volume 12, pages 231-296 National Bureau of Economic Research, Inc*

Marvin Goodfriend, 1993. "Interest rate policy and the inflation scare problem: 1979-1992,"*Economic Quarterly, Federal Reserve Bank of Richmond, issue Win, pages 1-24*.

Mccalum and Nelson (2004), "Targeting vs. Instrument Rules for Monetary Policy" *NBER Working Papers No. W10612*.

McKinnon, R. (1973) Money and Capital in Economic Development, Washington DC: *Brookings Institution*.

Mehra Y (2001), "The Taylor Principle, Interest Rate Smoothing and Fed Policy in the 1970s and 1980s", *Federal Reserve Bank of Richmond, Working Paper No 01-05*.

Mishkin, Frederic S. and Klaus Schmidt-Hebbel (2001) "One Decade of Inflation Targeting in the World: What Do We Know and What Do We Need to Know?" *NBER Working Papers, No 8397, July (www.nber.org/papers/w8397)*

Orphanides A and Wieland V and (1998), "Price Stability and Monetary Policy Effectiveness when Nominal Interest Rates are Bounded at Zero' *Finance and Economic Discussion Series, No.35 Board of Governors of the Federal System*

Osterholm, P. (2003), "The Taylor rule: a spurious regression?" *Working Paper 2003:20, Department of Economics, Uppsala University* Perspective', Journal of Economic Literature, 37, December, 1661-1707

Romer, P. (2002), "Keynesian Macroeconomics without LM Curve", *Journal of Economic Perspectives, Vol 14, No. 2, 149-169*

Rudd, J and K Whelan (2006) 'Can rational expectations sticky-price models explain inflation dynamics?', *American Economic Review, 96, 1, 303-320.*

Rudd, J and K Whelan (2007) 'Modeling inflation dynamics: a critical review of recent research', *Journal of Money, Credit and Banking', 39, 1, 155-170.*

Rudebush, G D (2002) 'Assessing nominal income rules for monetary policy with model and data uncertainty', *Economic Journal, 112, 402-32.*

Sack, B. (1998a) "Does the Fed Act Gradually? A VAR Analysis" Board of Governors of the Federal Reserve System, Finance and Economics Discussion Series, 98-17

Sack, B. (1998b) "Uncertainty, Learning, and Gradual Monetary Policy" Board of Governors of the Federal Reserve System, Finance and Economics Discussion Series, 98-34

Sack, B. and V. Wieland (1999) "Interest-Rate Smoothing and Optimal Monetary Policy: A Report on Recent Empirical Evidence." *Board of Governors of the Federal Reserve System, mimeo.*

Sawyer M (2010) 'Phillips' Curve, Independence of Central Banks and Inflation Targeting', in G Fontana, J McCombie and M Sawyer (eds) Macroeconomics, Finance and Money (London: Palgrave)

Setterfield, Mark (2006) "Is Inflation Targeting Compatible with Post Keynesian Economics?" *Journal of Post Keynesian Economics, 28 (4): 653-671.*

Shaw, E.S. (1973) Financial Deepening in Economic Development, New York: *Oxford University Press*

Sims, C., 1980, "Macroeconomics and Reality," *Econometrica*, Vol. 48, pp. 1–48.

Sims, C., 1992, "Interpreting the Macroeconomic Time Series Facts: The Effects of Monetary Policy," *European Economic Review*, Vol. 36, pp. 975–1011.

Sims, C., and T. Zha, 1999, "Error Bands for Impulse Responses," *Econometrica*, Vol. 67, pp. 1113–1155.

Sinclair, P. (2005) "The Transmission of Monetary Policy Through Interest Rates" , in How Monetary Policy Works (edited by Mahadava and Sinclair), Routledge, New York.

Stiglitz, Joseph (2000) "Capital Market Liberalization, Economic Growth and Instability" *World Development, 28(6): 1075-1086.*

Stiglitz, Joseph (2002) "Financial Market Stability and Monetary Policy" Pacific Economic Review 7(1):13-30.

Svensson, L E O (2003) 'Escaping from a liquidity trap and deflation: the foolproof way and others', *Journal of Economic Perspectives, 4, Fall, 145-166.*

Swensson, L. (2002), "What is Wrong With Taylor Rules? Using Judgement in Monetary Policy Through Targeting Rules" *National Bureau of Economic Research Working Paper 9421.*

Taylor, J (1980) 'Aggregate Dynamics and Staggered Contracts', *Journal of Political Economy 88, 1, 1-24.*

Taylor, J. (1993), "Discretion versus Policy Rules in Practice", Carnegie-Rochester Conference Series on Public Policy 39 pp 195-214.

Taylor, J. (1998), "A Historical Analysis of Monetary Policy Rules", *NBER Working Paper, No 6768*

Taylor, John B., 1999. "The robustness and efficiency of monetary policy rules as guidelines for interest rate setting by the European central bank,"*Journal of Monetary Economics, Elsevier, vol. 43(3), pages 655-679, June*

Us, Vuslat (2004) "Monetary Transmission Mechanism in Turkey under Monetary Conditions Index: An Alternative Policy Rule", *Applied Economics, 36:967-976.*

Us, Vuslat (2006) "Alternative Monetary Policy Rules in The Turkish Economy under Inflation Targeting Framework" *Central Bank of the Republic of Turkey, Ankara, mimeo.*

Woglom, Geoffrey (2003) "How Has Inflation Targeting Affected Monetary Policy in South Africa?" *The South African Journal of Economics, June, pp. 198-210.*

Woodford M (2003) Interest and Prices: Foundations of a Theory of Monetary Policy (Princeton: Princeton U P)

Woodford M. (2002) "Optimal Interest Rate Smoothing", Review of Economic Studies, Vol. 70 Issue.4, 861-886.

Woodford, M. (2001) "The Taylor Rule and Optimal Monetary Policy," *American Economic Review, Papers and Proceedings 91, 232-37*

Woodford, M. (2003) Interest and Prices, Princeton University Press, Oxford and Princeton

Yates, T (2004) 'Monetary policy and the zero bound to interest rates: a review', *Journal of Economic Surveys, 18, 3, 427-81*

Chapter 7

Empirical Analysis of the Effectiveness of Monetary Policy in Zambia

By Peter Zgambo and Patrick M. Chileshe

1.0 Introduction

The conduct of monetary policy in Zambia during the 1990s to March 2012 was exclusively based on the MAT framework. During this period, monetary policy helped to reduce inflation from the triple digits of the 1990s to current single digits. Other member countries in the COMESA region using the similar framework have also managed to lower inflation from higher levels to relatively lower levels in recent times. An assessment of the performance of monetary policy in Zambia under the MAT framework suggests that monetary policy has been effective, judging from the reduction in inflation rates from triple digits of the early 1990s to current single digits. However, firm conclusions about the effectiveness of monetary policy can only be deduced through a detailed empirical analysis that takes account of the underlying relationships between the monetary policy framework and monetary policy goals or objectives and outcomes. Such an analysis may also shed light on the motivation behind the Bank of Zambia's recent move to consider alternative monetary policy frameworks for the conduct of monetary policy.

The main objective of this paper is to empirically assess the effectiveness of monetary policy in Zambia. This is accomplished through the empirical examination of the money demand function and empirical analysis of the monetary transmission mechanisms. The rationale behind the adopted approach is to assess whether the money demand function exhibits the characteristics required for the success of monetary policy under a MAT framework as well as to assess the channels through which monetary policy is transmitted under such a framework. Based on the empirical findings, the study makes recommendations for an appropriate monetary policy regime that can be implemented in Zambia, and by extension in the COMESA region over the medium to long-term.

The rest of the paper is structured as follows: Section 2 discusses monetary policy implementation and economic performance in Zambia while the monetary policy framework is reviewed in Section 3. Theoretical literature review on the money demand function and monetary transmission mechanisms is presented in Section 4; empirical literature review on the money demand function and monetary transmission mechanisms is provided in Section 5. The empirical approaches used in the study are presented in Section 6 while Section 7 discusses the results of the estimated models. The paper ends with concluding remarks and recommendations in Section 8.

2.0 Monetary Policy Implementation and Economic Performance

Prior to the 1990s, the conduct of monetary policy in Zambia was driven by multiple objectives, which included the provision of cheap credit mainly to state owned enterprises and promotion of economic growth through various initiatives and incentives. In addition, monetary policy was used to finance the government's budget through borrowing from the central bank. During this period, monetary policy relied mainly on the use of direct instruments such as interest rate controls, directed credit allocation as well as core liquid assets and statutory reserve ratios. Reliance on direct monetary policy instruments was partly based on the prevailing economic paradigm which was dominated by the state, and the realisation by the central bank that it had little control over money supply since the banking sector was dominated by foreign banks that tended to issue loans to mostly foreign owned companies without regard to prevailing economic and financial conditions (Kalyalya, 2001).

Partly due to monetary policy's lack of clear focus, macroeconomic conditions deteriorated steadily during the period prior to the 1990s.The persistent use of the central bank to finance fiscal deficits as well as failure of the monetary authority to control money supply resulted in rising inflation (Bigstern and Mugerwa, 2000). The growing economic problems were compounded by internal and external imbalances as well as structural and institutional deficiencies. Domestically, price controls on most food items, widespread consumer subsidies, and the industrialisation strategy of import substitution coupled with weak public administration worsened the fiscal position and led to a highly inefficient allocation of resources. Externally, the country's balance of payment position became unsustainable following the loss of international reserves due to growing foreign debt servicing and dwindling export earnings resulting from falling copper prices and production volumes.

The combined effect of the factors noted above pushed the economy to a state of stagnation and near hyperinflation (Table 1). Annual economic growth fell from an average of 3.9% during 1961-65 to 1.1% during 1981-90. At the same time, external debt as a percentage of gross domestic product (GDP) rose from 49 to 119%. Inflation reached an average of 76.9% during the 1980s, and with negative real interest rates, the banking system started to lose its intermediation role and credit to the private sector declined relative to GDP.

The worsening economic problems led to discontent among the citizenry that culminated in elections in 1991 and the ushering in of a new Government. 1992 marked a new chapter in the nation's economy as the new government embarked on an agenda to restore economic growth through a series of economic reforms and policies aimed at creating a market-based economic system, driven by the private sector. Through the reforms, market forces were given a greater role in the allocation of resources as prices were decontrolled and most subsidies abolished. Other measures taken include the liberalisation of the foreign exchange market through the removal of exchange controls and the decontrolling of interest rates.

Table 7.1: Evolution of Key Monetary and Economic Variables

Indicator Name	1961-1970	1971-1980	1981-1990	1991-2000	2001-2010	2011	2012
Real Per Capita GDP Growth (annual % growth)	0.8	-1.9	-1.8	-1.7	2.8	3.6	4.0
Real GDP Growth (annual % growth)	3.9	1.5	1.1	0.8	5.6	6.8	7.3
Average Annual Inflation Rate	-	11.1	76.9	68.1	15.5	6.4	6.6
External Debt Stocks (% of GNI)	-	75.3	206.1	214.3	89.9	27.4	27.6
External Debt(% of GDP)	-	48.7	119.3	147.3	67.9	18.1	19.0
Total Debt Service (% of exports)	2.9	26.2	25.1	25.0	12.9	2.2	2.2
Total Reserves (% of total external debt)	-	10.1	2.8	2.8	23.1	47.0	56.5
Total Reserves (% of GDP)	18.6	7.1	4.5	5.0	9.1	12.1	14.7
Broad Money (% of GDP)	19.3	29.0	30.9	18.2	21.3	23.4	24.1
Broad Money Growth (annual % growth)	27.2	10.5	41.5	49.9	22.7	21.7	17.9
Real Interest Rate (%)	-	0.8	-15.5	3.1	11.3	5.6	5.6
Domestic Credit (% of GDP)	-0.3	41.9	63.9	59.6	28.2	18.1	18.5
Domestic Credit to Private Sector (% of GDP)	8.5	17.1	14.0	7.5	9.6	12.3	14.8
External Balance (% of GDP)	15.1	0.9	-1.7	-6.9	-2.4	9.0	-

Source: World Bank Database and Bank of Zambia database

Changes in the economic environment carried through to the conduct of monetary policy. The Bank of Zambia (BoZ) Act was amended in 1996, narrowing the central bank's objective to price and financial system stability. Consequently, monetary policy concentrated on creating a stable macroeconomic environment to support sustainable economic growth. The resultant institutional arrangement following the amendment of the BoZ Act was that the Bank was empowered to pursue appropriate monetary policy in support of sustainable economic growth. The inflation target was to be set by the Ministry of Finance in consultation with the Bank of Zambia. Once the inflation target has been set, BoZ had discretion to use monetary policy instruments at its disposal in managing liquidity conditions with the aim of achieving the inflation target. Under the new framework, BoZ started to target monetary aggregates, an approach premised on a strong and stable relationship between the ultimate target (inflation) and money supply.

The Bank also started to rely on indirect market-based monetary policy instruments in the conduct of monetary policy. These instruments included primary auctions of treasury bills and government bonds, as well as auctions of short-term credit and term deposits under open market operations (OMO). In addition, the Bank can use purchases and sales of foreign exchange as a tool of monetary policy as well as management of exchange rate policy. With these indirect instruments, the BoZ tried to influence the behavior of financial institutions and other market players through market mechanisms. This helped improve control of money supply and inflation and also promoted a more efficient allocation of credit and financial market development in general.

The change in the monetary policy framework and its implementation contributed to a marked improvement in Zambia's macroeconomic environment. Money growth and inflation declined sharply, with the latter being held in the single digits since 2006.The liberalization of lending and deposit rates initially caused real interest rates to spike, but they subsequently stabilised at about 5%. Moreover, real GDP growth steadily increased to an average of 6.6% during the period 2001 to 2012 from an average of 0.8% during 1991 to 2000 (see Table 1).

3.0 Overview of the Monetary Policy Framework

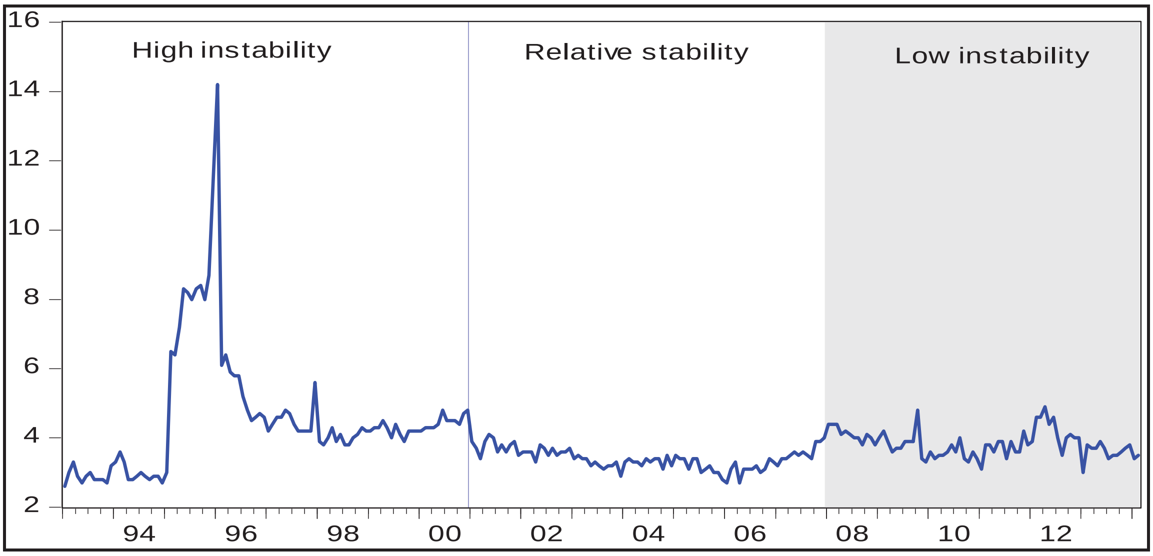
The MAT framework employed by Bank of Zambia to conduct monetary policy is based on the existence of a strong and predictable relationship between monetary aggregates and the ultimate monetary policy target, inflation. Literature developed around the role of money in monetary policy suggests that money can be useful in the conduct of monetary policy if it is used as an "information variable" and or as a monetary policy instrument or target. In this regard, money is useful as an information variable "if fluctuations in money provide relevant information about the current or future fluctuations in key macroeconomic variables that monetary policy seeks to influence, while as a target or policy instrument, money is useful if a given rate of growth in money is consistent with the desired level of inflation or output's rate of growth" (Friedman and Kuttner, 1982).

From the foregoing, it should be noted that for money to be useful as an information variable, it must provide important and systematic information about the future paths of key variables for monetary policy. Similarly, for money to be useful as a monetary policy target or instrument, it must have some relation with key macroeconomic variables such as inflation or output. The implication of this is that for a monetary policy framework based on money to be successful, there has to be a strong and reliable relationship between the monetary aggregate selected as the target or instrument and the ultimate target, which could be inflation or output.

In the case of Zambia, base money or reserve money has been used as the operational target in the conduct of monetary policy while broad money has been used as the intermediate target with inflation being the ultimate target. Reserve money represents the liability of the central bank, and its choice as the operational target is premised on the central bank's ability to control this liability. Reserve money is in turn linked to broad money through the money multiplier, which is assumed to be stable and predictable. In this regard, if the money multiplier is stable and predictable, the central bank could control the overall monetary conditions in the economy by keeping reserve money at a level that is consistent with desired broad money growth. The desired expansion of broad money should in turn be consistent with the inflation target.

A review of the money multiplier for Zambia depicted in the Figure 1 suggests that the money multiplier has not been particularly stable during the period of the MAT framework. Prior to 2000, the economy was characterized by general instability with relatively high growth rates in money supply and high inflation rates. This is partly reflected in the relatively high instability of the money multiplier. However, from about 2001 to around 2007, the money multiplier exhibits some relative stability. From around 2008 to the end of the sample period (February 2014), the stability of the money multiplier seems to be questionable.

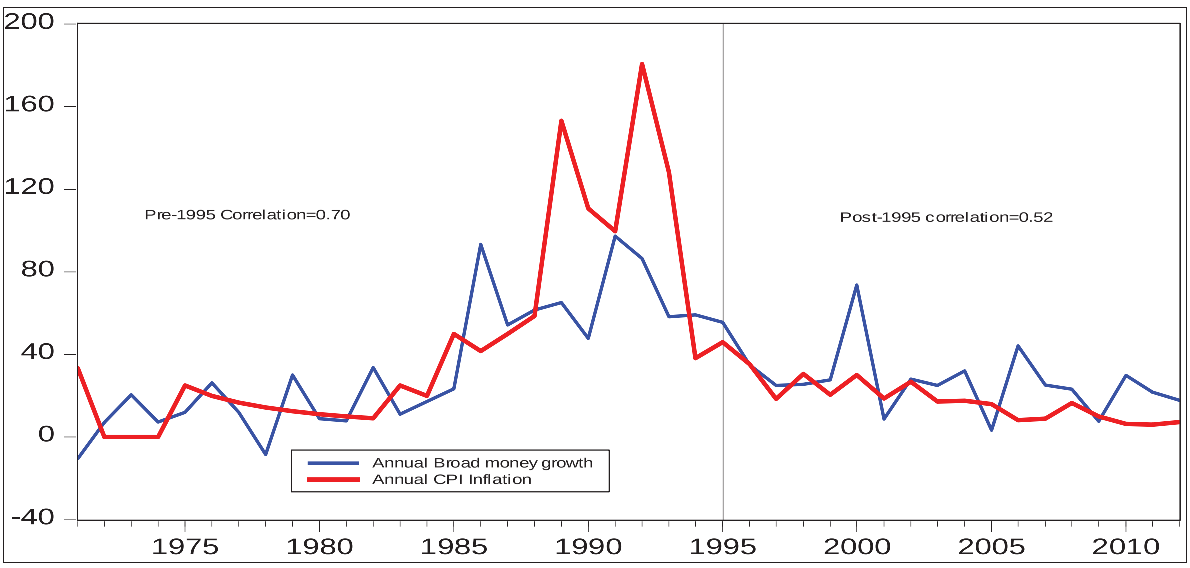
Figure 7.1: Money Multiplier



Source: Bank of Zambia

Another important requirement for successful implementation of monetary policy under the MAT framework is the existence of a strong and predictable relationship between the monetary aggregate selected as the intermediate target and the ultimate target of inflation. In the Zambian case, this entails that growth in broad money should be consistent with inflation. In other words, there has to be a strong positive relationship between growth in broad money and inflation for monetary policy to achieve the inflation objective.

Figure 7.2: Trends in Broad Money Growth and Inflation since 1971



Source: Bank of Zambia database and computations by authors

Figure 2 depicts the relationship between growth in broad money and inflation. From the Figure, it can be noted that prior to 1995, the relationship between growth in broad money and inflation was relatively stronger than during the post-1995 era. The weakening of the strength of the relationship between growth in broad money and inflation as reflected in the lower correlation coefficient in the post-1995 era entails that broad money has become a less reliable indicator of future developments in inflation and this presents a challenge to the conduct of monetary policy under the monetary aggregate targeting framework.

The relative instability of the money multiplier and the weakening relationship between broad money and inflation partly motivated the Bank of Zambia's recent move toward an alternative monetary policy framework. To this effect, the Bank embarked on modernising its monetary policy framework with the ultimate objective of adopting an inflation targeting monetary policy framework. The first step in the modernisation of the monetary policy framework was the introduction of the policy rate in April 2012.

One of the motivations for the introduction of the policy rate was to enhance market participants understanding of the monetary policy stance. Under a monetary aggregate targeting framework, it is usually difficult for market participants and other economic agents to understand the central bank's monetary policy stance as the monetary aggregates (reserve and broad money) used in conducting monetary policy may convey opaque signals. Hence, one of the main objectives for the introduction of the policy rate was to help the market understand the Bank's monetary policy stance. This is because price signals (interest rates) are better understood by the market than monetary aggregates. In this case, an increase in the policy rate is a clear indication of the tightening of monetary policy while a reduction in the policy rate signals the loosening of monetary policy.

Other motivations behind the need to modernise the monetary policy framework include strengthening of the monetary policy transmission channel, particularly the interest rate channel; reducing interest rate volatility, which tends to characterise monetary aggregate targeting frameworks; anchoring market expectations with regard to interest rates and inflation; and, promoting transparency in the way banks set the lending rates by making the policy rate the reference rate for pricing of credit products.

However, it should be noted that despite the weakening of the relationship between broad money and inflation, relative money multiplier instability and the need to modernise the monetary policy framework, monetary aggregates will continue to play a role in the conduct of monetary policy in Zambia.

4.0 Literature Review

4.1 Theoretical Perspectives on the Demand for Money

There are a number of theories on the demand for money. In the classical tradition, cash balances are held primarily to undertake transactions, and therefore depend on the level of income. However, this position was changed in the 1930s when Keynes postulated three motives for holding real money balances: transactions; precautionary; and speculative demand for money. Transactions and precautionary motives of the demand for real money balances follow the classical tradition in that it depends on the level of income while the speculative demand for money departs from the classical tradition by arguing that the demand for real money balances depend on the interest rates. Following Keynes liquidity preference theory, several authors have offered criticisms regarding Keynes rationale for a speculative demand for money and have contributed to the theoretical literature by distinguishing broadly between the transactions demand (Baumol, 1952; Tobin, 1956) and the asset motive (Tobin, 1956; Friedman, 1956). In general, all available theories portray that the demand for money depends positively on the real GDP and the price level due to the transactions motive while it is negatively related to interest rates due to the speculative motive as shown below:

$$M^{D} = f\left(Y^{(+)}, P^{(+)}, r^{(-)}\right) \qquad (1)$$

In real terms, the money demand function is often denoted as:

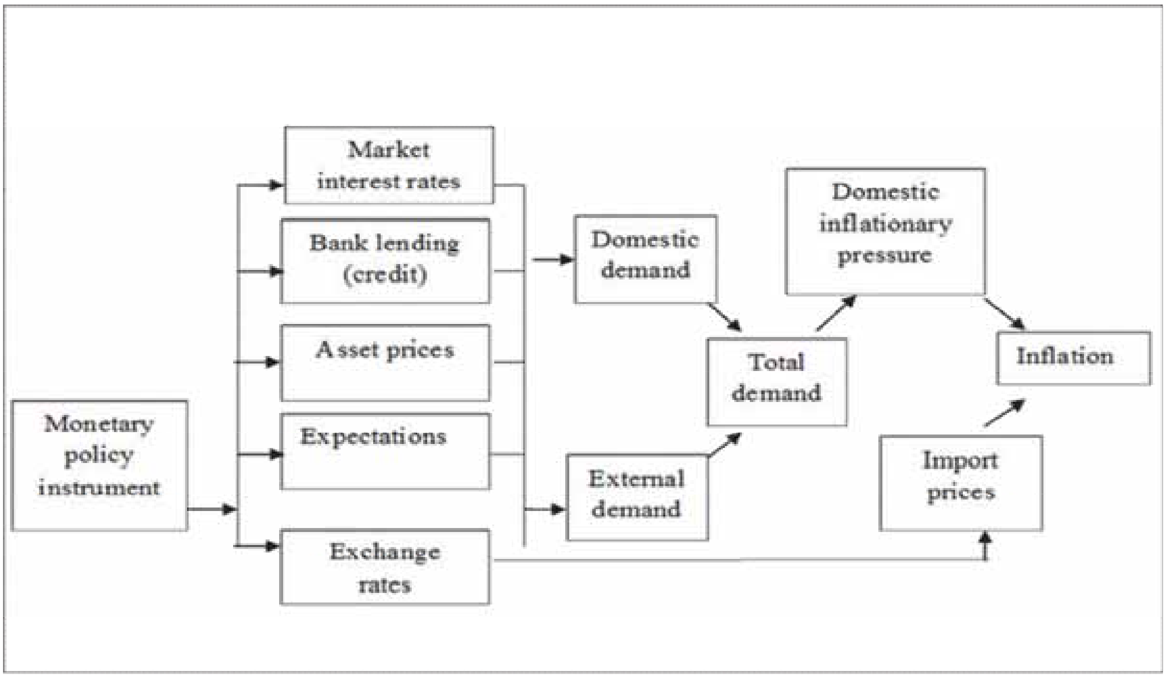
$$\frac{M}{P} = f\left(Y, r\right) \qquad (2)$$

Equation (2) is viewed as the liquidity preference and represents the desired level or long run real money demand function and assumes a unit elasticity of the nominal cash balances with respect to the price level. The unitary elasticity of the demand for money portrays the common argument in the monetarist literature that "inflation is everywhere and always a monetary phenomenon in the long-run" (Friedman, 1968). In this regard, monetary policy will only be effective in controlling inflation if there is a stable money demand function in the long-run. If money demand is stable, changes in money supply are closely related to prices and income, and hence it is possible for the central bank to control inflation through appropriate changes to money supply. On the other hand, if the demand for money function is unstable, changes in money supply are not closely related to prices and income and it becomes difficult to control inflation using adjustments in money supply.

4.2 Theoretical Perspectives on Monetary Policy Transmission Mechanisms

Monetary policy transmission is a process through which central bank actions are transmitted to real sector variables of inflation, output and employment (Taylor, 1995). Although the long-run neutrality of money view of the classical tradition is widely accepted, monetary policy is at least assumed to affect real variables in the short-run due to the Keynesian view of nominal sticky prices or due to wealth, income, liquidity and expectations effects (Dabla-Norris and Floerkemeier, 2006). Although there have been several channels of monetary policy transmission, literature seems to converge on five main channels namely; interest rate, exchange rate, bank lending, asset price, and expectations channels (Bank of England, 1999; Horvath *et al.*, 2006; Loayza *et al.*, 2002; Mishkin,1995; Obstfeld *et al.*,1995; Taylor, 1995). The monetary policy transmission mechanism can be graphically presented in the following manner;

Figure 7.3: Monetary Policy Transmission Channels



Source: Adapted from Loayza et al.(2002) and Bank of England (1999).

4.2.1 The traditional interest rate channel

According to the traditional interest channel, an increase in the money supply leads to a decrease in the real interest rate due to the Keynesian assumption of sticky prices. In earlier works of the Keynesian approach, this channel was thought to mainly operate through the investment channel but later theoretical and research works recognised that consumers' decisions about real estate and durable expenditure (spending on cars, own house construction and other durable goods) are also influenced by the real interest rate (Mishkin, 1995). Changes in the real interest rates induce economic agents to change their investment and consumption expenditure and thereby changing economic activity. This channel implicitly assumes that the central bank is able to influence long-term real interest rates through manipulation of short-term real interest rates. Mishkin (1995) notes that this suggests the expectation hypothesis of the term structure of interest rates holds true. The expectation hypothesis of the term structure states that the long-term interest rate is an average of expected future short-term interest rates, suggesting that lower real short-term interest rate leads to a fall in the real long-term interest rate. Ozsuca (2009) also notes that theoretically the interest rate channel also circumvent the zero interest bound. Expansionary monetary policy increases expected prices of goods and services and therefore lowers real interest rates, hence lower interest rates stimulates consumer spending. The Interest rate channel is often referred to as the hallmark of the "Money View".

4.2.2 The credit channel

The credit channel came into being as a result of dissatisfaction over the effects of monetary policy explained through interest rate effects on durables expenditure and investment. The credit channel explains the impact of monetary policy via the effects of informational asymmetry between the lender and the borrower (Mishkin, 1995). The credit view proposes that as a result of these informational asymmetries, two channels of monetary transmission arise: those that operate through the effects on bank lending as well those that affect the firms' and households balance sheets. The bank lending channel is based on the assumption that financial intermediaries are best suited to solve problems of informational asymmetry in credit markets while the balance sheet channel is based on the effects of monetary policy on the net worth of firms and hence their collateral (Simatele, 2004).

The bank lending channel operates through the quantity of loans supplied by the commercial banks to firms and households. As Dabla-Norris and Floerkemeier (2006) notes "The bank lending channel operates via the influence of monetary policy on the supply of bank loans, that is, the quantity rather than the price of credit". An expansionary monetary policy increases excess reserves in the banking system. This makes loans available to bank dependent economic agents to increase. Increased supply of loans makes it possible for bank dependent economic agents to increase investment as well as consumption spending which result in increased economic activity. This channel is likely to be more effective in economies where there are many small firms with little capacity to raise capital on stock markets. Further, an under-developed capital markets as is the case in most developing or underdeveloped economies makes the bank lending channel stronger.

Due to asymmetric information in financial markets, the role played by commercial banks as financial intermediaries becomes important and thus comes in the balance sheet channel (Tahir, 2012). Existence of asymmetric information gives rise to moral hazard and adverse selection. As Mishkin (1995), Tahir, (2012) and Bernanke and Gertler (1995) emphasis that banks have a comparative advantage in assessing the balance sheets of borrowers and hence help in mitigating adverse selection as well as moral hazard. Under the balance sheet channel, there are several ways through which monetary policy affect the balance sheets of economic agents and hence the occurrence of moral hazard and adverse selection.

Expansionary monetary policy affects the net-worth of firm through an increase in stock prices as described earlier. Further, expansionary monetary policy which reduces interest rates reduces the debt servicing burden of firms and households. This improves the cash flow of firms and thereby enhances their chance of accessing loans from banks. The improvement in the balance sheets of households and firms due to expansionary policy reduces the possibility of moral hazard and adverse selection. All this brings about an increase in borrowing resulting in increased consumer spending and investment, and consequently economic activity. It is important to emphasise here that all the other channels operate mostly through the credit channel.

4.2.3 The exchange rate channel

The exchange rate channel is one of the primary transmission channels of monetary policy in open economies, especially those with flexible exchange rate regimes. Monetary policy can influence the exchange rate through interest rates (the popular uncovered interest rate parity condition), direct intervention in foreign exchange markets or through inflationary expectations (Dabla-Norris *et al*., 2006). In this channel, monetary policy affects economic activity (output) through net exports. This link between monetary policy and exchange rate under the uncovered interest parity (UIP) condition were popularised by the open macroeconomic models developed independently by Fleming (1962), Mundell (1963), and Dornbusch (1976). Under the UIP assumptions, the difference between interest on domestic financial assets and foreign assets is equal to the expected change in exchange rates.

The change in exchange rate as a result of monetary policy action in these models affects both aggregate demand and aggregate supply. On the demand side, expansionary monetary policy which reduces interest rates makes the local currency to depreciate as investors divest from the local market to invest in foreign markets. The real depreciation of the currency makes the country's exports cheaper compared to foreign produced goods. This results into an increase in the net exports and hence stronger aggregate demand leading to an increase in output (Obsfeld and Rogoff, 1996; Taylor, 1993; Mishkin (1995, 2001); Loazya and Schmidt-Hebbel, 2002). However, on the supply side a real depreciation of the currency raises the domestic prices of imported goods, which directly increases domestic inflationary pressure through the so-called exchange rate pass through (Ozdogan, 2009; Loazya and Schmidt-Hebbel, 2002; Alper 2003; Campa and Goldberg, 2004; Kara *et al*., 2005). Moreover, the higher prices of imported inputs contracts output and increases prices (Loazya and Schmidt-Hebbel, 2002).

The extent of the exchange pass-through to domestic price, hence overall inflation, depends on the level of the country's dependence on imported consumer and intermediate goods, the magnitude and timing of the appreciation, as well as macroeconomic environmental (Alper, 2003; Campa and Goldberg, 2004; Kara *et al*., 2005). The exchange rate channel also operates through the effect of monetary policy on the international competitiveness of exports and import competing goods (Dabla-Norris and Floerkermeier, 2006). Expansionary monetary policy which lowers interest rates leads to a real currency depreciation making domestically produced exports cheaper on international markets resulting in increased demand for them and more output and vice versa. Furthermore, the effects of monetary policy on the exchange rate may exert significant effect on the balance sheets of households and firms which change the net-worth and debt-service ratio. These changes affect the borrowing and spending patterns of economic agents, especially for highly dollarized countries (Dabla-Norris and Floerkermeier, 2006; Kamin *et al.*, 1998).

The strength of the exchange rate channel is affected by several factors such as the exchange rate regime, sensitivity of the interest rates, the size and openness of the economy, degree of capital mobility and the degree of expenditure switching between domestic and imported goods (Boivin *et al.*, 2010;Mishra *et al.*,2010; Tahir, 2012).

4.2.4 The asset price channel

Monetary policy affects asset prices such as bonds, equity and real estate, changing firms' stock market values and household wealth. Changes in stock market values and household wealth in turn affect aggregate demand. The asset price channel of monetary policy transmission is assumed to operate through two mechanisms namely; the Tobin's (1969) Q-theory of investment and Ando-Modigliani (1963) life cycle theory of consumption. Although monetarists and Keynesians arrive at the same conclusion of how these views work, they disagree on how monetary policy affects equity prices (Afandi, 2005). The Keynesians argue that the fall in interest rates following monetary expansion makes bonds less attractive to investors relative to equities, thereby making the prices of equities to increase and vice versa. On the other hand, the monetarists believe that expansionary monetary policy affects equity prices through an increase in the demand for equities as economic agents find themselves with excess liquidity which they can use to invest in equities, given their short-run supply, prices increase (Mishkin, 1995).

The asset price channel that works through the Tobin's Q (1969) theory of investment relies on the effect of monetary induced changes in equity prices on the Tobin's Q. James Tobin (1969) defined the Q as the ratio of the market value of a firm to the replacement cost of capital owned by that firm. This ratio is a summary measure of one important impact of financial markets on purchases of goods and services (Afandi, 2005). Tobin (1969) argues that although in equilibrium the Q has a normal value equal to one, which sustains capital replacement and expansion at the natural rate of economic growth, in reality the Q often exceeds one by the capitalised value of monopoly profits and rents. In the short-run, the Q changes as a result of random events, policies and expectations which create or destroy incentives for capital investment. Amongst these is monetary policy.

Thus, the Tobin's view of the asset channel works as follows. Expansionary monetary policy increases the demand for equities (either by the Keynesian or Monetarist argument), raising equity prices and thereby boost market value of firms relative to the replacement cost of capital. This will result in increased investment and therefore output. Furthermore, higher equity prices also raise the net-worth of firms and households and hence improve their credit worthiness and access to funds, the effects of which would partly reflect the balance sheet channel of monetary policy (Afandi, 2005).

On the other hand, in the Ando-Modigliani life cycle model of consumption monetary policy changes affect the economic agents' long-term wealth and therefore, alters their consumption pattern. The basic premise of Ando-Modigliani theory is that consumers smooth out their consumption over time and this consumption depends on lifetime resources and not only current consumption (Mishkin, 1995). Expansionary monetary policy which lowers interest rates changes consumers' portfolio composition in accordance with the risk of each asset class. In this case, a decrease in the interest rates encourages people to reduce their holding of interest earning deposits and bonds and substitute them with equity/stocks, thereby increasing stock prices (Afandi, 2005). Given that a major component of wealth is in common stocks, the increase in stock prices increases their wealth resulting in higher consumption expenditure and hence output.

Although Tobin's Q theory of investment and Ando-Modigliani assume that monetary policy affects the prices of stocks and bonds, Meltzer (1995) takes a wider view of the impact of monetary policy on various asset prices. He contends that the short-term nominal interest rate is not the only mechanism affected directly by monetary policies. Monetary policy actions affect the markets for durable goods, real estate, equities, and financial assets along with interest rates. Changes in all of these asset prices affect aggregate demand and output. Tahir (2012) notes the following factors as the key determinants of the asset price channel: the participation of households in the capital market; the generation of funds by firms through issuance of shares; and the level of development of the national stock market. This is confirmed by Kamin et al. (1998) and Butkiewicz and Ozgdogan (2008) who notes that the asset price channel in developing and emerging markets is weak and more unpredictable compared to developed economies due to shallower and uncompetitive markets as well as highly unstable macroeconomic environments.

4.2.5 *The expectations channel*

Since the early years of modern macroeconomics, expectations have been acknowledged to influence the behaviour of economic agents. For example, Keynes (1936) in his General Theory comments "…the behaviour of each individual firm in deciding its daily output will be determined by its *short-term expectations* — expectations as to the cost of output on various possible scales and expectations as to the sale-proceeds of this output; though, in the case of additions to capital equipment and even of sales to distributors, these short-term expectations will largely depend on the long-term (or medium-term) expectations of other parties". Economists generally agree that expectations are important in influencing economic activity, but they differ on how these expectations are generated. Friedman and other monetarists, postulate adaptive expectations while the new classical school lead by Lucas and the New Keynesian School argue for rational expectations.

Since economic agents are forward looking and rational, the expectation channel is in effect fundamental to the working of all channels of monetary policy transmission. Empirically, this channel is mainly operational in developed economies with well-functioning and deep financial markets (Davoodi *et al.*, 2013). For example, if economic agents expect future changes in the policy rate, this can immediately affect medium and long-term interest rates. Further, monetary policy can be used to influence expectations of future inflation and thus influence price developments. Inflation expectations matter in two important areas. First, they influence the level of the real interest rate and thus determine the impact of any specific nominal interest rate. Second, they influence price and money wage-setting behaviour and feed through into actual inflation in subsequent periods. Similarly, changes in the monetary policy stance can influence expectations about the future course of real economic activities by affecting inflationary expectations and the ex-ante real interest rate and guiding the future course of economic activities.

5.0 Empirical Review

5.1 Empirical Literature on the Demand for Money

Empirical literature on the money demand function has been in existence for long time, elsewhere. However, in the sub-Saharan Africa region empirical studies on the demand for money started to emerge following significant economic reforms undertaken in these countries focusing on establishing the impact of the financial sector reforms on the stability of the money demand function. Generally, it is argued that economic reforms especially those focusing on the financial sector have significant impact on the money demand function with important consequences for monetary policy effectiveness under a monetary targeting framework.

In a monetary aggregate policy framework, the stability of the demand for money function is crucial for the for monetary policy formulation. This is because it enables a policy driven change in a monetary aggregate to have a forecastable influence on aggregate demand, interest rates and prices (Sriram, 1999). Thus, any reforms with fundamental impact on money demand will affect the effectiveness of monetary policy. In this regard, a number of studies have been done to ascertain the impact of financial reforms on the stability of the demand function with varied results; a few of these studies are reviewed.

Ogunsakin and Awe (2014) investigates the impact of financial sector reforms on the stability of the money demand function in Nigeria. They estimate a parsimonious error correction model (ECM) which include real broad money balances; inflation; exchange rate; foreign interest rates; savings deposit rate; treasury bill, and a dummy for post-liberalisation era. They find that the significant determinants for money demand in Nigeria are inflation, foreign interest rates, Treasury bill rate, savings deposit rate and real GDP. A test for the stability shows that the demand for money function remained stable despite the reforms, implying using of monetary targets is still relevant.

