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Policy Innovations and Sectoral Credit Expansion in Kenya

By Tiriongo Samuel & Faridah Abdul*

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Abstract

The paper examines the bank lending channel of monetary policy specifically testing if there is any asymmetric response of sectoral credit to policy innovations on the Central Bank Rate (CBR), Cash Reserve Requirement (CRR), and Foreign Exchange (FX) transactions by CBK. Using a SVAR specification, where the requisite order of variables was guided by literature as well as practical realities in line with the conduct of monetary policy in Kenya. A seven variable SVAR was specified. The findings indicate that there are asymmetric effects of policy innovations on bank reserves when the aggregate credit to private sector is considered. CBR and FX transactions innovations do not seem to significantly impact on bank reserves, even though any changes in the bank reserves when these instruments are actively in use translate to significant changes in overall credit adjustments. But an active use of CRR leads to significant changes in bank reserves. However, when this instrument is active, the resultant change in bank reserves is not translated into credit allocation. Asymmetric effects on sectoral credit allocation when the three policy innovations are triggered was tested. This revealed that when CBR is applied, there is a significant change in bank reserves, which is also transmitted significantly to changes in credit allocation to the key sectors of the economy. And in fact, there is a stronger effect when CRR is used as an instrument of monetary policy. The use of FX transactions in this case does not seem to show significant influence on bank reserves. Even when any changes in bank reserves when FX transactions is used still leads to a significant adjustment in sectoral credit, but to a few sectors. The study therefore recommends a careful choice of monetary policy tool to use if the credit channel of monetary policy is expected to yield desirable results on credit expansion. .

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1.0 Introduction

Central banks world-over that pursue the dual mandate of supporting economic growth and price stability are driven by three main goals: promotion of financial sector development, financial inclusion and alignment of the financial system with the countries' respective development agenda.

In pursuit of both economic growth and price stability, such central banks have to delicately balance between the achievement of these two objectives since in most cases, they are in conflict .In the execution of its mandate, central bank actions that include adjustments of key policy instruments (herein called policy innovations) would directly impact on decisions by commercial banks on loans extended to the economy.

The experience of the Central Bank of Kenya is not any different. The country's development blueprint, Vision 2030, which seeks to transform the economy into a newly industrializing middle income economy by 2030, places a heavy responsibility on the financial sector. For instance, under the vision's economic pillar, the main focus of the government as at 2008 was to achieve an economic growth rate of 10% by 2012 and sustain it through to 2030. This was to be driven primarily by an increase in savings ratio from 17% in 2006 to at least 30% by 2012 via enhanced mobilisation of domestic resources to finance higher investment levels, as well as exploring options for tapping increased remittances, foreign direct investment and overseas development assistance. These objectives were to be pursued alongside other long term goals for the sector, that include: improvement in the depth and width of the financial system, enhancement of financial inclusion from both access and usage perspectives; achievement of greater efficiency in the delivery of financial services to ensure that the cost of mobilising resources and allocating these resources becomes increasingly affordable; and enhancement of the overall stability of the financial system to spur confidence in the sector. Activities for achieving the vision were to be supported by heavy investment in infrastructure as well as a reduction in energy costs (CBK, 2014) .

The vision identifies tourism, agriculture (through enhanced value addition), trade, manufacturing sector (with a regional market view), and business process outsourcing as the key sectors to support economic growth. Most importantly, the role of the domestic financial system in mobilizing savings needed for enhanced growth was highlighted as paramount. Mobilization of domestic resources is considered a more stable source of financing than foreign funds, which are predominantly characterised by uncertainties-making them unreliable. They are also volatile and are prone to sudden withdrawals/ outflows which can disrupt economic programmes and also cause devastating economic effects. In fact, Gavin, Hausmann and Talvi (1997) , argue that international capital flows are limited in the long run, and as such, a sustained rise in the rate of domestic investment requires a steady growth in the rate of national saving. Experiences from Latin America and East Asia show that saving is an important driving force for economic stability as well as growth. Elbadawi and Mwega (2000) argue that narrowing the savings–investment gap contributes to macroeconomic stability and hence economic growth; borrowing from abroad has adverse effects on the balance of payments as the foreign loans will have to be serviced in the future. In addition, foreign borrowing carries with it foreign exchange risk and thus add to existing menu of risks present in the domestic market.

The efficiency of or rate at which savings are mobilised and channelled to productive use depends, to a large extent, on the existing policy environment; in particular the policy actions taken by the monetary authority. The conduct of monetary policy in Kenya is aimed primarily at achieving price stability but with a secondary objective of supporting economic growth. It is executed through a monetary targeting framework with reserve money (or its component-net domestic assets of the Central Bank) as the daily operational target, broad money supply as the intermediate target and inflation as the ultimate target . In pursuit of this target, CBK uses a host of instruments including the Central Bank Rate (CBR), cash reserves ratio (CRR), foreign exchange market operations, monetary policy communication including moral suasion, as well as licensing and supervision of financial institutions licensed under the Banking Act. Monetary policy decisions are reflected through changes in the instruments, but the impact on the real sector of the economy depends on the intermediate financial sector's structure. Changes in the instruments are operationalised by open market operations that directly impact on commercial banks' reserves. The framework has remained fairly the same with the CBK continuously refining monetary policy operations and procedures with a view to enhancing the effectiveness of monetary policy in a changing financial and economic environment.

In particular, changes in CBR, CRR as well CBK participation in the foreign exchange market (here regarded as policy innovations) that impact on commercial banks' reserves position influence their lending to the private sector. This is primarily analysed through the credit channel of monetary policy transmission. Mishkin (1995) argues that this channel is based on asymmetric information in financial markets so that a monetary contraction can lead to an increase in the external finance premium faced by borrowers and to a decrease in the loan supply. It amplifies other channels rather than a stand-alone mechanism (Bernanke & Gertler, 1995a) and is usually decomposed into the bank lending channel and the balance sheet channel (Ireland, 2010) . Under the bank-lending channel, which is common among developing economies with underdeveloped capital markets, when the monetary authority undertakes a contractionary policy (by either increasing the policy rate, or through foreign exchange sale to the market or increasing cash reserve ratios), the result is a contraction in bank reserves, which induces banks to reduce their lending. This in turn makes households and business/firms to reduce their consumption and investment spending-and thus output and prices.

Through the balance sheet channel and in the presence of financial market imperfections, firms' cost of accessing credit, whether from banks or any other external source, increases when the strength of their balance sheets deteriorates. In this case, an increase in interest rates following a tight monetary policy may reduce the capitalization value of the firms' long-term assets, weakening their balance sheets and increasing their cost of accessing credit. This reduces borrowing, investment and output (Davoodi et al., 2013) . A worsening of balance sheets reduces the net worth of the borrowers. Banks then need to tighten credit profiling of borrowers to minimize incidences of non-performing loans. This reduces the amount of loans made available by banks to borrowers- thus domestic demand and output. In this analysis, the key assumption is that bank loans are firms' principal sources of funds, for which few close substitutes exist (Mishkin, 1995). This is true for the case of Kenya where the domestic capital markets are still underdeveloped.

There is vast empirical literature on monetary transmission from policy actions through commercial banking decisions to real output and prices. However, most of the studies have primarily focused on developed economies. The most distinguishing characteristic of monetary policy transmission in developed countries is the focus on prices (interest rate, exchange rate, and other asset prices) rather than quantities (money, credit, base money, bonds, foreign assets, etc.). However, there are arguments that monetary policy transmission mechanisms in low (and some middle) income countries focus more on the quantities rather than prices. These differences are often attributed to weak institutional frameworks, oligopolistic banking structures, shallow financial markets, and extensive central bank interventions in foreign exchange markets in low and many middle income countries (see for instance Christiano et al. 2010).

Mishra et al., (2010) argue strongly for greater effectiveness of credit channel (especially the bank lending channel) than any other channel in a cross-country study of low income countries. They provide strong evidence of a weak interest rate pass-through—from central bank lending rates to money market rates and from money market rates to commercial banks' lending rates. In addition, they argue that in most Sub-Saharan Africa (SSA) countries monetary policy shocks (defined by changes in reserve money) affect output significantly, but the impact of the shocks on inflation depends on the monetary policy instrument adjusted. For instance, while a decline in reserve money (the operating target for many SSA countries) does not reduce inflation significantly, an increase in the central bank discount rate or policy rate (the operating target for a small number of SSA countries) has a statistically significant impact on inflation (IMF, 2010). Such findings reflect the asymmetric effects of monetary policy actions on macroeconomic variables of interest (growth and inflation) and, thus point to the need to conduct analyses on transmission mechanism through the credit channel but focusing on the adjustments of different policy instruments.

A number of studies have been conducted on monetary policy transmission in Kenya but mainly focusing on the changes in the policy rate (see for instance: Cheng, 2006 ; Buigut, 2009 ; Misati et al., 2010 ; Sichei & Njenga, 2010 ; and Mwega, 2013) with little focusing on the treasury bill rate (Buigut, 2010) and on broad supply (Maturu, 2011) , as measures of policy shocks. From these studies, none attempted to analyse the role of changes in other policy actions such as foreign exchange market participation and adjustments in the CRR. Nevertheless, Sichei & Njenga (2010) attempted to cover the bank lending channel in depth. The study employed 3-Stage Least Squares estimation techniques on static annual data (2001-2008) for 37 commercial banks to investigate whether monetary policy had differential effects on banks and whether the credit channel is more operative through loan demand or loan supply. Findings indicated that banks contract loan supply in response to monetary tightening, thus reflecting credit rationing. This shows strong evidence for the effectiveness of the bank-lending channel in Kenya but through quantities rather than price:- the lending rate.

Studies on transmission mechanisms reviewed so far show no attempt to explore the effect of other monetary policy actions such as changes in central bank foreign transactions with the banking industry and CRR on commercial bank reserves and lending in the credit channel. This paper intends to fill-in this gap and provide empirical evidence for Kenya using shocks on CBR, CRR and foreign exchange transactions as policy shocks (innovations) that potentially affect output and prices through the commercial bank lending channel of monetary policy. Specific research questions include:

(i) Do different policy actions/ innovations (as measured by changes in CBR, CRR and foreign exchange transactions) affect sectoral credit expansion differently? Or establish whether there is evidence of sectoral asymmetric response of credit to the policy innovations?

(ii) How does sectoral credit expansion (in terms of magnitude and transmission lags) respond to the different policy innovations? Is their evidence of credit rationing to some sectors of the economy, and if so, to what degree?

2.0 Methodology

In analysing monetary policy transmission mechanisms, many authors adopt the Vector Autoregression (VAR) approach pioneered by Sims (1980). This approach is useful tool for analysing situations with short data series, recent history of macroeconomic instability, and with significant structural changes that make reliance on structural models questionable.

It sidesteps the need for structural modelling by treating every endogenous variable as a function of exogenous variables as well as the lagged values of all the endogenous variables in the system. In addition, it explicitly recognizes the simultaneity between monetary policy and macroeconomic developments (reaction function) as well as the dependence of economic variables on monetary policy (Dabla-Norris & Floerkemeier, 2006). Most studies in low income countries as reviewed by Mishra et al., (2010) have used structural recursive VAR that facilitates analysis of impulse responses and forecast error variance decomposition. Structural VAR is appropriate for studying the impact of interventions or policy changes in the economy. This approach assumes a recursive relationship between errors of reduced form VAR.

The paper sets out to analyse the effects of policy signals from changes in the main policy instruments; the CBR, CRR and foreign exchange transactions between CBK and the commercial banks on sectoral credit expansion in Kenya. The policy signals directly influence the level of bank reserves and thus affect commercial banks' lending decisions. Credit expansion to the sectors of the economy is used to capture the bank lending channel of monetary policy. We adopt a recursive structural VAR framework. The variables of interest (denoted by *matrix X*) include: the logarithm of real GDP (RGDP), logarithm of credit to private sector (Credit), logarithm of bank reserves (Reserves), logarithm of price level (CPI), nominal exchange rate (NER), the logarithms of Central Bank Rate (CBR) and the average lending rate (Lrate). This represented as follows:

$$X_t = [RGDP_t, CPI_t, CBR_t, \mathrm{Re}serves, Lrate_t, Cred_t, NER_t] \quad \text{.........................} (1)$$

Minimization of multicollinearity commonly present in VAR models is done by using granger causality analyses before we examine transmission lags and magnitudes using impulse response functions and forecast error variance decompositions as proposed by Enders (2006). Both impulse response functions and variance decomposition are sensitive to ordering of the variables in the VAR specification. Theoretical arguments and the operational realities in the conduct of monetary policy in Kenya are employed to guide variable ordering in the analyses, as in **Model (1)**. RGDP is ordered first since it is assumed not to react contemporaneously to shocks from other variables in the system. Second is the CPI, which is assumed not to react contemporaneously to shocks from all other factors except RGDP. Third in the ordering is the short-term policy rate (CBR). The other measures of policy actions are replaced in this position one at a time. Fourth in the order are bank reserves to capture the first host of policy shocks in the credit channel.