Dagher and Kovanen (2011) analyses the stability of the money demand function in Ghana using bounds testing procedure developed by Pesaren (2001). They estimate an Auto-Regressive Distributive Lag (ARDL) model which includes changes in broad money, its own lags, current and lagged values of the explanatory variables. The explanatory variables include income, exchange rate, deposit rate, TB rate, US TB rate, and the US libor rate. They find that the TB rate, US TB rate and the Libor rate have no significant impact on the demand while income and exchange rate were found to have significant effects. Specifically, they find that a depreciation increases money demand as is the increase in incomes. Furthermore, they find a faster convergence of the ECM to equilibrium once there is a misalignment. Using a CUSUM and CUSUM squares test on the residuals of the ECM model they find that the money demand is stable.

Lungu *et al.* (2012) examines the behaviour of the demand for money in Malawi for the period 1985 to 2010. Specifically, they seek to tackle two objectives: i) to estimate a demand for money function; and ii) to test for the stability of the money demand function. Their model include real money balances, real GDP, inflation, TB rate, exchange rate, and a measure of financial depth. The model estimates show that short-run dynamics are mainly driven by lagged money balances, prices, and financial innovation. However, their results show that the exchange rate, income and TB rate are not significant. The error correction term is negative and significant, implying that variables return to equilibrium after a shock. Using characteristic roots they find that the estimated VECM is stable.

In Zambia, there are not many studies that have been undertaken on the impact of financial reforms on the stability of the money demand function. Mutoti, Zgambo and Kapembwa (2012) estimate a money demand function for the Zambia for the period 1994 to 2008. Their model includes real money balances, real GDP, exchange rate, and TB rate. Their results indicate that real money balances is positively influenced by incomes, the exchange rate has a negative relationship while the TB rate negatively affects the demand for real money balances. To incorporate the financial sector reforms, they include a time trend as a proxy for financial liberalisation and they find that it is positively related to the demand for money. To check for the stability of the money demand function they plot the residuals from both the regression with a time trend and one without. They find that generally the demand for money function is stable.

Another study by Adam (1999) looks at the impact of monetary policy reforms in Zambia. He estimates the money demand function with portfolio shifts to evaluate whether there have been any changes in the stability of the demand function since the reforms. His model includes the Treasury bill rate, deposit rates, changes in the parallel exchange rate, inflation, currency in circulation and the real Gross National Income. His results indicate that there is evidence of a stable long-run money demand function with a policy induced structural break. In addition, he finds that there is an increased underlying variations in the money demand from about 1989, which begins to reduce around 1994. The results from this study suggest that because of the observed short-run forecast variance around the money demand function, stabilization policy based on controlling reserve money is likely to have an imprecise link to inflation in the short to medium-term despite the long-run correspondence between the two.

5.2 Empirical Literature on Monetary Policy Transmission

Although the monetary policy transmission mechanism has been a subject of intense empirical research for over three decades in developed and emerging economies, it is only now that interest is being paid to it in the developing countries such as Zambia. This increase in interest can be attributed to several factors; notably the economic reforms undertaken in these countries since the early 1980's as well as the increased availability of longer time series data which are critical in carrying out those investigations. In Zambia, although there have been numerous studies on the effects of money supply on real variables and output, very few focus on monetary policy. Notable among these includes Mwansa (1999), Simatele (2004), Mutoti (2006), Mwenda (1993), Adam (1999) and Bova (2009). In actual sense only Simatele (2004), Mutoti (2006) and Bova (2009) specifically deal with monetary policy transmission to the best of our knowledge. In this section, we present a survey of available literature on monetary policy transmission mechanism in Zambia.

Early studies on monetary policy in Zambia in the early and late 1990s focussed on the effect of financial and economic liberalisation that took place after the new government was ushered into office in 1991 (Mwenda, 1993; Adam, 1999; and Mwansa, 1999). A study by Mwenda in 1993 looked at the impact on the effectiveness of monetary policy of switching to indirect monetary policy instruments from direct instruments, with a special focus on growth and variability in broad money and in inflation. He estimates Auto Regressive models to evaluate whether there has been a change in the growth of money supply and inflation since the switch to indirect instruments. He also looks at the variability in the two variables to observe if there has been any change in the instability over the period. The study finds that the move to indirect instruments for policy has indeed reduced the variability in broad money and inflation. However, he finds that the growth in money supply has not changed.

One of most recent and comprehensive analysis is one done by Mutoti (2006) in which the short and long-term dynamics are investigated. The author uses a cointegrated structural VAR, in which restrictions are imposed according to a priori information on the relationships between the variables. The model is framed in an IS-LM-AS theoretical structure and uses monthly data on domestic 91-day TB rate, foreign (South African) interest rate, money supply (as broad money), real GDP, domestic CPI, foreign CPI (south Africa) and the nominal exchange rate Kwacha to the South African Rand. Estimating the model for the period 1992-2003, the results indicate that there is a stable money demand relationship, implying that money growth has a predictable impact on the economic activity and also that money demand is sensitive to the interest rate; inflation appears to be associated with excess demand and disequilibrium in the exchange rate.

The impulse responses to expansionary monetary policy shocks makes interest rates to significantly fall for a period lasting one year, with domestic interest rate falling below the foreign interest rate by 0.5 basis points. This induces a depreciation of the exchange rate reaching a peak of 1.7% after 4 months. Further, expansionary monetary policy shocks appear to strongly affect domestic prices only in the first period, suggesting that the link between money supply and inflation may be weak. However, monetary policy shocks where found to have no significant effect on real economic activity as output fluctuations are mostly accounted for by aggregate supply shocks. The results of this study seems to confirm literature from other small open developing countries where the exchange rate channel is seen to be a strong mechanism through which monetary policy is transmitted to real sector.

Another comprehensive study of monetary policy transmission is done by Simatele (2004). The study examines the impact of financial liberalization on the monetary transmission mechanism using two different models for the period prior and the period after the reforms. The analysis adopted a VAR using the Choleski decomposition to impose restrictions, thus, relying on the assumption that policy does not respond contemporaneously to macro-shocks and that this may be due to information lags. The VAR model uses monthly data on the following variables real GDP, CPI, monetary aggregates (M2, base money), TB-rate (a measure of monetary policy stance), weighted saving rate (a measure of policy stance), lending rate, liquidity asset ratio, the exchange rate (a measure of policy stance), and commercial bank loans to private sector.

Using the variance decompositions, it was found that in the pre-reform period innovations to policy variables contributes very little to variations in output and prices while their contributions increases after the reforms. Using impulse responses, a positive shock to base money reduces prices while a shock to interest rates leads to price increase, a result commonly referred to as the “price puzzle”. Furthermore, as expected, contractionary monetary policy dampens output in both periods. In addition, they find that the response of the variables to shocks is faster and larger in the post-reform period. The study also finds the existence of bank lending channel after the reforms as well as an enhanced exchange rate channel. Thus, the study illustrates that the potency of monetary policy has increased with the reforms, since prices are more responsive to monetary policy shocks. The study also illustrates that the exchange rate seems to be an important variable in the explanation of prices in Zambia.

Bova (2009) takes a similar approach to Mutoti (2006) to test how sensitive Zambian food and non-food inflation is to changes in the money supply and in the exchange rate. They estimate a six variable cointegrated structural VAR with monthly time series data for the period April 1996 to April 2008. The model includes broad money, nominal exchange rate (ZMK/USD), non-food inflation and food inflation as endogenous variables while copper and oil prices are exogenous variables in the model. Broad money and the nominal exchange rate are used as indicators of monetary policy.

The results indicate that expansionary monetary policy (or increase in money supply by 0.2 percent) depreciates the exchange rate by 1 percent in the long-run. In the long-run, money supply is found to affect food inflation and non-food inflation, but has no effect on the exchange rate. Further, it is found that in the short-run broad money is very sensitive to changes in food inflation and the exchange rate. At the same time, the exchange rate adjusts to changes in the money supply and in copper prices in the short-run. The study concludes that the monetary transmission mechanism is weak and only effective for non-food prices, while the exchange rate channel is stronger, especially for food prices. These results also confirm the finding by Mutoti (2006) regarding the existence of a strong exchange rate channel in Zambia as is the case with other developing small open economies.

6.0 Empirical Analysis

6.1 Data

In this study, we employ quarterly data to estimate the demand for money function and analyse monetary policy transmission. In Zambia, there is no quarterly data for GDP hence we use the Index of Industrial Production to obtain quarterly GDP series. The data for this study was obtained from the Bank of Zambia, IMF, World Bank and the Central Statistical Office.

6.2 Empirical Approach

6.2.1 *Empirical model of the money demand function*

This study will borrow from common practice in the literature in which the error correction model (ECM) is increasingly becoming the model of choice (Lungu et al., (2012); Ogunsakin et al., 2014). This is because this technique is capable of revealing more information on the long- and short-run behaviour of the economic variables. In this study, we will employ Autoregressive Distributive Lag (ARDL) approach to testing for co-integration. This approach is partly settled for due to its advantage of avoiding the classification of variables into stationary or non-stationary, and hence no need for pre-testing of unit roots in the variables (Sharifi-Renani, 2007).

Empirical literature surveyed seems to converge on a particular real money demand function in which real money balances is a function of a scale variable (income, wealth or expenditure); own rate of return on money, the opportunity cost of holding money (domestic interest rates and expected inflation). In addition, with increasing globalization and flexible exchange rate regimes, an exchange rate has been added as a potential explanatory variable. Therefore, to analyse the factors that influence the demand for money in Zambia, we will borrow from Bahmani-Oskooee (1996); Anwar et al., (2012); and Lungu et al., (2012) and estimate the following:

$$\ln m_t = \alpha_0 + \alpha_1 \ln Y_t + \alpha_2 \ln E_t + \alpha_3 TBrate_t + \alpha_4 \inf_t + \varepsilon_t \quad \text{...} (3)$$

Where Y is real GDP, E_t is the nominal exchange rate (K/USD), $TBrate_t$ is the 91-day Treasury bill rate, m_t is the real money balances, and $\inf$ is the annual inflation rate.

The error correction version of the Autoregressive Distributive Lag (ARDL) model pertaining to the money demand equation given above is specified as follows;

$$\Delta lmn_t = \alpha_0 + \sum_{t=1}^{n} \alpha_{1i} \Delta \ln m_{t-i} + \sum_{t=0}^{n} \alpha_{2i} \Delta \ln Y_{t-i} + \sum_{t=0}^{n} \alpha_{3i} \Delta \ln E_{t-i} + \sum_{t=0}^{n} \alpha_{4i} \Delta TBrate_{t-i}$$
$$+ \sum_{t=0}^{n} \alpha_{5i} \Delta \inf_{t-i} + \delta_1 \ln m_{t-1} + \delta_2 \ln Y_{t-1} + \delta_3 \ln E_{t-1} + \delta_4 TBrate_{t-1} + \delta_5 \inf_{t-1} + \varepsilon_t \quad \text{...} (4)$$

The ARDL formulation specified above is very suitable for estimating an error correction model in which variables are either stationary such as inflation or non-stationary such as income or money. In this regard, the approach does not need unit root pre-testing. However, in this study unit root tests are undertaken for all the variables under consideration.

We expect that based on the conventional theory the income elasticity coefficient (α_1) is positive; α_2 can either be positive or negative, it can be positive if the depreciation of the exchange rate is perceived as the increase in wealth leading to an increase in the demand for money, on the contrary it can be negative if the depreciation leads to a substitution of the domestic currency for the foreign currency as a store of value; α_3 is expected to be negative; and, finally, α_5 is expected to be negative since during inflationary periods, economic agents tend to hold less of the assets in monetary terms in preference for physical assets such as real estate.

6.2.2 *Econometric methodology*

Unit root tests

Non-stationarity is a common feature in time series data. Estimating a regression with differently integrated series could result in spurious correlation in the estimated equation. In this regard, there is need to test for stationarity or non-stationarity in the time series data before proceeding to estimation. Normally, the Augmented Dickey Fuller (ADF) test is used to determine the order of integration of the data. However, literature has shown ADF test has lower power in the presence of structural breaks; it is biased towards non-rejection of a unit root. Hence, the Phillip Peron (PP) Test is also used in addition to the ARDF to test for the presence or absence of unit roots in the data series.

Co-integration test

In the presence of non-stationarity in the variables, it has become standard to check for the existence of co-integrating relationship among the variables. For example, if real money balances, income and interest rates are non-stationary variables with unit roots and a linear combination of these variables is stationary, then any deviation from the relation is temporary and the relationship holds in the long-run. If this is the case, then the variables are said to be co-integrated. In this study, we will employ the ADL approach to co-integration which is based the bounds testing approach developed by Pesaran *et al.* (2001).

In the ARDL set up given in Equation 4 above, the null hypothesis for no co-integration is defined by $H_0 = \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = 0$ against the alternative hypothesis that $\mathrm{H}_0 \neq \delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq \delta_5 \neq 0$. The Wald test statistic is used to carry out this test.

Test for stability in the money demand function

To check for the stability of the demand for money function, we will use the CUSUM and CUSUM squared tests. In this regard, if the estimated coefficients of the money demand function are found to lie within the defined confidence bands (critical values), the money demand function is said to exhibit stability. However, if the estimated coefficients breach the defined confidence bands, the money demand function is considered to be unstable.

Test for the non-serial correlation in the residuals of the ARDL model

A key assumption in the ARDL / Bounds Testing methodology of Pesaran et al. (2001) is that the errors must be serially independent. In this regard, it is important to test for the existence of serial correlation as it is a requirement for the selection of the number of lags (Pesaran et al., 2001). In order to test for serial correlation of the residual, the LM test is used to test the null hypothesis that the errors are serially independent against the alternative hypothesis that they are either moving average [MA(m)] or autoregressive [AR(m)], where m is 1,2,3,…, is the lag length.

6.2.2 Econometric approaches for monetary policy transmission

Monetary policy transmission is a process through which central bank actions are transmitted to real sector variables of inflation, output and employment (Taylor, 1995). Monetary policy transmission involves two stages (Demchuk *et al.*, 2012). The first one looks at the effects of monetary policy-induced changes on the prices of the financial sector assets while the second one looks at the effects of monetary policy induced changes on aggregate demand and consequently output and prices. In this study, we investigate both stages of the monetary policy transmission.

Interest rate pass-through

The first stage in the monetary policy transmission involves the effect of monetary policy actions on the prices of financial market variables such as short-term interest rates, commercial banks' lending rates, deposit rates, stock prices and exchange rates. The effect of monetary policy actions on financial market prices can be quantified through the interest rate pass-through. In this study, we use a method similar to Mishra *et al.* (2010); Westelius (2011); and Espinoza *et al.* (2012) to quantify the short-run and long-run effects. The model is adapted as follows;

$$\Delta lr_t = \alpha \Delta lr_{t-1} + \beta \Delta lr_{t-2} + \gamma \Delta ibr_t + \tau \Delta ibr_{t-1} + \omega \Delta ibr_{t-2} \quad \text{.......... (5)}$$

Where, lr is lending rates and ibr stands for interbank rate. The coefficient γ provides the short-term effects and the long-term effects are provided by $(\gamma + \tau + \omega)/(1 - \alpha - \beta)$.

VAR model of the monetary policy transmission

A review of empirical literature on monetary policy transmission (see Mishra *et al.* (2010); Davoodi *et al.* (2013); Mishra and Montiel (2013); Espinoza and Prasad (2012); Cheng (2006) reveal that Vector Auto regression (VAR) is widely used to investigate the effects of monetary policy shocks on real economic activity and the price level in low income countries. Thus, following this literature, we assume that the Zambian economy can be described by the following structural model;

$$AY_t = B(L)Y_{t-1} + C(L)X_t + \varepsilon_t ; \varepsilon_t \sim iid(0, \Lambda) \quad \text{.......... (6)}$$

In Equation 6, Y_t represents an nx1vector of endogenous variables while X_t is a $mx1$ vector of exogenous variables, and ε_t is a $nx1$ vector of structural disturbances with a zero mean and constant variance, Λ. In the specification given in (6), *A* is an nxn matrix of contemporaneous coefficients of the interaction of variables in Y_t while *B* is the matrix of lagged coefficients of interactions in Y_t.

However, since the structural model given in (6) cannot be estimated directly due to inadequate information, the existence of the inverse of the matrix *A*, A^{-1}allows us to have a reduced-form of the structural model, which can be specified as follows (Maturu, 2014):

$$Y_t = A^{-1}B(L)Y_{t-1} + A^{-1}C(L)X_t + A^{-1}u_t ; u_t \sim iid\ (0, \Sigma) \quad \text{.......... (7)}$$

Or

$$Y_t = D(L)Y_{t-1} + \delta X_t + u_t ; u_t \sim iid\ (0, \Sigma) \quad \text{.......... (8)}$$

Where: $D(L) = A^{-1}B(L); \delta = A^{-1}C(L); u = A^{-1}u_t$.

Given that *A* is a matrix of contemporaneous coefficients in the structural model and *B(L)* is matrix of lagged coefficients in the structural model, we can define *G(L)* as the matrix of both contemporaneous and lagged coefficients as follows:

$$G(L) = A + B(L) \quad \text{.......... (9)}$$

Following Cheng (2006) and using equation (6), structural and reduced-form equations can be related by:

$$D(L) = -A^{-1}B(L) \text{ and } \delta = -A^{-1}C(L) \quad \text{.......... (10)}$$

and the disturbance terms through: $\mu_t = A^{-1}\varepsilon_t$ or $\varepsilon_t = A\mu_t$, which implies:

$$\Sigma = A^{-1}\Lambda A^{-1} \quad \text{.......... (11)}$$

In VAR analysis of the MTM, the important issue is to investigate how a shock to a monetary policy variable impacts on other variables, particularly real sector variables such as inflation and output. Impulse responses are used in this regard. The impulse responses of interest are usually those associated with a structural model, but since the structural model cannot be directly estimated, convention requires the estimation of the reduced-form model from which the covariance matrix, Σ can be obtained. The results are then exploited to recover structural shocks from reduced-form shocks (Maturu, 2014).

Before estimating a VAR, there is need to identify the system through the imposition of *a priori* restrictions. Due to the symmetric nature of the covariance matrix, *Σ,*the number of independent equations to be estimated is usually less than the number of unknown elements in *A*, giving rise to the identification problem. To identify the system, a minimum number of values of the elements of the *A* matrix must be assigned *a priori* to allow the estimation of the remaining part of the restricted version of Equation (8). When the diagonal elements of the *A* matrix are normalized to unity, the remaining additional restrictions will be determined by $n \times (n-1)/2$; where *n* is the number of endogenous variables. The additional restrictions can be motivated by economic theory. In VAR studies of the MTM, the Choleski approach is used to impose identifying restrictions. This approach imposes a recursive ordering of the endogenous variables, resulting in a lower-triangular matrix *A* and a just identified system.

In this paper, the endogenous vector Y_t is assumed to include real GDP, consumer price index (CPI), broad money (M2), short-term interest rates (91-day TB rate and the interbank rate) and the nominal exchange rate of the Kwacha to the US dollar (EXR). Hence:

$$Y_t = [RealGDP, CPI, M2, TBrate, EXR] \quad \text{.......... (12)}$$

The exogenous vector, X_t is assumed to contain copper prices *(Cupr)*, crude oil prices *(Oilpr)* and the US ederal Funds rate *(FFR)*. These variables are considered to be important to the Zambian economy and are aimed at capturing the global economic environment. Copper is the main export commodity and major foreign exchange earner in Zambia while crude oil is an important input in almost all sectors of the economy and one of the main imports. Sims (1992) argues that including such variables may help to reduce the likelihood of having empirical puzzles such as the "price puzzle". Therefore, the vector of exogenous variables is given by:

$$X_t = [Cupr, Oilpr, FFR] \quad \ldots\ldots (13)$$

The ordering determines the level of exogeneity of the variables, so that the most exogenous variables are ordered first as given in Equation 12. Real GDP is ordered first on the assumption that real economic activity responds sluggishly to policy and economic shocks; Consumer price index (CPI) comes second in the ordering on the assumption that prices have no immediate effects on output. Broad money is ordered after CPI to indicate that money stock has no contemporaneous effect on prices while the Treasury bill rate (which may represent a monetary policy shock) is ordered after broad money to indicate that it has no immediate effect on the money stock. Finally, the EXR is ordered last to reflect that the exchange rate responds contemporaneously to all relevant economic variables. This ordering is akin to estimating the reduced-form and computing the Choleski factorization of the reduced-form VAR covariance matrix.

7.0 Results of the Estimated Models

7.1 Unit Root and Co-integration Tests

It is common practice to check for the existence of unit roots in time series data. The importance of checking for unit roots in the data is to avoid spurious results that may arise from the regressing of differently integrated time series. Furthermore, for us to apply the Auto-Regressive Distributive Lag co-integration technique, there is need to determine the degree of integration in each variable. For this purpose, we utilise the Augmented Dickey Fuller (ADF) and the Phillip-Perron (PP) tests whose results are presented in Table A1 in the Appendix.

The results from the ADF and PP tests presented in Table A1 in the Appendix suggest that with an exception of inflation, which is stationary or I(0), all the variables are integrated of order one I(1) since they are non-stationary in levels but stationary in first differences. This justifies the estimation of the money demand function using the ARDL approach and interest rate pass-through model using variables in differences without encountering possibility of spurious correlation. Furthermore, co-integration tests results using ARDL bound test presented in the Table A2 in the Appendix shows that the F-value of the M2 equation exceeds the upper bound value at any of the confidence intervals, which is an indication of the existence of co-integration in the money demand function in Zambia. As a result of the existence of co-integration in the variables of the money demand function, an error correction model is estimated. The main aim is to capture the short-run and long-run dynamics of the money demand function in Zambia.

7.2 Estimated Results of the Money Demand Function

One of the important steps in estimating a model using the ARDL approach is to choose the optimal lag length to use in the estimation. In this regard, the lag length selection criteria is used to select the optimal lag length. The results presented in Table A3 in the Appendix indicate that the optimal lag length is three lags using the Likelihood Ratio (LR) test, the FPE, and the (Akaike Information Criterion AIC). However, the Schwarz Criterion (SC) and HQ suggest one lag and four lags, respectively. In this regard, we settle for three lags to estimate the ARDL model.

The results of the estimated long-run and short-run money demand function using three lags are presented in Tables 2 and 3 below:

Table 7.2: ARDL Long-Run Coefficient Estimates

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ECT_{t-1}	-0.174874	0.064801	-1.155443	0.0525
Constant	-13.50136	0.766827	-17.60680	0.0000
LOG(GDP)	1.586269	0.087881	26.77846	0.0044
LOG(USD)	-0.053179	0.010241	2.097354	0.0382
Inflation	- 0.005402	0.003265	-0.668207	0.5077
TB91	-0.885609	0.186722	-1.915680	0.0624

The coefficients reported in Table 2 above represents $\delta_1 - \delta_5$ from the ARDL model specified in Equation 4. According to literature, the long-run elasticities are normalised by dividing them by $-\delta_1$. This yields a significant long-run income elasticity of the real money balances of 1.586269. The inflation elasticity is negative (-0.005402) though it is insignificant. The negative coefficient supports our theoretical expectation that as inflation accelerates, economic agents reduces their demand for real money balances as economic agents prefer physical assets to holding money. In addition, the exchange rate coefficient is negative and significant (-0.053179). This result is similar to those obtained by others such as Anwar (2010) and Bhamani-Oskoee and Pourhedrian (1990). The negative coefficient on the exchange rate demonstrates the presence of currency substitution in the estimated money demand function for Zambia.

In an environment of currency substitution, a depreciation in the exchange rate may induce economic agents to substitute foreign currency-denominated assets for domestic currency-denominated assets as they perceive a depreciation as indicative of loss of wealthy. In addition, Bhamani-Oskoee et al., (1990) argues that a foreign currency represents an avenue which economic agents can use to hedge their risks. The sign on the short- term interest rate is negative, but only significant at 10 percent level of significance. In this regard, an increase in interest rates reduced the demand for real money balances, in line with the speculative motive of the demand for money. Finally, although the lagged error correction term *(ECT)* is insignificant, it is correctly signed implying that real money demand is co-integrated with its determinants.

Table 3 presents the estimated short-run coefficients of the ARDL model. The results indicate that the demand for real money balances in the short-run is significantly influenced by nominal exchange rate, short-term interest rates, inflation, and income dynamics.

Table 7.3: ARDL Short-run Coefficient Estimates

Dependent Variable: DLOG(REALM2)

	Coefficient	Std. Error	t-Statistic	Prob.
Constant	0.054310	0.022747	2.387583	0.0201
$\Delta \log(RealMoney)_{t-1}$	-0.256843	0.089468	-2.870794	0.0056
$\Delta \log(gdp)_{t-1}$	0.264940	0.241412	1.097459	0.2768
$\Delta \log(gdp)_{t-2}$	0.650475	0.228999	2.840518	0.0061
$\Delta \log(gdp)_{t-3}$	0.276273	0.235095	1.175157	0.2446
$\Delta \log(usd)$	0.383827	0.094476	4.062712	0.0001
$\Delta \log(TB91)$	-0.355775	0.131410	-2.707361	0.0088
$\Delta(Inflation)$	-0.002178	0.000839	-2.596422	0.0118
Seasonal Dummy	-0.107650	0.017356	-6.202544	0.0000
Step Dummy	-0.008990	0.018988	-0.473434	0.6376

R-squared	0.675272	Mean dependent var	0.016517
Adjusted R-squared	0.615738	S.D. dependent var	0.077722
S.E. of regression	0.048179	Akaike info criterion	-3.076776
Sum squared resid	0.139273	Schwarz criterion	-2.697332
Log likelihood	122.7639	Hannan-Quinn criter.	-2.925718
F-statistic	11.34273	Durbin-Watson stat	2.016581
Prob(F-statistic)	0.000000		

As already mentioned, one critical aspect in the application of the ARDL models to cointegration is the confirmation that residuals of the estimated equation are not serially correlated. In this regard, the test for the presence or absence of serial correlation in the residuals was undertaken using the LM test. The results of the LM test suggest the absence of serial correlation in the residuals (see Table A4 in the Appendix).

The stability of the estimated real money demand function is investigated through the use of the CUSUM and CUSUM Square tests proposed by Brown, Durbin and Evans (1975). The advantage of the CUSUM and CUSUMSQ tests is that it does not require the specification of the break points, but uses the cumulative sum of recursive residuals based on the first *n* observations and is updated recursively and plotted against the break point (Sharifi-Renani, 2007). Figure 4 presents the stability test based on the CUSUM test, which suggests that the real money demand function is stable. However, the CUSUM test has been criticized because it only tests for the instability in the intercept alone and not the whole range of estimated coefficients (Ploberger and Kramer, 1990). In this case, we also utilise the CUSUM Square test, whose results are presented in Figure 5. The test indicates that the CUSUM Square plot crosses below the critical value for a while. However, since the CUSUM Square plot gets back above the critical line it can be argued that the real money demand function is generally stable even in the parameters over time.

Figure 7.4: CUSUM Test for the Money Demand Function

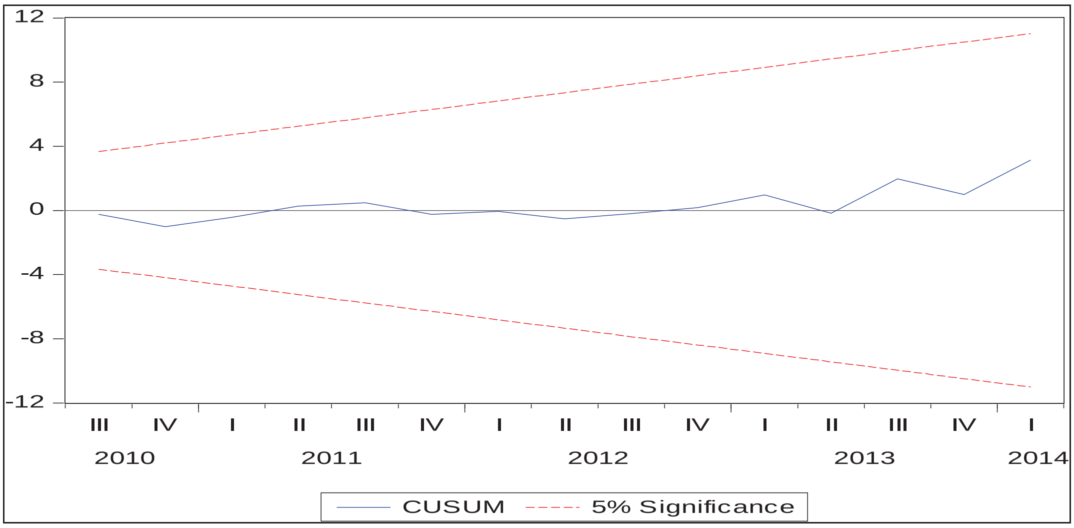
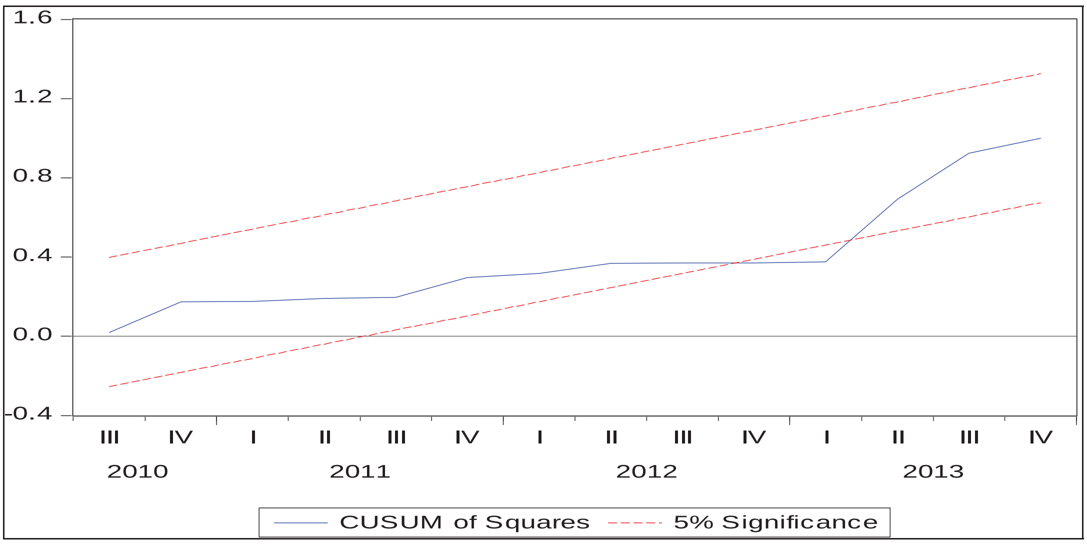


Figure 7.5: CUSUM SQ test for residuals of the Money Demand Function



7.3 Estimated Results of the MTM

7.3.1 Interest rate pass-through

One of the most important aspects of monetary policy is the ability of central bank to influence market interest rates through influencing short-term money market rates. Ability to influence the market interest rates is crucial in influencing aggregate demand and consequently inflation. With the introduction of the Policy Rate in April 2012, the Bank of Zambia started to target the overnight interbank rate in its conduct of monetary policy. Thus, we estimate the interest rate pass-through in the short and long-run horizons. Table 4 below presents the short- and long-run effects of the interest rate pass-through from the interbank interest rate to commercial banks' lending rates computed from the estimation of Equation 5 above.

Table 7.4: Interest Rates Pass-through from Interbank Rates to Lending Rates

Description	Short-run Effects	Long-run Effects	R-Squared
Full Sample (1995Q1-2014Q1)	0.21	0.45	0.26
1995Q1-2000Q4	0.05	0.29	0.31
2001Q1-2014Q1	0.29	0.66	0.41

Source: Authors Computations

The results from the computations indicate that for the full sample, a one percent increase in the interbank rate leads to 0.21 percentage points increase in average lending rates in the short-run and 0.45 percent increase in the long-run. This result is similar to those obtained for emerging economies (see Westelius, 2011). The results further indicate that in the 1990s interest rate pass-through was lower compared to the time after 2001. Specifically, in the period 1995 quarter one to the fourth quarter of 2000 the short-run interest rate pass-through was 0.05% for every one percent increase in the interbank rate while for the later period it is 0.29%. This suggests that overtime the interest rate pass-through is improving though it remains low.

7.3.2 Estimated VAR model of the MTM

We estimate two VAR models to investigate the MTM in Zambia using quarterly data spanning the period 1995 quarter 2 to 2013 quarter 3. The models are estimated in levels with the constant, endogenous variables and exogenous variables noted in Section 6. The difference between the two estimated models is that the Treasury bill rate is included in one of the models (Model A) while in the other model (Model B), the interbank rate is included.

An important aspect in the estimation of VAR models is the selection of an appropriate lag length that ensures the absence of serial correlation in the estimated models and well behaved residuals. In this regard, the lag length selection criteria are used to select an appropriate lag length. Lag length selection criteria results presented in Table A4 in the Appendix suggests different lag lengths for the two models. However, we use the principle of parsimony in the selection of the lag length, which entails that if two or more models explain the same phenomena but have different lag lengths, choose the model with lower lags in order not to lose information when higher lags are included and to preserve the degrees of freedom. Hence, based on the Schwarz information criterion, we select models with one lag length.

The next important step in the estimation of VAR models is to test for the stability of the VAR once estimated with the selected lag length. The results of stability tests presented in Table A5 in the Appendix suggests that the estimated VARs for both models are stable as all the roots lie within the unit circles. The importance of the stability a VAR is to ensure that although a particular variable may increase or decrease following a shock, the variable will eventually return to its equilibrium position in the long-run as the shock gradually dissipates or "dies".

To analyse the monetary transmission mechanism, impulse response functions are used of a one-standard deviation of a monetary policy shock to trace the response of real GDP and prices as well as other relevant variables. A monetary policy shock in this regard is defined as an exogenous, unexpected temporary increase in the interest rate or money supply.

In addition, we examine the relative importance of the monetary policy shock to fluctuations in output and prices through the forecast error variance decompositions. Forecast error variance decompositions indicate the forecast error of relevant variables at different forecast horizons that can be attributed to a monetary policy shock. Figure 6 shows the impulse responses of real GDP, CPI, Treasury bill rate and nominal exchange rate to the shock to money supply. In this case, a monetary policy shock leads to statistically significant effects for real GDP, CPI and the exchange rate which tends to persist for a long period of time. An expansionary monetary policy results in an increase in real GDP with the maximum effect coming through after 6 or 7 quarters (about one and half years). However, the effect on real GDP becomes insignificant after 24 quarters.

Similarly, an expansionary monetary policy results in an increase in CPI and a depreciation in the exchange rate. The response of prices to a monetary policy shock seems to peak at about 7 to 8 quarters though the response becomes insignificant after about 22 to 23 quarters.

The response of the exchange rate to a monetary policy shock is rather instantaneous with the exchange rate depreciating immediately following a monetary expansion. However, the response of the exchange rate to a monetary policy shock becomes insignificant after about 9 to 10 quarters. This result demonstrates the importance of the exchange rate in the monetary policy transmission mechanism in Zambia, and is in line with other studies on the monetary transmission mechanism in Zambia. Similar results are obtained when Model B is used to analyse the MTM (see Figure 7). However, when the interest rate is used as a policy variable, impulse response functions suggests statistically insignificant effects on all the relevant variables (see Figures A1 and A2 in the Appendix).

These results show that the use of interest rates as a policy variable in the conduct of monetary policy in Zambia is rather ineffective in influencing the key variables of real GDP and inflation. This result may be an indication of the underdeveloped nature of the money market in Zambia as well as lack of financial depending, which is partly reflected in sticky and wide interest rate spreads between the lending and deposit rates. Variance decompositions for real GDP and CPI presented in Table 5 shows that shocks to broad money explain about 31 percent of the variations in real GDP after three years, that is 12 quarters, while shocks to the interest rate (TB rate) explain around 9 percent of the variation in real GDP over the same period. As regards variation in prices, shocks to broad money explain around 30 percent of variations after three years while shocks to interest rates explain about 22 percent of the variation. These results demonstrate the importance of broad money in inflation and real GDP outcomes in Zambia. However, interest rates also seem to be important in explaining variations in prices.

Figure 7.6: Impulse Responses of Model A to Shock to M2

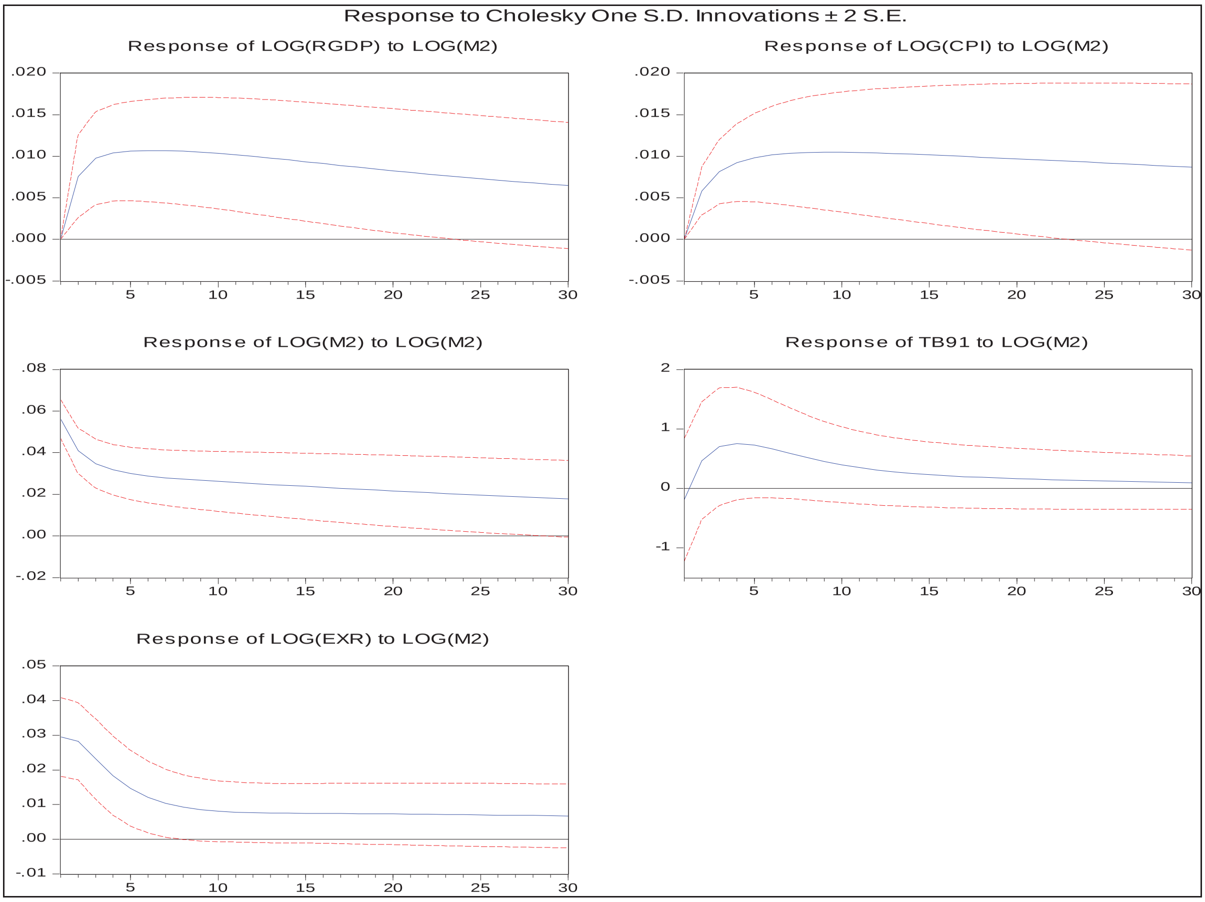


Figure 7.7: Impulse Responses of Model B to Shock to M2

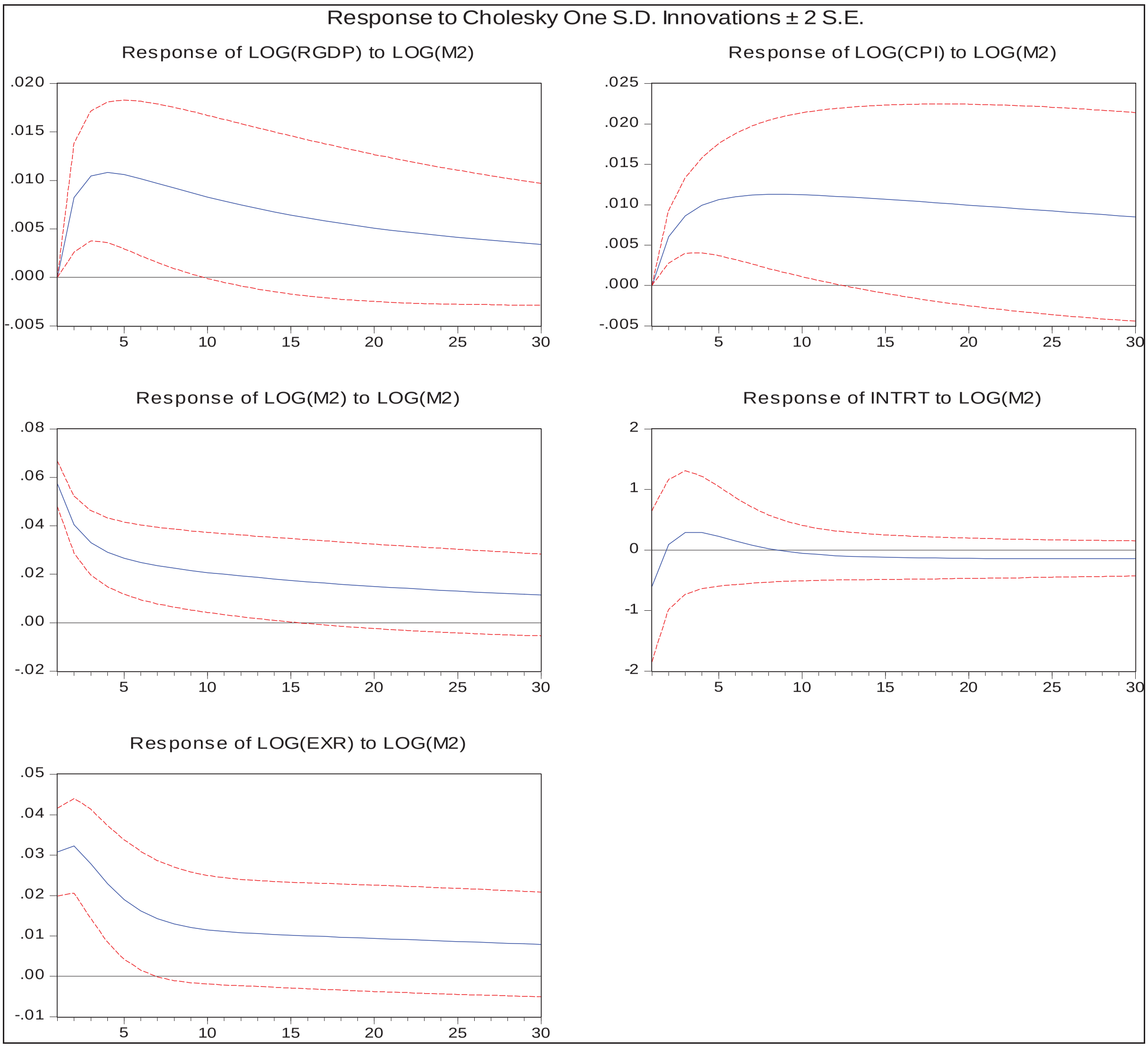


Table 7.5: Variance Decompositions of Real GDP and CPI

Variance Decomposition of LOG(RGDP)

Period	S.E.	LOG(RGDP)	LOG(CPI)	LOG(M2)	TB91	LOG(EXR)
1	0.034049	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.039651	94.62520	0.884602	3.663672	0.114626	0.711896
3	0.043161	87.98011	1.782628	8.201239	0.592042	1.443977
4	0.045998	81.86510	2.431295	12.33703	1.428209	1.938360
5	0.048470	76.53097	2.865607	15.90843	2.477531	2.217456
6	0.050690	71.91798	3.151875	18.98716	3.592659	2.350323
7	0.052708	67.93219	3.339293	21.66217	4.672297	2.394046
8	0.054554	64.48677	3.459895	24.00483	5.661480	2.387022
9	0.056247	61.50460	3.534238	26.06982	6.538271	2.353071
10	0.057802	58.91750	3.575763	27.89992	7.300516	2.306302
11	0.059230	56.66578	3.593520	29.52966	7.956273	2.254770
12	0.060543	54.69795	3.593807	30.98750	8.517843	2.202896

Variance Decomposition of LOG (CPI)

Period	S.E.	LOG(RGDP)	LOG(CPI)	LOG(M2)	TB91	LOG(EXR)
1	0.019531	8.381844	91.61816	0.000000	0.000000	0.000000
2	0.025732	6.111333	88.71083	5.145200	0.001533	0.031106
3	0.030951	7.605883	81.86899	10.48247	0.021134	0.021527
4	0.035531	9.221363	75.97225	14.71135	0.053837	0.041201
5	0.039585	10.41965	71.37939	18.01839	0.087573	0.095004
6	0.043203	11.24373	67.80033	20.67301	0.116715	0.166206
7	0.046455	11.79582	64.95962	22.86371	0.140446	0.240404
8	0.049397	12.15750	62.65910	24.71417	0.159864	0.309356
9	0.052075	12.38613	60.76046	26.30747	0.176449	0.369489
10	0.054527	12.52114	59.16599	27.70140	0.191499	0.419967
11	0.056782	12.58976	57.80531	28.93759	0.206004	0.461332
12	0.058865	12.61095	56.62693	30.04676	0.220664	0.494694

8.0 Conclusion and Policy Recommendations

The conduct and success of monetary policy in any economy is crucially dependent of the monetary policy framework used as well as the structure of the economy. However, evolving economies such as those in the COMESA region, including Zambia, present challenges that may render monetary policy less effective in the achievement of the monetary policy goals. In this regard, empirical analyses of the monetary policy frameworks in place is important in order to assess the effectiveness of the frameworks and to design frameworks that will yield the desired goals, if existing frameworks are found to be ineffective.

The money demand function is stable money demand function. This result implies that monetary aggregates can still play a critical role in monetary policy implementation in Zambia, and possibly in other COMESA member countries that have been using a similar framework. The results from the VAR analysis of the monetary transmission mechanism also support the importance of monetary aggregates in the conduct of monetary policy given the significant effects that monetary aggregates have on output and prices. However, the weakening link between consumer prices and monetary aggregates would naturally require that the Bank of Zambia—along with many other central banks in similar situations—starts the search for a policy framework that will be more effective in the future conduct of monetary policy, such as inflation targeting which focuses on targeting inflation through a policy rate instead of focusing on maintaining a certain growth rate in money aggregates.

The overall recommendation from this study is that as the process of modernising monetary policy frameworks gets underway to address the emerging economic challenges, it is clear that in the case of Zambia monetary aggregates will still continue to play a role in monetary policy conduct. In this regard, it would be premature to abandon the traditional policy focus on monetary aggregates, given their influence on the key macroeconomic outcomes of output and prices. A key implication from this study is therefore that monetary policy in Zambia, and other COMESA member countries, should continue to consider developments in monetary aggregates while gradually transitioning to modern monetary policy frameworks. In addition, measures should be put in place that are aimed at enhancing monetary transmission mechanisms, particularly the interest rate channel, by promoting financial deepening and economic development more generally.

Appendices

Table A1: Unit Root Test Results

VARIABLES	ADF TEST		PP test	
	t-statistic	**P-value**	**t-statistic**	**P-value**
Variables in levels				
Average Lending rate	-0.41	0.90	-0.68	0.85
Interbank Rate	-2.65	0.09	-2.49	0.12
TBrate	-2.15	0.22	-1.20	0.67
Inflation	-5.47	0.00	-5.16	0.00
FFR	-1.93	0.32	-1.39	0.58
Ln(GDP)	2.52	0.99	1.78	1.00
Ln(CPI)	-2.24	0.99	-2.45	0.39
Ln(real M2)	0.93	1.00	1.17	0.97
Ln(M2)	-1.73	0.41	-4.49	0.00
Ln(USD)	-1.11	0.71	-1.06	0.73
Ln(Cupr)	-0.56	0.87	-0.69	0.84
Ln(Oilpr)	-0.56	0.87	-0.61	0.86
Variables in First Differences				
D(Average Lending rate)	-7.38	0.00	-7.38	0.00
D(Interbank Rate)	-7.72	0.00	-19.48	0.00
D(TBrate)	-6.29	0.00	-6.12	0.00
D(FFR)	-3.85	0.00	-4.01	0.00
D(Ln(GDP))	-9.71	0.00	-11.85	0.00
D(Ln(CPI))	-5.29	0.00	-8.91	0.00
D(ln(real m2))	-4.36	0.00	-11.64	0.00
D(ln(m2))	-4.44	0.00	-8.82	0.00
D(log(USD))	-7.74	0.00	-5.69	0.00
D(Ln(Cupr))	-6.58	0.00	-5.98	0.00
D(Ln(Oilpr))	-7.33	0.00	-6.73	0.00

Table A2: ARDL Bound Testing for Co-integration

Dependent Variable	F-Statistic	
Log(Real M2)	Lag(4,4,4,4,4)	
	5.8790671	
Critical Value	Pesaran et al (2001)[a]	
	Lower Bound	Upper Bound
1%	3.29	4.37
5%	2.56	3.49
10%	2.20	3.09

Table A3: Lag Length Selection Criteria for the ARDL Model

Lag	LogL	LR	FPE	AIC	SC	HQ
0	91.89003	NA	0.003713	-2.758414	-2.588324	-2.691516
1	92.78365	1.617016	0.003726	-2.755036	-2.550928*	-2.674760
2	93.49760	1.269252	0.003762	-2.745956	-2.507829	-2.652299
3	96.92783	5.989297*	0.003484*	-2.823106*	-2.550962	-2.716070
4	100.0255	5.310351	0.003261	-2.889700	-2.583538	-2.769285*
5	100.1034	0.130978	0.003361	-2.860425	-2.520245	-2.726630
6	100.1999	0.159303	0.003462	-2.831742	-2.457544	-2.684568
7	101.7187	2.459083	0.003409	-2.848214	-2.439998	-2.687660
8	101.9811	0.416407	0.003494	-2.824796	-2.382562	-2.650863

* indicates lag order selected by the criterion

Table A4: Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.880856	Prob. F(2,58)	0.4199
Obs*R-squared	2.122485	Prob. Chi-Square(2)	0.3460

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 11/18/14 Time: 16:03
Sample: 1996Q1 2013Q4
Included observations: 72
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.036514	0.074061	-0.493024	0.6239
C(2)	0.023481	0.243342	0.096492	0.9235
C(3)	-0.052418	0.252798	-0.207350	0.8365
C(4)	-0.029383	0.230747	-0.127340	0.8991
C(5)	-0.021293	0.243145	-0.087574	0.9305
C(6)	0.015015	0.096297	0.155923	0.8766
C(7)	-0.018500	0.132960	-0.139143	0.8898
C(8)	-0.000217	0.000895	-0.242162	0.8095
C(11)	0.000156	0.017832	0.008741	0.9931
C(12)	0.005260	0.023671	0.222200	0.8249
C(13)	-0.004442	0.019693	-0.225560	0.8223

C(14)	0.014705	0.119087	0.123481	0.9022
RESID(-1)	0.037259	0.189315	0.196808	0.8447
RESID(-2)	0.187281	0.144534	1.295759	0.2002
R-squared	0.029479	Mean dependent var		1.54E-18
Adjusted R-squared	-0.188052	S.D. dependent var		0.044290
S.E. of regression	0.048275	Akaike info criterion		-3.051143
Sum squared resid	0.135167	Schwarz criterion		-2.608458
Log likelihood	123.8411	Hannan-Quinn criter.		-2.874909
F-statistic	0.135516	Durbin-Watson stat		1.998261
Prob(F-statistic)	0.999833			

Table A5: Lag Length Selection

Model A

Endogenous variables: LOG(RGDP) LOG(CPI) LOG(M2) TB91 LOG(EXR)

Exogenous variables: C LOG(CUPR) LOG(OILPR) FFR

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-55.13370	NA	4.55e-06	1.887933	2.211717	2.016389
1	362.3121	750.1924	5.23e-11	-9.487307	-8.354064*	-9.037712
2	399.2225	60.98239	3.76e-11	-9.832536	-7.889834	-9.061801
3	436.5134	56.20654	2.72e-11	-10.18879	-7.436633	-9.096919*
4	464.5660	38.21666	2.66e-11	-10.27728	-6.715656	-8.864262
5	497.6092	40.22651*	2.34e-11*	-10.51041	-6.139334	-8.776259
6	527.7520	32.32708	2.37e-11	-10.65948*	-5.478942	-8.604187

* indicates lag order selected by the criterion

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

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Model B

Endogenous variables: LOG(RGDP) LOG(CPI) LOG(M2) INTRT LOG(EXR)

Exogenous variables: C LOG(CUPR) LOG(OILPR) FFR

Lag	LogL	LR	FPE	AIC	SC	HQ
0	25.72429	NA	5.83e-07	-0.165922	0.481646	0.090990
1	356.7117	575.6303	8.26e-11	-9.035122	-7.578096*	-8.457071*
2	378.9958	35.52538	9.13e-11	-8.956400	-6.689915	-8.057210
3	425.8998	67.97676	5.06e-11	-9.591297	-6.515354	-8.370968
4	451.0373	32.78815	5.45e-11	-9.595285	-5.709883	-8.053816
5	486.2160	40.78686*	4.60e-11*	-9.890319	-5.195458	-8.027711
6	513.2019	27.37698	5.26e-11	-9.947881*	-4.443561	-7.764133

* indicates lag order selected by the criterion

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

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

TableA6: Stability of Estimated VAR Models

Model A

Roots of Characteristic Polynomial

Endogenous variables: LOG(RGDP) LOG(CPI) LOG(M2) TB91 LOG(EXR)

Exogenous variables: C LOG(CUPR) LOG(OILPR) FFR

Lag specification: 1 1

Root	Modulus
0.984141	0.984141
0.954145	0.954145
0.699060 - 0.104744i	0.706863
0.699060 + 0.104744i	0.706863
0.291164	0.291164

No root lies outside the unit circle.

VAR satisfies the stability condition.

Model B

Roots of Characteristic Polynomial
Endogenous variables: LOG(RGDP) LOG(CPI) LOG(M2) INTRT LOG(EXR)
Exogenous variables: C LOG(CUPR) LOG(OILPR) FFR
Lag specification: 1 1

Root	Modulus
0.980766	0.980766
0.921399	0.921399
0.598007 - 0.094020i	0.605353
0.598007 + 0.094020i	0.605353
0.305875	0.305875

No root lies outside the unit circle.
VAR satisfies the stability condition.

Figure A1: Impulse Responses of Model A to Shock to TB91

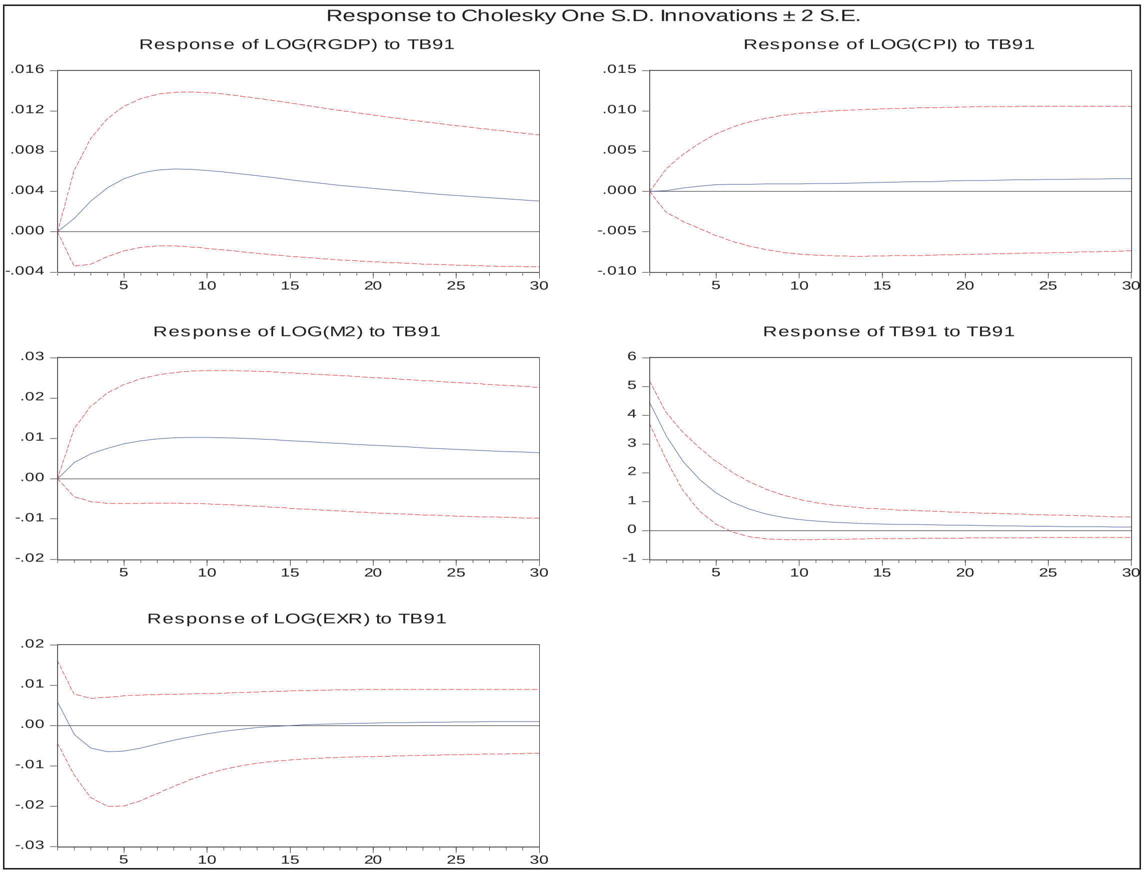
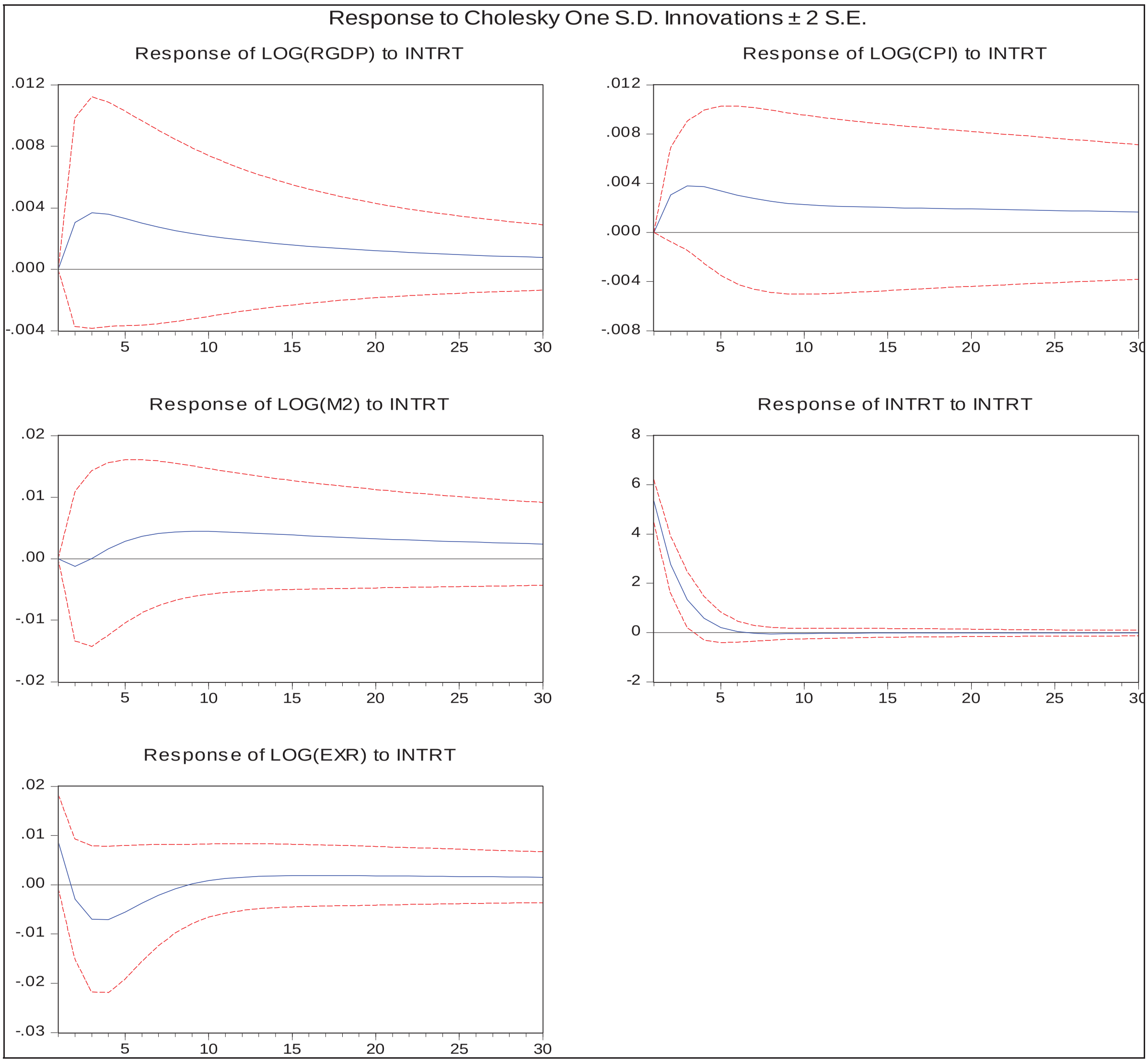


Figure A2: Impulse Responses of Model B to Shock to Interbank Rate



References

Adam, C.S., 1999. "Financial Liberalisation and Currency Demand in Zambia", *Journal of African Economies*, Vol. 8 (3)

Afandi, A., 2005. "Monetary Policy Transmission Mechanism and Structural breaks in Indonesia", PhD Thesis, School of Economics and Information Systems, University of Wollongong

Anwar, S. and N. Asgha 2012. "Is the Demand for money Stable in Pakistan?" *Pakistan Economic and Social Review* Vol. 50(1): 1-22.

Ando, Albert, and Franco Modigliani 1963 "The 'life-cycle' hypothesis of saving: aggregate implications and tests", *American Economic Review*, 53(1), 55–84.

Alper, K. 2003 "Exchange Rate Pass-through to Domestic Prices in Turkish Economy", MSc Thesis, Middle East Technical University

Bahmani-Oskooee, M. and Mohammad Pourhedarian 1990 "Exchange rate sensitivity of demand for money and effectiveness of fiscal and monetary policies", Applied Economics, Volume 22, No. 7, pp. 917-925

Bahmani, S. and M. Bahmani-Oskoee 1996 "Exchange Rate Volatility and Demand for Money in Iran", Available on line at *ttp://iraneconomy.csames.illinois.edu/full%20papers /Bahmani%20-20Exchange%20Rate%20Volatility%20and %20Demand%20for%20 Money%20in%20Iran.pdf*

Bank of England, 1999 "The Transmission Mechanism of Monetary Policy," Bank of England Quarterly Bulletin, May, pp. 161-70

Baumal, W.J., 1952 "The Transactions demand for Cash: An Inventory Theoretic Approach," Quarterly Journal of Economics 66. pp. 545-556.

Bernanke B. and A. Blinder. 1992. "The Federal Funds Rate and the Channels of Monetary Transmission," *American Economic Review* Vol. 82: 901-21.

Bernanke, B.S. and M. Gertler. 1995. "Inside the black box: the credit channel of monetary policy transmission," .*Journal of Economic Perspectives*, Vol. 9(4), 27-48.

Bernanke, B. 2006. "Monetary Aggregates and Monetary Policy at the Federal Reserve: A Historical Perspective," Paper presented at the fourth ECB Central Banking Conference.

Bigstern, A. and Mugerwa-Kiyizzi, S. 2000. "The Political Economy of Policy Failure in Zambia", Working Paper in Economics No. 23/00, University of Gothenburg.

Blanchard, O. 2000. "What do we know about Macroeconomics that Fisher and Wicksell did not?" NBER Working Paper 7550.

Boivin J. M., M. Kiley and F. Mishkin. 2010. "How has the Monetary Transmission Mechanism Evolved over Time?" NBER Working Paper, No. 15879.

Bordon, A.R. and A Weber. 2010. "The transmission mechanism in Armenia: new evidence from a regime switching VAR analysis," IMF Working Paper No. 270.

Bova, E., 2009. "Is the Zambian Kwacha a Commodity Currency? The Co-movement between Copper Prices and the Exchange Rate," Swiss National Centre for Competence in Research Working Paper No. 2009/11

Brown, R.L., J. Durbin and J.M. Evans (1975)."Techniques for Testing the Constancy of Regression Relationships over Time," Journal of the Royal Statistical Society, Series B, 35, 149-192.

Butkiewcz J. and ZelilaOzdogan. 2008. "Financial crisis, monetary policy reform and the monetary transmission mechanism in Turkey". Turkey: SBT analysis

Campa, J. and L. Goldberg.2004. "Exchange Rate Pass-through into Import Prices: A Macro or Micro Phenomenon?" NBER Working Paper 8934.

Carter, T. J. 2005. "Monetary Policy, Efficiency Wages, and Nominal Rigidities," .*Eastern Economic Journal*, vol. 31, No. 3; 349-359.

Cevik S. And K. Teksoz. 2012. "Lost in Transmission? The Effectiveness of Monetary Policy Transmission Channels in the GCC countries," IMF Working Paper no. 12/191.

Cheng, K.C., 2006. "A VAR Analysis of Kenya's Monetary Transmission Mechanism: How Does the Central Bank's Repo Rate Affect the Economy?", IMF Working Paper No. 06/300

Christiano, L. J., M. Eichenbaum. 1992. "Identification and the Liquidity Effect of a Monetary Policy Shock", in *Political Economy, Growth and Business Cycles*, A. Cukierman, Z. Hercowitz and L. Liederman, (eds), Cambridge and London; MIT Press.

Dabla-Norris E. and Holger Floerkemeier. 2006. "Transmission Mechanisms of Monetary Policy in Armenia: Evidence from VAR Analysis," IMF Working Paper, No. 06/248.

Dagher, J. and A. Kovanen, 2011. "On the Stability of Money Demand in Ghana: A Bounds Testing Approach," IMF Working Paper No. 11/273

Davoodi, H., S. Dixit, and G. Pinter, 2013. "Monetary Transmission Mechanisms in the East African Community: An Empirical Investigation," IMF Working Paper No. 39/2013

Dornbusch, R., 1976. "Expectations and Exchange Rate Dynamics," *Journal of Political Economy,* Vol. 84, pp. 1161 - 1176

Espinoza, R. and Prasad, A., 2012. "Monetary Policy Transmission in the GCC Countries," IMF Working Paper No. 2012/132

Fleming, J.M. 1962. "Domestic Financial Polices Under Fixed and Under Floating Exchange Rates," IMF Staff Papers no. 9: 369–79.

Friedman, M., 1956. "The Quantity Theory of Money – A Re-statement," in M. Friedman, ed, Studies in Quantity Theory of Money. University of Chicago Press, pp. 3 - 21

Friedman, M. 1968. The Role of Monetary Policy.*American Economic Review*, Vol. 58; 1-17.

Friedman M., and Anna Schwartz. 1971. A Monetary History of the United States, 1967-1960. Princeton: NBER.

Friedman, B. and Kuttner, K. *Money, Income, Prices and Interest Rates* American Economic Review 82. June, 1982.

Handa, Jagdish. 2009. *Monetary Economics*, Second Edition, Routledge.

Hannsgen, G. 2004. "The Transmission Mechanism of Monetary Policy: A Critical Review," The Levy Economics Institute Working Paper No. 412.

Horvath, B. and R. Maino, 2006. "Monetary Transmission Mechanisms in Belurus," IMF Working Paper No.2006/246

Ireland, P. 2005. "The Monetary Transmission Mechanism," Federal Reserve Bank of Boston Working Papers, No. 06/1.

Kakes, J. 2000. Monetary Transmission in Europe-The role of Financial Markets and Credit. Edward Elgar Publishing.

Kalyalya, D.H (2001), "Monetary Policy Framework and Implementation in Zambia", paper presented at the SARB Conference on Monetary Policy Frameworks.

Kamin, S., P. Turner, and J. Van'tdack.1998."The Transmission Mechanism of Monetary Policy in Emerging Market Economies: An Overview," BIS Policy Papers No. 3, 5-64.

Kara, Hakan, HandeKucukTuger, UmitOzlale, BurcTuger, DevrimYavuz, and ErayYucel. 2005. "Exchange Rate Pass Through in Turkey: Has It Changed, and to What Extend?" Research Department Working Papers, No: 05/04, The Central Bank of Republic of Turkey

Kassim S.H., M.S. A. Majid. 2008. “The Role of Bank Lending in the Monetary Transmission Process of a Developing Economy: Evidence from Malaysia,” *Savings and Development*, Vol. 32(4).

Keynes, J.M. 1936. The General Theory of Employment, Interest and Money. London; Macmillan.

Keynes, J. M. 1937. “The General Theory of Employment,” *Quarterly Journal of Economics* vol 51; 209-223.

King R. and C. Plosser. 1984. “Money, Credit and Prices in a Real Business Cycle,” *American Economic Review*, vol. 74; 363-80.

Kuttner, K., and P. Mosser.2000.”The Monetary Transmission Mechanism: Some Answers and Further Questions,” Federal Reserve Bank of New York Economic Policy Review.

Kydland, F. And E. Prescott. 1982. “Time to Build and Aggregate Fluctuations,” *Econometrica*, vol. 50; 1345-70.

Lucas R. E. ([1972] 1981). “Expectations and the Neutrality of Money,” reprinted in *Studies in Business Cycle theory*, Cambridge: MIT press; 65-89.

Loazya, N. and K. Schmidt-Hebbel. 2002. “Monetary Policy Functions and Transmission Mechanisms: An Overview,” In Loazya and Schmidt-Hebbel (eds), “Monetary Policy: Rules and Transmission Mechanisms, Santiago; Central Bank of Chile.

Long, J. and C. Plosser. 1983. “Real Business Cycles,” *Journal of Political Economy*, vol. 94; 39-69.

Lungu, M., Simwaka, K., Chiumia, A., Palamuleni. A., and Jombo, W. 2012. “Money Demand Function for Malawi – Implications for Monetary Policy Conduct,” *Banks and Bank Systems*, Volume 7, Issue 1.

Maturu, O.B., 2014, “Short-term Capital Flows and Pressure on the Exchange Rate in Kenya,” Paper presented at the Centre for Studies of African Economies (CSAE) Annual Conference, 23 – 25th March, 2014.

Mabrouk A. F., S. M. Hassan. 2012. “Evolution of Monetary Policy in Egypt: A Critical Review,” *The International Journal of Social Sciences* Vol. 4 no. 1

McCallum, B.T., and E. Nelson.2001. “Monetary Policy for an Open Economy: An Alternative Framework with Optimizing Agents and Sticky Prices,” NBER Working Paper No: 8175.

Meltzer, A. H. 1995. “Monetary, Credit, and (Other) Transmission Processes: A Monetarist Perspective,” *Journal of Economic Perspectives*, vol. 9 no. 4: 49-72.

Mishkin, S. F., 1995. "Symposium on the Monetary Transmission Mechanisms," *Journal of Economic Perspectives,* Vol. 9, pp. 49 – 72.

Mishkin, S. F. 2007. The economics of Money, Banking and Financial Markets, ed. USA; Pearson-Addison-Wesley.

Mishkin, S. F. 2001. "The Inexorable and Mysterious Trade-off between Inflation and Unemployment," *Economic Journal*, vol. 111: C45-C61.

Mishkin S. F. 2001. "The Transmission Mechanism and the Role of Asset prices in Monetary Policy," NBER Working Paper no.8617.

Mishkin, F. 1996. "The Channels of Monetary Transmission: Lessons for Monetary Policy," NBER Working Paper, No. 5464.

Mishra, P. and P. Montiel and A. Spilimbergo. 2010. "Monetary Transmission in Low Income Countries," IMF Working Paper, No. 10/223.

Mundell, R.A. 1963."Capital Mobility and Stabilization Policy under Fixed and Flexible Exchange Rates," *Canadian Journal of Economics and Political Science* vol.29: 475-485.

Mutoti, N., 2006. "Monetary Policy Transmission Mechanisms in Zambia," Bank of Zambia Working Papers (WP/06/2006).

Mutoti, N., Kapembwa, C., and Zgambo, P., 2010, "Inflation Targeting in Zambia," Unpublished Bank of Zambia Working Paper.

Mwansa, L., 1998, "Determinants of Inflation in Zambia," PhD Dissertation, University of Gothenburg, Sweden.

Mwenda, A, 1993, " Credit rationing in Investment Behaviour under Market Imperfections". Ph.D. Thesis, University of Gothenborg, Gothenborg

Obstfeld, M., and K. Rogoff, 1995. "Exchange Rate Dynamics Redux," *Journal of Political Economy*, vol. 103: 624–660.

Ogunsakin, S. and A.A. Awe, 2014. "Impact of Financial Liberalisation on the Stability of Nigerian Money Demand Function," International Journal of Economics, Business and Finance, Vol. 2, No.1, pp. 1 – 18

Ozdogan Z. 2009. "Monetary Transmission Mechanism in Turkey", PhD Dissertation: University of Delaware

Pesaran, M. H., Yongcheol Shin and R. J. Smith .2001. "Bounds testing approaches to the analysis of level relationships," *Journal of Applied Econometrics*, Volume 16(3): pp.289-326.

Phelps, E.And J. Taylor. 1977. "Stabilizing Powers of Monetary Policy under Rational Expectations," *Journal of Political Economy*, vol. 85; 163-190.

Phillip, C. 1965. “Determinants and Effects of Changes in Stock of Money,” NBER working paper 13.

Ploberger, W. and W. Kramer (1990), "The Local Power of the CUSUM and CUSUM of Squares Tests," Econometric Theory, 6, 335-347.

Poole, W. 1970.”Optimal Choice of Monetary Policy Instruments in a Simple Stochastic Macro Model,”*Quarterly Journal of Economics*.

Putkuri, H. 2003.” Cross-country asymmetries in euro area monetary transmission: the role of national financial systems,” Discussion Paper No. 15, Bank of Finland.

Roberts, J. 1987. “An Equilibrium Model with Involuntary Unemployment at Flexible Competitive Prices and Wages,” .*American Economic Review*, vol. 77; 856-74.

Rogoff, K. 1989. “Reputation, Coordination, and Monetary Policy,” in R. Barro ed., *Modern Business Cycle Theory*, Cambridge: Harvard University Press.

Romer, D. 2006. *Advanced Macroeconomics*, Third Edition, McGraw-Hill.

Rothbard, M. 2009. “Economic Depressions: Their Cause and Cure,” Ludwig Von Mises Institute, USA.

Salop, S. 1979. “A Model of the Natural Rate of Unemployment.America,” *Economic Review*, Vol. 74; 433-44.

Samuelson, P and Nordhaus, W. 2004.*Economics*; McGraw Hill.

Sawar, H. Sawar, M. and M. Waqas, 2013, “Stability of Money Demand Function in Pakistan,” Economic and Political Review, Vol. 15, No. 3, pp. 197 - 212

Shapiro, C. and J.E Stiglitz. 1984. “Equilibrium Unemployment as Per Worker Discipline,” *American Economic Review*, vol. 74: 177-94.

Sharifi-Renani, H. 2007, “Demand for Money in Iran: An ARDL Approach,” Munich Personal RePEc Archive (MPRA)

Simatele, M.C.H., 2004, “Financial Sector Reforms and Monetary Policy Reforms in Zambia,” PhD Dissertation, University of Gothenburg, Sweden

Smith, A. 1776. AnInquiry into the Nature and Causes of the Wealth of Nations. London

Sriram S.S, 1999. “The Demand for M2 in Malaysia”, PhD dissertation: George Washington University.

Stein, L. J. 1981. “Monetarist, Keynesians and new Classical Economics,” *American Economic Review*, vol. 71 issue 2: 139-44.

Tahir M. N. 2012. “Relative Importance of Monetary Transmission Channels: A Structural Investigation; A case of Brazil, Chile and Korea,” University of Lyon Working paper Series.

Tahir, M. N. 2009. "Essays in Inflation and Monetary Policy Dynamics in a Globalised world", Unpublished Dissertation: University of Leuven.

Taylor, J. B. 1979. "Estimation and Control of an Econometric Model with Rational Expectations," *Econometrica*, vol. 47; 1267-86.

Taylor, J.B. 1993. "Discretion versus Policy Rules in Practice," Carnegie Rochester Conference Series on Public Policy, vol. 39: 195–214.

Taylor, J.B.1995. "The monetary transmission mechanism: an empirical framework." .*Journal of Economic Perspectives*, vol. 9(4), 11-26

Taylor J.B. 1999. The Monetary transmission Mechanism and the Evaluation of Monetary Policy Rules. Prepared for third annual international conference of the central bank of Chile on "Monetary policy: Rules and Transmission mechanisms" September, 1999.

Tobin, J., 1956, "The Interest elasticity of Transactions demand for Cash," *Review of Economics and Statistics 38*: 241 - 247

Tobin, J. (1969). "A General Equilibrium Approach to Monetary Theory," *Journal of Money, Credit, and Banking* Vol. 1: 15–29

Chapter 8

The Effectiveness of Monetary Policy in Zimbabwe

By Samuel Tarinda

1.0 Introduction

Monetary policy in Zimbabwe has gone through a number of distinct phases since the country gained independence in 1980, reflecting fundamental shifts in broad macro-economic policy and developments. The conduct of monetary policy in the 1980s, against the background of broad macro-economic controls, remained passive. Direct controls related to caps on prices, wages, interest rates, credit rationing, a raft of administered prices, as well as stringent exchange control regulations. Although controls helped to keep inflation at artificially low levels, they severely limited the contribution of monetary policy to economic development. The next section discusses the evolution of the monetary policy frame in Zimbabwe since independence in 1980.

2.0 Monetary Policy Framework and Implementation

2.1 Monetary Policy in the 1980s

The 1980s were also characterised by periodic droughts, which put pressure on the economy in general, and on the fiscus in particular. The high fiscal deficits that ensued, absorbed a disproportionately high level of domestic savings, and limited the contribution of monetary policy to economic growth and development. The resultant decline of investment, with private sector investment contracting from 12.5% of GDP in 1985 to a low level of 7.7% in 1988, led to uneven economic growth which, on average, remained low at close to 3% in real terms, and in some cases negative. With the rate of inflation averaging 12.7% during the decade to end 1989 and short-term interest rates averaging 10%, controls on interest rates effectively led to negative real interest rates, which served only to discourage financial intermediation and savings mobilization.

2.2 Monetary Policy in the 1990s: Monetary targeting framework

In the 1990s, however, a more active conduct of monetary policy was witnessed, as most controls on domestic economic activity were removed under a series of macro-economic reforms and liberalisation programmes, including the Economic Structural Adjustment Programme (ESAP) in the early 1990s, and the Zimbabwe Programme for Economic and Social Transformation (ZIMPREST), from 1996 to 2000, among others. The adoption of these phases of economic reforms, which set to liberalise and deregulate the domestic economic environment by increasing the role of market forces in the efficient allocation of resources, dictated that monetary policy assume a more active role. Consequently, the thrust of monetary policy shifted from direct controls in the 1980s to more liberal and market-based instruments of monetary control, during and after the 1990s.

The removal of direct controls also necessitated the introduction and development of indirect instruments of monetary policy. These included secondary trading in treasury bills; the use of Reserve Bank of Zimbabwe bills to complement open market operations; variations in the reserve requirement ratios; and the active use of repurchase agreements (repos) for liquidity management purposes. The rediscount rate was also actively used to project the Central Bank's medium term view of inflation on the one hand, and as a primary rate through which the monetary authorities influenced other interest rates in the economy. This rate was, however, phased out and replaced by the Bank rate, at the end of 1998.