Fifth is the commercial banks' average lending interest rate which is assumed to be adjusted based on volumes of bank reserves and policy rate changes. Sixth is credit extended to the private sector which is placed after the lending rate because the private sector is assumed to respond (perhaps not contemporaneously) by changing their demand for loans following adjustments in lending rates. As such, credit to private sector is allowed to respond to changes in interest rates. This ordering is convenient to allow a loosening of monetary policy to be transmitted to credit expansion, subsequently affecting output and inflation with a lag (if the credit channel is effective). After credit to private sector, the nominal effective exchange rate is ordered last because it responds contemporaneously to shocks on all macroeconomic variables in the system identified.

The following system of **equations (2)** represents the structural VAR model of the system[1].

$$RGDP_t = a_{10} - a_{11}CPI_t - a_{12}CBR_t - a_{13}\,\mathrm{Re}serves_t - a_{14}Lrate_t - a_{15}Cred_t - a_{16}NER_t + A_{11}RGDP_{t-1}$$
$$+A_{12}CPI_{t-1} + A_{13}CBR_{t-1} + A_{14}\,\mathrm{Re}serves_{t-1} + A_{15}Lrate_{t-1} + A_{16}Cred_{t-1} + A_{17}NER_{t-1} + \varepsilon_t^{RGDP}$$

$$CPI_t = a_{20} - a_{21}RGDP_t - a_{22}CBR_t - a_{23}\,\mathrm{Re}serves_t - a_{24}Lrate_t - a_{25}Cred_t - a_{26}NER_t + A_{21}RGDP_{t-1}$$
$$+A_{22}CPI_{t-1} + A_{23}CBR_{t-1} + A_{24}\,\mathrm{Re}serves_{t-1} + A_{25}Lrate_{t-1} + A_{26}Cred_{t-1} + A_{27}NER_{t-1} + \varepsilon_t^{CPI}$$

1. We use a lag length of 1 just for demonstration, but the appropriate optimal lag length is established empirically.

$$CBR_t = a_{30} - a_{31}RGDP_t - a_{32}CPI_t - a_{33}\,\mathrm{Re}serves_t - a_{34}Lrate_t - a_{35}Cred_t - a_{36}NER_t + A_{31}RGDP_{t-1}$$
$$+A_{32}CPI_{t-1} + A_{33}CBR_{t-1} + A_{34}\,\mathrm{Re}serves_{t-1} + A_{35}Lrate_{t-1} + A_{36}Cred_{t-1} + A_{37}NER_{t-1} + \varepsilon_t^{CBR}$$

$$\mathrm{Re}serves_t = a_{40} - a_{41}RGDP_t - a_{42}CPI_t - a_{43}CBR_t - a_{44}Lrate_t - a_{45}Cred_t - a_{46}NER_t + A_{41}RGDP_{t-1}$$
$$+A_{42}CPI_{t-1} + A_{43}CBR_{t-1} + A_{44}\,\mathrm{Re}serves_{t-1} + A_{45}Lrate_{t-1} + A_{46}Cred_{t-1} + A_{47}NER_{t-1} + \varepsilon_t^{\mathrm{Re}serves}$$

$$Lrate_t = a_{50} - a_{51}RGDP_t - a_{52}CPI_t - a_{53}CBR_t - a_{54}\,\mathrm{Re}serves_t - a_{55}Cred_t - a_{56}NER_t + A_{51}RGDP_{t-1}$$
$$+A_{52}CPI_{t-1} + A_{53}CBR_{t-1} + A_{54}\,\mathrm{Re}serves_{t-1} + A_{55}Lrate_{t-1} + A_{56}Cred_{t-1} + A_{57}NER_{t-1} + \varepsilon_t^{Lrate}$$

$$Cred_t = a_{60} - a_{61}RGDP_t - a_{62}CPI_t - a_{63}CBR_t - a_{64}\,\mathrm{Re}serves_t - a_{65}Lrate_t - a_{66}NER_t + A_{61}RGDP_{t-1}$$
$$+A_{62}CPI_{t-1} + A_{63}CBR_{t-1} + A_{64}\,\mathrm{Re}serves_{t-1} + A_{65}Lrate_{t-1} + A_{66}Cred_{t-1} + A_{67}NER_{t-1} + \varepsilon_t^{Cred}$$

$$NER_t = a_{70} - a_{71}RGDP_t - a_{72}CPI_t - a_{73}CBR_t - a_{74}\,\mathrm{Re}serves_t - a_{77}Lrate_t - a_{75}Cred_t + A_{71}RGDP_{t-1}$$
$$+A_{72}CPI_{t-1} + A_{73}CBR_{t-1} + A_{74}\,\mathrm{Re}serves_{t-1} + A_{75}Lrate_{t-1} + A_{76}Cred_{t-1} + A_{77}NER_{t-1} + +\varepsilon_t^{NER}$$

where ε_t^{RGDP}, ε_t^{CPI}, ε_t^{CBR}, $\varepsilon_t^{\mathrm{Re}serves}$, ε_t^{Lrate}, $\varepsilon_t^{Cred}\varepsilon_t^{NER}$, are uncorrelated structural disturbances. Since VAR models are estimated in their standard/ reduced form, this study considers a transformation of the above structural representation into reduced form, by shifting the contemporaneous effects to the left hand side of the respective equations. This in matrix form yields:

$$\begin{pmatrix} 1 & a_{11} & a_{12} & a_{13} & a_{14} & a_{15} & a_{16} \\ a_{21} & 1 & a_{22} & a_{23} & a_{24} & a_{25} & a_{26} \\ a_{31} & a_{32} & 1 & a_{33} & a_{34} & a_{35} & a_{36} \\ a_{41} & a_{42} & a_{43} & 1 & a_{44} & a_{45} & a_{46} \\ a_{51} & a_{52} & a_{53} & a_{54} & 1 & a_{55} & a_{56} \\ a_{61} & a_{62} & a_{63} & a_{64} & a_{65} & 1 & a_{66} \\ a_{71} & a_{72} & a_{73} & a_{74} & a_{75} & a_{76} & 1 \end{pmatrix} \begin{pmatrix} RGDP_t \\ CPI_t \\ CBR_t \\ \mathrm{Re}serves_t \\ Lrate_t \\ Cred_t \\ NER_t \end{pmatrix} = \begin{pmatrix} a_{10} \\ a_{20} \\ a_{30} \\ a_{40} \\ a_{50} \\ a_{60} \\ a_{70} \end{pmatrix} + \begin{pmatrix} A_{11} & A_{12} & A_{13} & A_{14} & A_{15} & A_{16} & A_{17} \\ A_{21} & A_{22} & A_{23} & A_{24} & A_{25} & A_{26} & A_{27} \\ A_{31} & A_{32} & A_{33} & A_{34} & A_{35} & A_{36} & A_{37} \\ A_{41} & A_{42} & A_{43} & A_{44} & A_{45} & A_{46} & A_{47} \\ A_{51} & A_{52} & A_{53} & A_{54} & A_{55} & A_{56} & A_{57} \\ A_{61} & A_{62} & A_{63} & A_{64} & A_{65} & A_{66} & A_{67} \\ A_{71} & A_{72} & A_{73} & A_{74} & A_{75} & A_{76} & A_{77} \end{pmatrix} \begin{pmatrix} RGDP_{t-1} \\ CPI_{t-1} \\ CBR_{t-1} \\ \mathrm{Re}serves_{t-1} \\ Lrate_{t-1} \\ Cred_{t-1} \\ NER_{t-1} \end{pmatrix} + \begin{pmatrix} \varepsilon_t^{RGDP} \\ \varepsilon_t^{CPI} \\ \varepsilon_t^{CBR} \\ \varepsilon_t^{\mathrm{Re}sreves} \\ \varepsilon_t^{Lrate} \\ \varepsilon_t^{Cred} \\ \varepsilon_t^{NER} \end{pmatrix} \qquad (3)$$

This can be represented as:

$$AX_t = \Gamma_0 + \Gamma_1 X_{t-1} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

Assuming that the inverse of A (matrix of coefficients capturing contemporaneous effects between variables) exists, then matrix (4) can be written as

$$X_t = A^{-1}\Gamma_0 + A^{-1}\Gamma_1 X_{t-1} + A^{-1}\varepsilon_t \quad \text{..............} \quad (5)$$

This can further be simplified to yield equation (9), as

$$X_t = \alpha_0 + B_1 X_{t-1} + e_t, \quad \text{..............} \quad (6)$$

where $\alpha_0 = A^{-1}\Gamma_0, B_1 = A^{-1}\Gamma_1$ and $e_t = A^{-1}\varepsilon_t$. Equation (6) is a reduced-form model representation of equation 3. The matrix e_t is a vector of reduced form disturbances, which are assumed to have zero mean, constant variance and zero auto-covariance. The matrix B_1 can be written in a general form to represent an nth order lag polynomial to capture n lags in the relationships. The variance covariance matrix of reduced-form disturbances is given as $\sum_e = Ee_t e_t^{'}$.

Once consistent estimates of B_1, α_0 and $\sum$ have been obtained, the structural parameters can be recovered by pre-multiplying the reduced-form parameters by the non-singular matrix A. It is assumed that the structural disturbances are uncorrelated with each other, i.e. the variance-covariance matrix $\Sigma_\varepsilon = E\varepsilon_t\varepsilon_t^{'}$ is diagonal. The relationship between the structural disturbances ε_t and the reduced-form disturbances e_t is described by $\Phi\varepsilon_t = Ae_t$. However, without restrictions on the parameters of A and Φ this model is not identified. This study performs identification using the recursive approach as proposed by Sims (1980). This approach requires that the matrix Φ is restricted to an identity matrix and matrix A to a lower triangular matrix with unit diagonal. This implies a decomposition of the variance-covariance matrix of the form:

$$\sum_e = A^{-1}\Sigma_\varepsilon (A^{-1})^{'} \quad \text{..............} (7)$$

This is generated from the Cholesky decomposition $\sum_e = PP^{'}$ by defining a diagonal matrix φ which has the same diagonal as P and by specifying $A^{-1} = P\varphi^{-1}$ and $\Sigma_\varepsilon = \varphi\varphi^{'}$, i.e. the elements of the main diagonal of φ and P are equated to the standard deviation of the respective structural shock.

Based on the ordering of variables earlier outlined, the relationship between the reduced form and structural disturbances therefore takes the form represented by matrix (8).

$$\begin{pmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ a_{21} & 1 & 0 & 0 & 0 & 0 & 0 \\ a_{31} & a_{32} & 1 & 0 & 0 & 0 & 0 \\ a_{41} & a_{42} & a_{43} & 1 & 0 & 0 & 0 \\ a_{51} & a_{52} & a_{53} & a_{54} & 1 & 0 & 0 \\ a_{61} & a_{62} & a_{63} & a_{64} & a_{65} & 1 & 0 \\ a_{71} & a_{72} & a_{73} & a_{74} & a_{75} & a_{76} & 1 \end{pmatrix} \begin{pmatrix} e_t^{RGDP} \\ e_t^{CPI} \\ e_t^{CBR} \\ e_t^{Lrate} \\ e_t^{Cred} \\ e_t^{NSE} \\ e_t^{NER} \end{pmatrix} = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} \varepsilon_t^{RGDP} \\ \varepsilon_t^{CPI} \\ \varepsilon_t^{CBR} \\ \varepsilon_t^{Lrate} \\ \varepsilon_t^{Cred} \\ \varepsilon_t^{NSE} \\ \varepsilon_t^{NER} \end{pmatrix} \quad (8)$$

Since the objective of this study is to investigate how policy innovations have impacted on the credit channels of monetary policy transmission, the study considers to undertake analyses using the policy innovation variables (CBR, CRR and Foreign exchange transactions volume),one at a time and the results of the transmission compared. Credit is also analysed at both overall level and sectoral level, one sector at a time. The speed and magnitude of transmission are then compared in different periods and differences (if any) attributed to the innovations.

3.0 Empirical Procedure

The standard practice in analyses using VAR framework is to focus on the impulse response functions and forecast error variance decomposition, and not the coefficients of the VAR model. The impulse response functions trace out the response of current and future values of the set of variables to a one standard deviation increase in each of the variables in the system.