2.3 Monetary Policy Between 1997 and 2003: Exchange rate controls

In the build-up to the turn of the century, particularly in the 5-year period between 1998 and 2003, a raft of policies characterised the rapidly changing economic landscape. The Central Bank’s monetary policy strategy, which hitherto, was premised on monetary targeting, became unsustainable due to increased monetization of fiscal deficits. Monetization of Government financing shortfalls began firstly in August 1997, when about 60,000 war veterans were granted ZWD50 000 (nearly USD3 000 at the time) each, outside the budget (Chitiyo, 2000). This triggered inflation and loss of confidence in the local currency, thus precipitating massive speculative currency attacks, on the money, capital and foreign exchange markets. Faced with limited options on exchange rate adjustments, the Central Bank responded by raising interest rates significantly, through frequent hikes in the Bank rate. This notwithstanding, the exchange rate, however, continued to depreciate, both on the official and parallel markets.

The excessive price build-up, associated with rapid depreciation in the exchange rate, forced Government to re-introduce price controls, which had been abolished at the beginning of the 1990s, as part of the wide-ranging macroeconomic reforms. The controls immediately resulted in shortages of basic commodities in official markets, as goods disappeared from the shelves of supermarkets, thus signalling the beginning of rapid informalization of the economy. The Central Bank responded by trading the local currency within a narrow and overvalued exchange rate band, resulting in significant losses of foreign currency reserves. Notwithstanding this defence of the exchange rate, excessive speculation in a largely open economy resulted in the collapse of the exchange rate, on 14 November 1997, in what has become known as the "Black Friday". On this day, the exchange rate depreciated by over 40% (Chitiyo, 2000).

Since then, the pass through from depreciation to prices had, however, became so direct and extremely vicious, under the environment of excessive speculation. This price formation was consistent with the findings of Odedokun (1997), who concluded that currency depreciation in the official and parallel markets, monetary growth, and foreign inflation, were the underlying causes of domestic inflation, in a cross-country study of several Sub-Saharan African countries, including Zimbabwe.

Zimbabwe's participation in the civil war in the Democratic Republic of Congo (DRC), beginning September 1998, under the SADC protocol, further strained Government's financial position, and according to Dietrich (2000), this fuelled speculation and negative perceptions about fiscal sustainability in the medium term. The Land Reform Programme in 2000, which followed the collapse of talks during 1998 Donor Conference on Land Reform, further damaged confidence in the economy and weakened the currency, with devastating effects on price stability. Armed with dwindling foreign currency reserves, and an ineffective interest rate and exchange rate regimes, the Central Bank resorted to a number of import controls, coupled with financial repression.

From 1997, therefore, the exchange rate policy became more pronounced, and overshadowed the effectiveness of monetary aggregates and interest rates, in transmitting policy messages to the real sectors of the economy. Government also adopted the Millennium Economic Recovery Plan (MERP) in 2001, which was development oriented, and effectively ushered in new challenges, opportunities and threats for monetary policy. Between 2000 and 2001, the monetary targeting framework faced additional institutional and operational challenges, including episodes of fixed exchange rates; explicit announcements of the Bank rate; increased recourse by government to the Central Bank financing of its operations; a manipulated low interest rate environment; and attempts by authorities to stimulate economic activity through directed lending, in the form of on-lending facilities backed by statutory reserves held by the Central Bank. The directed lending policies, as well as direct interventions by the Central Bank in the economy, though various on-lend facilities bank-rolled by issuance of currency, were escalated in the period beginning 2004, when the Central Bank embarked a developmental agenda, through the financing of a plethora of quasi fiscal activities.

The cumulative effect of exchange rate controls and escalating inflation led to shortages of both local and foreign currency, which reached a climax in 2003. An acute shortage of Zimbabwean dollar banknotes followed inability of the Central Bank to secure adequate imports of bank note paper, ink and other currency printing materials, due to crippling foreign currency shortages in the official market. In response to the currency shortages, the Central Bank introduced the first series of bearer cheques, as emergency currency notes, which circulated alongside the main currency, from 15 September 2003, until their withdrawal on 21 August 2006. The bearer cheques, also known as Special Traveller's Cheques, were in the denominations of $5 000 and $10 000, while higher denominations of $20 000, $50 000 and $100 000 were later issued. All bearer cheques of this series were, however, demonetised in August 2006, following the first re-denomination of currency.

2.4 Monetary Policy between 2004 and 2008: Hyperinflation

The monetary stance at the beginning of 2004 was, in principle, contractionary monetary targeting framework, aimed at reducing inflation, which had reached just above 600% by December 2003. Under this strategy, a Framework for Liquidity Management was put in place, aimed at containing money supply growth to levels consistent with desired inflation targets. Reserve money, which was fairly and reasonably under the control of the Central Bank at the time, became the operational target, while interest rates (through use of the Bank Rate) were the main instruments of monetary policy. Frequent hikes of the Bank Rate, tightening of Central Bank lending to Government and banks, coupled with reduced inflation expectations, as economic agents initially believed the Central Bank's declaration of inflation as "enemy number one" in the economy, had some positive impact on macroeconomic variables. Inflation, which had peaked to 623% in January 2004, decelerated sharply from March to around 130% by the end of 2004.

As highlighted above, the Central Bank embarked on an expansionary monetary policy drive, aimed at directly and indirectly financing Government, public enterprises and private entities, in projects meant to prop up economic activity, under an overall development agenda (December 2003 RBZ Monetary Policy Statement). Although the monetary policy strategy was predominantly monetary targeting, active use of exchange rate, multiple interest rates and direct injections of money supply in the economy, diluted the effectiveness of the monetary targeting framework, resulting in severely weakened underlying fundamentals in the economy. The economy, however, initially responded positively to the monetary stimulus packages in the very immediate to short-term, with nominal GDP expanding, and inflation falling from around 600% at the end of 2003 to 124% by end March 2004. This somewhat gave credence to the monetarist view that changes in money supply can result in changes in real variables in the short-term. This was partly because pat of the funds injected into the economy was offset by commercial bank statutory reserves held at the Central Bank – which was some form of directed lending.

The positive output gains were, however, short-lived, and were eventually reversed by the inflationary effects of excessive monetary expansions. Monetary injections would soon exceed the funds held by the RBZ in the form of bank statutory and other reserves, implying that the development agenda of the Bank was now financed directly from printing money. Beginning 2005, the economy embarked on a hyperinflationary journey, which only ended in 2009, with the adoption of dollarization.

As observed by Makochekanwa (2007) and Coorey, et al (2007) hyperinflation in Zimbabwe was basically and predominantly a monetary phenomenon, fuelled largely by excessively monetary expansions, arising from the Central Bank's quasi-fiscal activities. According to Kairiza (2012), "The quasi-fiscal activities went beyond the operational realm of a normal Central Bank and had the effect of undoing the ephemeral achievements in the inflation battle and firmly set course for the drive towards hyperinflation". The sharp decline in domestic production resulted in widespread shortages of basic goods and services, which continuously pushed up prices. Kairiza (2012) also notes that, in addition, rapid and sustained depreciation of the exchange rate, itself largely a consequence of rising inflation, also fuelled inflation via the pass-through effects on prices. It became a vicious cycle. Makochekanwa (2007) modelled the money demand function using an Error Correction Methodology, and concluded that the country's hyperinflation had been largely driven by excessive liquidity injections from the Central Bank.

As early as the first Quarter of 2005, the Central Bank itself had realized that the development agenda had been the fundamental cause of escalating inflationary pressures in the economy. In a document titled *Inflation Drivers in Zimbabwe: Supplement to the First Quarter 2005 Monetary Policy Review Statement*, the RBZ noted, "On the demand side, excessive money supply growth was identified as one of the major cause of inflation. Empirical evidence for Zimbabwe has shown that excessive money supply growth, which is not matched by productive economic activity, has adverse effects on inflation". The Bank noted further that "On the demand side, money supply growth unrelated to economic activity is a major source of inflation in the economy. The Reserve Bank, therefore, created a Framework for Liquidity Management, whose primary objective is to contain money supply growth to levels consistent with inflation targets".

In document titled "A Synopsis of the Impact of the Central Bank's Interventions to the Economy from January 2004 to June 2006", "Extra-Ordinary Interventions by the Reserve Bank of Zimbabwe (2008), and in various other Supplements to Monetary Policy Statements, the RBZ listed the following quasi-fiscal activities (QFAs) as underpinning the development agenda:

- Concessional financing to the productive sectors of the economy, particularly agriculture for both working capital and infrastructure development;
- Farm Mechanization Programme;
- Transport Sector Interventions;
- Revolving Fund for Small to Medium Enterprises (SMEs);
- Gold Development Fund;
- Bio-Diesel Project;
- Maize and Tobacco Support Schemes;
- Basic Commodity Supply Side Interventions (BACOSSI);
- Distressed Companies Fund;
- Funding of country-wide dam construction and rehabilitation;
- Parastatal Re-Orientation Programme (PARP);

- Parastatals and Local Authorities Rehabilitation Programme (PLARP);
- Provision of foreign exchange to some key social Ministries, such as Health and Child Welfare;
- Fund to strengthen the Judicial System; and
- Payment for other National strategic interests, food imports, including financing of general Government operations, particularly those that required foreign currency.

As a result of these quasi-fiscal interventions, money supply and inflation rose sharply (Munoz, 2007). Broad money supply (M3) growth was continuously on an upward trend, rising from 177.6% in January 2005 to 585.8% by December 2005, and further to 1 185% by June 2006, underpinned by the Central Bank quasi-fiscal operations. Faced with this scenario, the Central Bank announced in October 2005, that "the Reserve Bank had moved from the eclectic monetary policy management framework to a monetary targeting framework. In the monetary targeting framework, reserve money is the operational target and inflation is the ultimate target. The Reserve Bank will continue to pursue explicit monetary targeting regime, through rigorous open market operations, as well as other forms of interventions targeted at reducing money supply expansion" (RBZ, 2005).

In line with this policy strategy, the Central Bank announced plans to further tighten monetary policy, in particular, the interest rate policy. "The prevailing high inflationary pressures in the economy require that the Reserve Bank maintains the policy of positive real rates, in line with inflation developments. The Bank's overnight rates will, therefore, continue to serve as a pre-emptive tool, whose main focus is to realign inflation expectations, as well as the real demand for credit in the economy. On an ongoing basis, therefore, the Bank's accommodation rates will be revised, consistent with levels deemed to be appropriate, based on projected inflation profiles, at the same time, minimizing the adverse effects of the interest rate instrument to the productive sectors".

By mid-2006, the high inflation environment had begun to pose technical risks on financial information and accounting systems in the economy, with most information technology (IT) systems failing to cope with the increasing number of digits or zeros. Most systems had fast approached their programmed digital handling capacity ceilings. In view of this challenge, the RBZ announced at the end of July 2006, that it was rebasing the national currency, by knocking off three (3) zeros from the currency. Subsequently, a changeover period of between 1 August 2006 and 21 August 2006, was prescribed for rolling over to the new currency, dubbed "New Family of Bearer Cheques". The 21-day changeover process was termed "Operation Sunrise – A New Beginning for Zimbabwe", under which the Central Bank led other national institutions country-wide to "buy-back" old currency with new currency, at a factor of 1 000 (RBZ July 2006 Monetary Policy Statement).

Because the underlying macroeconomic fundamentals had not been corrected, and that monetary injections into the economy continued unabated, the positive impact of currency rebasing did not last for long. The three zeros knocked out of the currency were soon to return – with a vengeance (Kramarenko, et al, 2010). Inflation continued rising, reaching 1 281.1% by December 2006. Money was losing value every hour, as people shuttled between the banking halls and the shops. Currency withdrawn from the banking system had no opportunity of being re-banked, as there was no incentive to save the worthless currency in the banks. In addition, the difficulty of obtaining money from the banks (due to cash withdrawal limits) destroyed the incentive to re-deposit the cash in the first place. All the currency issued by Central Bank was circulating outside the banking system, implying that banks required to order cash from the Central Bank nearly all the time.

With the country's BOP position worsening rapidly, parallel foreign exchange market activities escalated, and compounded the currency crisis, as these activities were essentially financed by cash movements on either terminal of the transactions. Soon, there was a vicious cycle involving loss of value of currency, escalation in the parallel exchange rates and rising prices of goods and services. The official exchange rate was fixed at grossly overvalued levels, and was only increased by insignificant margins after long periods of fixation. Meanwhile, the parallel exchange rate, which had become the actual exchange rate for over 95% of transactions, was deteriorating at least three times daily.

Numerous methods of calculating parallel market exchange rates emerged, with the one based on Purchasing Power Parity, utilizing the dual listing of companies on the Zimbabwe Stock Exchange (ZSE) and London Stock exchange, gaining more credibility. In particular, the Old Mutual Implied Rate (OMIR) was calculated by dividing the Zimbabwe Stock Exchange Price of shares of the insurance company by its London Stock Exchange Price for the same share. In addition, the United Nations country office in Zimbabwe also posted their own rates, for use by UN Agencies and other NGOs.

In the absence of adequate cash, the parallel market activities were being funded through the real time gross settlement system (RTGS), through a phenomenon which became known as "burning". The "burning" syndrome and syndicates increased pressure for cash withdrawals at the banks, as cash was eventually required to complete certain transactions in an economy, which had increasingly become a cash society. Due to the difficulty of obtaining cash from banks, there appeared another cash-based parallel market rate, markedly different from the RTGS-based rate.

Consequently, the Central Bank was forced to embark on a series of currency re-basing exercises, which involved knocking off many zeros from the currency, at subsequent intervals, between December 2006 and December 2008. In total, the Zimbabwean currency gained nearly 40 zeros between 1st of August 2006 and 2nd of February 2009. By then, money supply had escalated exponentially, from below 200% in December 2004 to 432 Quintillion% ($10^{18)}$ by end December 2008. Inflation had also accelerated uncontrollably, from 66 212.3% in December 2007 to 231 million% by July 2008 (RBZ Annual Report, 2008). After July 2008, ZIMSTAT, the Government Statistical Agency (then Central Statistical Office), announced that it was no longer able to measure the country's inflation rate. This was due to the unprecedented number of zeros, as well as lack of availability of basic goods in the formal markets, as most trading had gone underground, leading to subsequent lack of official information from which to calculate the inflation rate. In addition, most computers systems and accounting software, which were not designed to handle such large amounts of digits, had mostly crushed.

Consequently, numerous unofficial measures of inflation emerged, to fill in the gap between July 2008 and early 2009, with IMF estimates putting it at over 500 billion per cent by end 2008 (Kramarenko, et al, 2010), while Steve Hanke (2009), from the CATO Institute at the Johns Hopkins University, contends that Zimbabwe's hyper-inflation peaked at 89.7 sextillion (10^{21}) per cent in November 2008.

Figure 8.1: Inflation Trends

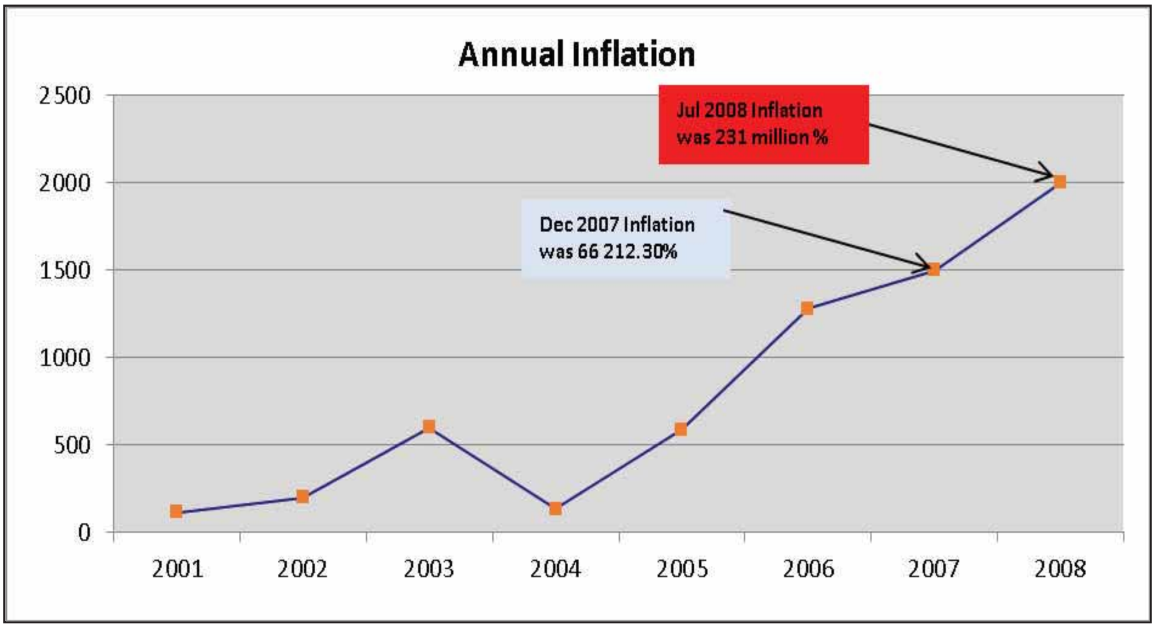


Table 8.1: Zimbabwe's Annual Inflation Rates (1980-2008)

Year	Inflation	Year	Inflation	Year	Inflation
1980	7	1991	48	2001	112.1
1981	14	1992	40	2002	198.93
1982	15	1993	20	2003	598.75
1983	19	1994	25	2004	132.75
1984	10	1995	28	2005	585.84
1985	10	1996	16	2006	1,281.11
1986	15	1997	20	2007	66,212.3
1987	10	1998	48	2008 (July)	231 million
1988	8	1999	56.9		
1989	14	2000	55.22		
1990	17				

Source: Reserve Bank of Zimbabwe

Notwithstanding attempts to control inflation, including by legislative price controls, and instituting three consecutive currency re-denominations (in 2006, 2008 and 2009), use of the Zimbabwean dollar as the official currency or legal tender was effectively and officially abandoned on 12 April 2009, when the country adopted a multiple currency system, under unofficial full dollarization. The immediate implication of adopting dollarization was that all national savings in local currency disappeared overnight, and had not been de-monetized to date. Depositors started all over again in 2009, which significantly affected confidence in the economy, particularly in the banking system, and consequently destroyed the culture of saving in the population. To date, it is believed that the country has anything between US$1 billion and US$2 billion worth of hard currencies, circulating outside the banking system, due to loss of confidence in banks.

3.0 Literature Review on Monetary Policy in Dollarized Economies

In this section, we draw parallels of Zimbabwe's experience with other countries that have experienced or adopted dollarization before. We will, however, be mindful of the differences in the manner of dollarization, the initial and prior conditions before dollarization, extend of use of own currencies, and distances from the anchor countries (e.g. the US), among other factors.

We discuss the concept and the theoretical foundations of dollarization, including the advantages and disadvantages of the various forms of dollarization, the effects of dollarization on the conduct of monetary policy, and the experiences of a selected few countries with dollarization. Again, we will be mindful of the abundance of literature on this subject, and will try to focus on experiences that are similar or relevant to Zimbabwe. We will, therefore, be narrowing the analysis towards the most relevant aspects of the selected country experiences to the Zimbabwean situation.

3.1 Dollarization: Stylized facts

Dollarization occurs when a country adopts the currency of another as a legal tender. This is where the domestic money is either replaced or used in parallel with foreign money in the performance of the functions of domestic money. There are various forms in which dollarization can assume, including asset, liability, partial and full dollarization. Dollarization, however, does not only refer to the use of the US dollar, but also to the use of any other foreign currency as, or in the place of, the national currency.

Official full dollarization occurs where a Government endorses, through political consensus, a foreign currency as having the exclusive status of legal tender in a country and abandons the use of its national currency. Semi-official dollarization refers to a situation where both the local and the foreign currencies are used as legal tender. Dollarization can also occur unofficially, without formal legal approval or treaty, where foreign currency is legal tender, but plays a secondary role to domestic currency officially, or where a country ceases to issue the domestic currency and uses only foreign currency (unofficial or unilateral full dollarization, as is the case with Zimbabwe).

3.2 Dollarization: Costs and benefits

Potential benefits of adopting dollarization include immediate cessation of inflation or hyperinflation, lower borrowing costs and deeper integration into the world market (Berg and Eduardo, 2000). The new currency would also help stabilize the economy, which usually follows a political crisis. This credibility and predictability promotes foreign investment. The new currency also helps to lower interest rates and eliminates the risk of devaluation, as well as other rent seeking behaviours and parallel market activities.

One of the major costs of adopting a foreign currency, is the immediate loss of monetary policy autonomy and the benefits of seigniorage. In addition, a country may also lose the “exit option” to devalue in face of major exogenous shocks (Berg and Eduardo, 2000). Dollarization also increases the susceptibility of the host country’s economy to shocks in the anchor country. Another pitfall associated with dollarization is that the Central Bank loses the lender of last resort function and dollarization may lead to loss of political sovereignty. Last but not least, as in the case of a country with a small export base, dollarization also leads to liquidity problems and hence lowers economic growth (Nota and Sakupwanya, 2013).

In addition, Goldfajn and Olivares (2000) analysed the benefits and costs of full dollarization in a number of countries and concluded that the Benefits are:

- The credibility gains associated with full dollarization induce lower average and variability of inflation. Inability of the Central Bank to embark on expansionary monetary policies also bestows a measure of confidence in the economy, thereby helping to lock away damaging and often self-fulfilling inflation expectations;
- The absence of currency risk should imply lower domestic interest rates, which helps to eliminate externally induced banking and financial crises;
- The absence of seignorage induces more fiscal discipline, while the absence of a lender of last resort induces banks to seek for alternative contingent funds. This gives a competitive edge to international banks over domestic banks inducing a more stable international banking system;

- while the Costs of dollarization are:
- The absence of monetary and exchange policy in a dollarized economy may induce more volatility of GDP, and exposes the economy to shocks and other vulnerabilities that the Central Bank and Government are not able to offset;
- The use of a hard currency may disenable the Central Bank and Government to issue domestic financial instruments, resulting in limited money market and inter-bank trading activities; and
- Under dollarization, the flexibility to use exchange and monetary policy is limited, and with it also, the inability of authorities to implement counter-cyclical measures.

3.3 Dollarization: The process

Dollarization is, in most cases, preceded by prolonged periods of hyperinflation, which are accompanied by severe economic dislocation (stagflation). The high and unanticipated inflation rates decrease the demand for domestic money and raise the demand for alternative assets including foreign currency and assets denominated in foreign currency. This phenomenon is called the "flight from domestic money". The flight from domestic money results in a rapid and sizeable process of dollarization, which usually starts in the banking sector (financial dollarization).

In high inflation countries, the domestic currency tends to be gradually displaced by a stable currency such as the U.S. dollar (currency substitution). At the beginning of this process, the store-of-value function of domestic currency will be replaced by the foreign currency. Then, the unit-of-account function of domestic currency will be displaced when many prices are quoted in a foreign currency. A prolonged period of high inflation will induce the domestic currency to lose its function as medium of exchange when the public carry out many transactions in foreign currency. In the end, authorities are forced to follow market preferences and pronounce official dollarization.

3.4 Dollarization: Selected country case studies

There are a number of countries that dollarized and used the United States dollar or other international currencies as the official currency or legal tender. These countries include Panama, Ecuador, El Salvador, and East Timor, among many others. In addition, the Pacific Ocean countries of Palau, the Marshall Islands, and the Federated States of Micronesia have all adopted the US dollar as official currency.

Other dollarized countries that have adopted currencies other than the United States dollar include mostly small Pacific Ocean countries like Kiribati, Tuvalu, and Nauru, which use the Australian dollar as their currency. The South African rand is used in Namibia, Swaziland, and Lesotho, alongside their official currencies. The Indian Rupee is used in Bhutan and Nepal, alongside the Bhutanese ngultrum and the Nepalese rupee, respectively. Liechtenstein has also been using the Swiss franc as its currency since 1920.

3.4.1 Panama's experience with dollarization

Panama is one of the largest and first economies to dollarize. The country officially dollarized in 1904 while the Panama Canal was being constructed by the United States government (Goldfajn and Olivares, 2000). The US dollar has remained as their legal tender, for over a century. Although there is a national currency, the Balboa, its role is largely symbolic. There is no central bank and the monetary authorities cannot issue Balboa-denominated notes. Panama benefited enormously from the strategic importance of the Canal to world trade, which has been the driving force in its economy for over a century. In addition, the domination of production by related services virtually insulates the economy from external shocks.

Since dollarization, Panama has experienced low inflation, macroeconomic stability, and low interest rates, including the existence of long term credit. Since 1970 Panama has had no controls on capital mobility, and has been financially integrated to the rest of the world. For decades, Panama has been an important center for offshore banking, with a large number of international banks operating in the country (Moreno-Villalaz and Juan Luis, 1999). This promoted international lending through numerous international banks that regulate liquidity levels in the economy. Excess liquidity is invested abroad and shortages are bridged by injections from international bank's parent companies.

Panama's experience confirms that an exchange rate peg, with full official dollarization, could generate low and stable inflation, as well as promote economic stability. This gain in inflation performance is sustained without compromising average GDP growth. However, Panama has a bit higher volatility in GDP growth, which could be attributed to its lack of flexibility in monetary and exchange policies. In addition, the country has also experienced large and persistent fiscal deficits, notwithstanding the absence of direct monetary financing (Goldfajn and Olivares, 2000) of the budgets. In the absence of the lender of last resort (LOLR), however, Panama instituted strict bank regulations, typified by bank auditing guidelines that assisted in the monitoring of bank practices, credit guidelines and overall bank administration.

3.4.2 Ecuador's experience with dollarization

Ecuador began the dollarization process in March 2000, amidst worsening macroeconomic conditions, heightened by banking sector problems. These problems culminated in a run on deposits and the subsequent freezing of demand and savings deposits for six months and time deposits for one year (Davidson, 2002; Quispe-Agnoli and Whisler, 2006). The banking crisis in Ecuador significantly undermined monetary policy, particularly with regards to ability to control inflation. Also, unofficial dollarization in Ecuador had increased to a level where approximately 80% of financial assets were being held in US dollars, implying that the Sucre (domestic currency of Ecuador) had virtually ceased to function as a store of value (Davidson, 2002; Quispe-Agnoli and Whisler, 2006).

The central bank floated the Sucre in February 1999 as exchange rate pressure mounted and international reserves dwindled. A full-blown crisis was emerging and on 9 January, 2000, the government announced official dollarization through enactment of the Economic Transformation Law (ETL). The ETL provided for the development of a liquidity fund, to supplement the Central Bank's capacity to manage liquidity, and modernized and tightened banking supervision and regulations. Banks were required to allocate one per cent of their deposit base to the liquidity fund.

Ecuador dollarized after experiencing both domestic and international financial crises and a growing fiscal deficit. Apparently, Ecuadorian officials decided that the resulting pessimistic expectations of both domestic residents, foreign investors and the IMF left them with no alternative than to dollarize to provide a "credible" financial system (Davidson, 2002). The Ecuadorian Sucre went out of circulation, and was replaced by the US dollar. Dollarization is estimated to have reduced Ecuador's seigniorage revenue by as much as 0.2 per cent of GDP (Davidson, 2002). The country also lost monetary policy autonomy, and its key policies on interest rates had to be in sync with Federal Reserve Bank's Monetary Policy stance.

Among the benefits of dollarization was that Ecuador's inflation was reduced from 96% in 2000 to 19% in 2001, before declining further to 2.7% in 2004; there were no more currency crisis; interest rates fell; iscal discilpine was imposed; which cretaed an environment condusive to long term planning and investment decisions, as wel as positive economic growth rates.

3.4.3 Montenegro's experience with dollarization

The Montenegrin government dollarized in 1999, after realizing that almost all transactions and savings were being conducted in German Marks. Montenegro introduced a parallel currency system, one in which the German Mark was made the legal tender and allowed to freely float alongside Montenegro's domestic currency, the Dinar. The entire process was conducted swiftly and without the support of external parties or institutions. At the time when the German Mark was introduced as the means of payment, the government was running fiscal deficits of around 20% of GDP.

After January 2001, the German Mark (DEM) became the only legal tender, and this was changed to Euro in June 2002, following adoption of the Euro by eurozone countries. Montenegro had a fairly successful experience in the implementation of dollarization. It was has remained a highly open economy with some measure of stability.

3.4.4 El Salvador's experiences with dollarization

In 2001, the Salvadoran government implemented the Monetary Integration Law, which made the US dollar legal tender and the only unit of account in the financial system. Steps were also taken to aggressively integrate the Salvadoran economy into world markets. Local currency denominated bank reserves were converted into remunerated liquidity requirement reserves, which banks accessed to fund short-term liquidity shortfalls. Through dollarization, El Salvador managed to achieve lower interest rate spreads and obtained the benefits of closer integration with international financial markets (Quispe-Agnoli and Whisler, 2006).

Adoption of the US dollar made sense for El Salvador, which relies substantially on remittances sent from Salvadorians living in the US. The US is also El Salvador's principal trading partner. It is estimated that there are about two million Salvadorians in the US, and that they remit about $1.97 billion annually, representing approximately 13% of El Salvador's GDP (Swiston, 2011). The country's economy is closely linked to that of the United States, while about 60%

of total exports are sent to U.S. markets. In general, dollarization in El Salvador resulted in lower inflation rates, low interest rates, lower country risk premiums, gains in policy credibility and improvement in economic growth and stability, particularly in the first few years of its implementation. Although El Salvador still uses the US dollar as its sole legal tender, its proximity and strong economic ties with the US economy makes its case markedly different from theb dollarization in Zimbabwe.

3.4.5 Other countries experiences with dollarization

In the aftermath of the financial crisis in Brazil, Argentina and Mexico in the 1990s and the East Asian financial crises of 1997, a number of Latin American and some Asian countries informally adopted dollarization in an effort to address rampant inflation and avert economic instability. Before dollarization, lack of confidence in economic policies, deteriorating economic conditions and worsening political outlook, had resulted in the citizens in these countries resorting to currency substitution, with the currency of choice being mostly the more stable US dollar. In some of the countries, dollarization took place not only because of the loss of confidence in the local currency, but also because of corruption and bureaucracy in both the public and private sectors (Oomes and Ohnsorge, 2005; Quispe-Agnoli and Whisler, 2006).

3.5 Lessons Drawn from Country Experiences

The balance of costs and benefits of full dollarization is still a complex issue which requires more research and empirical evidence (Berg and Eduardo (2000)). While dollarization results in potential benefits of lower inflation, lower interest rates, increased confidence and more stable economies; the cost of forgone seigniorage revenues, loss of monetary policy, inability to cushion the economy against external shocks, and lack of a clear exit strategy from dollarization, remain important considerations for adopting such a policy framework.

Countries which are already highly integrated with the host country's trade and financial relations are likely to benefit more from dollarization, compared to those that are distant and economically unrelated to the anchor countries. For example, European countries which adopted the Euro benefited immensely from dollarization as a result of deep market integration in the European Union (Berg and Eduardo, 2000), while Latin American countries drew immense benefits from their economic relations and ties with the US.

Zimbabwe's situation is, however, unique in the sense that most of these countries retained some proportion of their own local currencies, while others went into formal arrangements with the anchor countries. In the case of Zimbabwe, the local currency was completely abandoned, while the country has no formal arrangements or agreements with the countries whose currencies Zimbabwe is using. While dollarization resulted in low inflation and some measure of economic stability in Zimbabwe, these nascent gains could not be sustained for long due to existence of underlying institutional rigidities and overarching infrastructural bottlenecks.

4.0 Monetary Policy under Dollarization in Zimbabwe

Zimbabwe abandoned its own currency and adopted multicurrency in 2009, which is a form of dollarization. This resulted in generally low and stable inflationary rates, restored financial stability, increased budgetary discipline, and re-established monetary credibility (Noko, 2011). However, the major challenge confronting the Zimbabwean authorities is on the choice of a specific currency to anchor the dollarization, and the subsequent inability of the government to enter into a formal dollarization agreement with the anchor country (Noko, 2011).

The Zimbabwean Government officially abandoned the Zimbabwean dollar in 2009, after nearly a decade of economic recession and hyperinflation (stagflation). The authorities, however, declared the use of multicurrency system without any formal arrangements with the host country's Governments. Under the multicurrency system, Government approved the use of major foreign currencies such as the United States Dollar, South African rand, British pound sterling, Japanese Yen and Botswana Pula, among others, as legal tender. In 2014, authorities also added other currencies such as the Chinese Yuan and the Indian Rupee, to the basket of international currencies, for use by economic agents.

The US dollar is, however, the predominant currency, also used as the settlement account. The rand circulation is also significant, given the country's proximity and trade linkages with South Africa. Banks keep depositors' accounts in any of the major international currencies. What makes the dollarization in Zimbabwe a rather unique phenomenon is the total abandonment of the country's currency, as well as its lack of official arrangements with the countries whose currencies Zimbabwe is using. Literature cites this arrangement as a phenomenon of *Unofficial Full Dollarization*.

Under dollarization, there is basically ***No Monetary Policy*** in Zimbabwe, in so far as the application of traditional monetary policy instruments is concerned. There are no monetary policy instruments to effectively influence macroeconomic and financial conditions in the economy. Due to inability to print local currency, and unavailability of a fund dedicated to the Lender of Last Resort function, there are no instruments like the Repo Rate, Bank Rate or such refinance facilities, which normally provide the Central Bank with a leverage over interest rates and other financial conditions in the market. As a result, the money, capital and inter-bank markets are not active. A few Treasury bills and Bonds issued by Government, as well as other securities issued by state enterprises have had no significant impact secondary market trading, due to the non-competitive nature of their issuance modalities, and most of them are long term nature (2 years and above), which makes them unattractive for short-term trading. As a result, institutions hold these to maturity. Most Treasury Bills and Bonds were issued through private placements, as opposed to open tenders, implying that their terms and conditions are not market determined. In addition, some of the bills of the same tenor have been issued at different rates, and vice versa, resulting in a convoluted yield curve.

In essence, therefore, apart from providing Research and Policy Advice to Government, the RBZ is relying mostly on Moral Suasion and other non-monetary policy interventions, such as Banking Supervision and Surveillance; administration of National Payment Systems; as well as enforcement of Exchange Controls and Anti-Money Laundering Regulations. Ideally, Fiscal Policy would play a more prominent role under dollarization, but a constrained fiscal space severely limits its effectiveness in Zimbabwe.

5.0 Empirical Analysis of Monetary Policy under Dollarization

5.1 Empirical Literature Review

5.1.1 Money demand functions

Generally, there is not much literature on money demand and inflation in dollarized economies. The available literature, however, seems to suggest that money demand in dollarized economies is highly unstable, making it difficult to forecast and control inflation (Oomes and Ohnsorge, 2005). Indeed, Oomes and Ohnsorge (2005) estimated a money demand function for Russia using a measure of effective broad money which included an estimate of foreign cash holdings. The study found that money demand was relatively stable, and that effective broad money growth had the strongest and most persistent effect on short-run inflation. The paper also established that excess supply of effective broad money was inflationary, while other measures of money supply were not. The study estimated a long-run money demand for Russia, using the following specification:

$$\frac{M^d}{Y} = f(Y, R) \quad \text{......} \quad (1)$$

where M^d is the demand for a particular monetary aggregate, P is the consumer price index, Y is a scale variable measuring the real level of economic activity, and R is a vector representing the rates of return on alternative assets (i.e., the opportunity costs of holding money). Monthly data on industrial production was used as a proxy for monthly GDP Y. The study used monthly data for all the variables, for the period April 1996–January 2004 (93 observations). The study concluded that money demand was fairly stable over the sample period. In Zimbabwe, however, broad money aggregates consist entirely of foreign currency deposits, with no components of local currency. The currency circulating outside the formal banking system, believed to be anywhere around 40-50% of broad money, is not included in the broad money aggregate, which seriously distorts the measure of demand for money.

Other studies of money demand in Russia, which did not include an estimate of foreign cash holdings, found that the money demand functions were not stable. For example, Banerji (2002) estimated a demand function for ruble (Russian local currency) broad money in Russia for the period June 1995–March 2001 and finds that VAR tests for the presence of a single cointegrating vector, which is one measure of money demand stability, "did not yield sensible or robust results."

In another study, Adam (2013) estimated the following extended version of the money demand model, which was in the form of a degree of dollarization equation:

$$dr2_t = \beta_0 + \beta_1 \inf_t + \beta_2 ir_t + \beta_3 tour_t + \beta_4 open_t + \mu_t \quad \text{......} \quad (2)$$

where $dr2_t$ is the dollarization ratio as measured by the ratio of foreign currency deposits to total deposits in the banking system, inf_t is the annual change in inflation rate, $tour_t$ is the number of tourist bed nights, to approximate the foreign currency inflows into the country, is the ratio of openness of the economy and, it is related to higher foreign currency deposits to facilitate trade and μ_t represents the error term. The study used monthly data from January 1991 to December 2010 (240 observations).

Although the model yielded mixed results, it is important to note that in the Maldives, the US dollar is extensively used alongside the local currency, rufiyaa, and that this level of partial dollarization has implications for the effectiveness of both exchange rate and interest rate channels of monetary policy transmission in the economy. The ratio of dollarization in Zimbabwe is, however, 100 percent, implying that $dr2_t = 1$. This complicates the estimation, and dilutes its meaning. In addition, data on the number of tourist bed nights ($tour_t$) is also inconsistent in Zimbabwe, as there are no consolidated statistics.

Watanabe and Pham (2005) investigated the money demand in Vietnam (a highly dollarized economy) by using the model of Branson and Henderson (1985) and Porqueras, *et al* (1999). They separated the money demand equation into two; one had broad money of domestic currency and the other used foreign currency deposits. The researchers also used these equations to estimate the money demand for each of these monetary aggregates. The following equations were used:

$$RM2D_t = \beta_0 + \beta_1 RGDP_t + \beta_2 DEPO_t + \beta_3 INF_t\_A + \beta_4 RF_t + \varepsilon_t \quad (3)$$

$$RFCD_t = \alpha_0 + \alpha_1 RGDP_t + \alpha_2 DEPO_t + \alpha_3 INF_t\_A + \alpha_4 RF_t + \varepsilon_t \quad (4)$$

where $RM2D_t$ is real M2 of local currency, $RFCD_t$ is real foreign currency deposits in terms of domestic currency, respectively; $RGDP_t$ is real GDP; is a 6-month annualised domestic deposit interest rate; INF A_t is the actual annual domestic inflation rate; and $RF_t = DEPOF_t + E_t^l$ is the rate of return of USD deposit in terms of domestic currency.

Watanabe and Pham (2005) found out that there is a negative correlation between broad money and inflation, which was attributable to the outburst of Asian financial crisis. Their research findings indicate that underlying theoretical relationships among key econonmic variables may be upset by the impact of dollarization.

In Zimbabwe, however, there is no distinction between foreign currency and local currency deposits, as all deposits are in foreign currency. A distinction can only be made in terms of the currency denomination of the deposits, e.g. a USD depsoit, a rand deposit, and so forth. Estimation of the equation without this ratios would, therefore, yield a different model specification altogether.

5.1.2 *Inflation equation/model*

Oomes and Ohnsorge (2005) modelled the determinants of inflation in Russia by combining two main theories: the mark-up theory of inflation and the monetary theory of inflation. The mark-up theory of inflation goes back to Duesenberry (1950), while the monetary theory of inflation, which is typically associated with Friedman and Schwartz (1963), has often been used as a framework for estimating the long-run determinants of inflation. The monetary theory is mostly used to model short-run inflation dynamics.

For Russia, Oomes and Ohnsorge (2005) employed a long-run inflation equation as a log linear function of unit labor costs, depreciation, and utility prices:

$$\rho = \ln(\mu) + \alpha.ulc + \beta.neer + \gamma.\rho\mu\tau \quad \text{.......} (5)$$

where *p* denotes the logarithm of the CPI index, *neer* denotes the logarithm of the nominal effective exchange rate index, *ulc* the logarithm of the unit labor cost index, and *put* the logarithm of the price index for paid services (utilities). The estimated cointegration relationship, normalized for inflation, established that long-run inflation for Russia was significantly influenced by changes in nominal effective depreciation (roughly 50%); growth in unit labor costs (about 40%); and increases in utility prices (roughly 10%). Oomes and Ohnsorge (2005) and re-estimated the above inflation model by including lagged variables of inflation and money supply, using vector error correction mechanism modeling techniques.

Michaël Goujon (2006) also ran a two-stage model to shed light on the determinants of inflation under dollarization in Vietnam in the 1990s and found out that inflation was induced by both exchange rate variations and by an excess supply of broad money. He estimated the following domestic inflation equation:

$$pt = \theta p \ (1) \ Tt + (1 - \theta)pNTt \quad \text{.......} (6)$$

where p is the log of the CPI, pT and pNT are the logs of the prices of tradable and of non-tradable goods, respectively, and θ is the constant weight of the prices of tradable goods in the CPI, with $0 < \theta < 1$. The exchange rate impact is captured by the link between the exchange rate policy and the change in the prices of tradable goods, while the impact of dollarization manifests through the prices of non-tradable goods, which are also influenced by changes in the monetary aggregate M2, consisting of the Vietnamese currency (dong) in circulation outside banks along with dong-denominated and dollar-denominated bank deposits.

In another paper by Armas and Grippa (2005), the authors explored the unique experience of Peru's Central Bank with inflation targeting in an economy characterized by a high degree of financial dollarization. Unique in the sense that the empirical evidence showed that financial dollarization does not preclude an independent monetary policy from maintaining a low and stable inflation rate. Peru's annual inflation target has been achieved every year since inflation targeting was adopted in 2002, and output variability was moderate in these years. The Peruvian Central Bank, however, was able to gradually influence and affect market conditions, particularly the interbank overnight interest rates, through increases in the share of local currency in its monetary aggregates, over time. The effectiveness of monetary policy in Peru was also strengthened by gradual de-dollarization, particularly in the financial sector.

Zimbabwe, however, unlike all the cases highlighted above, has no exchange rate under dollarization, since it has no local currency. While the South African rand/USD exchange rate could be used as a good proxy for the exchange rate, since most of Zimbabwe's inflation is imported from South Africa (about 60%), the challenge, however, is that the USD in Zimbabwe is significantly undervalued, because prices were set at artificially high levels when the economy rolled over, from hyperinflation. In addition, monetary authorities in Zimbabwe cannot influence the rand/dollar exchange rate, which makes this estimation a futile exercise.

Zimbabwe's current low inflation is also explained by weak domestic demand, for which there is no suitable proxy for the variable. There is no nationally agreed measure or estimation of unit labour costs in the country, while utility prices are currently distorted, as local authorities do not charge standard service or utility prices. Money supply in Russia also includes components of both local and foreign currency deposits, while Zimbabwe's monetary aggregates are composed of foreign currency only.

5.1.3 Monetary transmission mechanism

Acosta-Ormaechea and Coble (2011) conducted a comparative study of the monetary policy transmission mechanisms in two sets of countries, dollarized (Peru and Uruguay) and non-dollarized economies (Chile and New Zealand). The study found that the traditional interest rate channel was more effective in Chile and New Zealand whilst the exchange rate channel was more relevant for Peru and Uruguay. It is important to note, however, that Peru and Uruguay retained some percentages of their own currencies throughout dollarization, while the progressive de-dollarization processes continuously strengthened their interest rate transmission channels.

In evaluating the ***interest rate channels*** in these countries, Acosta-Ormaechea and Coble (2011) used the following equation:

$$\gamma_{it} = c_i + \alpha_i x_{it} + \varepsilon_{it} \quad \text{(7)}$$

where for any country i and period t, γ_{it} is the change in either the deposit or the lending rate, c_i is a constant, x_{it} is the change in the money market rate and ε_{it} is a white noise component. The short-run effect of a money market rate change on the other interest rates is thus given by α_i.

The model above, however, used a vector of short-term and long-term interest rates (x_{it}), which data is either not reliable or currently not available in Zimbabwe. Zimbabwe has no lender of last resort and related refinancing facilities, which makes the interest rate channel of policy transmission unavailable. The yield curve in Zimbabwe is also currently distorted, due to inactive money or inter-bank markets, as well as the predominant short-termism in the economy. There is, therefore, no credible term structure of interest rates, as Government securities are currently being issued through non-competitive means. Without a Central Bank rate to guide the market, there is hardly any interest rate channel to talk about.

In order to analyze whether the exchange rate channel Acosta-Ormaechea and Coble (2011) used the VAR model shown below:

$$Y_t^1 = neer_t, IP_t, \pi_t, R_t \quad \text{(8)}$$

where $neer_t$ indicates the year-on-year change in the nominal effective exchange rate (NEER), IP_t is the y-o-y change of an index of economic activity, π_t represents the annual CPI inflation rate and R_t is the money market. The results of this model suggest that the exchange rate transmission channel was somewhat effective in the case of Peru and Uruguay, which maintained fixed exchange rate regimes over the dollarization periods.

The exchange rate channel of the monetary transmission mechanism is, however, not available in Zimbabwe, as the country has no local currency. As highlighted above, the rand/dollar exchange rate could used as a proxy for the exchange rate, but Zimbabwean authorities cannot influence its fluctuations in the rand/US dollar exchnage rate.

5.2 Empirical Estimations for Zimbabwe

Borrowing from the above model specifications for the money demand, inflation and monetary transmission equations, this study sought to establish the effectiveness of monetary policy in Zimbabwe using the same variables. In general, monetary policy (especially for monetary targeting regimes) tends to be more effective under the following technical preconditions:

- a stable money demand function;
- a strong and reliable relationship between monetary policy instruments and the desired macroeconomic variables (e.g. inflation-money supply relationships);
- existence of an effective monetary transmission mechanism; and
- a reasonable degree of control of monetary aggregates and interest rates by the Central Bank.

The study, therefore, attempted to run the following models on Zimbabwe data:

(i) Money Demand Function: RMD = a1 + a2*RGDP + a3*IR + a4*CPI + e

(ii) Inflation Model: CPI = a1 + a2*M3 + a3*RGDP + a4*IR + e

(iii) Transmission Model: RGDP =a1+a2*Ygap+a3*M3+a4*IR + a5*EXR +e

where: RMD is real money demand (the dependent variable)

M3 is a measure of money supply (the money variable)

RGDP is real GDP (the scale variable)

IR is an interest rate (the opportunity cost variable)

CPI is consumer price index (Inflation variable)

Ygap is output gap estimate

EXR is the exchange rate variable

The estimations, however, did not yield any meaningful results, which were either counterintuitive or inconsistent with mainstream economic theory. This is largely to do with the poor quality data, few observations (data covering only 4 years), as well as lack of suitable proxies for missing data variables. Spurious results and very weak or insignificant coefficients on some estimations are also consistent with the fact that there is no monetary policy in Zimbabwe at the moment, and as a result, the transmission mechanism is rather externally driven, as opposed to being driven domestically, by Central Bank actions.

5.3 Data Challenges for Empirical Estimation in Zimbabwe

5.3.1 Broad money (M3) variable

Monthly series of broad money, which is also the same total of all deposits in the banking system, are available from Jan 2009 to current. However, there is no data on currency in circulation, which is believed to be anywhere between US$1 billion and US$2 billion, or as much as 40% of total deposits. The broad money variable, however, does not represent the liability of the Central Bank, since the Bank no longer issues own legal tender, which gives a different meaning altogether for monetary policy. Under dollarization, money is generated from the supply side, that is, from the performance of exports, foreign direct inflows (FDI), grants and other external flows.

An analysis of the M3 series shows that money supply in Zimbabwe has been falling rapidly, from an annual growth of above 300% at the beginning of 2010, to negative levels at the end of 2013. This, however, does not reflect falling demand for money, but is largely a result of poor external performance and negative trade balance (representing outflow of liquidity). Instead, the widespread liquidity shortage in the country is reflective of high demand for money in the economy. Under normal circumstances, the Central Bank would have issued more legal tender.

5.3.2 Real GDP and output gap variables

Real GDP series consists of at most 5 observations (2009-2013). There is no monthly or quarterly GDP series. An attempt was made to splice the GDP series into monthly data using the volume of manufacturing index (VMI). The VMI in Zimbabwe is, however, currently distorted and unreliable, due to the large informal sector in the economy, which is not included in the Index. In addition, manufacturing is no longer a significant contributor to GDP, due capitalization and viability challenges besetting the sector.

Modelling the monetary transmission mechanism requires an estimation of the output gap, which is nether neither available nor computable for Zimbabwe. There have been no long run trends of output under the dollarization period, which would inform the estimation of potential or long run equilibrium output.

5.3.3 Exchange rate variables

The monetary transmission model also requires an exchange rate variable, with which to trace the exchange rate channel of policy. Zimbabwe, however, has no exchange rate under dollarization.

5.3.4 *Interest rate variable*

There are no active or vibrant money and capital markets in Zimbabwe, which makes the setting of interest rates difficult. As a result, banks quote a wide range of interest rates (minimum and maximum) on deposits and loans. The range of rates quoted by banks has almost been static and not reflective of market conditions, due to lack of competition. Lack of a Central Bank rate, to act as a reference rate for the market, leaves the market with no common benchmark for rates, leaving individual banks to determine their own interest rate levels. In addition, the RBZ has no means by which to influence market interest rates, due to lack of lender of last resort facilities.

Although Government had started issuing Treasury Bills, these were largely issued on a non-competitive basis, through private placement of the paper. This led to a distorted yield curve, where bills of the same tenor have been issued at different nominal rates.

5.3.5 *Inflation (CPI) variable*

Monthly inflation series is available from February 2009 to current. The negative inflation series at the beginning of dollarization largely reflects price correction, from the abnormal price levels inherited from hyperinflation. Deflation, particularly in 2014, is also a result of waning effective demand, due to generally depressed incomes in the country.

Inflation in the country is largely driven by external factors, such as movements in the South African rand/USD exchange rate, as well as international food and oil prices, all of which are outside the control of the local authorities. This makes the estimation of an inflation model an academic exercise, since the RBZ has no means by which to influence prices in the economy, or to take offsetting measures against undesirable developments on the underlying causes of inflation.

6.0 Conclusions and Recommendations

Due to the unique nature of the dollarization in Zimbabwe, where the local currency has been completely abandoned, the country cannot pursue some of the monetary policy practices of the once dollarized economies in Latin America, Asia and others. To a larger extend, these countries managed to retain some proportion of their own currencies, albeit insignificant initially. As policies strengthened, and confidence returned, the countries gradually increased the proportion of their currencies to significant levels, and most are now able to conduct normal Central Banking functions, while a significant others have de-dollarized.

Zimbabwean authorities have indicated that the multiple currency system (dollarization) will be in place for the foreseeable future, or at least until most or all of the following economic fundamentals have reached acceptable and sustainable levels (RBZ Monetary Policy Statement, January 2015):

- Minimum foreign exchange reserves equivalent to one (1) year of import cover;
- Sustainable Government budget position;
- Market determined interest rate structures;
- Some measure of domestic business and consumer/public confidence;
- Stable inflation rates, determined by domestic factors under the influence of authorities; and
- Stability and confidence in the financial sector, among other preconditions.

Meanwhile, however, there is continuing debate in the country about the options for a ***successor monetary regime***, should the country eventually decide to exit dollarization. Some of the Post-Dollarization (or De-dollarization) Policy Frameworks that have been discussed include:

- Full Official Dollarization (with USD or ZAR);
- Joining CMA/COMESA/AU Monetary Union/Currency Board Arrangements; and
- Re-Introduction of a new Zimbabwe Currency.

The case of hyperinflation and subsequent dollarization of the Zimbabwean economy, therefore, provides some critical lessons for the COMESA region, particularly in terms of the need for member countries to avoid the policy pitfalls that engineer stagflation and severe macroeconomic dislocation. Loss of the use of own currency, for whatever reason, should be avoided at all costs, as the ability to issue own legal tender lies at the heart of effective monetary policy implementation and management, particularly in developing countries where monetary aggregates still play a central role in inflation control macroeconomic management policies.

References

Acosta-Ormaechea, S. and Coble, D. (2011). Monetary Transmission in Dollarized and Non-Dollarized Economies: The Cases of Chile, New Zealand, Peru and Uruguay. *IMF Working Paper , WP/11/87*, 1-22.

Adam, A. (2013). Dollarization in a Small Open Economy – The Case of Maldives. *World Review of Business Research , 3* (3), 1-15.

Adrián Armas and Francisco Grippa (2005), Targeting Inflation in a Dollarized Economy: The Peruvian Experience, *Banco Central de Reserva del Perú*, September 2005

Berg, A. and Eduardo, B. (2000). Prons and Cons of Full Dollarization. *IMF Working Paper.*

Chitiyo K. Tapera (2000), "Land Violence and Compensation: Re-conceptualizing Zimbabwe's Land and War veterans' Debate", *Harare Center for Conflict Resolution, available at: http://ccrweb.ccr.uct.ac.za/two/9_1/zimbabwe.html*

Coorey Sharmini, et al (2007), Lessons from Hyperinflation Episodes for Stabilizing the Economy in Zimbabwe, *IMF Working Paper WP/07/99*.

Davidson, P. (2002). Dollarization, the Functions of a Central Bank, and the Ecuadorean Economy. Paper presented at the 75th anniversary of the Central Bank of Ecuador. Quito: *Central Bank of Ecuador*.

Dietrich, Christian (2000), Hard Currency: The Criminalized Diamond Economy of the Democratic Republic of Congo and its Neighbours, *Partnership Africa Canada,* Occasional Paper Number 4.

Federal Reserve Bank of Dallas (2011), "Hyperinflation in Zimbabwe", in *Globalization and Monetary Policy Institute Annual Report*

Goldfajn. I and Olivares. G. (2000). Is adopting Full Dollarization the solution? Looking at evidence. 2-21.

Hanke, H. Steve and Kwok, A. K. (2009), "On the Measurement of Zimbabwe's Hyperinflation", *Cato Journal, Volume 29 No. 2.*

Kairiza T (2012), "Unbundling Zimbabwe's journey to hyperinflation and official dollarization", *GRIPS Policy Information Center Discussion Paper:09-12*

Kramarenko, V, et al (2010), "Zimbabwe: Challenges and Policy Options after Hyperinflation", *International Monetary Fund, African Department*.

Makochekanwa A (2007), "Dynamic Enquiry into the Causes of Hyperinflation in Zimbabwe", *Working Paper: 2007-10*, *University of Pretoria Working Paper Series.*

Michaël Goujon (2006), Fighting Inflation in a Dollarized Economy: The case of Vietnam, *Journal of Comparative Economics,* Vol. 34 (2006) pp 564–581.

Moreno-Villalaz, and Juan Luis,. (1999). Lessons from the Monetary Experience of Panama: A Dollar Economy with Financial Integration. *Cato Journal* .

Munoz Sonia (2007), "Central Bank Quasi-Fiscal Losses and High Inflation in Zimbabwe: A note", *I.M.F. Working paper, WP/07/98*

Nienke Oomes and Franziska Ohnsorge. (2005). Money Demand and Inflation in Dollarized Economies: The Case of Russia . *IMF working Paper WP/05/144* .

Noko, J. (2011). Dollarization: The Case for Zimbabwe. *Cato Journal Vol31* , 1-5.

Nota. F, and Sakupwanya. B. (2013). The Sustainability of a Multi-currency System: An Examination of Zimbabwe's Currency Management Options, *Centre for Economic and Social Policy Analysis.*

Odedokun, O. Matthew (1997), "Dynamics of Inflation in Sub-Saharan Africa: The Role of Foreign Inflation, Official and Parallel Market Exchange Rate, and Monetary Growth", *Applied Financial Economics, 7(1), pp. 395-402.*

Quispe-Agnoli M. and Whisler A. (2006). Official Dollarization and the Banking System in Ecuador and El Salvador. *Economic Review Third Quarter 2006, Federal Reserve Bank of Atlanta.*

Reserve Bank of Zimbabwe Monetary Policy Statements and Supplements, 2003-2015, Various, *www.rbz.co.zw*

Reserve Bank of Zimbabwe (2005), "Inflation Drivers in Zimbabwe", Supplement 1 of 4 to the 2005 First Quarter Monetary Policy Statement.

Reserve Bank of Zimbabwe (2005), "Strategic Provincial Resource Allocation and Quick Turnaround Activities Based on the Concept of Comparative Advantage", *Supplement 3 of 4 to the 2005 First Quarter Monetary Policy Statement.*

Reserve Bank of Zimbabwe (2006), "A Synopsis of the Impact of the Central Bank's Interventions in the Economy, from January 2004 to June 2006", *Supplement to the First Half 2006 Monetary Policy Statement.*

Reserve Bank of Zimbabwe (2007), "Round Up of the Reserve Bank of Zimbabwe's Quasi-Fiscal Operations", *Supplement January 2007 Monetary Policy Statement*

Reserve Bank of Zimbabwe (2008), "Extra-Ordinary Interventions by the Reserve Bank of Zimbabwe", *Supplement Second Half January 2008 Monetary Policy Statement*

Shinichi. W and Binh., P. T. (2005). Demand for Money in Dollarized, Transitional Economies.

Swiston Andrew (2011), "Official Dollarization as a Monetary Regime: The Case of El Salvador", *IMF Working Paper, WP/11/129.*

Watanabe S. and Pham T. B. (2005). Demand for Money in Dollarized, Transitional Economy: The Case of Vietnam. *International University of Japan* , 1-35.

Zimstat, 2009-2014. Various Monthly Inflation Reports. Harare, *Zimbabwe National Statistics Agency*, www.zimstat.co.zw

Chapter 9

Efficacité de la Politique Monétaire au Burundi

Par Busogoro Joseph Martin

1.0 Introduction Générale

En général, les politiques économiques ont pour ambitions d'influencer notamment le niveau d'activité, le niveau général des prix, la répartition du revenu et l'équilibre interne et externe. Une des politiques les plus fréquemment utilisées pour atteindre certains de ces objectifs est la politique monétaire. Celle-ci se définit comme l'utilisation par la banque centrale de ses instruments pour contrôler l'offre et/ou le prix de la monnaie dans le souci d'influencer les conditions économiques dans le secteur réel.

Pour qu'une stratégie de politique monétaire s'avère un succès, les autorités monétaires doivent pouvoir s'assurer du respect des hypothèses sous-tendant son cadre et évaluer précisément le rythme, l'incidence et le processus de transmission de leurs actions sur l'économie. Pourtant, rien ne rassure que les hypothèses émises sont toujours observées. En outre, le transfert des effets du secteur monétaire vers le secteur réel se fait à travers des canaux dont le fonctionnement varie dans le temps et dans l'espace suite notamment au comportement des agents économiques, aux structures de l'économie et à l'environnement externe à l'économie. C'est cet état de fait qui justifie la conduite de la recherche sur l'efficacité de la politique monétaire au Burundi.

La Banque de la République du Burundi gère la politique monétaire nationale depuis plus de cinquante ans dans le souci d'influencer la sphère réelle. Ce privilège lui est actuellement conféré par la loi N°1/34 du 02 décembre 2008 portant statuts de la Banque de la République du Burundi. Pour améliorer l'efficacité de sa politique monétaire, la BRB doit d'une part s'assurer de la vérification des hypothèses émises sous le cadre de politique monétaire qu'elle a adopté. D'autre part, elle doit savoir évaluer quels sont les canaux de transmission les plus actifs.

Cet article est structuré en trois chapitres majeurs. Le premier chapitre porte sur la description du cadre et des instruments de politique monétaire de la BRB. Le deuxième chapitre aborde, sous une approche comparative, le fonctionnement des mécanismes de transmission de la politique monétaire. En dernier lieu, l'article développe une modélisation VAR des mécanismes de transmission de la politique monétaire au Burundi. Tous ces développements sont clôturés par une conclusion sur l'efficacité de la politique monétaire de la BRB.

2.0 Cadre et instruments de la politique monétaire de la BRB

2.1 Cadre de politique monétaire adopté par la BRB

La BRB a adopté le cadre de politique monétaire basé sur **le ciblage des agrégats monétaires.** Sous ce régime de politique monétaire, la Banque définit la base monétaire(B) comme **objectif opérationnel**, la masse monétaire (M2) comme **objectif intermédiaire** et le niveau général des prix (P) comme **objectif final**. Elle doit aussi regarder le produit intérieur brut (Y) comme **objectif final auxiliaire** car ses statuts lui reconnaissent ce privilège sans préjudice à l'objectif de stabilité des prix.

Ce schéma suppose que la transmission des impulsions monétaires se fait séquentiellement sur la base monétaire qui de son côté influence la masse monétaire dont les variations affectent le niveau général des prix à court terme et la production à long terme. Pour agir dans ce circuit, la BRB fixe un programme monétaire compatible avec le programme économique et financier du pays. A cet effet, elle fixe des niveaux de la base monétaire qu'elle doit respecter pour maintenir la croissance de la masse monétaire dans les limites conciliables avec les objectifs de prix et de production. Le niveau de la base monétaire fixé est contrôlé à travers les objectifs quantitatifs d'avoir intérieurs et extérieurs nets.

Ce cadre de politique monétaire est érigé sur un système d'équations reflétant la Théorie quantitative de la monnaie que la Banque Centrale est appelée à gérer quotidiennement.

$$\begin{cases} B * k = M_2 \\ M_2 v = Py \end{cases}$$

Avec k le multiplicateur de monnaie, v la vitesse de circulation de la monnaie et y le pib réel.

La réalité de ce système d'équations est conditionnée par la vérification de l'hypothèse de stabilité du multiplicateur de monnaie et celle de la vitesse de circulation de la monnaie.

3.0 Instruments de politique monétaire de la BRB

Pour conduire sa politique monétaire, la BRB utilise ses instruments indirects agissant principalement sur les contreparties de la base monétaire ou sur le multiplicateur de monnaie.

3.1 Réserves obligatoires

Il s'agit d'une obligation imposée aux banques commerciales de constituer des dépôts non rémunérés à la Banque Centrale sur leurs comptes courants. Ces dépôts sont séparément détenus en BIF, en Dollars Américains (USD) et en Euros(EUR) selon que l'assiette est exprimée dans ces monnaies. Les réserves obligatoires en USD sont majorées de la contrevaleur des réserves obligatoires exprimées dans d'autres monnaies autres que le BIF et l'Euro.

Le coefficient des réserves obligatoires se situe actuellement à 3%. Le montant des réserves obligatoires est défini sur base des dépôts des clients des banques du mois précédent. La période de constitution des réserves obligatoires s'étend du premier au dernier jour de chaque mois. Le montant des réserves obligatoires constituées par chaque banque correspond à la moyenne mensuelle des soldes créditeurs journaliers de ses comptes courants, ouverts dans les livres de la Banque. Les soldes moyens de ces comptes doivent être au moins égaux aux montants respectifs des réserves requises.

La décision d'augmenter les réserves obligatoires rentre dans le cadre d'une politique monétaire restrictive et vice-versa. Pour un non-initié, il n'est pas aisé de considérer cette action comme restrictive car elle fait augmenter la base monétaire. Tout se fait au niveau du multiplicateur de monnaie. L'augmentation des réserves obligatoires diminue le multiplicateur de monnaie, donc la capacité de création de monnaie par les banques de second rang à travers les prêts qu'elles accordent.

3.2 Appels d'offres de liquidité

Ce système permet à la Banque Centrale d'ajuster le niveau de la liquidité aux besoins réels des banques tout en assurant un suivi permanent du programme monétaire. A cet effet, la Banque Centrale contrôle la liquidité bancaire à travers les opérations d'appels d'offres normaux d'apport ou de reprise de liquidité qui agissent sur les avoirs intérieurs nets. Elle en fixe librement la durée et la périodicité. Les appels d'offres de liquidité peuvent être à taux fixe ou à taux variables. Dans le cas d'appels d'offres à taux fixe, la BRB annonce le taux d'intérêt auquel toutes les banques présentent leurs soumissions. Dans les appels d'offres à taux variables, chaque banque indique les montants qu'elle souhaite emprunter ou placer, selon le cas, et les taux correspondants.

Si la BRB estime qu'il y a eu un choc ayant conduit à une augmentation (diminution) imprévue de la liquidité bancaire, elle peut, à sa propre initiative, prêter ou reprendre de la liquidité aux banques par le moyen d'appels d'offres rapides dont toutes les étapes sont exécutées le même jour. La durée de ces opérations est fixée par la BRB. La participation aux appels d'offres rapides peut être limitée à certaines banques.

3.3 Facilité de prêt marginal

La BRB a mis à la disposition des banques une fenêtre pour un refinancement permanent appelée facilité de prêt marginal. Contrairement aux autres modes de refinancement qui sont de l'initiative de la Banque Centrale, la facilité de prêt marginal relève de l'initiative des banques commerciales. La BRB fixe le taux d'intérêt auquel est servi ce prêt. Aujourd'hui, ce taux est reçu par majoration de 3 points de pourcentage au taux mayen pondéré sur les Bons du Trésor à 13 semaines de l'émission précédente. La facilité de prêt marginal est d'une maturité journalière. Cette facilité est accordée automatiquement à la clôture de la journée, si une banque dégage un solde débiteur de son compte courant à la BRB, à condition qu'elle ait constitué des garanties suffisantes auprès de la BRB.

Si elle le juge nécessaire, la BRB peut fixer des limites aux recours à cette facilité. Ces limites peuvent être globales ou par banque et porter soit sur les montants prêtés soit sur le nombre de jours de recours par semaine.

En plus de ces instruments, la BRB peut accorder à titre exceptionnel des prêts à une banque ou à un établissement financier dans le cadre de conventions bilatérales.

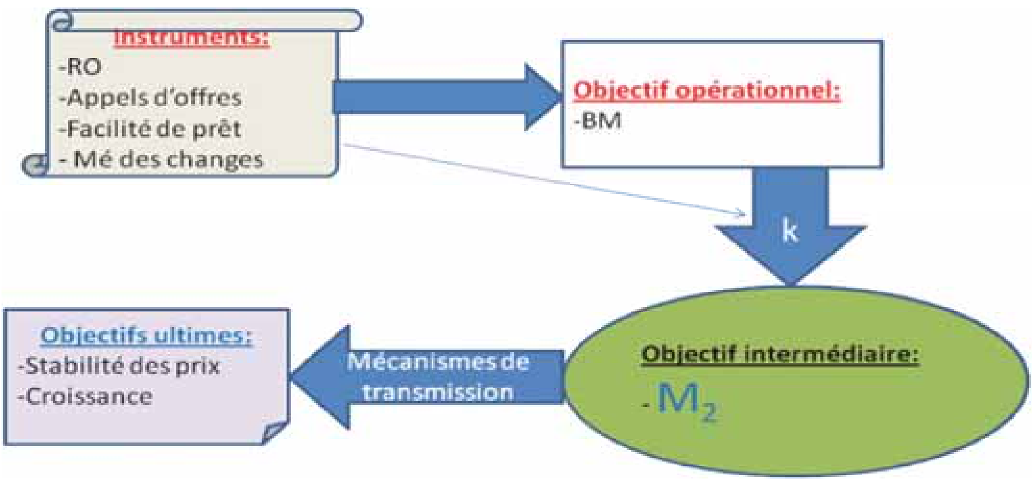
3.4 Ventes de devises sur le marché interbancaire

La BRB intervient sur le marché interbancaire en vendant ou en achetant les devises. L'intervention de la Banque Centrale est faite soit dans le souci d'orienter les conditions du marché des changes, soit dans le but de gérer la liquidité bancaire. Quoi qu'il en soit, les effets sur les avoirs extérieurs nets et sur la base monétaire sont évidents. Quel que soit l'objectif, la vente de devises aboutit à la baisse des avoirs extérieurs nets de la Banque Centrale. De l'autre côté du bilan de la Banque, c'est la base monétaire qui est affectée.

4.0 Mécanisme de transmission de la politique monétaire dans le cadre du ciblage des agrégats monétaires

Sur le plan théorique, le fonctionnement du mécanisme de transmission de la politique monétaire suit un schéma de base qui se traduit par la manipulation des **instruments** qui conduisent à l'**objectif opérationnel** intimement lié à l'**objectif intermédiaire.** L'objectif intermédiaire conduit à son tour aux **objectifs finals**. Ce schéma de base montre les liens par lesquels les impulsions de la politique monétaire se répercutent sur l'activité économique et, plus particulièrement, sur le niveau des prix.

Graphique No 9.1: Schéma de réaction d'une décision de politique monétaire



La Banque Centrale décide des actions en utilisant les instruments à sa disposition. Les appels d'offres de liquidité, les facilités permanentes de prêt et les ventes de devises affectent la base monétaire. Par contre, les réserves obligatoires affectent le multiplicateur de monnaie. Par l'intermédiaire du multiplicateur de monnaie, la base monétaire affecte la masse monétaire. C'est par l'intermédiaire des mécanismes de transmission de la politique monétaire que les impulsions monétaires se propagent dans la sphère réelle.

4.1 Les canaux de transmission de la politique monétaire

Les effets d'une politique monétaire ne sont pas aisément perceptibles. La force et le temps de réaction dépendent des attentes des investisseurs, des consommateurs, de l'état de développement du secteur financier et de l'environnement économique international. C'est ainsi que l'impact des décisions de politique monétaire sur l'économie réelle emprunte différents canaux de transmission. Ces canaux varient selon le degré de développement et d'ouverture de l'économie. En économie ouverte, ce transfert d'effets se fait à travers le comportement du système financier et des agents non financiers qui réagissent par la formation des taux d'intérêt, le crédit bancaire et le taux de change.

4.2 Les canaux de taux d'intérêt

La modification du taux d'intérêt de la Banque Centrale influe sur le comportement de dépenses des agents (ménages, entreprises et Etat) à travers la réaction des établissements de crédit. C'est principalement les dépenses de consommation, d'épargne et d'investissement qui sont affectées.

En effet, les modifications de taux d'intérêt conduisent les agents à procéder à l'arbitrage entre consommation immédiate et épargne. Une baisse de taux d'intérêt diminue la valeur de la consommation future et incite à consommer aujourd'hui puisque l'épargne devient moins intéressante et le crédit moins cher.

Théoriquement, une politique monétaire expansive fait baisser les taux d'intérêt; ce qui, autrement dit, traduit la réduction du coût du capital. Les dépenses d'investissement sont de ce fait stimulées. Avec l'augmentation des dépenses d'investissement, la demande globale augmente. Au moment où les investissements effectués commenceront à rapporter, la production va croître en fonction de leur rentabilité.

Or, dans la plupart des économies sous développées, les dépenses d'investissement sont peu ou pas du tout sensibles aux variations de taux d'intérêt. Aussi, les taux des établissements de crédit sont souvent déconnectés des taux de la Banque centrale. En effet, si le système financier n'est pas suffisamment développé, la concurrence n'est pas effective et la fixation des taux d'intérêt peut faire objet de spéculation. Ceci constitue un véritable blocage au bon fonctionnement des mécanismes de transmission de la politique monétaire par le canal de taux d'intérêt.

4.3 Le canal du crédit bancaire

Les banques commerciales jouent un rôle de premier plan dans le processus de financement par l'intermédiaire de l'octroi de crédits. A cet effet, le système bancaire n'est plus neutre dans la transmission de la politique monétaire. En cas de durcissement de la politique monétaire, les banques vont ajuster leurs conditions débitrices : augmentation du taux d'intérêt sur les nouveaux crédits et/ou une diminution des crédits offerts. Les agents économiques les plus fréquemment touchés sont les ménages et les petites et moyennes entreprises. Ainsi, la transmission de l'action monétaire à la sphère réelle s'opère par les variations de l'offre de crédit.

Sous un autre angle, une politique monétaire expansive qui contribue à accroître les réserves et les dépôts bancaires augmente en même temps la quantité de prêts bancaires disponibles. Compte tenu du rôle spécifique des banques en tant que prêteuses à certaines catégories d'emprunteurs, cette augmentation du volume des prêts disponibles conduira à une hausse des dépenses d'investissement et éventuellement de consommation. Toutefois, l'efficacité de ce canal est tributaire de l'intensité de l'activité de prêt subordonnée à la gestion de l'asymétrie de l'information par les banques sur le marché du crédit.

Une conséquence importante de la thèse du crédit est que la politique monétaire aura une incidence plus forte sur les dépenses des entreprises et des consommateurs qui dépendent davantage des prêts bancaires. Le comportement des grandes entreprises qui ont directement accès aux marchés de capitaux sans avoir à solliciter les banques n'affecte pas le canal du crédit. Ce canal joue beaucoup dans une économie d'endettement et perd d'efficacité dans une économie de marché.

4.4 Le canal du taux de change

Dans l'analyse des effets de la politique monétaire sur l'économie, les monétaristes reprochent au paradigme IS-LM de focaliser toute son attention sur le taux d'intérêt uniquement. Selon eux, les prix des autres actifs jouent une importance de taille dans la transmission de la politique monétaire. C'est notamment le prix des devises-le taux de change.

Sous le régime de change flottant, le taux de change devient un véritable canal de transmission de la politique monétaire. En effet, le taux de change a une influence sur l'économie à travers la modification des exportations nettes. Théoriquement, ce canal fait intervenir les effets du taux d'intérêt car la baisse des taux d'intérêt réels nationaux réduit l'attrait des dépôts nationaux en monnaie nationale par rapport aux dépôts en devises c'est-à-dire une dépréciation de la monnaie nationale.

Les effets de la dépréciation d'une monnaie nationale sur l'économie diffèrent selon le type d'économie. Généralement, le renforcement du cours d'une devise aura des effets désinflationnistes tandis que son affaiblissement produira un effet inverse. La dépréciation de la monnaie nationale abaisse le prix des biens nationaux par rapport aux biens étrangers, ce qui se traduit par une augmentation des exportations nettes (NX) et donc de la production globale. Dans les grands pays il y a effet de substitution en faveur des biens nationaux. Aussi, les biens de cette économie deviennent davantage compétitifs sur le marché international d'où la stimulation des exportations. Par contre pour les pays sous-développés, le prix des importations des produits primaires et de consommation augmente. Ceci aura pour effet des tensions inflationnistes par le biais des biens importés. Dans ce cas, la baisse du taux de change ne peut pas exercer un effet favorable en améliorant la compétitivité de ses produits et ses importations sont peu ou pas du tout réduites.

Ce canal joue un rôle important dans la façon dont la politique monétaire affecte l'économie nationale en général, mais est d'efficacité limitée dans les pays sous-développés. En effet, les élasticités des exportations nettes et des investissements aux variations du taux de changes ne sont pas importantes dans les économies sous-développées.

4.5 Le canal de l'information

Le canal de l'information est aujourd'hui en vogue. Les banques centrales modernes sont convaincues que la politique monétaire ne doit pas être conduite sur une base discrétionnaire. A cet effet, elles diffusent des informations que les agents économiques vont traiter et intégrer dans leur comportement. Dans le cadre de leurs décisions, les agents y intègrent de nombreuses anticipations portant notamment sur la consommation future, les capacités de production futures, les conditions d'endettement et la valeur future de la monnaie nationale. Elles vont faire de la projection à partir d'indicateurs anticipés comme l'évolution du PIB estimé, le taux d'inflation estimé, l'évolution du taux d'intérêt et l'évolution de la masse monétaire.

Les banques centrales utilisent les effets d'annonce pour orienter le comportement des agents économiques. Par cette action, la banque concernée envoie des signaux à l'endroit des agents financiers et non-financiers en leur annonçant ses intentions. Le message de la banque centrale, avant d'avoir tout effet quantité et/ou prix, influence le comportement des acteurs économiques. Cette action rend transparente et crédible la politique monétaire de la banque centrale et la renforce de fait.

Les effets d'annonce sont tributaires de la perception des intensions de la banque centrale par les agents économiques et surtout de la manière dont les médias relayent le message envoyé par elle. Il peut y avoir des effets en retour « feed back effects » sur les autres variables ou une amplification plus ou moins forte « over shooting effects » des résultats attendus. Le rôle des médias est donc crucial des la réussite d'une politique monétaire de la Banque centrale.

4.6 L'analyse empirique de l'efficacité de la politique monétaire

L'analyse empirique de l'efficacité de la politique monétaire doit s'analyser en deux temps. La première étape consiste à vérifier les hypothèses émises dans le cadre du régime de politique monétaire basée sur le ciblage des agrégats monétaires. La deuxième étape va porter sur l'analyse du fonctionnement des canaux de transmission de la politique monétaire.

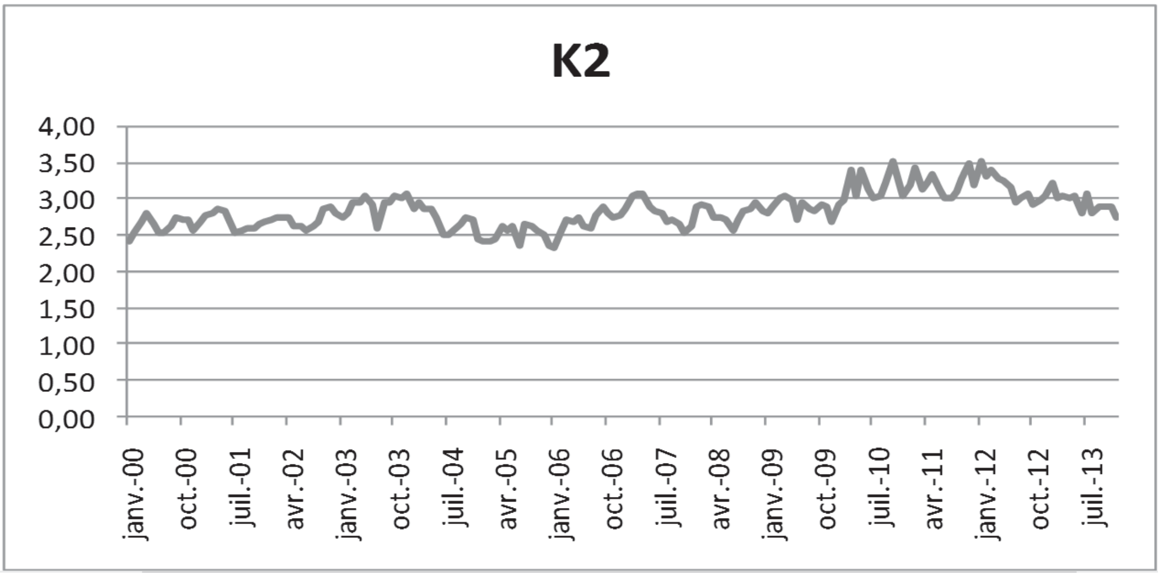
5.0 Vérification des hypothèses de stabilité du multiplicateur et de la vitesse de circulation de la monnaie

Ces hypothèses constituent le soubassement même du régime de politique monétaire basée sur le ciblage des agrégats monétaires. Pour le multiplicateur de monnaie, nous prenons le lien entre la base monétaire et la masse monétaire M2.

5.1 Stabilité du multiplicateur de monnaie

Le multiplicateur de monnaie traduit le comportement des agents économiques en matière de création monétaire à partir de la monnaie de base. C'est donc le rapport entre la masse monétaire et la base monétaire. Une des conditions de base pour que la Banque Centrale puisse maîtriser la croissance de la base monétaire est la stabilité du multiplicateur de monnaie.

Graphique No 9.2: Evolution du multiplicateur de monnaie



A travers ce graphique, nous constatons que le multiplicateur de monnaie varie de façon alternée et modérée au cours du temps avec une tendance générale haussière. Toutefois, quoique le multiplicateur de monnaie ait connu une évolution modérée tout au long de la période retenue, il est difficile de conclure sur sa stabilité. Encore faut-il utiliser les tests statistiques élaborés pour tirer des conclusions fouillées. Nous avons choisi d'utiliser les tests de racine unitaire.

Tableau No 9.1: Test de racine unitaire de DF augmenté

Null Hypothesis: K2 has a unit root				
Exogenous: Constant				
Lag Length: 1 (Automatic - based on SIC, maxlag=13)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-3.261952	0.0183
Test critical values:	1% level		-3.469933	
	5% level		-2.878829	
	10% level		-2.576067	
*MacKinnon (1996) one-sided p-values.				

Le test de Dickey-Fuller augmenté confirme la stabilité du multiplicateur de monnaie au cours du temps. Le lien entre la base monétaire et la masse monétaire est donc prévisible d'où la Banque Centrale peut maîtriser la variation de la masse monétaire par le biais du contrôle de la base monétaire.

5.2 Stabilité de la vitesse de circulation de la monnaie

Pour la vitesse de circulation de la monnaie, nous analysons la relation entre le PIB nominal et la masse monétaire M2. Elle traduit le nombre de fois qu'une même unité de monnaie permet de régler des transactions pendant la période considérée. La connaissance approfondie du comportement de cette variable permet à la Banque de savoir si ses actions sur la masse monétaire vont influer ou non sur la production et/ou l'inflation.

Graphique No 9.3: Evolution de la vitesse de circulation de la monnaie

L'évolution illustrée par ce graphique ne présage point la stabilité de la vitesse de circulation de la monnaie. Cette conclusion est renforcée par conduite des tests de racine unitaire.