The forecast error variance decomposition helps to account for variations in variables overtime. It apportions the variations in each variable to shocks from within and from other variables in the system.

The study undertakes structural VAR estimations involving all the variables outlined in equation (1) but incorporating all the policy innovations and sectoral credit, one at a time. The results are compared to isolate the transmission of one policy innovation through the overall as well as sectoral credit expansion. As in many VAR models, analysis is done in levels. This allows for implicit cointegrating relationships in the data. Imposing cointegrating restrictions on a VAR in levels could increase efficiency in the estimation. Sims (1980) recommends against differencing the data even if the variables contain a unit root, as the goal of the VAR analysis is to determine interrelationships among the variables, not parameter estimates. Differencing throws away information concerning the co-movements in the data such as the possibility of cointegrating relationships (Enders, 1995). All the variables are expressed in logarithms[2]. The optimal lag length of the VAR estimation is selected using five standard tests, namely

2. Interest rates are expressed in logarithms after transforming appropriately as follows: $Ln(1 + r/400) \approx r/400$ where r = annual interest rate in %.

sequential modified LR test (LR), Final Prediction error (FPE), Akaike Information Criteria (AIC), Schwarz Information Criteria (SIC) and Hannan-Quinn information criteria (HQ)[3].

The paper uses quarterly data spanning 1996Q1-2015Q4 on the following variables: RGDP, CPI, policy rate (CBR after June 2006 and the TBR+3% rule before June 2006) CRR, CBK foreign exchange transaction volumes, average lending rate, total credit to private sector, bank reserves, nominal exchange rate and the stock market price index. The choice of this study period is limited by availability of data on key variables such real GDP.

3. A brief review of the lag selection method is provided in Table 3 in the Appendix.

4.0 Empirical Results

Data on endogenous variables i.e. real Gross Domestic Product (RGDP), Consumer Price Index (CPI), the average lending rate (Lrate), Credit to private sector (CREDIT), and the nominal exchange rate (NER), used in the study is presented graphically in Figure 1 in the Appendix.

The exogenous variables used in the study are adopted from Cheng (2006) include a proxy for foreign interest rates (captured by the US Treasury bill rate) i.e. USTbill, as well as seasonal dummies (quarterly)[4]. The use of the US Treasury bill rate is also included in the analysis to account for interest rate parity. Seasonal dummies are included in the analyses to account for seasonal effects. In the analysis, monetary policy stance is represented by the bank rate (CBR), cash reserve requirement and CBK foreign exchange transaction volumes.

Table 1 in the appendix presents the results of the full sample VAR lag order selection criteria based on five tests, namely sequential modified LR test (LR), Final Prediction Error (FPE), Akaike Information Criteria (AIC), Schwarz Information Criteria (SC) and Hannan-Quinn information criteria (HQ). A majority of the tests (FPE, SC, and HQ) support a maximum lag of 1 quarter for the VAR. To ascertain the stability of the estimated SVAR, an examination of the inverse roots of the characteristic polynomial shows that all the roots lie within the unit circle, as shown in **Figure 2**.

Table 2 in the Appendix displays the VAR Granger causality (block exogeneity test) results. The results show that the most important

4. Dummies for quarter 1, 2 and 3 are included in the analyses , except quarter 4 dummy (to avoid dummy variable trap)

relationships at 10% level of significance (or higher) are from CPI, CREDIT, NER to Real GDP; RGDP, Bank Reserves, CREDIT and NER to prices; real GDP and CREDIT to the CBR; CPI, and NER to Bank Reserves, RGDP and CBR to the LRATE; CPI, Bank Reserves and LRATE to CREDIT; and finally, real GDP and LRATE to NER. The results indicate strong bidirectional causality pattern thus justifying the use of VAR approach. We then consider the impulse response functions and the forecast error variance decomposition.

Impulse Response Functions (IRFs) and Forecast Error Variance Decompositions (VD)

The analyses of IRFs and VD is undertaken focusing on the effect of the changes in the policy innovations on the bank reserves and ultimately on the credit to private sector (CREDIT), both at aggregate level and at sector level; representing an in-depth analyses of the credit channel of monetary policy transmission. Unlike in other past monetary policy transmission channels that focus on impact of policy innovations on output and prices, this study particularly seeks to tease out information on the link between policy changes and credit allocation scheme in Kenya. Since policy innovations in practice do not directly affect credit supply, but through changes in bank reserves, A two stage analysis was conducted. The first stage focuses on the impact of policy innovations on bank reserves. The second stage then analyses the impact of changes in bank reserves on credit allocation (both at aggregate and sectoral level).

Figure 3a presents the two stage results on IRFs of changes in CBR on bank reserves (Left panel) and IRFs of changes in Bank Reserves on CREDIT (right panel)[5]. The IRFs trace out a one standard deviation shock on the policy variable on the bank reserves and also analyse a one standard deviation shock of the bank reserves on credit allocation. It is evident from the results that a one standard deviation positive shock in the CBR does not significantly impact on bank reserves, when analysed at 5% level of significance. While this result questions the effectiveness of the CBR in influencing credit allocation in Kenya, it also justifies our intention to measure the effectiveness of other policy innovations. However, the VAR specification that incorporates CBR allows for a one standard deviation positive shock in bank reserves to significantly affect the overall credit allocated to the private sector at least from the 2nd period. This effect is sustained for five quarters following the shock [6].

The forecast error variance decomposition of bank reserves when CBR is considered as the policy variable are then presented. This apportions the variations in bank reserves to shocks in the SVAR variables. The results indicate that in the first four quarters, CBR is the second most important variable that accounts for variations in bank reserves (despite being insignificant-accounting for less than 7% of variations) while own innovations account for over 73% (**Table 1**).

5. Test for stability results using the inverse roots of the AR characteristic polynomial are provided in appendix Figure 5a-c.They indicate stability of the SVAR specification.
6. We exclude the IRFs results for the other variables in the VAR due to space limitation. The results are available upon request.

Figure 3a: IRFs of CBR policy innovations on Commercial Banks' Reserves (left panel) and Credit to Private Sector (Right Panel)

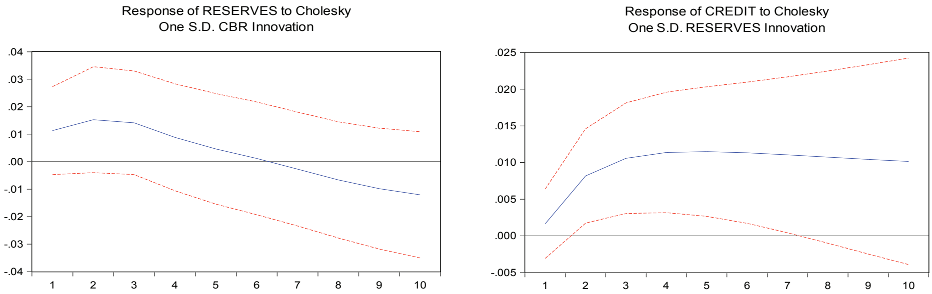


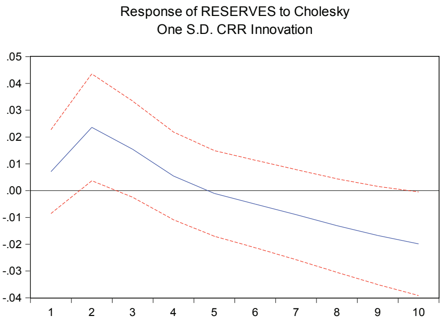
Table 1: Variance Decomposition of Bank Reserves (policy variable: CBR)

Period	S.E.	RGDP	CPI	CBR	RESERVES	LRATE	CREDIT	NER
1	0.024044	0.018804	4.423334	3.879146	91.67872	0.000000	0.000000	0.000000
2	0.028945	0.389730	4.352748	4.780809	87.17065	0.263582	0.121303	2.921177
3	0.032412	2.055107	3.889154	5.982121	80.60645	0.364666	0.270293	6.832206
4	0.035578	4.725389	3.373536	7.072296	73.44838	0.325850	0.437508	10.61704
5	0.038727	7.863631	2.962095	7.734358	66.57631	0.301646	0.626300	13.93566
6	0.041921	11.13493	2.689606	7.892438	60.35173	0.351315	0.831650	16.74834
7	0.045155	14.38751	2.532184	7.645118	54.82808	0.459250	1.040575	19.10729
8	0.048409	17.56131	2.447877	7.151596	49.93455	0.589922	1.237167	21.07757
9	0.051664	20.63137	2.397358	6.557203	45.57571	0.715171	1.407414	22.71578
10	0.054907	23.58380	2.352007	5.964243	41.66927	0.819932	1.542043	24.06871

Cholesky Ordering: RGDP CPI CBR RESERVES LRATE CREDIT NER

Moreover, a one standard deviation positive shock on the CRR leads to a significant decrease in bank reserves but only in the second quarter after the shock. The one period lag in the impact of CRR increase on reserves is attributed to the fact that a majority of the CRR adjustments in the sample period were effective one month after they were made; which may coincide with the next quarter[7]. However, there is no significant transmission of the impulse from reserves to commercial banks' credit allocation; indicating the ineffectiveness of the CRR as a policy tool to influence credit allocation (**Figure 3b**). The forecast error decomposition of the variation in bank reserves show that in the first four quarters, CRR accounts on average for less than 8.5% of the variations in bank reserves while own innovations account for over 72% of the variations (**Table 2**).

Figure 3b: IRFs of CRR policy innovations on Commercial Banks' Reserves (left panel) and Credit to Private Sector (Right Panel)



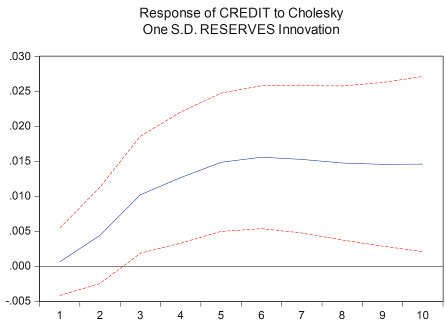


Table 2: Variance Decomposition of Bank Reserves (policy variable: CRR)

Period	S.E.	RGDP	CPI	CBR	RESERVES	LRATE	CREDIT	NER
1	0.021797	0.016187	2.374822	1.016309	96.59268	0.000000	0.000000	0.000000
2	0.026756	0.078981	8.958790	8.172652	81.30356	0.309634	0.119655	1.056727
3	0.029222	1.151966	9.349427	9.612094	76.67293	1.039102	0.606542	1.567942
4	0.031266	2.853601	8.937593	8.917417	72.25516	1.677190	0.827055	4.531985

7. Most of the MPC meetings between June 2006 and 2013 were held in January, March, May, July, September & November during when CBR and CRR adjustments. One lag from these dates coincide with the beginning of the next quarter.

Period	S.E.	RGDP	CPI	CBR	RESERVES	LRATE	CREDIT	NER
5	0.033386	3.903120	8.183759	8.039249	67.31634	1.997701	1.289625	9.270203
6	0.035726	4.954426	7.404379	7.450326	62.22378	2.075473	1.843852	14.04776
7	0.038027	6.253481	6.682675	7.323199	57.53543	2.026431	2.215159	17.96363
8	0.040343	7.571209	6.036418	7.763364	53.17829	1.909270	2.374607	21.16684
9	0.042743	8.755435	5.462596	8.725116	49.11441	1.768478	2.417659	23.75631
10	0.045204	9.839614	4.952141	10.07494	45.37788	1.628407	2.385612	25.74140

Cholesky Ordering: RGDP CPI CRR RESERVES LRATE CREDIT NER

When foreign transactions with the banking sector are used as policy impulses, a one standard deviation positive shock on the FX transactions seems not significantly influence commercial bank reserves. However, the second stage of the transmission indicates that a one standard deviation positive shock causes a significant increase in credit allocated to the private sector, but the effect is significant from the 2nd quarter to the 7th quarter (**Figure 3c**). In the first four quarters, only an average of about 0.6% of the variation in bank reserves are accounted for by changes in foreign exchange transactions of the central bank with commercial banks. A large proportion of the variations (over 85%) in bank reserves are accounted for by its own changes (**Table 3**).