Tableau No 9.2: Test de racine unitaire de DF augmenté

Null Hypothesis: V2 has a unit root				
Exogenous: Constant				
Lag Length: 0 (Automatic - based on SIC, maxlag=8)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-2.011297	0.2808
Test critical values:	1% level		-3.646342	
	5% level		-2.954021	
	10% level		-2.615817	
*MacKinnon (1996) one-sided p-values.				

Le test de DF augmenté confirme que la vitesse de circulation de la monnaie n'est pas stable pour l'économie burundaise. Ceci met en mal la conduite de la politique monétaire par la Banque Centrale. En effet, il lui sera difficile d'estimer le juste niveau de la masse monétaire compatible avec le niveau d'activité. C'est pour cette raison que des accès involontaires de monnaie imputables à la variation de la vitesse de circulation de la monnaie peuvent conduire à des tensions inflationnistes. Dans certains cas, ils peuvent aussi stimuler l'activité économique. Ce qui gène dans cette situation est l'incertitude qui plane sur cette liaison.

6.0 Modélisation VAR des canaux de transmission de la politique monétaire

Pour étudier la transmission de la politique monétaire au Burundi, nous utilisons le modèle VAR structurel qui est réputé efficace dans ce genre d'étude.

6.1 Spécification du modèle

Comme indiqué ci-dessus, nous avons choisi d'étudier l'efficacité de la politique monétaire à travers l'analyse du fonctionnement des canaux de transmission de la politique monétaire. Nous nous référons à la représentation VAR structurelle pour analyser le fonctionnement des canaux de transmission de la politique monétaire. On est face à une matrice symétrique de dimension (5,5). On doit alors imposer **n(n-1)/2** restrictions supplémentaires à la matrice des coefficients où n est le nombre de variable dans le modèle. Alors, 25 éléments de la matrice peuvent être identifiés. Il est donc nécessaire d'introduire 10 contraintes supplémentaires pour que le modèle structurel soit juste identifié. D'amblée, nous estimons la forme réduite du modèle VAR par le calcul de la factorisation de Cholesky. L'ordre des variables dans le modèle VAR importe beaucoup.

$$\begin{bmatrix} e_t^{ipi} \\ e_t^{ipc} \\ e_t^{tbb} \\ e_t^{mmo} \\ e_t^{tch} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ e_{21} & 1 & 0 & 0 & 0 \\ e_{31} & e_{32} & 1 & 0 & 0 \\ e_{41} & e_{42} & e_{43} & 1 & 0 \\ e_{51} & e_{52} & e_{53} & e_{54} & 1 \end{bmatrix} * \begin{bmatrix} \mu_t^{ipi} \\ \mu_t^{ipc} \\ \mu_t^{tbb} \\ \mu_t^{mmo} \\ \mu_t^{tch} \end{bmatrix}$$

Toutefois, la connaissance du fonctionnement de notre économie nous conduit à transformer de la précédente matrice des coefficients. Ainsi, nous savons vu que pour notre économie, le niveau des taux d'intérêt intérieurs n'influence pas le taux de change. Nous aurons une matrice transformée de cette forme:

$$\begin{bmatrix} e_t^{ipi} \\ e_t^{ipc} \\ e_t^{tbb} \\ e_t^{mmo} \\ e_t^{tch} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ e_{21} & 1 & 0 & 0 & 0 \\ e_{31} & 0 & 1 & e_{34} & 0 \\ e_{41} & e_{42} & e_{43} & 1 & e_{45} \\ e_{51} & e_{52} & 0 & e_{54} & 1 \end{bmatrix} * \begin{bmatrix} \mu_t^{ipi} \\ \mu_t^{ipc} \\ \mu_t^{tbb} \\ \mu_t^{mmo} \\ \mu_t^{tch} \end{bmatrix}$$

6.2 Description des variables

A cet effet, notre modèle va comporter 5 variables:

- l'indice de la production industrielle(IPI) qui est considéré comme un bon proxy du PIB ;
- le taux d'intérêt sur les bons du Trésor à 13 semaines(TBB). Compte tenu du fait que la série de cette variable n'est disponible qu'à partir de janvier 2007, nous allons la compléter par la série de données des taux des certificats du Trésor à 3 mois;
- la masse monétaire au sens large M2 (MMO);
- le niveau général des prix traduit par l'indice des prix à la consommation (IPC);
- le taux de change nominal du Bif pour le dollar américain (TCH) avec cotation à l'incertain.

Pour appréhender le canal du crédit, on pourra remplacer la masse monétaire par le crédit au secteur privé (CSP).

Les données qui seront utilisées sont des données mensuelles portant sur la période 2000-2013. Toutes les variables, à l'exception du taux d'intérêt débiteur seront exprimées en logarithme népérien.

La première étape d'analyse du modèle VAR consiste à tester si les variables sont stationnaires ou pas.

6.3 Test de stationnarité des variables

Le test de stationnarité est réduit à l'analyse de l'existence d'une racine unitaire pour notre exercice. Plusieurs méthodes ont été développées pour tester l'hypothèse de non stationnarité. Les méthodes les plus fréquemment utilisées se fondent sur le test de Dickey-Fuller augmenté (DFA) et celui de Phillips-Perron. Ces tests sont plus efficaces car ils considèrent l'hypothèse de corrélation des erreurs.

Au bout d'une démarche itérative utilisant ces tests, nous avons constaté que toutes les variables retenues dans ce modèle sont d'ordre d'intégration 1. Nous pouvons donc les utiliser dans le modèle VAR.

6.4 Détermination du nombre de retards

Les effets d'une politique économique se transmettent sur les variables réelles et s'estompent avec le temps. Il est donc indispensable de savoir le nombre de retards pour déterminer l'ordre du VAR à utiliser.

Tableau No 9.3: Résultats de la recherche du nombre de décalage.

VAR Lag Order Selection Criteria						
Endogenous variables: LIPI LIPC TBB LMMO LTCH						
Exogenous variables: C						
Date: 11/01/14 Time: 12:36						
Sample: 2000M01 2013M12						
Included observations: 160						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-537.0681	NA	0.000603	6.775852	6.871951	6.814874
1	409.0251	1821.229	6.03e-09	-4.737813	-4.161218*	-4.503678*
2	447.9471	72.49227	5.07e-09*	-4.911839*	-3.854748	-4.482591
3	468.9544	37.81308	5.34e-09	-4.861929	-3.324343	-4.237569
4	493.4536	42.56740	5.40e-09	-4.855670	-2.837587	-4.036196
5	516.4686	38.55020	5.57e-09	-4.830858	-2.332279	-3.816272
6	538.8332	36.06282	5.82e-09	-4.797915	-1.818840	-3.588216
7	566.1808	42.38891	5.73e-09	-4.827261	-1.367690	-3.422449
8	594.1092	41.54338*	5.63e-09	-4.863865	-0.923798	-3.263940
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

Les résultats que nous avons divergent sur le retard maximal. Après quelques itérations, nous avons constaté que le retard 2 proposé par AIC et FPE donne de meilleurs résultats. Donc, nous pouvons retenir que le VAR qui sera utilisé sera d'ordre deux. Ceci signifie que le modèle répond significativement aux variables qui le constituent jusqu'au décalage temporel 2.

Stabilité du VAR

Pour pouvoir interpréter les résultats fournis par le VAR, on doit se rassurer qu'il est stable sous peine d'avoir des régressions fallacieuses.

Tableau No 9.4: Test de stabilité du VAR

Roots of Characteristic Polynomial	
Endogenous variables: LIPI LIPC TBB LMMO LTCH	
Exogenous variables: C	
Lag specification: 1 2	
Date: 11/01/14 Time: 12:35	
Root	Modulus
0.997763	0.997763
0.947579	0.947579
0.892559	0.892559
0.735669	0.735669
0.016834	0.016834
No root lies outside the unit circle.	
VAR satisfies the stability condition.	

Notre VAR est stable car toutes ses racines unitaires en valeur absolue sont inférieures à 1 et sont à l'intérieur du cercle unitaire.

Restrictions de court- terme

Quand Sims (1980) a d'abord préconisé l'utilisation d'un VAR en économie, c'était en réponse au courant de pensées en vogue à l'époque qui considérait que les modèles économiques contiennent des restrictions économiques. Or, les modèles diffèrent selon les économies compte tenu de leurs spécificités. Spécifiquement pour le cas du Burundi, il est indispensable d'imposer certaines restrictions de court terme pour appréhender l'efficacité de la politique monétaire de la Banque Centrale.

Dans la matrice des coefficients de CHOLESKI, nous avons imposé des contraintes tenant compte des spécificités de l'économie burundaise. En effet, nous avons vu que la définition des taux d'intérêt n'est pas constamment indexée à l'inflation. En outre, les variations du taux d'intérêt n'affectent pas le taux de change.

Fonctions de réponses impulsionnelles.

Les fonctions de réponses impulsionnelles permettent d'analyser les effets d'une politique économique au travers de simulations de chocs aléatoires. Cette analyse s'effectue sous la clause « toutes choses égales par ailleurs ».

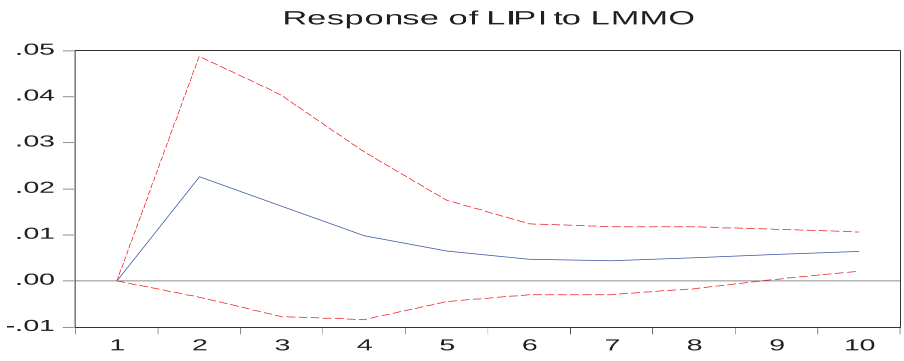
Toute variable peut subir un choc qui se propage sur toutes les autres variables du système avec le temps et en s'amortissant. Toute innovation sur chaque variable représente un choc spécifique. Ainsi, une innovation sur le l'IPI représente un choc d'offre, une innovation sur la masse monétaire MMO représente un choc de politique monétaire, une innovation sur l'indice des prix à la consommation IPC représente un choc de prix, une innovation sur le taux de base représente un signal sur le marché des fonds prêtables, une innovation sur le taux de change représente un choc de la balance des paiements et une innovation sur le crédit au secteur privé représente un choc de crédit.

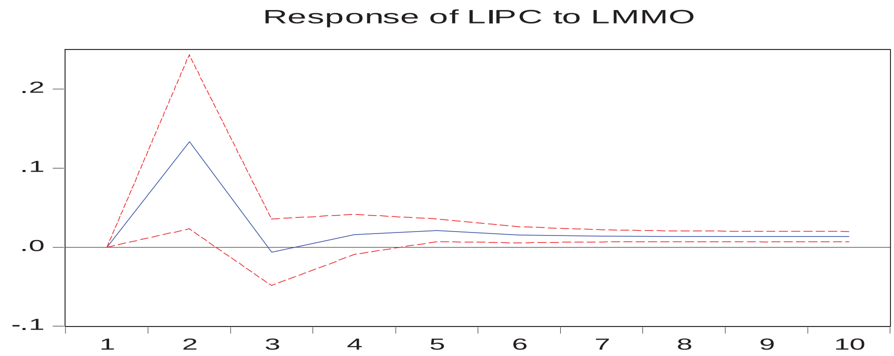
Dans l'étape qui suit, on va simuler des innovations respectivement sur chaque variable et analyser les réactions des variables du système conformément aux restrictions imposées au système.

Choc de politique monétaire

Toute action de la Banque Centrale conduisant à la hausse de la masse monétaire produit des effets positifs sur la production industrielle et le niveau général des prix. Les effets sur la production ne sont pas toutefois significatifs, ce qui traduit la neutralité de la monnaie sur la production à court terme. Par contre, l'inflation réagit à la hausse consécutivement à une politique monétaire expansive. La hausse de l'inflation devient significative au 2ème mois et l'effet s'estompe entièrement au bout de trois mois. ***En gérant la croissance des agrégats monétaires, la Banque Centrale contribue à la maîtrise de l'inflation.***

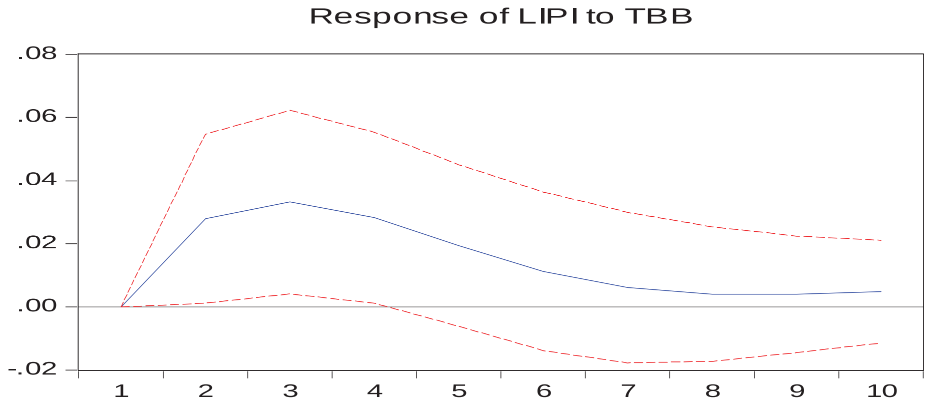
Response to Cholesky One S.D. Innovations ± 2 S.E.

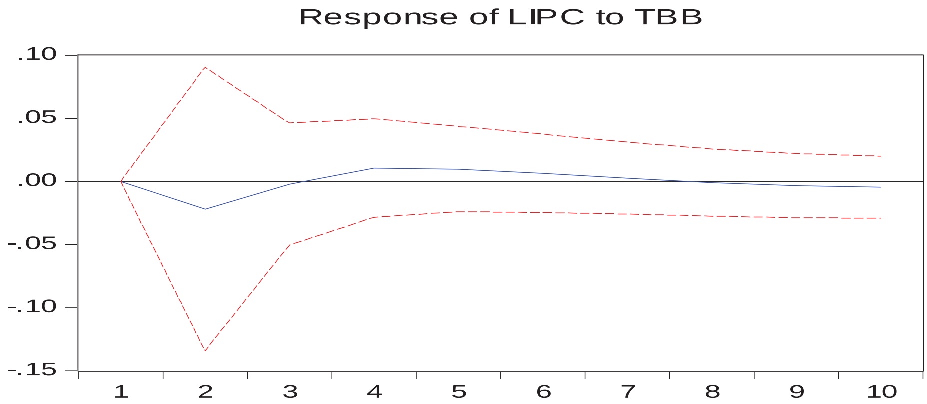




Choc lié aux signaux monétaires

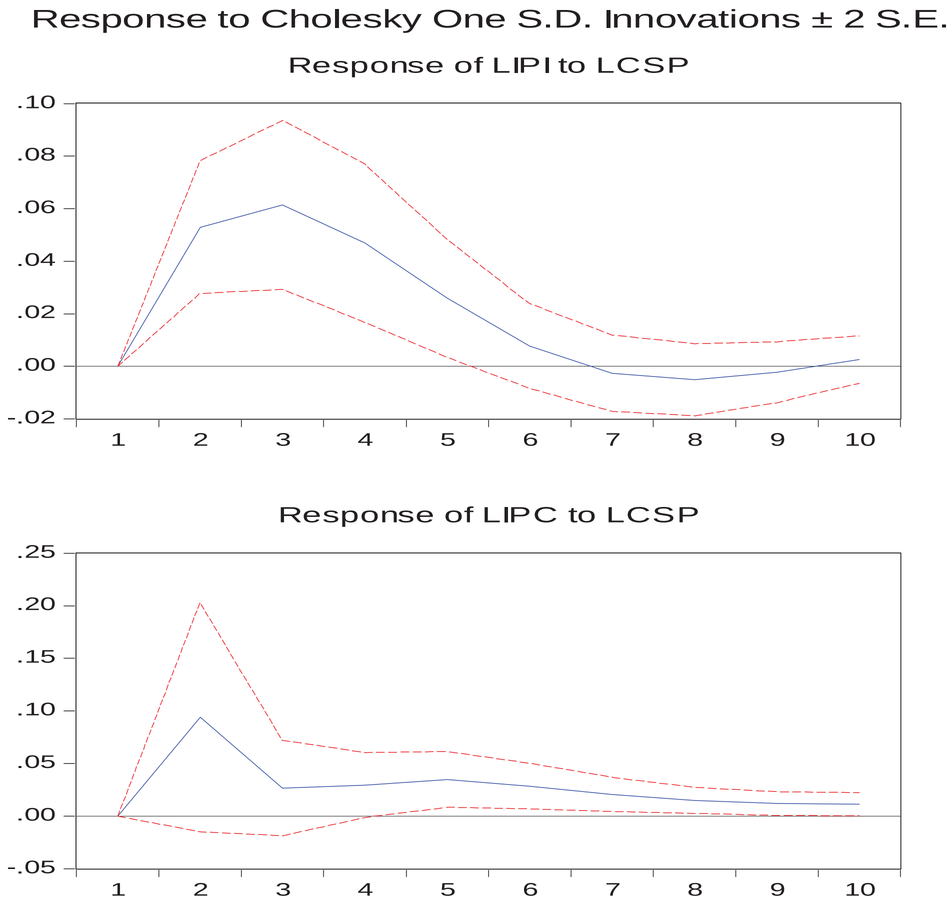
Response to Cholesky One S.D. Innovations ± 2 S.E.





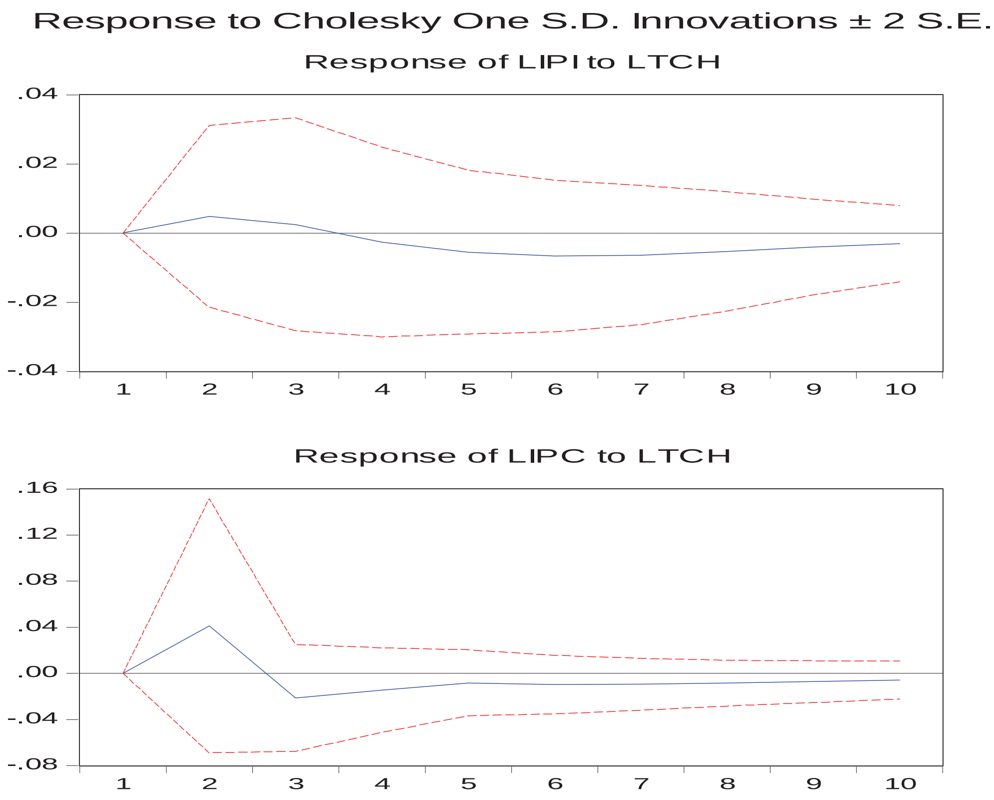
Contrairement à nos attentes, si un signal de hausse de taux d'intérêt est lancé, la production industrielle réagit positivement. C'est une relation fortuite dont l'interprétation est à prendre avec des pincettes. Quoique la réaction des prix ne soit significative, son sens ne répond pas à nos attentes car une hausse du taux d'intérêt correspond à une politique monétaire restrictive qui devrait conduire à une baisse de l'inflation. On en conclut que **toute politique monétaire basée sur le ciblage des taux d'intérêt n'est pas indiquée pour la BRB.**

Choc lié au crédit bancaire



La production industrielle réagit positivement et significativement à toute hausse des crédits. La production atteint le pic après trois mois et demi et l'effet s'annule au septième mois. Le crédit au secteur privé a des effets inflationnistes qui ne sont pas significatifs. A l'état actuel des choses, **l'opportunité d'une politique visant à accroitre le crédit au secteur privé est envisageable pour stimuler la production.**

Choc lié au taux de change.



Ni la production industrielle, ni le niveau général des prix à la consommation ne réagit significativement à la variation du taux de change, faisant de lui un mauvais canal de transmission de la politique monétaire. Toutefois, la réaction des prix vers la hausse, quoique faible, répond à nos attentes car toute dépréciation de la monnaie nationale conduit à la hausse des prix des produits importés, avec le risque que les prix des autres biens réagissent à la hausse par sympathie. **La dépréciation du franc Burundi conduit à la hausse des prix quoique sa contribution soit faible.**

Décomposition de la variance

La décomposition de la variance de l'erreur est aussi un instrument populaire dans l'interprétation des modèles VAR. Au moment où les fonctions de réponses impulsionnelles illustrent les effets d'un choc porté à une variable sur les autres variables du système, la décomposition de la variance montre les contributions de chaque variable du système dans la variation d'une variable endogène. En d'autres termes, la décomposition de la variance nous renseigne sur la proportion des mouvements d'une variable dus à ses propres valeurs passées contre ceux qui sont dus aux autres variables du VAR.

Tableau No 9.5: Décomposition de variance

Variance Decomposition of LIPI:						
Period	S.E.	LIPI	LIPC	TBB	LCSP	LTCH
1	0.159515	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.234506	91.82044	2.108976	0.924797	5.102079	0.043706
3	0.271473	84.26032	5.511802	1.238953	8.936478	0.052446
4	0.281854	80.52470	6.981650	1.384992	11.05675	0.051909
5	0.283715	79.56696	7.208330	1.400635	11.74197	0.082101
6	0.286102	79.76762	7.093298	1.381493	11.61988	0.137717
7	0.289069	79.89994	7.121106	1.389809	11.39109	0.198061
8	0.290876	79.78605	7.268123	1.417438	11.28072	0.247672
9	0.291432	79.64961	7.381886	1.441191	11.24367	0.283642
10	0.291561	79.57980	7.417248	1.452416	11.24163	0.308915
Variance Decomposition of LIPC:						
Period	S.E.	LIPI	LIPC	TBB	LCSP	LTCH
1	0.704154	0.004186	99.99581	0.000000	0.000000	0.000000
2	0.714208	0.351609	97.20043	0.313804	1.734511	0.399646
3	0.718736	0.901532	96.32720	0.496112	1.849158	0.425993
4	0.721586	1.468405	95.56866	0.508517	2.003431	0.450992
5	0.723271	1.640517	95.14089	0.537214	2.227881	0.453495
6	0.724172	1.655146	94.91904	0.589171	2.377041	0.459604
7	0.724771	1.657733	94.76231	0.658781	2.454087	0.467087
8	0.725392	1.684250	94.60581	0.745112	2.492136	0.472695
9	0.726002	1.709492	94.45895	0.840669	2.514642	0.476244
10	0.726541	1.718575	94.33149	0.936851	2.535114	0.477975
Cholesky Ordering: LIPI LIPC TBB LCSP LTCH						

Le crédit au secteur privé joue un rôle déterminant dans le niveau de la production industrielle. Au bout de 10 mois, le crédit au secteur privé contribue pour 11, 24% dans la croissance de la production industrielle. Toutefois, 79,58% des contributions restent liées aux politiques de production des industries et aux autres facteurs qui ne sont pas pris en compte dans notre modèle. Toujours au bout de 10 mois, le niveau de la production industrielle et du crédit au secteur privé contribuent respectivement pour, 1,72 et 2,74% dans la variation du niveau des prix. Toutefois, 94,33% des variations des prix restent subordonnés à l'omission de certaines variables explicatives de l'inflation et au phénomène autoentretenu de la formation des prix. Les variations du taux de change contribuent très faiblement à la production et à l'inflation.

Le canal du crédit est donc fonctionnel et affecte plus le niveau de la production industrielle que le niveau général des prix. La banque centrale peut donc stimuler la production industrielle en élaborant notamment des politiques de refinancement visant à augmenter le crédit au secteur privé. Par contre, le canal de taux d'intérêt n'a que des effets limités sur le niveau des prix.

7.0 Conclusion Générale

Au cours de cette recherche, nous avons constaté que la conduite de la politique monétaire par la BRB est basée sur le ciblage des agrégats monétaires fondé sur la théorie quantitative de la monnaie. A cet effet, la Banque Centrale utilise des instruments indirects qui affectent soit la base monétaire, soit le multiplicateur de monnaie. La modification de ces deux dernières grandeurs se reflète sur la masse monétaire qui, quant à elle, affecte le niveau général des prix à travers les canaux de transmission. Pour que ce type de politique monétaire devienne efficace, le multiplicateur de monnaie et sa vitesse de circulation doivent être stables en vue de faciliter la détermination de la quantité de monnaie compatible aux objectifs de prix et de production. En outre, les canaux de transmission doivent fonctionner parfaitement pour pouvoir transférer les effets des innovations monétaires vers la sphère réelle.

Notre analyse a conclu à la stabilité du multiplicateur de monnaie et à l'instabilité de sa vitesse de circulation. Ceci revient à dire que la Banque Centrale a la maîtrise de la croissance des agrégats monétaires mais que leurs effets sur l'inflation sont aléatoires. Ceci ne nous conduit pas à la remise en cause du cadre de politique monétaire adopté par la BRB. En effet, la maîtrise de l'évolution des agrégats monétaires est une condition *sine qua none* de la réussite de la politique monétaire. En outre, l'instabilité de la vitesse de circulation de la monnaie est imputable notamment aux innovations incessantes de l'environnement financier, à la multiplicité des facteurs exogènes explicatifs de l'inflation, … ***Le cadre de politique monétaire basé sur le ciblage des agrégats monétaires restent indiquée pour la BRB.***

La réussite de ce type de politique monétaire requiert un fonctionnement efficace des canaux de transmission. Notre analyse a conclu que seul le canal du crédit bancaire fonctionne parfaitement au moment où le canal de taux de change et le canal de taux d'intérêt ne fonctionnent que partiellement.

Recommandations

Toute décision de politique monétaire doit produire des effets par le canal d'un certain nombre de mécanismes que nous avons développés tout au long de notre propos. Ces mécanismes pourtant relativement bien rodés posent des problèmes d'application dans l'économie du Burundi. Le développement d'un environnement financier solide est un préalable à l'efficacité des mécanismes de transmission de la politique monétaire.

Les marchés financiers jouent un rôle central dans la transmission de la politique monétaire en ce sens qu'ils amplifient les effets des taux d'intérêt dans une économie. L'absence de ceux-ci ou leur étroitesse constitue un obstacle à l'accroissement de l'efficacité des politiques monétaires fondées sur les mécanismes de marché. Alors, **la mise en place d'un marché financier opérationnel** est indispensable pour le meilleur fonctionnement du canal de taux d'intérêt et du crédit en vue de renforcer l'efficacité de la politique monétaire.

L'économie burundaise n'est pas suffisamment monétisée. Or, mener une politique monétaire dans une économie dont la majeure partie de la population n'a pas accès aux services financiers est une action dont les effets sur le secteur réel sont limités. La BRB doit **accélérer et renforcer la politique d'inclusion financière** pour faciliter l'accès aux services financiers par la population.

Dans les économies modernes, la variation du taux de change se répercute sur la production à travers les exportations et les importations. Dans les économies sous-développées, les effets de la variation du taux de change sont perceptibles sur le niveau des prix à travers les produits importés. Pour que le taux de change joue pleinement au Burundi, la **diversification des produits industriels exportables** est plus que nécessaire. Cette recommandation va à l'endroit des politiques sectorielles.

Pour qu'une politique monétaire soit efficace, elle doit être annoncée au public pour qu'il puisse faire ses ajustements car toute politique dépend du comportement qu'adoptent les agents économiques face aux nouvelles mesures. La BRB est engagée dans une nouvelle réforme de communication de sa politique monétaire. La BRB doit **renforcer sa communication de la politique monétaire pour améliorer sa crédibilité et sa transparence**.

Bibliographie Sommaire

Ouvrages Généraux

Banque De France, Politique Monétaire, Cycle Economique et Dynamique Financière, Eurosystème, 2003, 363 p.

Benassy-Quere A., Boone L., Les taux d'intérêt, Paris, La Découverte, 2003, 198p.

Bernanke B. et Blinder A., 1992: « The Federal Funds Rate and the Channels of Monetary Transmission", in American Economic Review, pp 901-921, septembre

Bernanke, B., et M. Gertler (1995), « Inside the Black Box : The Credit Channel of Monetary Policy Transmission », in Journal of Economic Perspectives, vol.9, n°4, pp. 27-48.

Bortolani Sergio, Système Bancaire du Niger, Milan, Lombarde, 1971, pp. 62-77.

Bourbonnais Régis, Econométrie : manuel et exercices corrigés, 2ème édition, Paris, Dunod, 1998, 329 p.

Denmarks National Bank, Monetary Policy in Denmark, Copenhagen, 2003, 166 p.

Haudeville Bernard, Econométrie Appliquée, Paris, édition ESTEM, 1996. 322 p.

Johnston J. et Dinardo J., Méthodes Econométriques, Paris, ECONOMICA, 4ème éd., 19999, pp.251-324

Lardic S. et Mignon V., Econométrie des Séries Temporelles Macroéconomiques et Financières, Paris, Economica, 2002, pp. 52-94.

Mankiw Gregory N., Macroéconomie, Bruxelles, De Boeck Université, 2001, pp471-499

Mourgues (de) Michelle, Macroéconomie Monétaire, Paris, Economica, 2000, 698 p.

Ruffini Pierre-Bruno, Les Théories Monétaires : la pensée économique contemporaine, Paris, Editions du Seuil, 1996, 416 p.

Revues

Clarider R., Gali J., Gertler M. (1999), "The Science of Monetary Policy: A New Keynesian Perspective", in Journal of Economic Literature, Vol. XXXVII, n°4, pp68-74

Clarida R., Gali G. and Gerterm M., (2000), "Monetary Policy Rules and Macroeconomic Stability: Evidence and some theory", in Quarterly Journal of Economics, pp 147-180.

Clerc L. et Fister Ch. (2003), " The role of Financial Factors in the Transmission of the Monetary Policy" BIS paper, n°19, part 8, www.bis.org

Gordon H., Sellon J., (2004), "Expectations and the Monetary Policy Transmission Mechanism", in Economic Review, Fourth Quarterly 2004, Vol. 89 n°4, pp. 5-41

Kadede Tharcisse, septembre 1998, « Dépréciation Réelle de la Monnaie Burundaise et l'efficacité relative des politiques fiscale et budgétaire », in RIDEC, Vol. 2 n° 2, pp. 196-219

Koziki Sharom, (1994), « Why Do Central Banks Monitor so Many Inflation Indicators?" in Economic Review, Vol. 86 n°3, pp. 5-42.

Mark W. (2006), "Interest rate Rules and Macroeconomic Stabilisation", in Louvain Economic Review, Vol. 72 n°2 Quarterly, pp. 195-204.

Mishkin F., (1996): " Les canaux de transmission monétaire: leçon pour la politique monétaire", Bulletin de la Banque de France, n° 27, mars.

Mojon B. et peersman G. (2001), " A VAR description of the effects of monetary policy in the individual countries of the Euro area." In ECB working paper, www.ecb.int

Ndenzako Jean, mars 1999, "L'efficacité relative des instruments de politique monétaire et budgétaire sur l'activité économique au Burundi : Une étude de la structure polynomiale des retards d'Almon. », in RIDEC, Vol.3 n°1, pp. 21-38.

Wickham P., « The choice of exchange rate regime in developing countries »; in IMF Staff Papers, Vol. 32, (juin 1985).

Chapter 10

Etude Sur L'efficacité de la Politique Monétaire de la Banque Centrale du Congo

By Alain Difumba Lumuna

1.0 Introduction Générale

Le conseil des Gouverneurs du COMESA avait recommandé au sous-comité de politique monétaire et de change de présenter des études pour vérifier l'efficacité du dispositif de la politique monétaire des pays membres.

C'est donc dans ce cadre que le présent travail est élaboré afin de vérifier la capacité des instruments de la politique monétaire de la Banque Centrale du Congo à atteindre ses objectifs.

Pour ce faire, l'étude se base sur le dispositif institutionnel et opérationnel mis en place par la République Démocratique du Congo pour concevoir et mettre en œuvre la politique monétaire. A cet effet, une démarche à la fois analytique et empirique est adoptée. La première, portant sur la description de la situation existante, laquelle intègre à la fois tout l'environnement de la mise en œuvre de la politique monétaire de la RDC et des problèmes structurels que posent les économies similaires à cette politique monétaire. La seconde par contre, vérifie, grâce à l'outil économétrique, notamment les relations de causalité entre les variables impliquées ainsi que l'aptitude du cadre opérationnel à atteindre les buts fixés par le législateur.

C'est ainsi que, globalement, la présente étude a recouru aux données récentes, couvrant la période de 2002 à 2013, période qui marque à la rupture avec l'hyperinflation que le pays a connue au cours de la décennie 1990 et qui permet également de mettre en lumière l'épisode de la crise financière internationale, laquelle n'a pas été sans conséquence sur la situation économique nationale.

Ainsi la présente étude comprend, outre cette introduction et la conclusion, neuf points suivants:

- Le cadre régissant la gestion monétaire en RDC ;
- Analyse des dispositions institutionnelles pour la mise en œuvre de la politique monétaire en RDC ;
- Evolution, analyse et performance des régimes de politique monétaire de la RDC ;
- La fonction de la demande de monnaie en RDC ;
- Analyse empirique du processus de transmission de la politique monétaire en République Démocratique du Congo ;
- Dollarisation et conduite de la politique monétaire ;
- Changements structurels dans l'économie réelle sur l'efficacité de la politique monétaire ;
- Recommandations pour la mise en œuvre de la politique monétaire à moyen et long terme.
- Analyse de la volonté de mise en œuvre du régime de politique monétaire recommandée.

L'issue de cette étude permettra de formuler quelques propositions qui devraient induire l'amélioration de la conduite de la politique monétaire en RDC.

1.1 Cadre régissant la gestion monétaire RDC

Nous présentons ci-après le cadre opérationnel et analytique de la politique monétaire de la RDC. Le cadre institutionnel, faisant l'objet du deuxième point chapitre.

1.1.1 Les objectifs

La Banque Centrale du Congo procède à un ancrage monétaire. En effet, l'objectif final de la politique monétaire est la stabilité du niveau général des prix[41]. Pour atteindre cet objectif, la banque centrale oriente la masse monétaire via le contrôle

41 Politique monétaire de la Banque Centrale du Congo : cadre de référence, 2013, p

de la base monétaire. Ainsi, en contrôlant l'expansion des agrégats monétaires, la Banque Centrale espère contrôler le niveau général des prix.

Ainsi donc, l'objectif final de la politique monétaire est stabilité du niveau général des prix, l'objectif intermédiaire étant la masse monétaire et la base monétaire est l'objectif opératoire.

Cependant, la masse monétaire congolaise est composée à 65 % des dépôts en devises. Ce qui limite l'impact des instruments de la politique monétaire sur l'objectif final.

1.1.2 Les instruments

Pour atteindre son objectif final, la Banque Centrale du Congo utilise trois instruments à savoir le ***taux d'intérêt directeur***, ***le coefficient de la réserve obligatoire*** et ***les appels d'offres des bons*** de la Banque Centrale du Congo.

La modification du taux directeur entraine celle du taux débiteur des banques et par conséquent le volume de crédit accordé à l'économie. Par ailleurs, l'action du taux directeur agit sur le taux moyen pondéré des Bons BCC. En effet, un relèvement du taux directeur implique celui du taux moyen pondéré et accroit donc l'attractivité du titre de la Banque Centrale du Congo. Ainsi, il peut être opéré une ponction de la liquidité entrainant une réduction de la base monétaire.

Le coefficient de la réserve obligatoire est utilisé en cas de choc structurel sur la liquidité bancaire tel qu'un changement dans les habitudes d'usage de la monnaie fiduciaire ou dans l'accélération du processus de la bancarisation.

Le Bon BCC est utilisé par la Banque Centrale pour la régulation courante de la liquidité bancaire. En effet, les appels d'offres permettent aux banques de placer à la Banque Centrale leurs excédents de liquidité. En cas de sous-liquidité, les appels d'offres permettent d'injecter de la liquidité. Ce qui permet de disposer à chaque instant d'un niveau de liquidité compatible au besoin de l'économie.

1.1.3 L'analyse de la liquidité

Un cadre de prévisions de la liquidité permet de procéder à une prévision des facteurs autonomes de la liquidité bancaire en vue d'orienter de façon proactive les instruments de la politique monétaire. Ainsi, les facteurs avoirs extérieurs nets, crédit net à l'Etat et circulation fiduciaire peuvent être prévus.

Toutefois, l'économie congolaise est affectée par trois types de chocs qui affectent la liquidité bancaire:

- *Les chocs permanents* qui sont causés par les déficits infra annuels du budget de l'Etat, induisent l'expansion de liquidité bancaire. Cela s'explique par le fait que l'Etat n'émet pas des titres pour financer ses besoins ;
- *Les chocs transitoires* liés notamment aux excédents de la balance des paiements liés à l'amélioration des termes de l'échange. La hausse des cours de produits miniers suite à la hausse de la demande mondiale entraine souvent une rentrée importante des devises sur le marché ;
- *Les chocs cycliques*: ils surviennent en infra mensuel gonflant les dépôts des banques par suite de la liquidation de la paie des agents de l'Etat. Le décalage avec l'exécution effective par les banques entraine une période de surliquidité bancaire. Par ailleurs, en infra annuel, il est noté une forte demande des devises pour importation en janvier, une accélération des dépenses privées et donc celle de la demande des billets apparait en Aout et septembre suite à la rentrée scolaire. En décembre, les festivités de fin d'année entrainent des déficits budgétaires récurrents.

2.0 Analyse Des Dispositions Institutionnelles Pour la Mise en Œuvre de la Politique Monétaire en RDC

2.1 Présentation des dispositions institutionnelles

La formulation et la mise en œuvre de la politique monétaire incombe au Conseil de la Banque. Il est l'organe suprême qui a les pouvoirs les plus étendus pour concevoir, orienter la politique de la Banque[42]. Il donne l'orientation stratégique de la politique monétaire. Celui-ci définit l'orientation sur les instruments qui peuvent être utilisés en vue d'accroitre efficacement l'objectif fixé. Le conseil de la Banque est présidé par le Gouverneur.

Par ailleurs, un Comité de Politique Monétaire assure l'exécution de la politique monétaire et en évalue les résultats. Il est l'instance de surveillance et de décisions en matière de conduite de la politique monétaire. Il veille à l'accomplissement de l'objectif de la stabilité des prix assigné à la politique monétaire.

[42] Cfr loi n°005/2002 du 07 mai 2002 relative à la constitution, organisation et fonctionnement de la Banque Centrale

L’objectif d’inflation est fixé sur base du cadrage macroéconomique en fonction des objectifs de politique économique par un comité interinstitutionnel chargé de l’élaboration du cadrage macroéconomique. Ce comité est présidé par le Ministère de Plan.

S’agissant de la mise en œuvre de la politique monétaire, les services de la Banque élaborent une programmation monétaire cohérente avec les directives du Conseil de la Banque et en fonction des prévisions du cadrage macroéconomique. Elle définit en conséquence le niveau des objectifs intermédiaire et opérationnel.

Ainsi, il peut être fixé des cibles mensuelles en fonction notamment de la saisonnalité. La manipulation des instruments par le Comité de Politique Monétaire sera donc fonction des objectifs ainsi définis.

En outre, la Constitution de la République fixe en son article 176 les missions de la Banque Centrale du Congo. Aux termes de cet article et des dispositions de la loi organique de la Banque Centrale du Congo, la Banque Centrale du Congo est indépendante dans la définition et la mise en œuvre de la politique monétaire.

2.2 Analyse des dispositions institutionnelles

a). Analyse de la prise de décision

Le Comité de Politique Monétaire prend les décisions en matière de politique monétaire. Ce comité s’appuie notamment sur un sous-comité chargé de prévisions de la liquidité. Cependant, les informations pertinentes notamment sur **« le facteur autonome Crédit net à l’Etat »** ne sont pas très disponibles eu égard à la non-participation de la Direction du Trésor. Ce qui limite la portée des prévisions et partant de la qualité des décisions.

b). De l’indépendance de la Banque centrale du Congo

Dans leurs articles 176 et 3 respectivement de la Constitution de la République promulguée en 2006 et de la loi n°005/2002 du 07 mai 2002 portant constitution, organisation et fonctionnement de la BCC, consacrent l’indépendance de la BCC dans la mise en œuvre de la politique monétaire. Cependant, la Banque Centrale du Congo est confrontée à des contraintes financières, caractérisées par des fonds propres négatifs et la faiblesse des actifs rentables dans son bilan.

Cette situation engendre une limitation dans la mise en œuvre de la politique monétaire. Cette situation est davantage accrue par la dollarisation de l’économie nationale qui réduit les revenus de seigneuriage de la Banque Centrale du Congo. Pour notamment résoudre cette question, la BCC et le Gouvernement se sont engagés dans le processus de dédollarisation de l'économie nationale depuis septembre 2012, processus dont ils ont inscrit les résultats dans la durée.

c) De la prise en charge des frais de politique monétaire

La loi n°005/2002 du 07 mai 2002, dans son article 3, relative à la constitution, organisation et fonctionnement de la Banque Centrale du Congo stipule que l'Etat prenne en charge les pertes nettes subies par la Banque. Cependant, la détérioration des ressources financières de l'Etat face à la multiplicité de ses besoins notamment d'infrastructures, a réduit la capacité de l'Etat à couvrir le déficit de la Banque Centrale. Il s'en est suivi une dégradation de la situation financière de la Banque Centrale et une forte pression sur les dépenses de politique monétaire.

d) Indépendance de la Banque Centrale et Coopération interinstitutionnelle

Il y a lieu de signaler que l'indépendance de la Banque Centrale du Congo est garantie, et ce, dans la mise en œuvre de la politique monétaire. Au sein de la Banque, le Comité de Politique Monétaire constitue le cadre par excellence de l'exécution et du suivi des résultats de la politique monétaire de la BCC. Ce Comité de Politique Monétaire avait décidé d'ouvrir la participation aux réunions, cependant sans voix délibérative, à certains membres du Gouvernement, notamment le ministère des finances, budget, la primature et la présidence.

Par ailleurs, pour une bonne coordination des politiques macroéconomiques, plus particulièrement les politiques monétaire et budgétaire, il existe des plates-formes entre la Banque Centrale du Congo et le Gouvernement de la République telles que les « Troïkas stratégique et politique ». Cette situation a eu l'avantage d'accroitre la convergence des politiques conjoncturelles (monétaire et budgétaire) et de stabiliser les prix. Cependant, le risque de compromission de l'indépendance de la banque Centrale avec la demande des droits de vote par les membres externes a eu pour conséquences le départ de ceux-ci.

3.0 Evolution, Analyse et Performance des Regimes de Politique Monétaire de la RDC

Une certaine évolution a été notée dans le régime de politique monétaire en RDC. Nous présentons ci-après l'évolution récente qui part de l'abandon de l'usage des instruments directs effectué en 2001.

3.1 Abandon des instruments directs de la politique monétaire

La politique monétaire de la Banque Centrale du Congo a connu des mutations structurelles importantes visant l'amélioration de l'efficacité depuis l'année 2001. Ces réformes ont concerné principalement les cadres conceptuel et opérationnel ainsi que le dispositif de surveillance de la politique monétaire.

Avant 2001, la Banque Centrale du Congo utilisait plusieurs instruments d'encadrement direct tels que les plafonds de taux d'intérêt ainsi que les restrictions quantitatives sur le crédit bancaire (plafond de refinancement, capacité de refinancement).

Ces instruments ont étouffé le développement du crédit au moment même où le pays avait besoin des capitaux pour financer la reconstruction nationale et l'activité économique. Par ailleurs, dans un contexte d'absence de discipline budgétaire, la capacité desdits instruments à réguler la liquidité était extrêmement limitée.

C'est ainsi qu'un diagnostic du cadre général de la politique monétaire et de change, un processus de restructuration du cadre de la politique monétaire a été enclenché après un prélude constitué essentiellement du démantèlement des plafonds des taux d'intérêt bancaires en 1998.

3.2 Adoption du régime de change flottant

Avec la chute des réserves de change du pays suite notamment à la guerre qui a paralysé le pays en 1996, la Banque Centrale était devenue incapable de soutenir son taux de change. En conséquence, il s'est développé un marché de change parallèle dont le cours s'écartait énormément du marché officiel. Afin d'éliminer ces distorsions, lesquelles amplifiaient le rythme de dépréciation monétaire, le régime de change flottant a été adopté et la détention des devises a été libéralisée en 2001[43]. Ces mesures, soutenues par une réforme de la politique budgétaire, ont

[43] Règlementation de change en République Démocratique du Congo, articles 1à 3.

permis de réduire considérablement le rythme de dépréciation monétaire. L'unification du marché de change a sensiblement diminué l'écart entre le cours de change parallèle et le cours indicatif. Cet écart est presque nul à l'heure actuelle alors qu'il était supérieur à 350 % en 2000.

3.3 Définition claire de l'objectif principal de la politique monétaire

Avant 2002, il y avait une absence de clarté dans les attributions de la Banque Centrale du Congo notamment en matière de politique monétaire. Sa mission allait jusqu'au développement économique, mission dont la banque centrale ne saurait atteindre. Cela s'explique par faute d'instruments monétaires appropriés.

Avec la promulgation de la loi n°005/2002 du 07 mai 2002 sur la Banque Centrale en 2002, un contenu clair a été donné à la mission principale de la BCC, en son article 3, qui stipulait que la mission première de l'Institut d'Emission est de définir et de mettre en œuvre la politique monétaire du pays dont l'objectif principal est la stabilité du niveau général des prix.

En conséquence, des indicateurs précis ont été établis pour mesurer les performances de l'action de la BCC au regard de la loi.

3.4 Consécration de l'autonomie et de l'indépendance de la Banque Centrale

La même loi sus évoquée, renforcée plus tard par la Constitution de la République de 2006 (article 176) va consacrer l'autonomie et l'indépendance de la Banque Centrale du Congo. Jusqu'en 2002, la Banque Centrale était certes autonome, mais le Gouvernement détenait des larges pouvoirs sur l'orientation de la politique monétaire et des activités de la Banque. Des membres du Gouvernement siégeaient au Conseil d'Administration de la Banque.

A cet effet, les membres du Gouvernement ne pouvaient plus siéger dans les instances dirigeantes de la Banque Centrale et une interdiction a été faite à la Banque Centrale d'accorder des crédits à l'Etat[44] pour mettre fin à la dominance budgétaire. Par ailleurs, un processus de recapitalisation de la Banque a été enclenché pour renforcer son assise financière.

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44 Loi n°005/2002 susévoquée, article 157

3.5 Précision des objectifs intermédiaire et opératoire

A partir de 2005, grâce à une bonne compréhension des mécanismes de transmission de la politique monétaire, la base monétaire et la masse monétaire ont été choisies respectivement comme objectifs opérationnel et intermédiaire. Compte tenu du poids de la dollarisation de l'économie, une attention particulière a été accordée au canal du taux de change dans le cadre analytique. Par ailleurs, un dispositif des prévisions des facteurs autonomes de la liquidité a été mis en place en 2008 pour orienter les interventions de la Banque sur le marché monétaire.

3.6 Coordination des politiques macroéconomiques

Dans le cadre du renforcement de la coordination entre les politiques macroéconomiques, la BCC a d'abord réorganisé, en 2009, sa structure interne et de décision en vue de faciliter en premier lieu la coordination de la politique monétaire et celle de change. Dans ce contexte, une Direction Générale de la Politique Monétaire et Opérations Bancaires a été créée et les interventions sur les marchés monétaires et de change sont désormais conduites par une seule Direction des Opérations Bancaires et des Marchés.

La BCC et le ministère des finances se sont employés à rechercher la coordination des politiques monétaire et de change avec la politique budgétaire. Un cadre de coopération interinstitutionnelle a été créé à cet effet, regroupant les ministères des finances et du budget ainsi que la BCC. Ce cadre permet, non seulement une meilleure circulation d'informations, mais aussi des concertations régulières en vue de l'harmonisation des décisions en matière des politiques macroéconomiques.

Aussi, au plus haut niveau, d'autres concertations avec le chef du Gouvernement ont permis le renforcement de la coordination entre la politique monétaire et les politiques structuro sectorielles.

Les fruits de l'amélioration de la coordination ont été notamment l'obtention des bons résultats en matière de stabilité du cadre macroéconomique lesquels ont facilité l'atteinte du point d'achèvement de l'Initiative PPTE en juin 2010.

3.7 Amélioration de l'efficacité des instruments indirects

3.7.1 Instrument bon BCC

L'instrument Bon de la Banque Centrale du Congo (bon BCC) avait été introduit en décembre 2002. A cette occasion, les liquidités excédentaires des banques pouvaient être placées à la banque centrale. A partir de 2008, les opérations sur ce titre sont soumises au processus d'adjudication et dont le volume à ponctionner est déterminé par la Banque Centrale après une analyse des prévisions de la liquidité.

En 2013, les tiers (ménages et entreprises commerciales) sont exclus de la souscription. Le titre étant entièrement réservé aux banques commerciales en tant que canal de transmission des impulsions de la politique monétaire.

3.7.2 Coefficient de la réserve obligatoire

Jusqu'en 2013, le coefficient de la réserve obligatoire s'appliquait indistinctement sur les dépôts de la clientèle de banques. Sur le plan de l'échéance, les dépôts à vue représentent 76,6 % et les dépôts à terme 23,4 %. Par contre, sur le plan de la monnaie de constitution, les dépôts en monnaies étrangères s'établissent à 85,8 % et ceux en monnaie nationale se situent à 14,2.

C'est ainsi que pour permettre aux banques de mobiliser davantage les dépôts à terme susceptibles de financer l'économie et en même temps faire de reculer la dollarisation, des discriminations ont été introduites dans la constitution de la réserve obligatoire. Ainsi, le coefficient de la réserve obligatoire est désormais plus élevé pour les dépôts à vue qu'à terme et également pour les dépôts en devises par rapport à ceux en monnaie nationale.

3.8 La Demande de Monnaie en RDC

Présentation de la fonction de la demande de monnaie de la RDC

Le modèle de demande de monnaie ci-dessous a été développé par la Banque Centrale du Congo[45]. En effet, plusieurs études empiriques de la fonction de demande de monnaie retiennent la masse monétaire réelle comme variable dépendante et un certain nombre de variables indépendantes composées de variables d'échelle et de coût d'opportunité de la détention de la monnaie.

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[45] Etude la demande de monnaie en RDC, Banque Centrale du Congo, 2013

Les équations de la demande de monnaie utilisant la masse monétaire réelle au sens large comme agrégat monétaire ont été estimées en recourant au modèle vectoriel à correction d'erreurs. Les signes attendus et le degré de signification des paramètres estimés ainsi que l'application des tests de diagnostic ont permis de vérifier la consistance des résultats.

Aussi, en se basant sur la fréquence mensuelle des données, la détermination du nombre optimal de retards du modèle vectoriel à correction d'erreurs, le processus itératif a commencé avec 12 retards en utilisant les critères d'informations de Schwarz (SC), de Hannan-Quinnon (HQC), du ratio de Maximum de vraisemblance (LR), de l'erreur finale de prévision (FPE) et d' Akaike (AIC) jusqu'à ce qu'on a trouvé le modèle à 8 retards qui semble approprié au contexte de l'économie de la RDC.

Les estimations sont effectuées sur base des données mensuelles allant de janvier 2001 à juin 2013. L'indisponibilité des séries mensuelles du PIB ont nécessité la mensualisation des données à fréquence annuelle. Ainsi, le résultat du modèle estimé se présente comme suit :

Relation de long terme

$$LM_2\_SPR_t=33.43-4.61*LPIB(-1)-0.21*INT\_BCMP(-1)+0.24*INF\_ANN(-1)+2.15*TXDEPR(-1)$$

[-2.17737] [-3.57416] [6.24999] [5.14938]

Relation de court terme

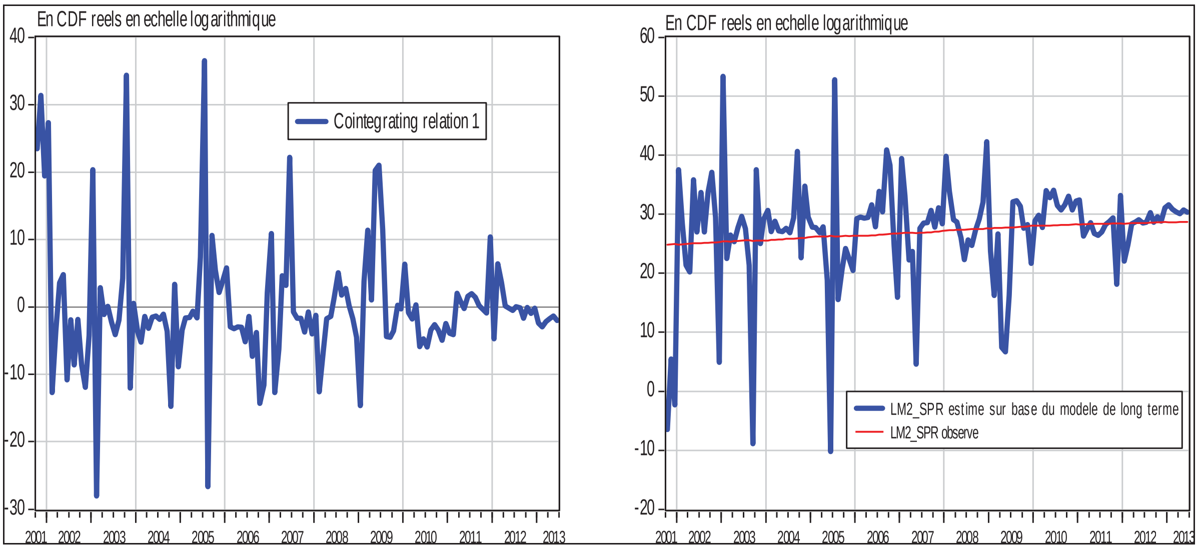
$$\Delta LM_2\_SPR_t=-0.0268+0,0075*\Delta INT\_BCMP_t-0.0026*TXDEPR_t-0.0017*EC\_MD022_t+e3_t$$

(0.0014) (0,0016) (0,0007) [5.3888] [-1.6220] [-2.4024]

Les variables (en échelle logarithmique) pris en compte pour l'estimation sont respectivement:

$LM_2\_SPR_t$: désigne les encaisses réelles
LPIB : Désigne le PIB à prix constant
INT_BCMP : Taux d'intérêt domestique
INF_ANN : Taux d'inflation en glissement annuel
TXDEPR : Taux de dépréciation de la monnaie nationale

Ce résultat est retracé par le graphique ci-dessous, lequel illustre clairement la pertinence de cette relation à partir de laquelle est issue l'estimation du modèle vectoriel à correction d'erreur ainsi que la représentation de la relation de long terme.



Source: Banque Centrale du Congo.

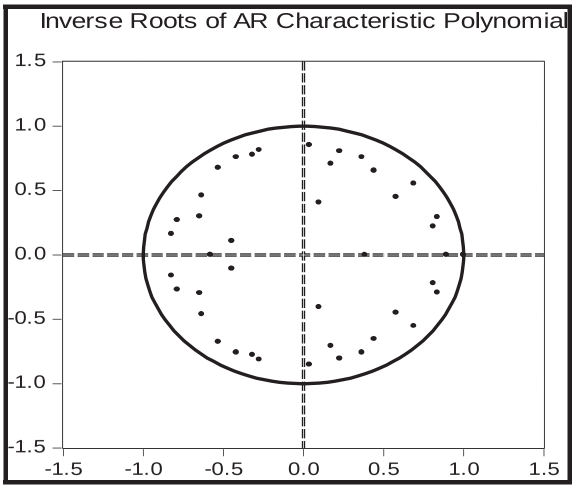
Il est à observer que le vecteur des résidus est stationnaire. Ce qui confirme l'évidence de l'existence d'une relation de long terme stable entre la demande des encaisses réelles, le revenu réel et les autres variables du coût d'opportunité de la demande de monnaie.

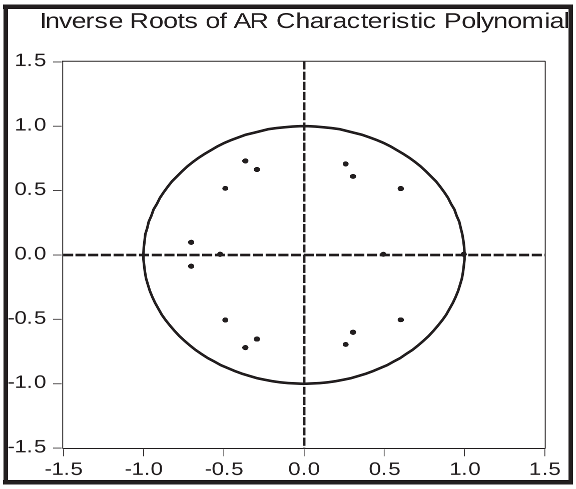
Variables	M_1R	M_2_SPR	PIBCONST	INF	INF_ANN	INT_BCMP	TXDEPR	TX_CR_BCM
Ordre integration	I(I)	I(I)	I(I)	I(0)	I(0)	I(I)	I(0)	I(I)

Les différents tests de diagnostic ont validé l'absence de l'autocorrélation sérielle dans le vecteur des résidus. De même, le test d'hétéroscédasticité, qui confirme la constance de la variance de l'erreur par l'acceptation de l'hypothèse nulle de l'absence de l'hétéroscédasticité à la lumière de la valeur de la statistique conjointe du Khi-Carré, indique une probabilité limite de 47,5 % qui est supérieure au seuil de significativité de 5,0 %.

Par ailleurs, la stabilité du modèle vectoriel à correction d'erreur de la demande de monnaie à long terme semble également être vérifiée au regard des valeurs propres de la matrice du VECM, lesquelles se trouvent à l'intérieur du disque unité, comme l'illustre le graphique ci-dessous.

Stabilité du modèle vectoriel de la demande de monnaie à long terme et à court terme pour la RDC.





Source: Banque Centrale du Congo.

Les résultats obtenus mettent en évidence la pertinence des variables revenu réel et dépréciation du taux de change, sur les encaisses réelles. En effet, un accroissement de 1 % du revenu réel impacte positivement les encaisses réelles de 4,6 %. L'élasticité de M2 par rapport au revenu réel est supérieure à l'unité (4,6). Ce constat, dans le modèle de long terme, traduit à la fois une croissance plus importante de la masse monétaire par rapport au revenu et une prévalence du sous-développement du secteur financier dans l'économie congolaise.

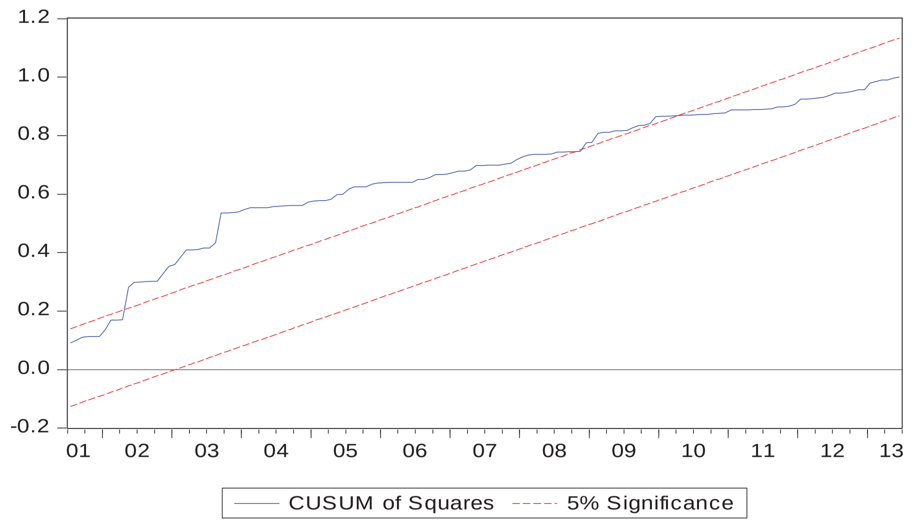
Par contre, dans le modèle de court terme, c'est la dépréciation du taux de change qui influe négativement sur les encaisses réelles en RD Congo. Cette influence significative de la variable taux de change sur la demande de monnaie se justifie dans un environnement économique marqué par la dollarisation et dans un contexte de régime de change flottant.

Analyse de la stabilité de la demande de la monnaie

L'intérêt de la poursuite des objectifs de la politique monétaire dépend plus de la stabilité de la demande de monnaie. Ainsi a-t-on soumis l'équation de demande de la monnaie de la RDC à toute une batterie de tests destinés à déceler d'éventuelles instabilités.

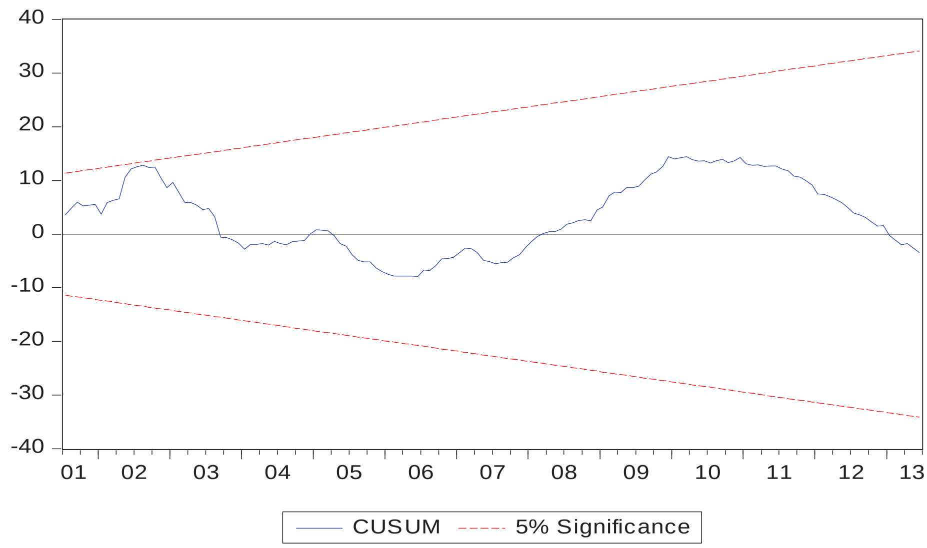
Il a été d'abord utilisé le test de CUSUM-carré (graphique 1) pour voir si une situation d'instabilité ponctuelle ne serait pas apparue durant toute la période sous analyse; et par la suite, le test de CUSUM simple (graphique 2) a été utilisé pour diagnostiquer sur l'existence ou non de l'instabilité structurelle au cours de la période sous examen.

Graphique 10.1: Test de CUSUM-Carré sur la demande de la monnaie



Source: Construit par l'auteur à partir du logiciel Eviews

Graphique 10.2 Test de CUSUM sur la demande de la monnaie



Source: Banque Centrale du Congo

Il résulte des tests de stabilité présentés ci-haut que, au cours de la période analysée, on pouvait observer des cycles d'instabilité ponctuelle allant de janvier 2002 à décembre 2010. A partir de janvier 2010, la situation s'est stabilisée pour revenir à l'équilibre. Cette situation est due notamment au comportement des principaux facteurs explicatifs de la demande de monnaie (taux d'intérêt, taux de dépréciation de la monnaie nationale, etc.) qui étaient caractérisés par de fortes instabilités.

En dépit de l'instabilité ponctuelle observée, il conviendrait de noter que la demande de monnaie était restée structurellement stable pour toute la période sous examen.

4.0 Analyse de la stabilité de la vitesse de circulation

L'analyse de la stabilité de la vitesse de circulation est d'autant plus importante qu'elle permet d'évaluer la stabilité de la demande de la monnaie. Se référant à l'équation quantitative de la demande de monnaie, la vitesse de circulation peut-être aisément dérivée :

$$V = \frac{P * Y}{M} \quad \text{..} \quad (3)$$

Toutefois, le calcul de la vitesse de circulation se heurte empiriquement à plusieurs difficultés. Pour les pays semi-dollarisés, la production nationale est détenue en une faction d'actifs en monnaie nationale et en une autre en monnaie étrangère. De ce fait, l'équation quantitative se modifie comme suit:

$$M * V + M^d * V^d = P * Y \quad \text{....................................} \quad (4)$$

M^d : Masse monétaire en devise ;

V^d : vitesse de la masse monétaire en devise ;

Dans la plupart des pays dollarisés partiellement, l'estimation de la vitesse de circulation ainsi que de la quantité des actifs en dollar est peu aisé. Pour ce fait, nous allons considérer comme hypothèse que la détention en dépôt bancaire des agents économique tant en monnaie nationale qu'en monnaies étrangères reflète la proportion de leur porte-feuille suivant les deux monnaies.

De ce fait, sachant que $\partial = \frac{dépôt\ en\ monnaisnationale}{total\ des\ dépôts}$

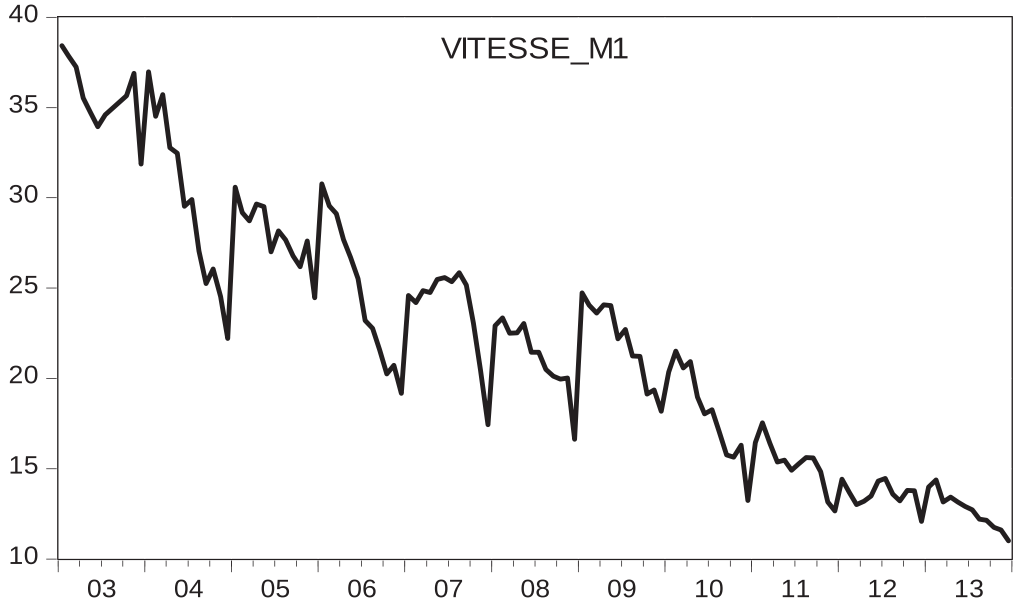
le produit national détenu en monnaie nationale peut-être approximé en pondérant la partie droite de l'équation(2) par ∂, ce qui donne :

$$M * V = \partial P * Y \quad \text{....................................} \quad (5)$$

Et par conséquent (3) devient :

$$V = \frac{\partial P * Y}{M} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (6)$$

Le sentier temporel de la variable trouvée est représenté par le graphique ci-dessous. Il est remarqué que la vitesse de circulation évolue à une tendance décroissante au cours des dix dernières années. Une explication à ce phénomène est l'expansion récente du secteur bancaire qui s'est vu augmenter du nombre des banques avec les dépôts bancaires des clients. Les différentes mesures des politiques monétaire et budgétaire visant le paiement par voie bancaire des fonctionnaires de l'état ont sensiblement contribué à réduire la vitesse de circulation.



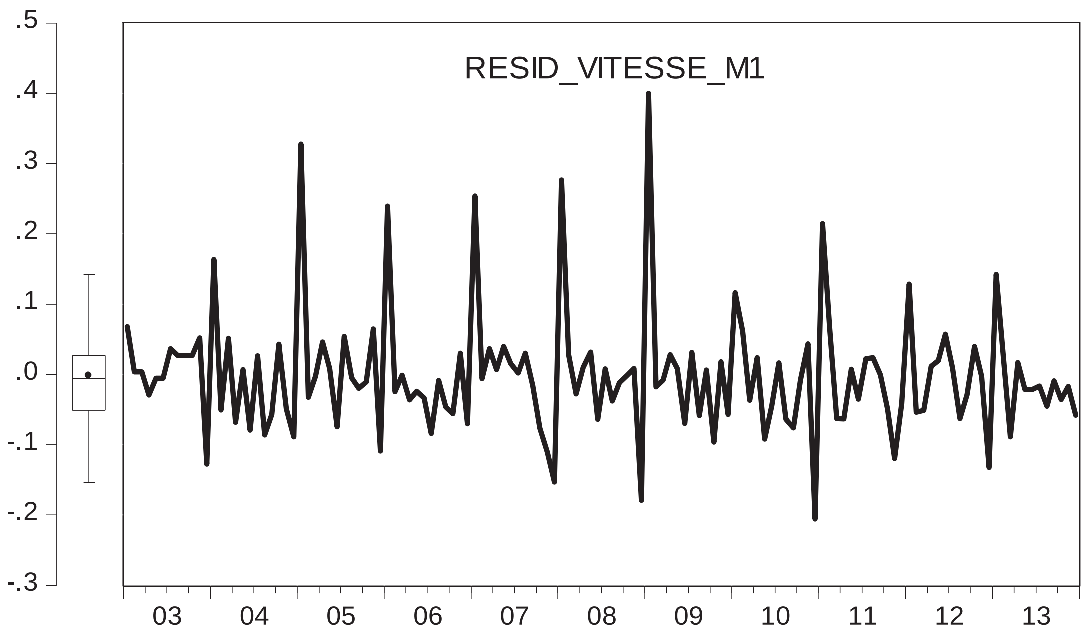
Nous allons étudier la stabilité de la variable aléatoire résultant de l'équation (6) en procédant à la régression de la vitesse de circulation par sa variable décalée. Le modèle est pris comme stable lorsque le coefficient de la variable décalée est inférieur à l'unité.

Les résultats de la régression se présentent comme suit :

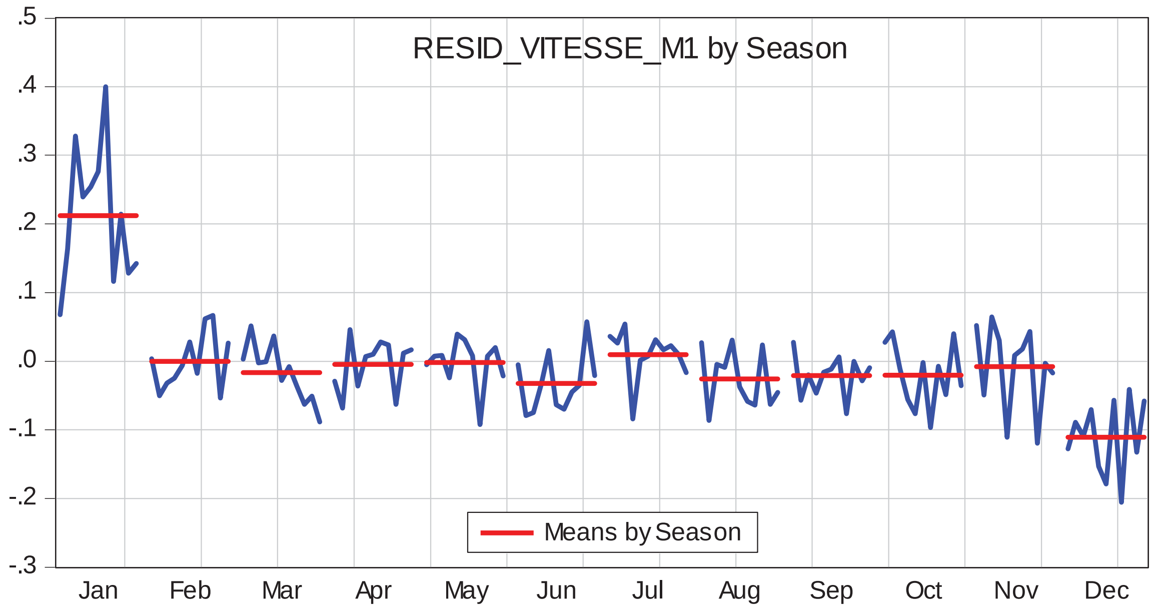
Dependent Variable: LOG(VITESSE_M1)
Method: Least Squares
Date: 05/11/14 Time: 21:31
Sample: 2001M05 2013M12
Included observations: 152

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.053837	0.055363	0.972438	0.3324
LOG (VITESSE_M1(-1))	0.979971	0.017501	55.99639	0.0000

R-squared	0.954346	Mean dependent var	3.132015
Adjusted R-squared	0.954042	S.D. dependent var	0.378118
S.E. of regression	0.081060	Akaike info criterion	-2.174175
Sum squared resid	0.985617	Schwarz criterion	-2.134387
Log likelihood	167.2373	Hannan-Quinn criter.	-2.158012
F-statistic	3135.596	Durbin-Watson stat	2.561173
Prob (F-statistic)	0.000000		



Il ressort de ce graphique une stabilité globale durant la période allant de 2003 à 2013. Toutefois, cette stabilité a été des niveaux de variation très élevés de vitesse de circulation de la monnaie fiduciaire pour les périodes de fin d'année prix comme variables accidentelles liées à la saisonnalité des dépenses de fin d'année. Ces variations ont cependant été moins élevées en 2009 en raison de la crise financière internationale et pour les années 2012 et 2013. La stabilité globale de la vitesse de circulation durant la période sous-analyse est assez évidente. Toutefois, le comportement saisonnier des agents économiques expliquent certains écarts disproportionnés par rapport à la moyenne. Il est ainsi remarqué sur le graphique la présence des pics à chaque fin d'année et une diminution à la baisse pour les mois suivants. Ceci décrit la demande élevée des agents économiques en vue de faire face aux transactions courantes. La présence d'une saisonnalité du comportement de la vitesse de circulation est aisément observable à l'aide du graphique ci-dessous.



Il est observé que les moyennes saisonnières du mois de janvier et de décembre sont fortement éloignées des autres moyennes mensuelles en raison des demandes de monnaie accrues pour les dépenses de fin d'année.

5.0 Analyse de la stabilité du multiplicateur monétaire

L'analyse du multiplicateur monétaire explique quel est le montant de la masse monétaire pouvant être distribué par les banques à partir de la base monétaire. Dans le cadre de cette étude, elle sera dérivée à partir de la formule ci-dessous :

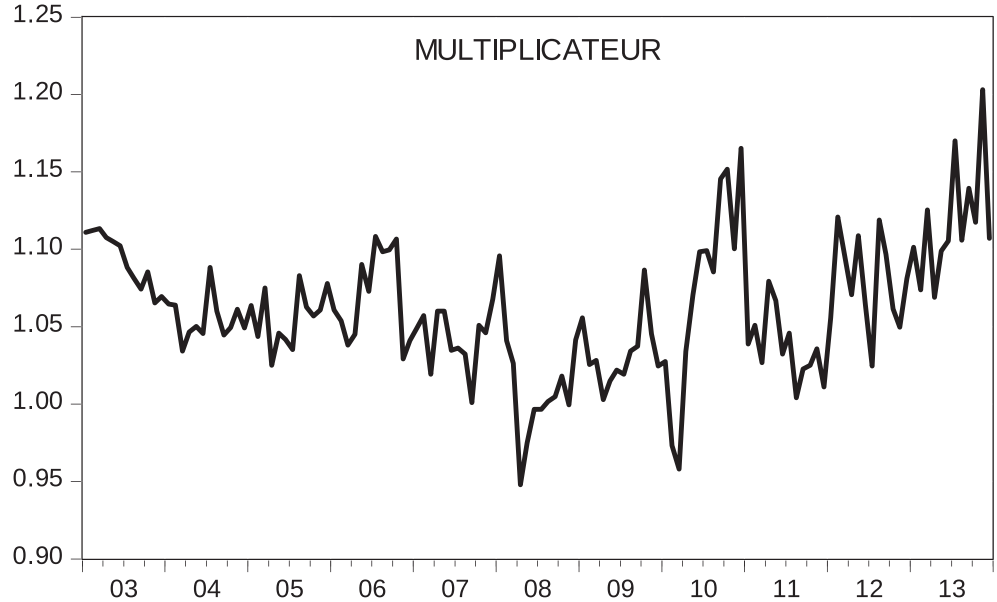
$$M = m * MBC \qquad (7)$$

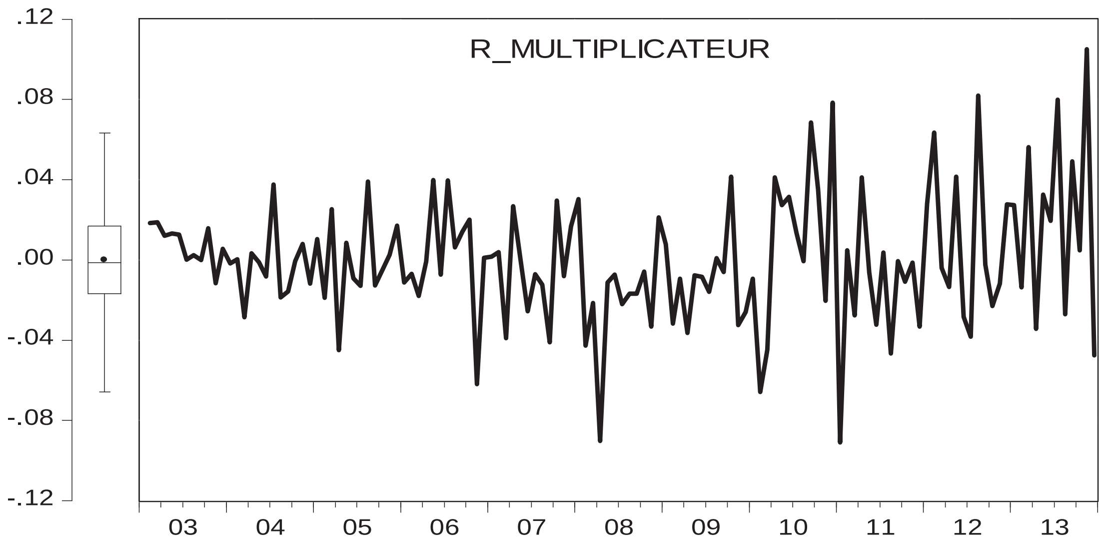
Ou $m = \dfrac{1+b}{r+e+b}$

M : représente la masse monétaire au sens large et MBC désigne la monnaie banque centrale.

Les agrégats pris en compte pour l'estimation du multiplicateur monétaire sont la masse monétaire sans provisions et dépôts en devises ainsi que la base monétaire au sens strict.