Figure 3c: IRFs of Foreign Exchange Transaction volume policy innovations on Commercial Banks' Reserves (left panel) and Credit to Private Sector (Right Panel)

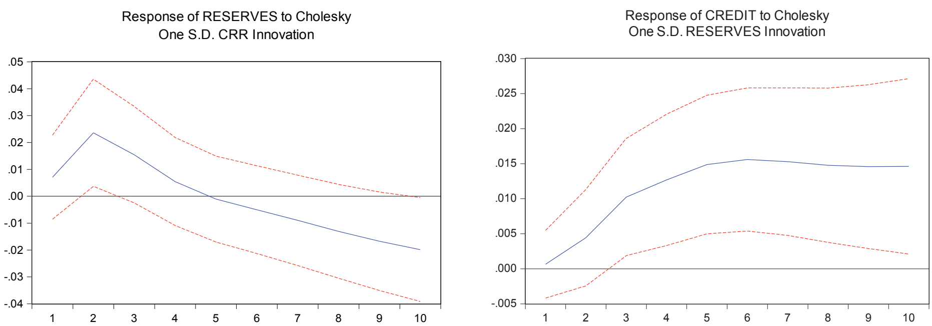


Table 3: Variance Decomposition of Bank Reserves (policy variable: Foreign Exchange Transactions)

Period	S.E.	RGDP	CPI	CBR	RESERVES	LRATE	CREDIT	NER
1	0.023837	0.063285	4.012372	0.033479	95.89086	0.000000	0.000000	0.000000
2	0.029017	0.353101	3.891717	0.567786	91.39821	0.627032	0.166891	2.995265
3	0.032601	1.626288	3.462861	0.611373	85.63992	1.148219	0.425809	7.085529
4	0.035854	4.055136	2.998872	0.789033	78.79009	1.434338	0.704345	11.22819
5	0.038908	7.065917	2.665605	0.871042	72.03001	1.433103	0.987538	14.94679
6	0.041856	10.35537	2.474367	0.948543	65.57514	1.302727	1.251753	18.09210
7	0.044722	13.64761	2.390428	0.992407	59.65824	1.167375	1.487309	20.65664
8	0.047532	16.81958	2.368062	1.022833	54.30667	1.105230	1.686633	22.69100
9	0.050298	19.79848	2.370012	1.039571	49.52155	1.150457	1.848479	24.27145
10	0.053033	22.56079	2.371588	1.048954	45.26285	1.306809	1.974080	25.47494

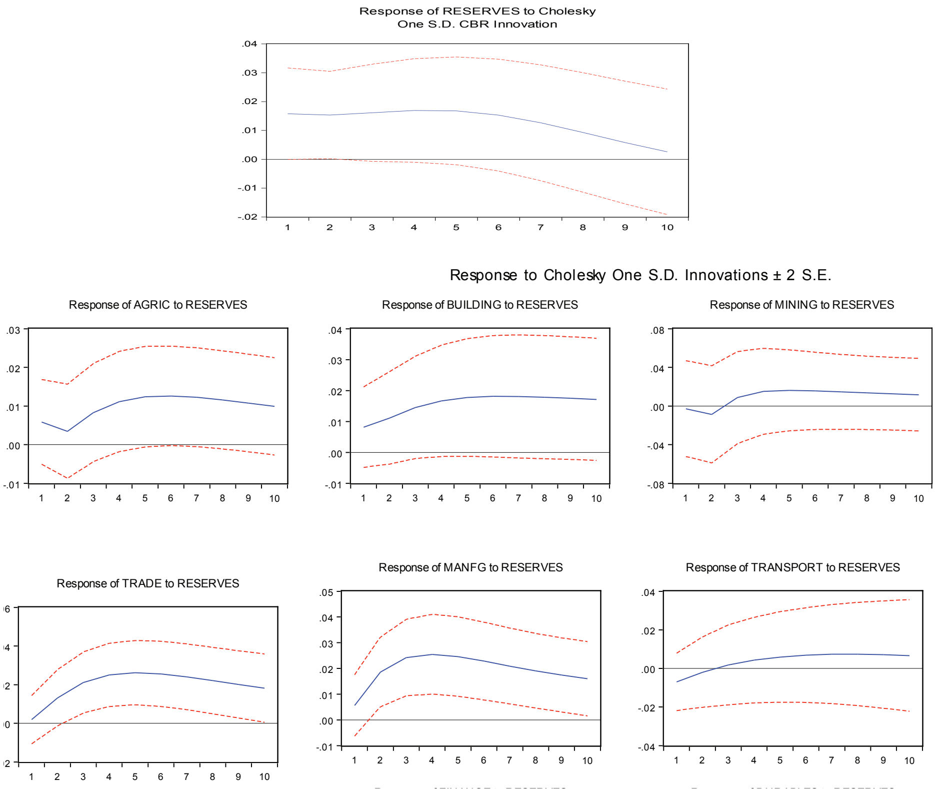
Cholesky Ordering: RGDP CPI FX RESERVES LRATE CREDIT NER

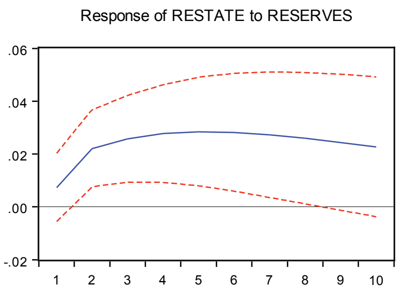
From the above analyses, it is evident that among the three policy innovations (CBR, CRR & FX transactions) only CRR changes have significant influence on bank reserves. But when CRR changes are instituted, there is no significant influence of changes in bank reserves on overall credit allocation by the banking sector. However, when CBR changes are effected or FX transactions are undertaken, there seems to be a stronger effect of bank reserves on credit allocation. This evidence indicates evidence of asymmetric effects of policy innovation on bank reserves and on credit allocation behaviour of the banking sector. We then proceed to also establish the effect of the policy innovations on sectoral credit allocation in the banking sector.

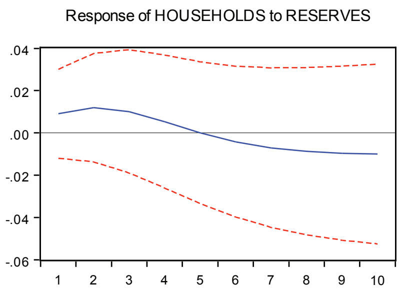
Figure 4a shows the results on IRFs of changes in bank reserves when CBR is adjusted. In this case, instead of using overall credit allocation, we consider sectoral credit for the 11 sectors (agriculture, building & construction, mining, trade, manufacturing, transport, real estate, households, finance & insurance, consumer durables and business activities). The results show that a one standard deviation innovation on the CBR significantly reduces bank reserves within the first 2 quarters following the innovation.

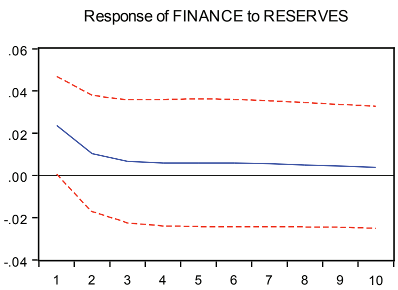
The impact of the changes in bank reserves on sectoral credit is heterogeneous. For instance, while a one standard deviation positive increase in bank reserves leads to a significant increase in bank credit to agriculture, trade, manufacturing, real estate and business activities (though with varying degrees of influence), credit expansion to the building & construction, mining, transport, households, finance & insurance and for purchase of consumer durables is not significantly affected. In particular, a positive (one standard deviation) shock on bank reserves significantly increases credit to agriculture sector but with a lag of 5 quarters, and to trade activities from the 2nd -through to the 9th quarter. Similarly, an increase in bank reserves increases credit to manufacturing sector from the 2nd to 10th quarter after the shock while credit to real estate and business activities would increase from the 2nd to 8th quarter and 2nd to 9th quarter, respectively (lower panel of Figure 4a).

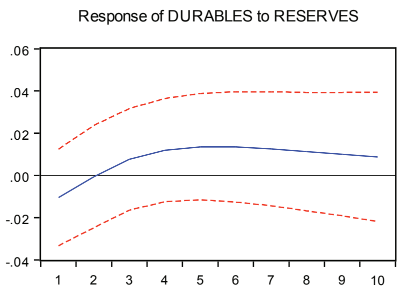
Figure 4a: IRFs of CBR policy innovations on Bank Reserves and Reserves on Sectoral Private Sector Credit

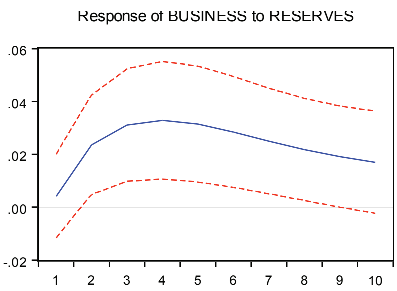



Response of RESTATE to RESERVES
.06
.04
.02
.00
-.02
1 2 3 4 5 6 7 8 9 10


Response of HOUSEHOLDS to RESERVES
.04
.02
.00
-.02
-.04
-.06
1 2 3 4 5 6 7 8 9 10


Response of FINANCE to RESERVES
.06
.04
.02
.00
-.02
-.04
1 2 3 4 5 6 7 8 9 10

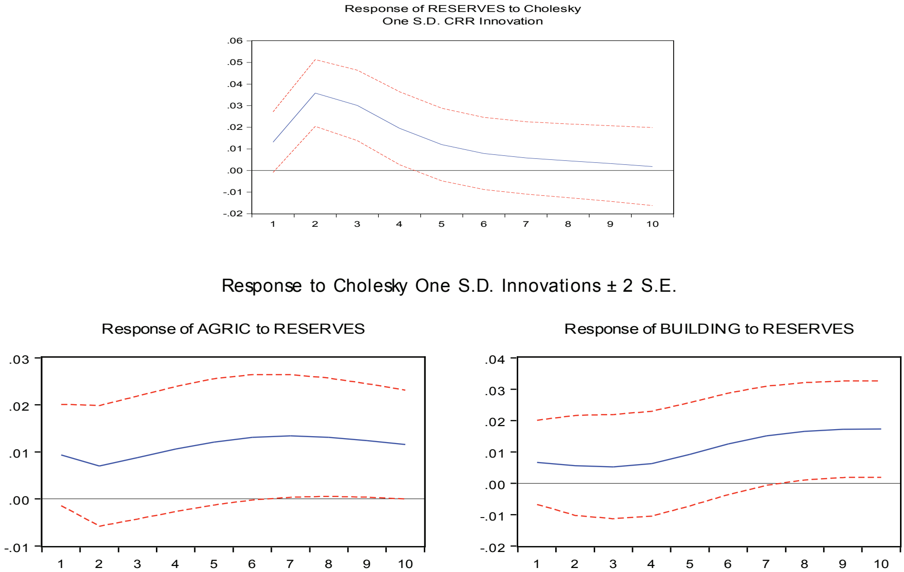

Response of DURABLES to RESERVES
.06
.04
.02
.00
-.02
-.04
1 2 3 4 5 6 7 8 9 10

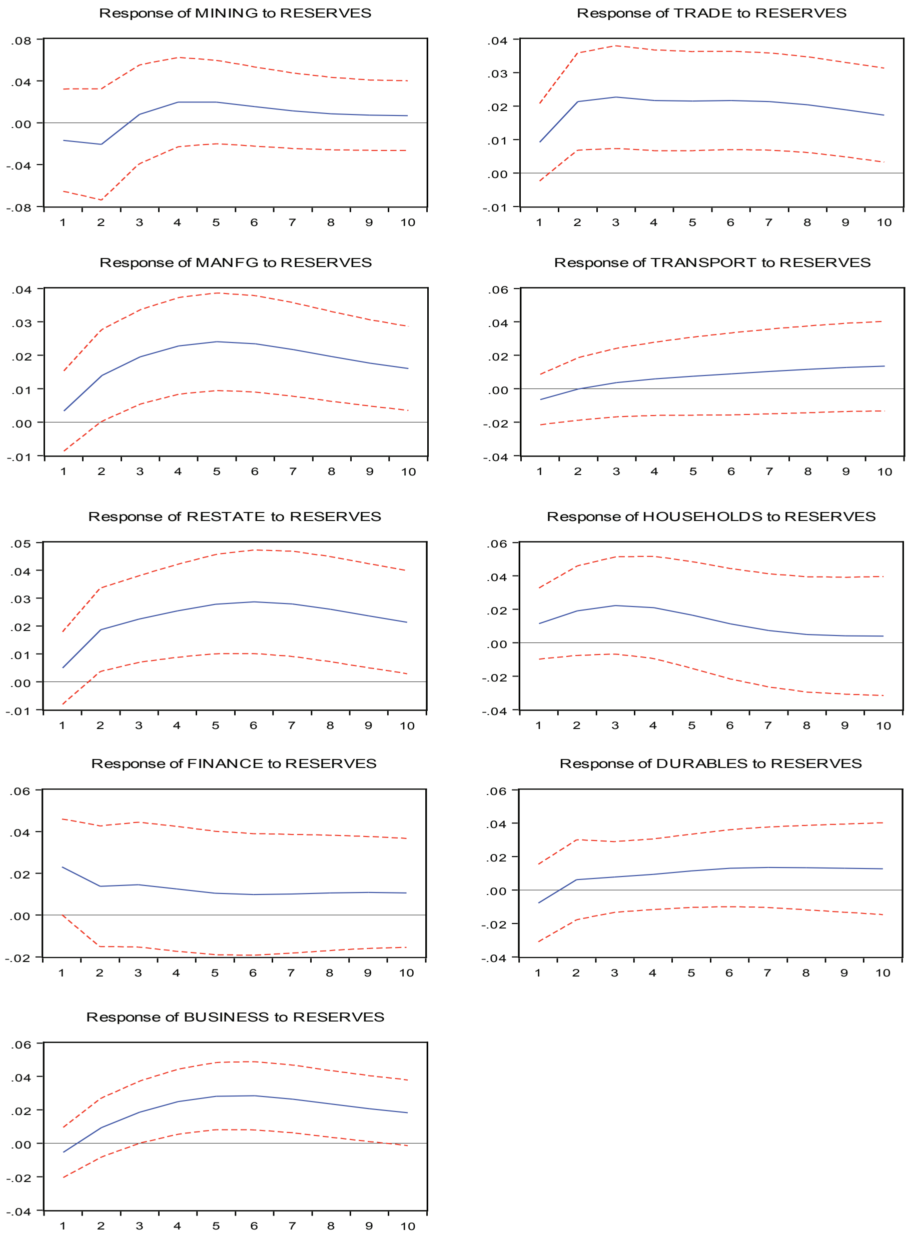

Response of BUSINESS to RESERVES
.06
.04
.02
.00
-.02
1 2 3 4 5 6 7 8 9 10

Similarly, we map out the effect of a one standard deviation positive shock on the CRR in place of the CBR. It is evident that a one standard positive shock on CRR significantly within the period of the shock but the subsequent increases in bank reserves die out slowly but significantly up to the fourth lag. The initial increase in bank reserves reflects the one month lag in effecting CRR changes that banks are given to prepare to meet the CRR. The subsequent decay in the increase in bank reserves represents the implementation of prior CRR adjustments. It appears that banks in Kenya over provide for meeting CRR and thus, bank reserves build up during periods of CRR adjustments. This is perhaps because of the heavy penalties that CBK applies in case of non compliance (upper panel of **Figure 4b**).

An analysis of the effect of changes in bank reserves on sectoral credit indicates that upward adjustments in bank reserves, in an environment when the policy instrument applied by CBK is CRR, significantly increases credit allocated by the banking sector to agriculture (from the 6th to 10th period), building & construction (from 7th to 10th period) trade (from 2nd to 10th period), manufacturing (from 2nd to 10th period), real estate (after 2 periods) and business activities (from the 3rd to 9th period). The increase in credit allocation to the rest of the sectors is established to be insignificant.

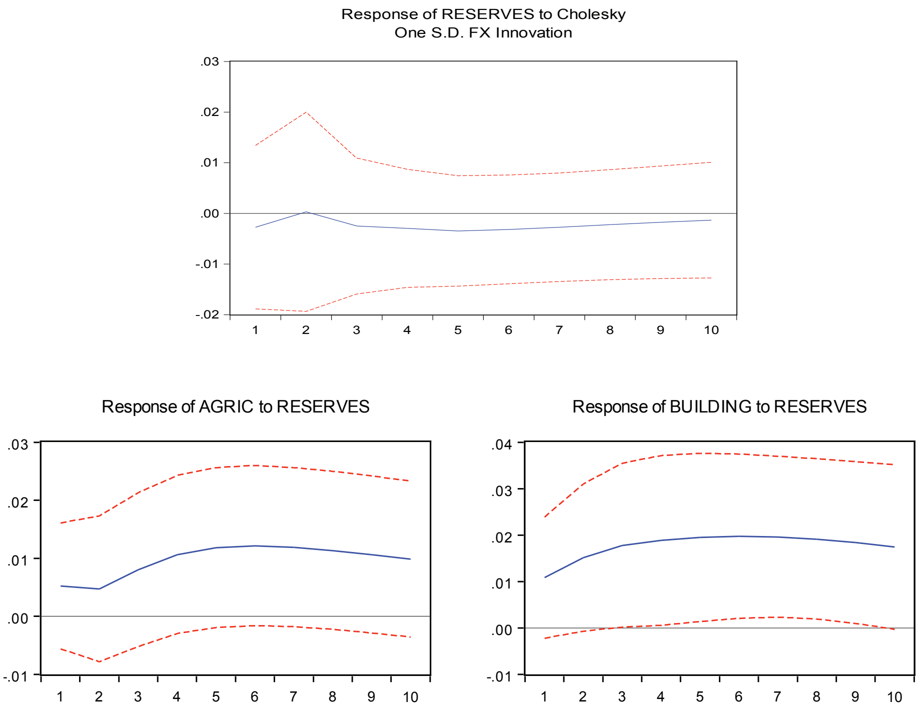
Figure 4b: IRFs of CRR policy innovations on Bank Reserves and Reserves on Sectoral Private Sector Credit

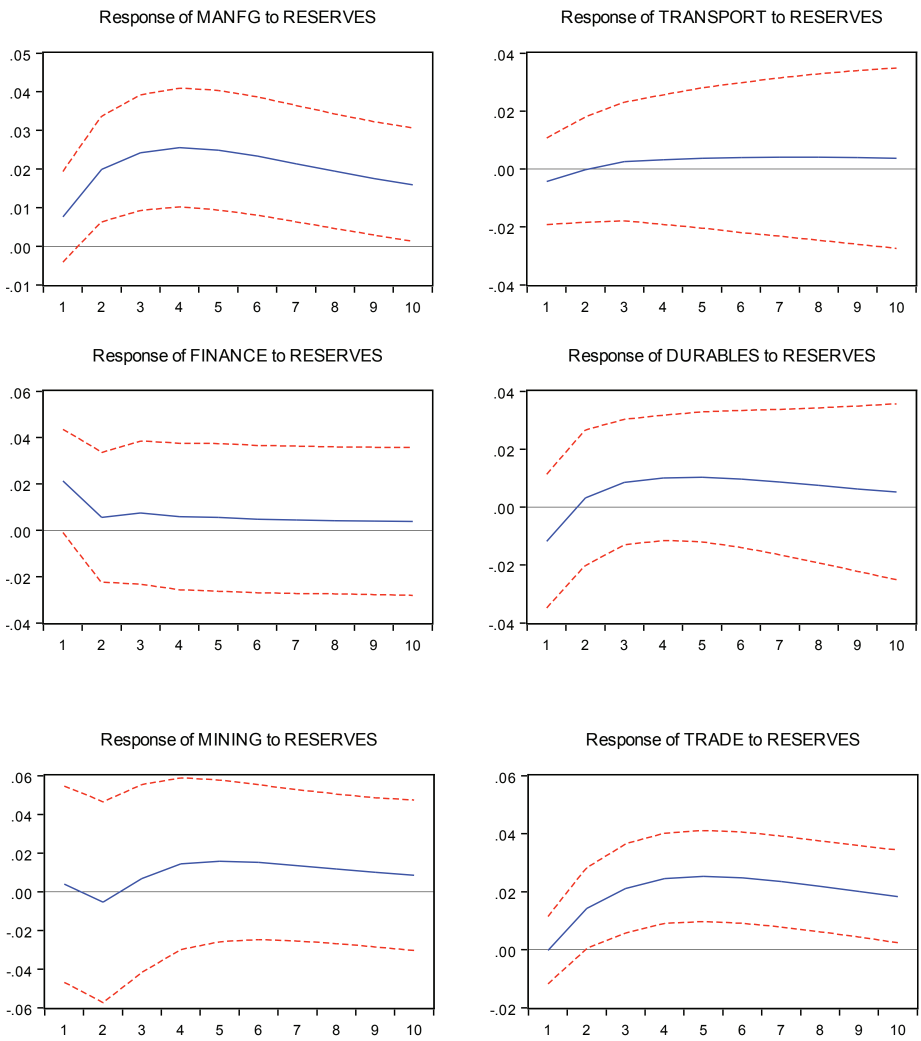


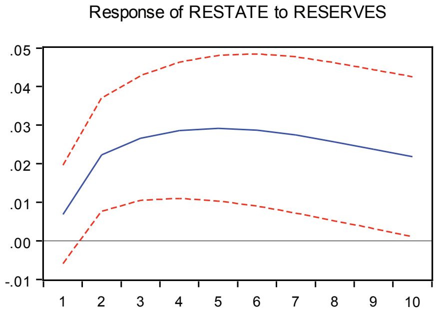

Response of MINING to RESERVES
Response of TRADE to RESERVES
Response of MANFG to RESERVES
Response of TRANSPORT to RESERVES
Response of RESTATE to RESERVES
Response of HOUSEHOLDS to RESERVES
Response of FINANCE to RESERVES
Response of DURABLES to RESERVES
Response of BUSINESS to RESERVES

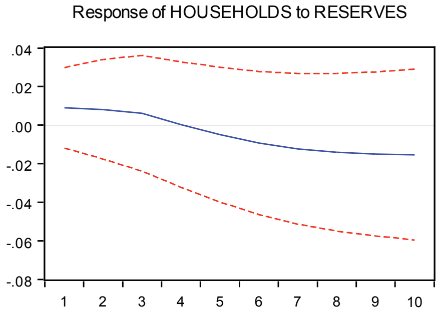
Finally, if the CBK pursues monetary adjustments through unsterilized foreign exchange transactions, the IRFs functions that measure a one standard increase in foreign exchange transactions does not seem to significantly impact on commercial bank reserves. Here, we assume that CBR and CRR remain fixed (Upper panel of Figure 4c). However, in this environment, any build-up in bank reserves cause significant increase in credit allocated to building & construction (but from the 4th to 9th period), trade, manufacturing and real estate (all from the 2nd to 10th period). In addition, credit to business activities increases from the 2nd to the 9th period (lower panel of Figure 4c). Credit to the rest of the sectors does not seem to respond significantly to changes in bank reserves when CBK uses FX transactions as the policy tool.

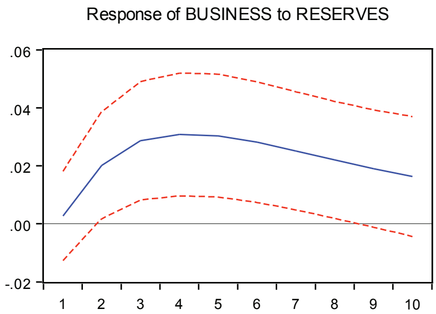
Figure 4c: IRFs of Foreign Exchange Transaction Volumes policy innovations on Bank Reserves and Sectoral Private Sector Credit




Response of MANFG to RESERVES
Response of TRANSPORT to RESERVES
Response of FINANCE to RESERVES
Response of DURABLES to RESERVES
Response of MINING to RESERVES
Response of TRADE to RESERVES







Analyses of the VD (Tables 3a-c in the appendix) show that the variations in sectoral credit that is accounted for by policy innovations vary across sectors. However, own sectoral credit innovations account for the largest proportions of changes in the sectoral credit. In the order of importance in terms of accounting for variations in sectoral credit (analysed in the first four quarters), CBR accounts for variations in credit to building & construction (21%), consumer durables (7%), transport (4%) and finance (4%). Similarly, changes in CRR account for variations in credit to building & construction (9%), trade (7%), and finance (3%). FX transactions changes account for variations in credit to trade (7%), building & construction (5%), manufacturing (4%), and real estate (3%).

Changes in bank reserves similarly have asymmetric effects on sectoral credit depending on the policy instrument adopted by CBK. For instance, when CBR is used to signal stance of monetary policy, changes in bank reserves account (ordered from largest to smallest) for variations in credit allocated to real estate (18%), manufacturing (15%), business activities (12%), and agriculture (4%).When the policy instrument is CRR, changes in bank reserves account for variations in credit to real estate (13%), trade (9%), households (8%), finance & insurance (6%), and agriculture (5%). In the event that CRR and CBR are fixed and CBK uses FX transactions as the instrument of monetary policy to influence bank reserves, the resultant change in bank reserves significantly account for variations in credit to real estate (18%), manufacturing (17%), business activities (11%), trade (8%)and building & construction (7%).