L'évolution au cours du temps du multiplicateur monétaire illustré comme suit:





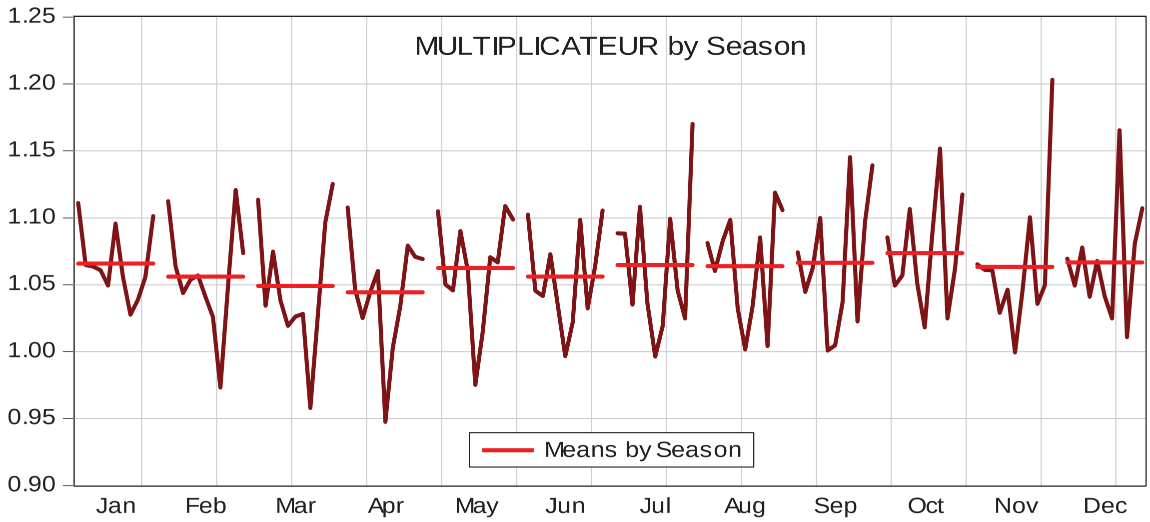
Il ressort du tableau ci-dessous que le processus n'est pas explosif (coefficient inférieur à 1) pour la période sous analyse, en raison de l'ampleur du coefficient de la variable décalée.

Dependent Variable: LOG(MULTIPLICATEUR_M2)
Method: Least Squares
Date: 05/11/14 Time: 21:29
Sample (adjusted): 2003M02 2013M12
Included observations: 131 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.019403	0.004604	4.214323	0.0000
LOG (MULTIPLICATEUR_M2(-1))	0.665909	0.065590	10.15260	0.0000

R-squared	0.444146	Mean dependent var	0.058132
Adjusted R-squared	0.439837	S.D. dependent var	0.039424
S.E. of regression	0.029507	Akaike info criterion	-4.193248
Sum squared resid	0.112313	Schwarz criterion	-4.149352
Log likelihood	276.6577	Hannan-Quinn criter.	-4.175411
F-statistic	103.0754	Durbin-Watson stat	2.274408
Prob (F-statistic)	0.000000		

L'analyse de la volatilité de résidu du multiplicateur reflète le caractère instable de la variable sous analyse. Le box-plot révèle à cet effet une variabilité élevée du multiplicateur monétaire suivant la règle de Tchebychev. L'analyse du résidu révèle un caractère stationnaire et par conséquent, une stabilité de la variable résiduelle. Toutefois, quoique le résidu révèle un caractère stationnaire, il est clairement révélé que les fluctuations du multiplicateur sont assez importantes au cours des 3 dernières années.



Toutefois, les variations saisonnières ont eu un comportement assez stable.

6.0 Analyse empirique du processus de transmission de la politique monétaire en République Démocratique du Congo

Le processus de transmission de la politique monétaire est entendu comme le mécanisme par lequel les effets des variations du taux directeur de la Banque Centrale se font sentir dans toute l'économie et jusque sur le taux d'inflation. Il s'agit d'un processus complexe et il existe un élément d'incertitude quant au moment où cette influence s'exerce et quant à l'importance relative de certaines relations d'influence (l'ampleur de l'impact).

Prenant en compte la particularité de la République Démocratique du Congo, cette étude s'est focalisée sur l'analyse de l'influence du taux d'intérêt directeur de la Banque Centrale du Congo sur l'inflation (saisie par l'Indice des Prix à la Consommation), le taux débiteur des banques et le taux de change indicatif.

Les résultats empiriques de cette étude ont permis de répondre aux questions spécifiques ci-après:

- Quel est le degré de variation du taux d'inflation en fonction des changements spécifiques de la masse monétaire?
- L'influence du changement du taux directeur sur l'inflation se produit-elle immédiatement ou progressivement?
- L'influence du changement du taux directeur sur l'inflation est-elle temporaire ou permanente?

Pour parvenir à une réponse appropriée, l'approche économétrique basée sur un modèle VAR était utilisée. L'analyse des causalités ainsi que des réponses impulsionnelles ont permis une meilleure compréhension de certains phénomènes.

6.1 Résultats de l'estimation du modèle VAR(1)

Tableau 10.1 Synthèse des résultats d'estimation

Variables endogènes	Variables explicatives	Coefficients	Ecart-type	T-statistiques
Variation de logarithme du taux de change indicatif	Variation de logarithme de l'indice de prix à la consommation	-0.779663	0.20113	-3.87650
	Logarithme du taux directeur	0.011894	0.00903	1.31729
Logarithme du taux directeur	Variation de logarithme de l'indice de prix à la consommation	2.418758	1.12684	2.14649
Variation de logarithme de l'indice de prix à la consommation	Logarithme du taux directeur	0.014948	0.00519	2.88107
	Variation de logarithme du taux de change indicatif	0.288254	0.06806	4.23513
	Logarithme du taux débiteur des banques	-0.019210	0.00993	-1.93381
	Variation de logarithme de la masse monétaire hors provisions et dépôts en devise	0.062973	0.05411	1.16377
Variation de logarithme de la masse monétaire hors provisions et dépôts en devise	Variation de logarithme de l'indice de prix à la consommation	-0.525206	0.18239	-2.87956
	Variation de logarithme du taux de change indicatif	0.243784	0.10741	2.26955
Logarithme du taux débiteur des banques	Logarithme du taux directeur	0.056934	0.03111	1.83018

Source: Banque Centrale du Congo

7.0 Analyses des résultats et enseignements

Les résultats obtenus sont intéressants et traduisent la réalité de l'économie congolaise. En effet, la variation du taux directeur agit significativement sur l'inflation (au seuil de 5 %) et sur le taux débiteur des banques commerciales (au seuil de 10 %). En dépit de cette influence, son ampleur reste très faible (les coefficients s'établissent à 0.014948 et à 0.056934, respectivement pour l'inflation et pour le taux débiteur).

Cependant, les variations du taux de change indicatif ne sont nullement influencées par le taux directeur de la Banque Centrale (t-statistique égale à 1.31729).

Les comportements de ces variables face à l'action de la politique monétaire se justifient pour des raisons suivantes:

- ***Premièrement***, cette situation s'explique par la dollarisation de l'économie congolaise laquelle réduit l'efficacité des instruments de la politique monétaire. Ainsi, les besoins de financement des banques sont exprimés en devises.
- ***Deuxièmement***, le caractère surliquide des banques commerciales fait que ces dernières ne recourent pas aux refinancements auprès de la Banque Centrale. Cette situation fait que les variations du taux directeur ne se traduisent pas directement et de façon significative sur le taux d'intérêt débiteur des banques.
- ***Troisièmement***, la stabilité du taux de change observé en République Démocratique du Congo est beaucoup plus attribuée aux actions de politique de change qu'à la politique monétaire. En effet, le taux de change étant un canal important de transmission des actions de l'Institut d'Emission sur l'inflation (coefficient = 0.288254 et t-statistique = 4.23513), la Banque Centrale intervient directement sur le marché de change en tant qu'acquéreur ou offreur des devises en cas des chocs importants sur le cours de change afin de prévenir toute perturbation de la stabilité des prix (objectif final de la politique monétaire).

Il convient de relever également le fait que les variations de la masse monétaire sans provision et dépôts en devises n'impactent pas sur le niveau général des prix (t-statistique = 1.16377).

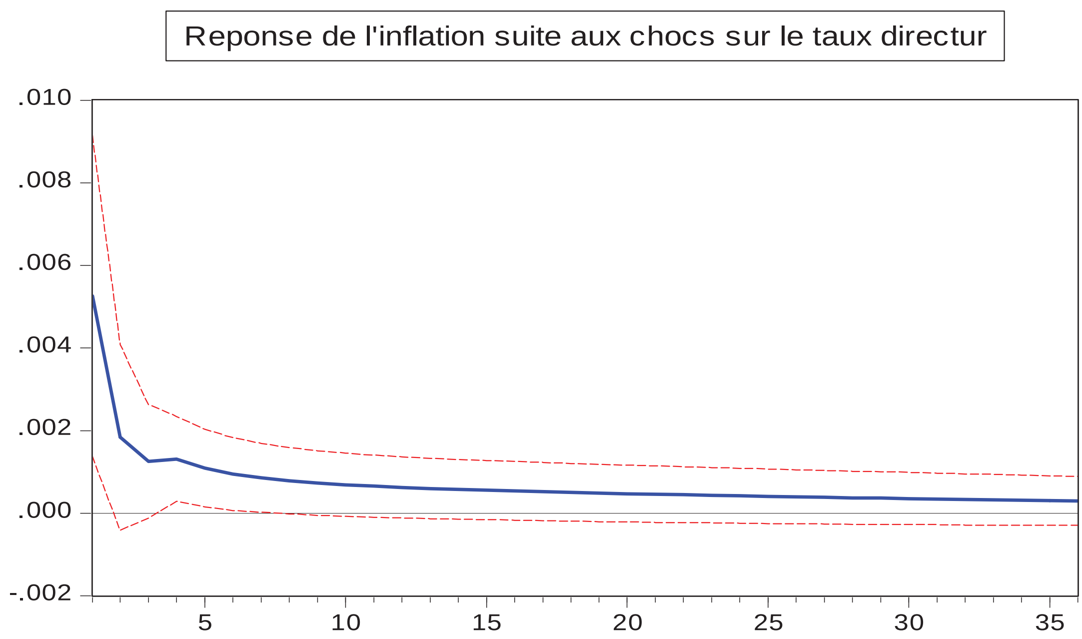
Ces résultats confirment le fait que la Banque Centrale du Congo dispose d'un dispositif de prévision ponctuelle de la liquidité. En effet, de manière ponctuelle (hebdomadaire), la Banque Centrale procède par la prévision du niveau de liquidité compatible au niveau de l'inflation attendu. En cas de dépassement ou d'insuffisance de la base monétaire, elle actionne son instrument Bons BCC afin de réguler la liquidité.

7.1 Analyse des réponses impulsionnelles de l'inflation suite aux chocs sur le taux directeur

Comme l'indique le Graphique 1 ci-dessous, les effets de la variation du taux directeur sur l'inflation sont ressentis immédiatement sur les prix, et son influence est permanente. Mais, au regard des résultats d'estimation obtenus ci-haut, ce caractère permanent n'inquiète pas la stabilité conjoncturelle des prix du fait de la faiblesse de l'ampleur de l'influence de la variation du taux directeur sur l'inflation (coefficient = 0.014948).

Ce caractère permanent est également traduit par le fait que pour un choc positif perçu sur le taux directeur, on observe une réaction instantanée de l'inflation dès le premier mois, et les effets persistent jusqu'à plus de 36 mois qui suivent.

Graphique 10.3: Analyse des réponses impulsionnelles



Source: Construit par l'auteur à partir du logiciel Eviews

Annexes. Résultats des tests de Racine Unitaire

Annexes 10.1: Tests de ratine unitaire

Logarithme de l'indice de prix à la consommation (LIPC)

A niveau

Null Hypothesis: LIPC has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.529862	**0.8151**
Test critical values:	1% level	-4.019975	
	5% level	-3.439857	
	10% level	-3.144346	

*MacKinnon (1996) one-sided p-values.
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LIPC)
Method: Least Squares
Date: 07/01/14   Time: 11:10
Sample (adjusted): 2001M06 2013M12
Included observations: 151 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LIPC (-1)	-0.031068	0.020307	-1.529862	0.1282
C	0.104272	0.060787	1.715362	0.0884
@TREND ("2001M05")	0.000431	0.000286	**1.507932**	0.1337

R-squared	0.015568	Mean dependent var	0.011520
Adjusted R-squared	0.002265	S.D. dependent var	0.026206
S.E. of regression	0.026177	Akaike info criterion	-4.428238
Sum squared resid	0.101411	Schwarz criterion	-4.368292
Log likelihood	337.3320	Hannan-Quinn criter.	-4.403885
F-statistic	1.170244	Durbin-Watson stat	2.086202
Prob(F-statistic)	0.313146		

Conclusion:
Non stationnaire du type DS, car $p = 0.8151 > 0.05$ et $t = 1.507932 < 2.78$.

Après différence première

Null Hypothesis: D(LIPC) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-12.88025	**0.0000**
Test critical values:	1% level	-4.020396	
	5% level	-3.440059	
	10% level	-3.144465	

*MacKinnon (1996) one-sided p-values.
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LIPC,2)
Method: Least Squares
Date: 07/01/14 Time: 11:14
Sample (adjusted): 2001M07 2013M12
Included observations: 150 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D (LIPC (-1))	-1.060397	0.082327	-12.88025	0.0000
C	0.011910	0.004476	2.660525	0.0087
@TREND("2001M05")	3.14E-06	4.98E-05	0.063132	0.9497

R-squared	0.530203	Mean dependent var	-0.000138
Adjusted R-squared	0.523811	S.D. dependent var	0.038271
S.E. of regression	0.026410	Akaike info criterion	-4.410377
Sum squared resid	0.102528	Schwarz criterion	-4.350165
Log likelihood	333.7783	Hannan-Quinn criter.	-4.385915
F-statistic	82.95041	Durbin-Watson stat	1.619222
Prob(F-statistic)	0.000000		

Conclusion: Stationnaire

Test de causalité

Pairwise Granger Causality Tests
Date: 06/08/14   Time: 17:52
Sample: 2001M05 2013M12
Lags: 1

Null Hypothesis:	Obs	F-Statistic	Prob.
LTXDIR does not Granger Cause DLIPC	150	2.89672	**0.0909**
DLIPC does not Granger Cause LTXDIR		9.51228	**0.0024**
DLTXCHIND does not Granger Cause DLIPC	150	18.0400	**4.E-05**
DLIPC does not Granger Cause DLTXCHIND		15.0072	**0.0002**
LTXDBC does not Granger Cause DLIPC	150	0.42553	0.5152
DLIPC does not Granger Cause LTXDBC		4.51767	**0.0352**
DLMMHP does not Granger Cause DLIPC	150	6.36719	**0.0127**
DLIPC does not Granger Cause DLMMHP		2.74587	**0.0996**
DLTXCHIND does not Granger Cause LTXDIR	150	5.93415	**0.0160**
LTXDIR does not Granger Cause DLTXCHIND		0.01444	0.9045
LTXDBC does not Granger Cause LTXDIR	151	11.3635	**0.0010**
LTXDIR does not Granger Cause LTXDBC		4.41215	**0.0374**
DLMMHP does not Granger Cause LTXDIR	150	1.01032	0.3165
LTXDIR does not Granger Cause DLMMHP		0.03139	0.8596
LTXDBC does not Granger Cause DLTXCHIND	150	0.10685	0.7442
DLTXCHIND does not Granger Cause LTXDBC		5.83555	**0.0169**
DLMMHP does not Granger Cause DLTXCHIND	150	6.39631	**0.0125**
DLTXCHIND does not Granger Cause DLMMHP		0.07875	0.7794
DLMMHP does not Granger Cause LTXDBC	150	2.67527	0.1041
LTXDBC does not Granger Cause DLMMHP		0.46383	0.4969

Annexe 10.2 Résultats de l'estimation

Vector Autoregression Estimates
Date: 06/08/14 Time: 17:42
Sample (adjusted): 2001M07 2013M12
Included observations: 150 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	DLMMHP	LTXDBC	DLTXCHIND	LTXDIR	DLIPC
DLMMHP(-1)	-0.055493	0.247114	0.196186	0.519967	0.062973
	(0.08540)	(0.32445)	(0.09417)	(0.52760)	(0.05411)
	[-0.64983]	[0.76165]	**[2.08335]**	[0.98554]	[1.16377]
LTXDBC(-1)	-0.021990	0.841434	-0.016926	0.370360	-0.019210
	(0.01568)	(0.05956)	(0.01729)	(0.09686)	(0.00993)
	[-1.40264]	[14.1266]	[-0.97904]	**[3.82369]**	**[-1.93381]**
DLTXCHIND(-1)	0.243784	0.427693	0.258307	0.095745	0.288254
	(0.10741)	(0.40810)	(0.11845)	(0.66363)	(0.06806)
	[2.26955]	[1.04801]	[2.18077]	[0.14428]	**[4.23513]**
LTXDIR(-1)	0.012294	0.056934	0.011894	0.789980	0.014948
	(0.00819)	(0.03111)	(0.00903)	(0.05059)	(0.00519)
	[1.50142]	**[1.83018]**	[1.31729]	[15.6164]	**[2.88107]**
DLIPC(-1)	-0.525206	0.217114	-0.779663	2.418758	-0.492861
	(0.18239)	(0.69295)	(0.20113)	(1.12684)	(0.11557)
	[-2.87956]	[0.31332]	**[-3.87650]**	**[2.14649]**	[-4.26460]
C	0.078092	0.398113	0.036103	-0.817738	0.039386
	(0.03828)	(0.14544)	(0.04221)	(0.23650)	(0.02426)
	[2.04004]	[2.73739]	[0.85528]	[-3.45768]	[1.62379]
R-squared	0.065287	0.912989	0.136083	0.941193	0.188176
Adj. R-squared	0.032832	0.909967	0.106086	0.939151	0.159987
Sum sq. resids	0.208073	3.003434	0.253012	7.942096	0.083542
S.E. equation	0.038012	0.144420	0.041917	0.234848	0.024086
F-statistic	2.011592	302.1910	4.536546	460.9375	6.675652
Log likelihood	280.6969	80.47515	266.0306	7.543572	349.1377
Akaike AIC	-3.662626	-0.993002	-3.467075	-0.020581	-4.575170
Schwarz SC	-3.542200	-0.872577	-3.346650	0.099844	-4.454744
Mean dependent	0.027172	3.805078	0.007331	3.152819	0.011450
S.D. dependent	0.038652	0.481313	0.044334	0.952050	0.026280

Determinant resid covariance (dof adj.)	4.94E-13
Determinant resid covariance	4.03E-13
Log likelihood	1076.333
Akaike information criterion	-13.95111
Schwarz criterion	-13.34898

8.0 Dollarisation et Conduite de la Politique Monetaire en RDC

8.1 Vue d’ensemble du problème

La RDC figure parmi des économies les plus dollarisées au monde. La dollarisation de l’économie affecte, en règle générale, les fonctions de réserve de valeur et d’unité de compte pour les biens durables. Lorsqu’elle est installée, il est très difficile de revenir en arrière. Le retour en arrière entraine des coûts fixes importants, c’est-à-dire le changement de comportement vis-à-vis de l’utilisation d’une monnaie et la volonté politique de s’engager dans le processus de la dé-dollarisation de l’économie.

Les pays qui enregistrent des niveaux élevés de dollarisation financière d’au moins 80 % n'ont pas pu l'éliminer entièrement. Des pays comme la Bolivie et le Pérou sont parvenus à la réduction sensible de plus de 35 points de pourcentage, par contre, d'autres pays tels que la Géorgie, le Laos et le Paraguay ont bien évolué sur ce plan plus de 20 points de pourcentage depuis le début du siècle présent. Toutefois, les niveaux de dollarisation financière restent supérieurs à 30 %.

Le phénomène dollarisation limite l’efficacité de la politique monétaire du fait qu’elle s’accompagne d’une volatilité accrue de la demande de monnaie à un degré élevé de substitution de monnaie à l’effet d’accroitre l’instabilité du taux de change. En RDC, le taux de change constitue le canal de transmission des impulsions monétaires. Une moindre fluctuation du cours de change due à la demande importante de la devise américaine par rapport à l’offre du franc congolais, étant donné que l’économie congolaise est extravertie, déprécie la monnaie nationale et déclenche l’inflation.

A ce stade, l’un des inconvénients majeurs de la dollarisation est qu’elle rime avec la perte progressive de l’indépendance de la politique monétaire en raison de la composante de l’offre de monnaie constituée des dépôts en devises.

En outre, le taux directeur de la BCC joue faiblement sur les taux débiteurs parce que les banques commerciales ne sont pas en Banque en raison notamment de la dollarisation élevée.

La politique monétaire a de l’emprise sur l’offre et la demande de monnaie, et ce, à travers ses dispositifs conventionnels tels que le taux directeur et l’assiette de la réserve obligatoire. Or, la demande de monnaie est, entre autres, fonction du revenu réel, du taux d’intérêt, du taux de change et du taux d’inflation. La terreur de la dollarisation ne laisse pas la place à la politique monétaire d'agir normalement sur les agrégats monétaires.

L'économie congolaise reste confrontée à une dollarisation manifeste qui se traduit sous trois formes, à savoir la dollarisation financière, réelle et des paiements.

Ainsi, cette question tourne autour de deux points. Le premier point est consacré aux origines, formes et causes caractéristiques de la dollarisation en RDC. Le deuxième point explique l'impact de la dollarisation sur la politique monétaire en RDC.

8.2 Conduite de la politique monétaire en RDC

Les épisodes de l'hyperinflation[46] causés par la dominance budgétaire découlant de mauvaises politiques macro-économiques de la décennie 1990 constituaient l'un des événements principaux qui étaient à l'origine de la préférence de la monnaie nationale par les monnaies étrangères particulièrement le dollar.

Par exemple, au lendemain de la réforme monétaire ratée de 1993, l'économie était mise en mal, affirmée par l'hyperinflation ouverte atteignant un pic de 9796,9 % en 1994 depuis l'accession du pays à l'indépendance en 1960. Les coûts élevés des transactions en monnaie nationale incitent les détenteurs et l'utilisateur de cette monnaie à faire l'arbitrage simple en portant le choix sur les devises étrangères, plus particulièrement le dollar américain.

Ainsi, la monnaie nationale perd ses fonctions traditionnelles notamment de réserve de valeur et d'unité de compte pour les biens de longue durée. Ici, il sied de noter qu'eu égard à cette inactivité de la monnaie nationale, la population n'avait plus confiance au franc congolais.

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46 Au fait, le fléau de la dollarisation en RDC avait commencé depuis les années 76 causée par l'inflation rampante de 67,04 % et s'établissant à un pic de 109,09 % en 79, entre 60 et 80, due notamment à la terreur de la crise pétrolière internationale et à la gestion peu disciplinée des finances publiques qui avaient mis l'économie en mal, conjuguée par une baisse du taux de PIB de -5,3 % en 76. Pour rétablir l'équilibre économique, deux programmes de stabilisation en 76 et 77 avaient été exécutés, avec le soutien de FMI et la Banque mondiale, pour notamment limiter le crédit à l'Etat et le crédit à l'économie dans le sens de restreindre l'expansion du stock monétaire ; aussi modifier le taux de change (1 Z = 1 DTS). Lire à ce propos, KIKASSA, M., *Les programmes de stabilisation de l'économie zaïroise de 76 et 77 : objectifs et résultats*, dans KABUYA, K., et KIKASSA, M., *Stabilisation économique et financière au Zaïre de 78 à 80. De dévaluation en cascade à la démonétisation*, Kinshasa, CEPAS, 1980, p. 48.

Les faits suivants sont remarqués dans l'économie congolaise:

- Les fortes fluctuations du taux de change qui traduisent les comportements inflationnistes dans le marché des biens et services ;
- L'instrument taux d'intérêt directeur a donc une efficacité limitée parce que les banques commerciales ne se refinancent quasiment pas à la banque centrale et la demande des crédits est en grande partie effectuée en devises étrangères;
- La surliquidité structurelle des banques primaires en monnaie nationale;
- Les dépôts en monnaie étrangère sont dominants sur le total des dépôts et s'établissent à fin 2013 au seuil de 85,14 % ;
- L'augmentation de l'encours des titres Bons BCC due à l'effet surliquidité.

Actions menées par la Banque Centrale du Congo

Dans le but de lutter contre le phénomène de dollarisation de l'économie nationale et d'accroitre ainsi l'efficacité des instruments de la politique monétaire, la banque centrale avait lancé en 2012, en collaboration avec le Gouvernement, un projet visant la de-dollarisation de l'économie nationale.

Par rapport à ce projet, qui a pour socle le maintien de la stabilité du cadre macroéconomique, une matrice de mesures appropriées avait été élaborée. Ainsi, ce projet, qui s'inscrit dans la durée devra permettre notamment l'émission des titres publics par l'Etat en vue d'accroitre la demande de la monnaie nationale via un rendement des titres en monnaie nationale plus important que celui en monnaies étrangères.

Cependant, d'autres actions ont déjà été réalisées notamment l'obligation d'affichage des prix en monnaie nationale, l'interdiction d'évaluer dans les discours officiels les grandeurs nationales en devises, l'usage d'un coefficient de réserve obligatoire discriminatoire pénalisant plus les dépôts en devises par rapport à la monnaie nationale, etc.

En tout état de cause, la Banque Centrale a opté pour dédollarisation graduelle au moyen des mesures incitatives; les mesures coercitives ayant montré leurs limites dans beaucoup des pays dollarisés.

9.0 Changements Structurels et Impact Sur L'efficacite de la Politique Monetaire

9.1 Vue d'ensemble du problème

L'économie réelle a connu des réformes importantes depuis la dernière décennie. Les réformes ont été annoncées à partir 2002 à la suite de la reprise de la coopération avec la communauté financière internationale.

Deux programmes à cet effet avaient été mis en place pour restructurer le cadre macroéconomique dans son ensemble, à savoir le programme intérimaire renforcé (PIR) et le programme économique du Gouvernement (PEG). Le premier programme visait le redressement des fondamentaux de l'économie afin de jeter des bases pour la reconstruction de l'économie nationale. Le deuxième visait à consolider la croissance économique en vue de la réduction de la pauvreté.

La mise en œuvre de ces programmes a permis de rompre avec la décroissance de l'économie et l'hyperinflation. En effet, depuis 2002, l'économie congolaise est en pleine croissance continue.

9.2 Eléments réels contributifs à la conduite de la politique monétaire

Le changement de la conjoncture économique observé ci-haut a permis à la politique monétaire d'agir dans un environnement propice, soutenu par le regain du secteur financier et les réformes tant structurelles que sectorielles avaient aussi confortées la conduite de la politique monétaire.

Parmi ces changements structurels dans l'économie réelle, il conviendrait de noter ce qui suit:

- La relative stabilité politique assise sur la démocratie, a permis à la Banque Centrale d'avoir le contrôle sur la masse monétaire de certaines zones de la République, jadis occupées par les rebelles ;
- La réforme et l'adoption des codes miniers, énergétiques et d'investissements du pays avaient contribués à l'amélioration du climat des affaires, donc l'augmentation de la création des richesses. Ces réformes avaient accru la confiance dans le pays, entrainant ainsi une hausse de la création des banques commerciales et des autres établissements de micro crédit ;
- La création du tribunal de commerce pour les règlements des conflits économiques et financiers ;

- L'implémentation des banques commerciales pour participer au financement des investissements, à travers les dépôts qui doivent se transformer aux crédits.

Ces changements ont été réellement structurels du fait que depuis 2002, le taux de croissance du PIB a progressé significativement établi à 8,5 % en 2013, par contre les dix années avant, cette croissance avait atteint un creux de -6,9 % en 2000 et -2,1 % en 2001. Grâce notamment à ces deux programmes PIR et PEG, l'économie était soulagée en 2002 réalisant un taux de croissance de 3,5 % après avoir connu une hausse importante établi à 7,8 % en 2005.

10.0 Recommandations Pour la Mise en Œuvre D'un Regime de Politique Monétaire Appropriee a Moyen et Long Termes

10.1 Recommandations des politiques

La politique monétaire congolaise s'avère impérieuse à réformer ou à adapter en tenant compte de l'environnement économique tant national qu'international.

Aussi, d'autres mutations sont observées au niveau de la structure de liquidité bancaire et certaines réformes en cours ainsi que les élections présidentielles et législatives à l'horizon 2016 sont nécessaires pour intégrer dans les cadres analytique et opérationnel de la politique. Car, depuis 2012, le pays a amorcé le processus de la dé-dollarisation de l'économie, fixant dans sa matrice de surveillance les paiements des obligations fiscales et non fiscales en franc congolais quelle que soit la nature des matières imposables. D'autres perspectives doivent être pris en compte, telles que la mise en place des marchés financiers et des guichets de refinancement à moyen et long termes ainsi que la vision de l'émergence à l'horizon 2030[47].

10.2 Des objectifs, instruments et stratégies

Le cadre analytique de politique monétaire actuel s'avère nécessaire à adapter dans la mesure où les effets de la crise financière internationale survenue au début du deuxième semestre de l'exercice 2008, ainsi que les changements importants

[47] Au fait, il est indiqué que les réformes envisagées ou mises en place en RDC requièrent des nouvelles perspectives des politiques macroéconomiques, plus particulièrement la politique monétaire et la politique budgétaire. Par exemple, la dé-dollarisation de l'économie entrevoit notamment une nouvelle structure de liquidité et un changement des comportements des détenteurs et utilisateurs de la monnaie nationale.

que connaît le pays sur les plans monétaire ont révélés d'autres informations pertinentes pour se prémunir aux éventuels déséquilibres. Cela est de même avec le cadre opérationnel en vigueur qui s'avère la révision.

Les recommandations principales qui suivent sont nécessaires à livrer pour améliorer la conduite de la politique monétaire à moyen et long termes.

S'agissant du cadre analytique de la politique monétaire, il y a lieu de formuler certaines recommandations ci-après :

- L'autorité monétaire devait se proposer un autre objectif prudentiel, en plus de la stabilité du niveau général des prix moyens des biens et services. Autrement dit, la politique monétaire menée par la BCC devait se donner les objectifs finaux tels que la stabilité des prix et la stabilité financière. Les raisons sont nettement établies sur les effets de la crise financière internationale récente. Malgré l'inflation américaine à un chiffre enregistrée en 2008, la crise financière n'a pas attendue pour se déclencher. Depuis cet événement, les économistes aujourd'hui se sont rendus compte de la pertinence des couples politique monétaire-politique macro prudentielle ;
- Il conviendrait de maintenir le cadre du ciblage monétaire en renforçant les mesures de la dé-dollarisation de l'économie nationale dans le souci notamment de réduire les coûts de transaction de la monnaie locale par rapport à la devise étrangère, le dollar, et d'améliorer l'efficacité des canaux de transmission des impulsions monétaires;
- Pour plus d'efficacité de la politique monétaire, la Banque Centrale doit élaborer un cadre de pilotage à moyen terme, lequel permettra de surveiller l'évolution de la situation monétaire et prendra des mesures d'ajustement monétaire le cas échéant, ayant mesuré la nature des chocs sur la liquidité et d'autres chocs conjoncturels et adopter par la suite un cadre de ciblage de l'inflation ;
- La réalisation d'une inflation compatible à la croissance économique dans l'optique de rester dans la programmation monétaire[48] . En effet, les récentes réalisations d'inflation faible ne sont pas de nature à favoriser un accroissement des investissements ;

48 Cette idée voudrait seulement renseigner la détermination des cibles de la politique monétaire après la projection des paramètres tels que : (i) la croissance économique réelle attendue, (ii) le niveau des recettes publiques et les soldes totaux attendus du Trésor et de la Banque et (iii) les flux extérieurs attendus.

- L'émission des titres publics par l'Etat. En effet, cela lui permettra de recourir de réaliser ses dépenses sans songer recourir au financement monétaire de son déficit. Par ailleurs, la Banque Centrale pourra améliorer sa gestion de liquidité au moyen des opérations d'Open Market.

10.3 Analyse de la Volonte de Mise en Œuvre du Regime de Politique Monetaire Recommandee

La Banque Centrale du Congo a certes la volonté de mettre en œuvre le régime de politique monétaire proposé ci-haut, en dépit de certaines pesanteurs du pouvoir politique, notamment, en matière de la coordination des politiques.

Cette affirmation de la ferme volonté de l'autorité monétaire de mettre en application les politiques proposées, s'appuie sur les raisons suivantes :

- L'intégration d'une Direction de la Recherche et des Statistiques dans la structure fonctionnelle et organique de la Banque en vue notamment de vérifier et renforcer les canaux et les délais de transmission monétaire ;
- L'option de lancer le projet de la création d'un marché financier afin de parvenir à un meilleur financement de l'économie, ainsi que l'amorce du processus de la dédollarisation;
- Les perspectives d'optimisation du cadre opérationnel de la politique monétaire, à travers la création du guichet de refinancement à moyen et long termes.

Néanmoins, dans le cadre de cette étude nous avons proposé l'intégration de l'objectif de la stabilité financière dans la conduite de la politique monétaire, l'adoption d'un système de ciblage de taux d'inflation, l'élaboration d'un cadre de pilotage de la politique monétaire à moyen terme, la réalisation d'un niveau inflation compatible avec les perspectives de croissance, le recours aux opérations d'Open Market.

10.4 De l'objectif de la stabilité financière

Le cadre légal régissant la politique monétaire au pays est en cours de modification de façon à intégrer la contribution de la banque centrale et du ministère des finances à l'objectif de la stabilité financière. Toutefois, le texte n'est pas encore promulgué et la Banque Centrale a intégré en son sein une unité chargée d'analyser les questions liées à la stabilité financière. Pour ce faire, il sera nécessaire à ce que les autorités s'activent dans la promulgation de ce nouveau texte de loi. C'est dans ce cadre que le Comité National de Stabilité financière pourra être établi et la conduite de la politique monétaire s'insérera dans cette nouvelle perspective.

L'élaboration d'un cadre de politique monétaire à moyen terme

La réalisation de cette recommandation suppose préalablement un cadrage macroéconomique à moyen terme. Or, ce travail suppose premièrement un système statistique très développé avec des données à haute fréquence notamment du secteur réel. D'autre part, il suppose des liens établis de différentes statistiques, y compris, ceux du secteur extérieur, avec celles du secteur monétaire. Ceci permettra d'anticiper les chocs et d'analyser leur impact sur l'atteinte de l'objectif final. Ce qui suppose un cadre de politique monétaire proactif.

A l'heure actuelle, la Banque Centrale détermine des objectifs intermédiaire et opératoire annuels, sans donner l'orientation à moyen terme des instruments. Ceci constitue donc un handicap pour orienter les anticipations des agents économiques.

Une telle mesure serait volontiers mise en application par le pays, mais il implique des statistiques disponibles et détaillées.

La réalisation d'un niveau d'inflation compatible avec l'objectif de croissance

Face à la crainte d'une résurgence de fortes inflations, la Banque Centrale du Congo a commencé à se montrer trop prudente. En effet, l'inflation réalisée aux cours de deux dernières années a été largement en deçà du niveau programmé et même celui projeté en 2014. Il faudra, dans ce cas, craindre le spectre de la déflation, laquelle aura des effets néfastes sur la croissance.

La réalisation d'une telle mesure suppose des injections de la liquidité tant que l'écart entre l'objectif et la réalisation projetée de l'inflation demeure important. Cette prise de risque est souvent évitée par l'autorité monétaire.

Le recours aux opérations d'Open Market

Ces opérations sont nécessaires pour une bonne régulation de la liquidité. Cela suppose dans une large mesure l'émission des titres par l'Etat dans un pays où les marchés financiers ne sont pas développés. Or, il subsiste à ce jour un niveau d'arriérés sur les titres passés émis par l'Etat. Ce dernier peut volontiers le mettre en application, mais cela suppose un apurement de ces arriérés ou l'actualisation des dettes au moyen du remplacement par les nouveaux titres. A ce jour, mon avis est que l'Etat ne jugerait pas encore prioritaire une telle option.

11.0 Conclusion Générale

L'étude sur l'efficacité de la politique monétaire menée par la Banque Centrale du Congo a révélé qu'en dépit des résultats engrangés au cours de la dernière décennie dans la mise en œuvre de la politique monétaire, le cadre général de la politique monétaire doit poursuivre son amélioration.

En effet, d'une part, l'analyse empirique révèle que l'effet du taux directeur sur l'inflation est réduit. Cette situation s'explique par la forte dollarisation qui caractérise l'économie nationale obligeant ainsi les opérateurs économiques à exprimer leurs besoins en devises.

Toutefois, il a été relevé que la variation de la base monétaire au sens strict et la masse monétaire hors provisions avait un effet sur les prix intérieurs lequel effet s'estompait avec le temps.

Aussi, a-t-on observé que la demande de monnaie nationale était fonction du revenu réel, de la dépréciation du taux de change, du taux d'intérêt débiteur domestique et qu'à court terme, la demande de monnaie était essentiellement fonction du taux d'intérêt. Il a également été noté que cette demande est structurellement stable, en dépit de quelques instabilités ponctuelles observées. Par ailleurs, il a été relevé une très forte causalité unidirectionnelle entre le taux de change et le taux d'inflation.

Eu égard à ce qui précède, nous aurions voulu proposer à ce que le pays adopte un régime de ciblage de taux de change. Cependant, compte des contraintes liées à la faiblesse des réserves de change nécessaires pour soutenir la parité en cas de choc, nous pensons que le cadre actuel peut être maintenu. En revanche, le pays devrait poursuivre les mesures visant la dédollarisation, éradiquer durablement la dominance budgétaire, développer les marchés des capitaux en vue d'adopter à moyen terme un cadre de ciblage d'inflation qui un cadre propice à une analyse prospective de la politique monétaire.

Bibliographie

Ouvrages et Articles

Azam Achsani, N., "Stability of Money Demand in an Emerging Market Economy: An Error Correction and ARDL Model for Indonesia", in Research Journal of International Studies, No. 13, March, 2010. Pp.54-62.

Banque Centrale Du Congo, Politique Monétaire de la Banque Centrale du Congo : cadre de référence, Kinshasa, BCC, juillet 2013, 168 p.

Banque Du Canada, Fonctionnement de la politique monétaire : le mécanisme de transmission, Documents d'information, avril 2012.

Bahmani-Oskooee, M., and T. BOHL, M., "German monetary unification and the stability of the German M3 money demand function", in Economics Letters, No. 66, 2000, pp.203–208.

Bailly, J.-L., Mise en œuvre de la politique monétaire, in Economie monétaire et financière, Collection Grand Amphi, 2006, p. 261-294

Bernd, H., "Estimating a European demand for money", in ZEI working paper, No. B 05, 1998.

Escribano, A., "Nonlinear error correction: the case of money demand in the United Kingdom (1878–2000)", in Cambridge University Press No. 1365-1005, 2004, pp.76-116.

Hafer, R.-W., and Hein, S.-E., "Evidence on the Temporal Stability of the Demand for Money Relationship in the United States", Review of Federal Reserve Bank of St. Louis, December 1979.

Kikassa, M. 1980. Les programmes de stabilisation de l'économie zaïroise de 76 et 77 : objectifs et résultats, in KABUYA, K., et KIKASSA, M., Stabilisation économique et financière au Zaïre de 78 à 80. De dévaluation en cascade à la démonétisation, Kinshasa, CEPAS, p.48.

Montousse, M. (sous la direction de), Economie monétaire et financière, Paris, Bréal, 2006, 383 p.

Mukoko S., Politiques économiques en RDC : les leçons des trois dernières décennies, in NOTES DE CONJONCTURE, Université de Kinshasa, Nouvelle série, Vol. 1, n°1, octobre 2003, p. 27-41

Ndaywel è Nziem I., Nouvelle histoire du Congo. Des origines à la République Démocratique, Bruxelles, Le Cri édition, 2008, p.481-490

Patat, J.-P., Monnaie, système financier et politique monétaire, Paris, Economica, 2002, p. 187

Reinhart, C., and Alii, "The demand for money in developing countries: Assessing the role of financial innovation", in MPRA Paper No. 14096, 16 March 2009.

Rapports et autres Documents

Banque Centrale Du Congo, Rapports annuels de la Banque Centrale du Congo (1971 - 2012), Kinshasa-RDC.

Banque Centrale Du Congo, Condensés hebdomadaires d'informations statistiques (janvier 2012 - mai 2014), Kinshasa-RDC.

Doing Business (Banque Mondiale), Rapports sur l'indice d'activités pour l'exercice 2013.

Fonds Monetaire International, Perspectives de l'économie mondiale, 2014.

Fonds Monetaire International, Rapport des Services du FMI sur la République Démocratique du Congo pour les consultations de 2013 au titre de l'article IV, 2013.

Fonds Monetaire International (Département des Marchés Monétaires et de Capitaux), Programme d'évaluation du secteur financier de la RDC, in Note technique : Proposition de dédollarisation de l'économie, Kinshasa, janvier 2014, 35 p.

Journal Officiel De La RDC. 2013. Recueil de textes législatifs et règlementaires en matière de monnaie, de change, de crédit, surveillance des intermédiaires financiers, lutte contre le blanchiment des capitaux et le financement du terrorisme. 53^{ième} année, numéro spécial, 356p.