5.0 Conclusions and Policy Implications

The objective of this study was to measure whether there is any asymmetric response of sectoral credit to the policy innovations by three instruments (CBR, CRR, and FX transactions by CBK).

In addition, the paper also aimed at measuring the magnitude of variation in credit allocation due to changes on bank reserves occasioned by varied policy innovations. Using a SVAR specification, where the requisite order of variables was guided by literature as well as practical realities in line with the conduct of monetary policy in Kenya, we specify a seven variable VAR. The paper examines the credit channel (especially the bank lending channel) of monetary policy by first, testing the effect of the three different policy innovations on bank reserves, then second, examining the impact of changes in bank reserves on overall credit as well as disaggregated sectoral credit allocations. These were examined using IRFs and VD and significance criteria judged on the basis of a 5% level of significance.

Results indicate that there are asymmetric effects of policy innovations on bank reserves when we consider the aggregate credit to private sector. In particular, a one standard deviation policy shock on the CBR does not result in a significant adjustment on the bank reserves. However, when CBR is used by CBK as a policy instrument, any form of adjustment in bank reserves leads to a significant change in credit allocation to the private sector. This is also experienced when FX transactions are used by CBK as an instrument of monetary policy (as CBR and CRR remain inactive). On the other hand, an adjustment in CRR leads to a significant change in bank reserves. However, when this instrument is active, the resultant change in bank reserves is not translated into credit allocation.

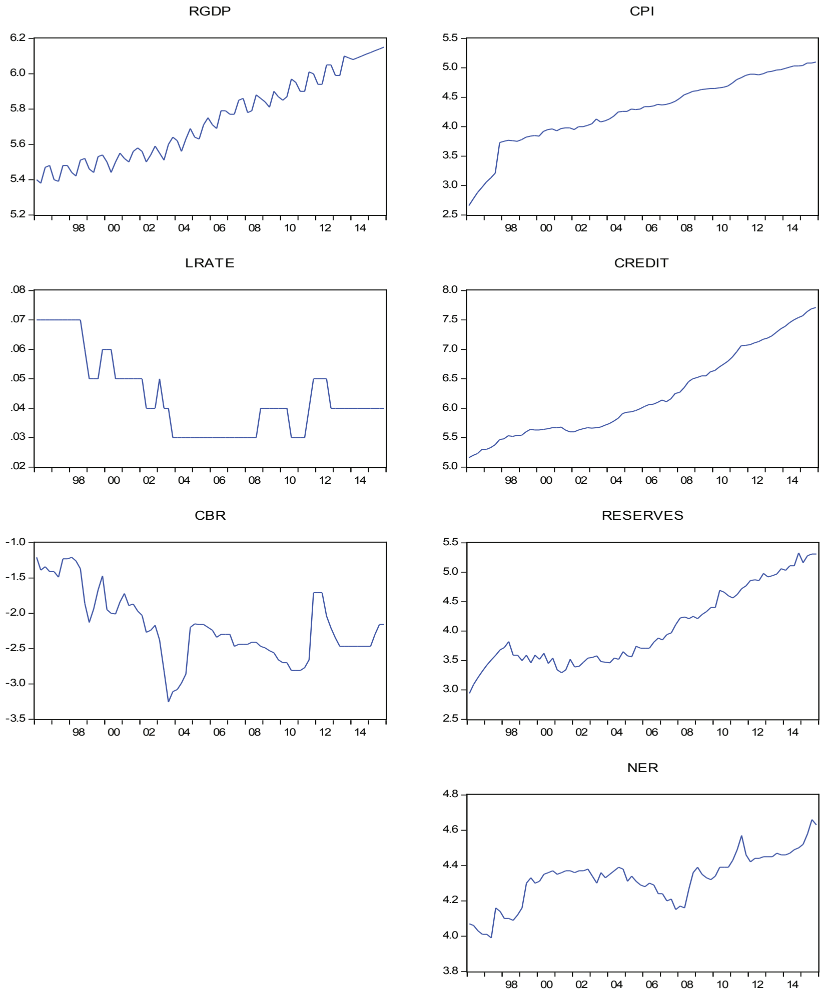
Asymmetric effects in sectoral credit allocation when the three different policy instruments are used was tested. The findings were that when CBR is applied by CBK, there is a significant change in bank reserves, which is also transmitted significantly to changes in credit allocation to key sectors of the economy (agriculture, trade, manufacturing, real estate and business activities).

When CBK uses CRR, there is a similar effect on bank reserves and sectoral credit allocation, but an additional sector that experiences significant adjustment in credit allocation is building & construction. As such, more sectors are affected when CRR is used as opposed to when CBR is used. The reason could be attributed to the fact that CRR is a direct instrument of monetary policy that does not rely on any other central bank operation for it to affect bank reserves. CBR adjustments affect bank reserves once the Repo market implements consistent actions to operationalise the CBR signal. For the use of FX transactions as a policy instrument, the results show that this approach does not yield a significant change in bank reserves. Despite this, any form of changes in bank reserves in this environment similarly causes a significant change in credit to building & construction, trade, manufacturing, real estate and business activities.

From the above results, this paper concludes that different policy instruments yield different effects on credit allocation, and the allocation differs across the sectors of the economy. We therefore recommend that for monetary policy actions to achieve desirable effects on credit expansion there is need for CBK to consider the appropriate instrument to use. This includes a stronger consideration on the economic performances of the different sectors of the economy so that challenges with absorption of credit do not yield undesirable outcomes such as build up in demand-driven inflationary pressure during periods of loose monetary policy.

Appendix

Figure A1: Endogenous Variables in the VARTable A1: Full Sample



SVAR Lag Selection Results

Endogenous variables: RGDP CPI CBR RESERVES LRATE NER
Exogenous variables: C USTBILL QRT1 QRT2 QRT3

Sample: 1996Q1 2015Q4
Included observations: 73

Lag	LogL	LR	FPE	AIC	SC	HQ
0	556.0817	NA	2.22e-14	-14.41320	-13.47191	-14.03808
1	901.2885	586.3786	4.70e-18*	-22.88462	-20.81379*	-22.05936*
2	936.1721	53.52009*	5.04e-18	-22.85403	-19.65366	-21.57863
3	972.2410	49.40945	5.45e-18	-22.85592	-18.52601	-21.13037
4	1005.600	40.21391	6.78e-18	-22.78357	-17.32412	-20.60788
5	1045.599	41.64292	7.69e-18	-22.89313	-16.30414	-20.26731
6	1091.686	40.40503	8.44e-18	-23.16949	-15.45096	-20.09352
7	1130.571	27.69836	1.38e-17	-23.24851*	-14.40043	-19.72240

* 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

Figure A2 : Stability of the SVAR

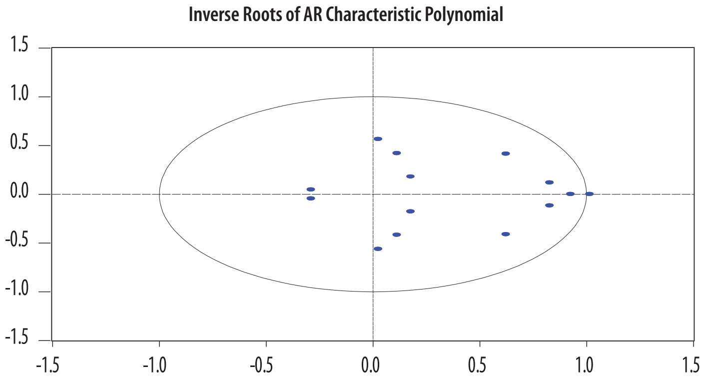


Table A2: VAR Granger Causality/Block Exogeniety Wald Test

VAR Granger Causality/Block Exogeneity Wald Tests
Sample: 1996Q1 2015Q4
Included observations: 78

Dependent variable: RGDP

Excluded	Chi-sq	df	Prob.
CPI	1.418053	2	0.4921
CBR	1.483608	2	0.4763
RESERVES	1.794645	2	0.4077
LRATE	9.205245	2	0.0100
CREDIT	23.89895	2	0.0000
NER	13.77033	2	0.0010
All	**38.23263**	**12**	**0.0001**

Dependent variable: CPI

Excluded	Chi-sq	df	Prob.
RGDP	7.806909	2	0.0202
CBR	3.442506	2	0.1788
RESERVES	5.327968	2	0.0697
LRATE	0.213158	2	0.8989
CREDIT	7.660639	2	0.0217
NER	18.92336	2	0.0001
All	**37.94921**	**12**	**0.0002**

Dependent variable: CBR

Excluded	Chi-sq	df	Prob.
RGDP	5.525559	2	0.0631
CPI	2.110033	2	0.3482
RESERVES	2.463332	2	0.2918
LRATE	0.335358	2	0.8456
CREDIT	11.86735	2	0.0026
NER	1.175268	2	0.5556
All	27.27665	12	0.0070

Dependent variable: RESERVES

Excluded	Chi-sq	df	Prob.
RGDP	0.345196	2	0.8415
CPI	5.600487	2	0.0608
CBR	1.846525	2	0.3972
LRATE	1.187423	2	0.5523
CREDIT	4.370402	2	0.1125
NER	6.483816	2	0.0391
All	35.67090	12	0.0004

Dependent variable: LRATE

Excluded	Chi-sq	df	Prob.
RGDP	5.164124	2	0.0756
CPI	3.802879	2	0.1494
CBR	18.78255	2	0.0001
RESERVES	0.095027	2	0.9536
CREDIT	2.757229	2	0.2519
NER	0.663140	2	0.7178
All	46.51836	12	0.0000

Dependent variable: CREDIT

Excluded	Chi-sq	df	Prob.
RGDP	0.925174	2	0.6297
CPI	10.06494	2	0.0065
CBR	3.926143	2	0.1404
RESERVES	7.805285	2	0.0202
LRATE	6.121741	2	0.0468
NER	2.756262	2	0.2520
All	**50.07879**	**12**	**0.0000**

Dependent variable: NER

Excluded	Chi-sq	df	Prob.
RGDP	9.843964	2	0.0073
CPI	0.834885	2	0.6587
CBR	0.648669	2	0.7230
RESERVES	3.226962	2	0.1992
LRATE	6.112426	2	0.0471
CREDIT	4.317781	2	0.1155
All	**27.17056**	**12**	**0.0073**

Figure 5a: Stability of the SVAR (with CBR on CREDIT)

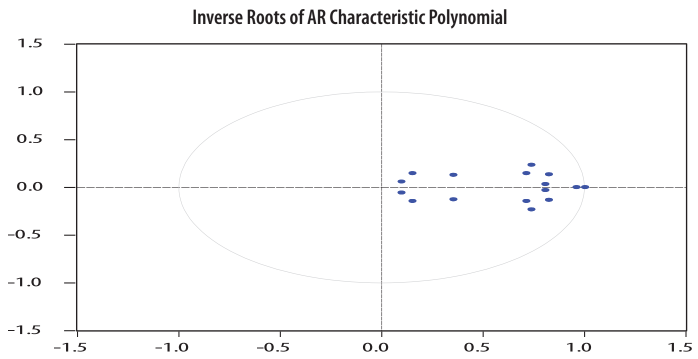


Figure 5b: Stability of the SVAR (with CRR on CREDIT)

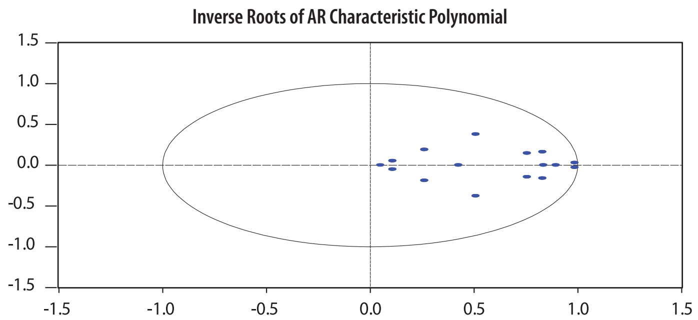


Figure 5c: Stability of the SVAR (with Foreign Exchange Transactions on CREDIT)

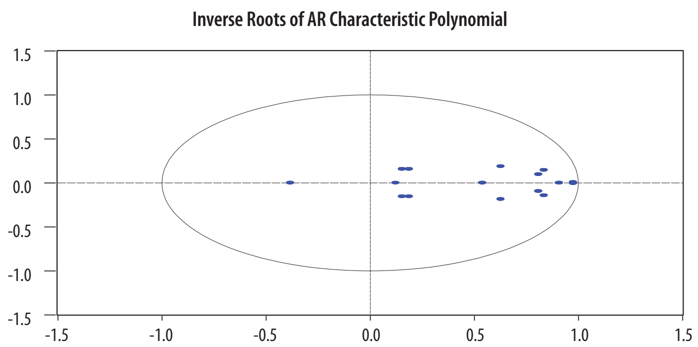


Figure 6a: Stability of SVAR (with CBR on Sectoral Credit)

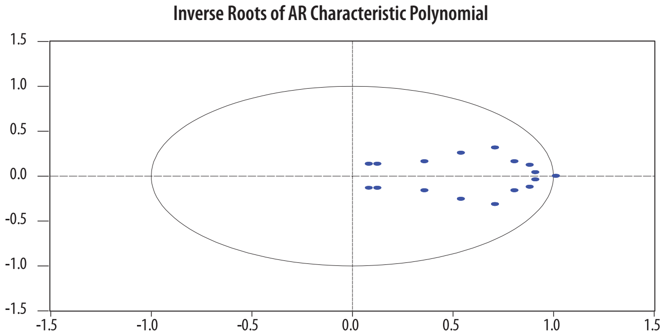


Figure 6b: Stability of SVAR (With CRR on Sectoral Credit)

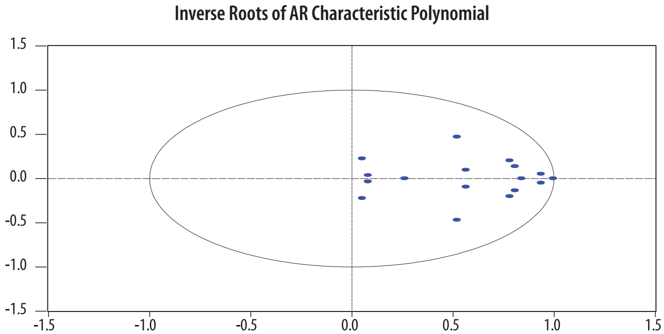


Figure 6b: Stability of SVAR (With FX transactions on Sectoral Credit)

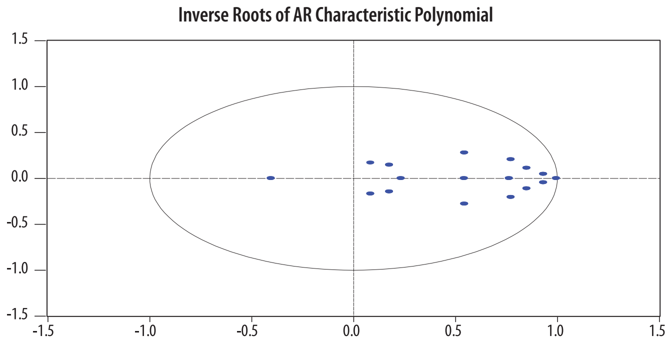


Table 3a: Variance Decomposition of Sectoral Credit due to CBR Policy Innovations

Variance Decomposition of Sectoral Credit due to CBR Innovations

	CREDIT TO AGRICULTURE:				CREDIT TO BUILDING & CONSTRUCION SECTOR:				CREDIT TO MINING SECTOR:			
Period	S.E.	CBR	RESERVES	AGRIC	S.E.	CBR	RESERVES	BUILDING	S.E.	CBR	RESERVES	MINING
1	0.022933	0.092371	1.052350	97.08659	0.053388	2.807717	1.046228	94.69292	0.185455	0.011295	0.186196	82.23258
2	0.025797	0.191567	0.843459	81.65146	0.074126	9.610514	1.386059	72.72662	0.264386	0.830357	0.893816	69.02335
3	0.027830	0.149953	1.867025	71.86775	0.088567	16.49500	1.851498	55.91491	0.315147	1.445813	0.841283	61.43392
4	0.029691	0.274381	3.773971	64.25958	0.097946	21.55440	2.383347	44.89101	0.347573	2.066607	0.760056	56.44918
5	0.031577	0.571173	5.885250	58.16686	0.104450	24.53204	3.015701	37.77589	0.369638	2.709951	0.702284	52.92441
6	0.033565	0.966802	7.780791	53.43630	0.109325	25.80357	3.724870	33.05966	0.385202	3.380254	0.660812	50.31572
7	0.035660	1.377577	9.310606	49.84865	0.113198	25.87288	4.460392	29.80288	0.396254	4.072410	0.631984	48.28887
8	0.037839	1.744753	10.47948	47.14843	0.116421	25.20890	5.171959	27.45414	0.404106	4.761711	0.616250	46.62646
9	0.040076	2.041402	11.35131	45.10090	0.119222	24.18121	5.820487	25.68944	0.409748	5.407405	0.615181	45.19505
10	0.042348	2.264243	11.99702	43.51610	0.121771	23.04093	6.380694	24.31345	0.413928	5.963902	0.628626	43.91944

	CREDIT TO TRADE SECTOR:				CREDIT TO MANUFACTURING:				CREDIT TO TRANSPORT SECTOR:			
Period	S.E.	CBR	RESERVES	TRADE	S.E.	CBR	RESERVES	MANFG	S.E.	CBR	RESERVES	TRANSPORT
1	0.071502	2.336512	0.244770	80.25716	0.003071	2.744791	0.502383	64.69865	0.049005	6.388071	1.493905	70.03449
2	0.084889	1.766138	1.081852	81.22122	0.004373	4.141981	5.372169	52.28324	0.063205	6.514431	0.860521	64.63624
3	0.092678	1.326596	3.878563	77.31207	0.005473	3.857878	10.33391	43.90065	0.073171	5.502879	0.596238	58.26233
4	0.100128	1.093975	7.493817	71.80200	0.006377	3.311392	14.49253	37.82061	0.080947	4.332231	0.463861	52.84872
5	0.107831	1.132750	10.93789	66.58470	0.007130	2.888628	17.74335	33.36547	0.087333	3.500306	0.416684	48.47171
6	0.115372	1.505149	13.63511	62.23578	0.007759	2.612067	20.14927	30.13313	0.092612	3.196063	0.452176	44.85750
7	0.122315	2.240861	15.37808	58.67787	0.008276	2.456680	21.80013	27.78392	0.096932	3.423940	0.559667	41.73941
8	0.128484	3.292890	16.22343	55.64780	0.008694	2.415662	22.79619	26.04143	0.100423	4.081173	0.708729	38.95697
9	0.133931	4.527067	16.37260	52.91679	0.009030	2.483820	23.25258	24.69497	0.103225	5.019018	0.861685	36.44364
10	0.138833	5.760330	16.06596	50.35495	0.009300	2.637058	23.29489	23.59541	0.105483	6.092705	0.989098	34.18199

	CREDIT TO REAL ESTATE SECTOR:				CREDIT TO HOUSEHOLDS SECTOR:				CREDIT TO FINANCE & INSURANCE SECTOR:			
Period	S.E.	CBR	RESERVES	RESTATE	S.E.	CBR	RESERVES	HOUSEHOLDS	S.E.	CBR	RESERVES	FINANCE
1	0.058706	0.707163	2.242391	68.99732	0.223330	1.974746	2.080736	64.94472	0.053066	1.170359	6.590668	66.74167
2	0.079264	0.431213	11.22345	54.17509	0.264599	1.079773	3.377572	58.87648	0.069531	0.944977	5.137775	43.64270
3	0.095697	0.997063	16.18562	43.23107	0.286242	2.488009	3.248625	51.90309	0.081163	1.939198	4.819726	34.08721
4	0.109061	1.735089	18.25329	34.59283	0.301833	5.256462	2.678786	44.76988	0.090443	3.459773	4.789419	28.76219
5	0.119720	2.232346	18.92075	28.34349	0.314032	7.963701	2.143467	38.53015	0.097899	5.145733	4.874292	25.25219
6	0.128187	2.555121	19.00244	24.00673	0.323848	10.10704	1.741408	33.52735	0.103879	6.799322	5.011466	22.78447
7	0.135021	2.830528	18.85630	21.00500	0.331940	11.71569	1.451193	29.61354	0.108811	8.342230	5.166354	20.99330
8	0.140707	3.143741	18.60411	18.88261	0.338814	12.94991	1.238446	26.54295	0.113124	9.755483	5.322739	19.65913
9	0.145607	3.537393	18.26785	17.32359	0.344841	13.95499	1.077837	24.10482	0.117149	11.03844	5.474780	18.64014
10	0.149962	4.018964	17.84247	16.11988	0.350269	14.83007	0.952862	22.14034	0.121074	12.19191	5.620816	17.84330

	CREDIT TO CONSUMER DURABLES SECTOR:				CREDIT TO BUSINESS ACTIVITIES:			
Period	S.E.	CBR	RESERVES	DURABLES	S.E.	CBR	RESERVES	BUSINESS
1	0.054422	2.310957	1.786678	73.80233	0.068855	0.080462	0.412405	71.17811
2	0.070388	4.391838	1.312607	62.61440	0.092784	0.098096	4.954488	62.60852
3	0.082113	6.671427	1.041319	52.76372	0.111468	0.221380	8.969857	54.20149
4	0.091277	7.395848	0.863760	45.47520	0.127716	0.504070	12.27582	47.95913
5	0.098529	7.168603	0.740676	39.86720	0.142432	0.799777	14.84942	43.10643
6	0.104219	6.556304	0.651548	35.39869	0.156127	0.964722	16.61869	39.20123
7	0.108684	5.862081	0.591996	31.74325	0.169215	0.980324	17.58722	35.99226
8	0.112273	5.219868	0.552276	28.68232	0.181992	0.916566	17.84368	33.27634
9	0.115303	4.679979	0.517802	26.08928	0.194617	0.851462	17.54162	30.89255
10	0.118020	4.258041	0.479175	23.89145	0.207133	0.820142	16.86265	28.73598

Cholesky Ordering: RGDP CPI CBR RESERVES LRATE AGRIC BUILDING MINING TRADE MANFG TRANSPORT RESTATE HOUSEHOLDS FINANCE DURABLES BUSINESS NER

Table 3b: Variance Decomposition of Sectoral Credit due to CRR Policy Innovations

Variance Decomposition of Sectoral Credit due to CBR Innovations

	Variance Decomposition of AGRIC:				Variance Decomposition of BUILDING:				Variance Decomposition of MINING:			
Period	S.E.	CRR	RESERVES	AGRIC	S.E.	CRR	RESERVES	BUILDING	S.E.	CRR	RESERVES	MINING
1	0.022853	0.007763	3.121929	95.22079	0.053255	2.071938	0.382681	93.38012	0.068225	5.089874	1.580930	75.91471
2	0.025656	0.162966	2.703854	78.78963	0.073331	4.312326	0.229664	73.76315	0.086561	3.596472	3.239025	64.73175
3	0.027681	0.178249	3.454958	69.59204	0.088497	6.321246	0.183486	60.36451	0.097342	3.413359	2.825496	58.43035
4	0.029520	0.484091	4.663083	62.60728	0.098678	8.727837	0.218707	50.94996	0.105947	3.456632	2.603174	54.25265
5	0.031313	0.873382	5.984518	57.06211	0.105587	10.74679	0.453672	44.43997	0.113742	3.420892	2.454655	51.26463
6	0.033120	1.125846	7.299318	52.80624	0.110645	11.94315	0.982117	39.83149	0.120990	3.296238	2.312456	49.04844
7	0.034952	1.211383	8.518752	49.62045	0.114604	12.34012	1.766997	36.42393	0.127802	3.139776	2.191534	47.30482
8	0.036800	1.201720	9.569892	47.23697	0.117846	12.18857	2.677127	33.79874	0.134167	2.993672	2.102096	45.81863
9	0.038655	1.161535	10.42215	45.41983	0.120611	11.75363	3.577031	31.71284	0.140012	2.867632	2.038064	44.46459
10	0.040510	1.120267	11.08793	43.99310	0.123067	11.21438	4.383077	30.00946	0.145319	2.757146	1.988702	43.17860

	Variance Decomposition of TRADE:				Variance Decomposition of MANFG:				Variance Decomposition of TRANSPORT:			
Period	S.E.	CRR	RESERVES	TRADE	S.E.	CRR	RESERVES	MANFG	S.E.	CRR	RESERVES	TRANSPORT
1	0.061295	6.773627	0.650375	74.19299	0.003467	0.000284	0.032924	61.92151	0.048828	2.893907	1.297334	70.65598
2	0.080688	9.108632	4.364067	69.70471	0.004630	1.050615	2.577023	50.12575	0.063652	3.331306	0.745145	66.67709
3	0.091497	7.991169	7.329965	66.61461	0.005414	2.151060	6.234365	39.29026	0.074077	2.879923	0.581526	60.76600
4	0.098463	6.554406	9.280699	64.22903	0.005881	2.757612	9.943395	31.89725	0.082305	2.313267	0.632936	54.66443
5	0.104269	6.010599	10.59867	61.74925	0.006189	2.964143	13.11490	27.25166	0.089097	1.860408	0.804834	49.40078
6	0.109775	6.059242	11.59725	59.13017	0.006441	2.979162	15.50385	24.33530	0.094721	1.545096	1.055055	45.21875
7	0.115111	6.182763	12.38020	56.47748	0.006670	2.934184	17.11013	22.39961	0.099327	1.340274	1.366400	41.95465
8	0.120275	6.171421	12.90887	53.80571	0.006882	2.880768	18.06781	21.00094	0.103060	1.223562	1.725409	39.35912
9	0.125306	6.031839	13.13778	51.11452	0.007074	2.829030	18.55072	19.90625	0.106071	1.184215	2.112548	37.23306
10	0.130276	5.820930	13.08814	48.44037	0.007246	2.773858	18.71443	18.99855	0.108500	1.215898	2.503014	35.44974

	Variance Decomposition of RESTATE:				Variance Decomposition of HOUSEHOLDS:				Variance Decomposition of FINANCE:			
Period	S.E.	CRR	RESERVES	RESTATE	S.E.	CRR	RESERVES	HOUSEHOLDS	S.E.	CRR	RESERVES	FINANCE
1	0.059952	0.081269	1.141055	66.83980	0.222917	1.719905	3.526354	62.00122	0.052259	5.665655	6.556183	64.50768
2	0.079128	0.127605	6.926227	53.41545	0.267061	0.958658	6.152222	54.49101	0.070997	5.072699	5.963877	41.47174
3	0.092457	0.485321	10.15607	43.47754	0.288146	0.752168	7.323092	47.28740	0.082680	4.003114	6.245078	33.16389
4	0.102691	0.758832	12.44738	35.59106	0.302595	1.232268	7.705483	40.92025	0.091305	3.398663	6.273220	29.20988
5	0.110724	0.798483	14.31892	29.83055	0.314214	2.190214	7.544491	35.75043	0.098501	2.990311	6.248698	26.82989
6	0.117149	0.737236	15.69186	25.79527	0.324216	3.117222	7.109693	31.82854	0.104601	2.682085	6.289286	25.24820
7	0.122512	0.666065	16.49338	22.94481	0.333133	3.768922	6.615243	28.88965	0.109676	2.442030	6.412021	24.14967
8	0.127235	0.611010	16.77646	20.85422	0.341223	4.166591	6.166126	26.61276	0.113966	2.256895	6.600031	23.36087
9	0.131569	0.574845	16.66718	19.24158	0.348645	4.415726	5.796318	24.75808	0.117796	2.118579	6.827668	22.77865
10	0.135639	0.555084	16.29968	17.93412	0.355563	4.605017	5.508548	23.18349	0.121426	2.018734	7.070496	22.33963

	Variance Decomposition of DURABLES:				Variance Decomposition of BUSINESS:			
Period	S.E.	CRR	RESERVES	DURABLES	S.E.	CRR	RESERVES	BUSINESS
1	0.053478	0.179827	1.136840	73.26640	0.069294	0.213578	0.801668	66.06051
2	0.068095	0.646577	0.920120	65.66969	0.092552	0.439909	1.059984	58.66487
3	0.079655	0.718527	0.807174	58.71177	0.110808	0.895251	2.436325	48.95131
4	0.088973	0.680734	0.762861	52.46615	0.127199	1.022131	4.535853	41.12819
5	0.096272	0.663384	0.810262	46.83939	0.142332	0.913039	6.787383	35.50797
6	0.101938	0.685287	0.912842	41.87911	0.156250	0.798711	8.598700	31.49540
7	0.106406	0.735872	1.016876	37.60625	0.169025	0.726617	9.737581	28.49890
8	0.110063	0.800289	1.095622	33.99252	0.180827	0.674245	10.26526	26.10827
9	0.113199	0.872570	1.147658	30.96846	0.191843	0.628336	10.35538	24.08664
10	0.115998	0.955964	1.181640	28.44467	0.202230	0.588023	10.17768	22.31358

Cholesky Ordering: RGDP CPI CRR RESERVES LRATE AGRIC BUILDING MINING TRADE MANFG TRANSPORT RESTATE HOUSEHOLDS FINANCE DURABLES BUSINESS NER

Table 3c: Variance Decomposition of Sectoral Credit due to FX transactions Policy Innovations

Variance Decomposition of Sectoral Credit due to FX Innovations

	Variance Decomposition of AGRIC:				Variance Decomposition of BUILDING:				Variance Decomposition of MINING:			
Period	S.E.	FX	RESERVES	AGRIC	S.E.	FX	RESERVES	BUILDING	S.E.	FX	RESERVES	MINING
1	0.022857	**0.213253**	**0.859912**	**96.70184**	0.053055	**6.106170**	**2.534932**	**85.45584**	0.143996	**0.196218**	**0.016000**	**80.41494**
2	0.025675	**1.199485**	**0.789256**	**79.81013**	0.073319	**6.163343**	**3.502306**	**68.18002**	0.175284	**2.137733**	**0.504584**	**69.06367**
3	0.027714	**1.055455**	**1.744427**	**70.02629**	0.087475	**5.557505**	**4.912148**	**55.55827**	0.179189	**2.094565**	**0.477283**	**62.97085**
4	0.029606	**0.928297**	**3.374480**	**63.11663**	0.096585	**4.938884**	**6.578754**	**47.00789**	0.180331	**2.041574**	**0.454825**	**58.86212**
5	0.031497	**0.817293**	**4.966740**	**57.88966**	0.102941	**4.509717**	**8.389488**	**41.19109**	0.180704	**1.925480**	**0.472455**	**55.73800**
6	0.033415	**0.739835**	**6.265157**	**53.99239**	0.107791	**4.200620**	**10.10396**	**37.07065**	0.180820	**1.832854**	**0.490924**	**53.30972**
7	0.035367	**0.683241**	**7.227801**	**51.09387**	0.111755	**3.964771**	**11.54352**	**33.96928**	0.180886	**1.751033**	**0.490036**	**51.34432**
8	0.037347	**0.642025**	**7.921302**	**48.92238**	0.115155	**3.764918**	**12.61847**	**31.50116**	0.180934	**1.680483**	**0.475712**	**49.68519**
9	0.039354	**0.611142**	**8.422280**	**47.26338**	0.118184	**3.582864**	**13.32780**	**29.46249**	0.180977	**1.617093**	**0.457288**	**48.21200**
10	0.041384	**0.587594**	**8.793075**	**45.96302**	0.120965	**3.410682**	**13.72199**	**27.74512**	0.181017	**1.559411**	**0.442008**	**46.84460**

	Variance Decomposition of TRADE:				Variance Decomposition of MANFG:				Variance Decomposition of TRANSPORT:			
Period	S.E.	FX	RESERVES	TRADE	S.E.	FX	RESERVES	MANFG	S.E.	FX	RESERVES	TRANSPORT
1	0.071104	**6.675853**	**0.486022**	**81.16047**	0.003672	**5.124118**	**1.535544**	**70.31286**	0.049034	**2.640337**	**0.484782**	**68.79874**
2	0.084634	**9.173442**	**1.242375**	**76.87287**	0.004884	**5.750037**	**7.267481**	**57.37065**	0.063855	**1.548470**	**0.289731**	**65.87105**
3	0.092074	**7.637726**	**3.860341**	**73.08405**	0.005683	**4.771142**	**12.34343**	**47.43726**	0.074137	**1.065101**	**0.216758**	**59.04658**
4	0.098438	**6.709286**	**7.607171**	**67.87582**	0.006218	**4.277111**	**16.58386**	**40.02674**	0.082200	**0.867563**	**0.180054**	**52.61202**
5	0.104389	**5.987477**	**11.09341**	**63.10762**	0.006626	**3.926191**	**19.66629**	**34.97961**	0.088774	**0.757608**	**0.173180**	**47.06005**
6	0.110019	**5.534617**	**13.89211**	**59.04984**	0.006968	**3.727602**	**21.82164**	**31.48701**	0.094243	**0.717325**	**0.180869**	**42.64033**
7	0.115408	**5.224873**	**15.85227**	**55.64660**	0.007267	**3.600801**	**23.23004**	**29.01784**	0.098790	**0.695095**	**0.197552**	**39.14439**
8	0.120657	**5.004576**	**17.06975**	**52.71072**	0.007529	**3.517097**	**24.07638**	**27.19579**	0.102564	**0.684306**	**0.214041**	**36.35460**
9	0.125843	**4.823815**	**17.69100**	**50.08330**	0.007758	**3.449895**	**24.50293**	**25.78528**	0.105686	**0.677074**	**0.224826**	**34.08613**
10	0.131012	**4.656186**	**17.86888**	**47.65302**	0.007957	**3.386250**	**24.62165**	**24.63703**	0.108270	**0.672531**	**0.227148**	**32.20987**

	Variance Decomposition of RESTATE:				Variance Decomposition of HOUSEHOLDS:				Variance Decomposition of FINANCE:			
Period	S.E.	FX	RESERVES	RESTATE	S.E.	FX	RESERVES	HOUSEHOLDS	S.E.	FX	RESERVES	FINANCE
1	0.060562	**3.539808**	**2.108219**	**65.44173**	0.226960	**0.134557**	**2.090599**	**68.69184**	0.052415	**0.247144**	**5.393927**	**67.77441**
2	0.080382	**4.255160**	**10.62823**	**49.55881**	0.270263	**0.721414**	**2.574285**	**59.47442**	0.070157	**2.907067**	**3.574765**	**40.94519**
3	0.094555	**3.678418**	**15.27976**	**40.39250**	0.291040	**0.502384**	**2.236159**	**50.37468**	0.081953	**2.117779**	**3.420473**	**30.61359**
4	0.105380	**3.414904**	**18.00293**	**33.43647**	0.305911	**0.423501**	**1.671953**	**42.47431**	0.091592	**1.789384**	**3.135545**	**26.30329**
5	0.113814	**3.175399**	**19.52889**	**28.28431**	0.318150	**0.376931**	**1.346462**	**36.05995**	0.099450	**1.531727**	**2.924667**	**23.45998**
6	0.120508	**3.009853**	**20.38590**	**24.55833**	0.328408	**0.396010**	**1.226309**	**31.18269**	0.105790	**1.374560**	**2.761124**	**21.62866**
7	0.126054	**2.880430**	**20.81509**	**21.87678**	0.337221	**0.432200**	**1.201692**	**27.48424**	0.110915	**1.256665**	**2.656327**	**20.34341**
8	0.130913	**2.780447**	**20.95821**	**19.90804**	0.344977	**0.485078**	**1.212165**	**24.62686**	0.115163	**1.171714**	**2.593186**	**19.43764**
9	0.135384	**2.695089**	**20.88504**	**18.41246**	0.352008	**0.543390**	**1.227753**	**22.36284**	0.118844	**1.105905**	**2.562410**	**18.77308**
10	0.139631	**2.615351**	**20.63654**	**17.22591**	0.358554	**0.604857**	**1.239334**	**20.52567**	0.122204	**1.054701**	**2.554204**	**18.27606**

	Variance Decomposition of CONSUMER DURABLES:				Variance Decomposition of BUSINESS:			
Period	S.E.	FX	RESERVES	DURABLES	S.E.	FX	RESERVES	BUSINESS
1	0.054301	**1.023149**	**1.762597**	**76.50932**	0.068147	**0.904821**	**0.127421**	**68.94175**
2	0.070654	**0.793028**	**1.348310**	**68.76987**	0.090577	**1.536960**	**4.144219**	**59.38635**
3	0.082474	**0.749996**	**1.193493**	**61.06438**	0.109281	**1.130258**	**8.177186**	**51.03905**
4	0.091856	**0.647835**	**1.090751**	**54.45195**	0.126389	**0.945391**	**11.11535**	**45.01235**
5	0.099147	**0.561508**	**1.017284**	**48.58261**	0.142519	**0.821392**	**13.43742**	**40.68318**
6	0.104841	**0.496098**	**0.946120**	**43.39474**	0.157562	**0.741960**	**15.06584**	**37.36338**
7	0.109335	**0.447771**	**0.870041**	**38.91915**	0.171555	**0.690056**	**16.06556**	**34.70443**
8	0.112984	**0.413944**	**0.787231**	**35.11205**	0.184603	**0.651775**	**16.49482**	**32.45897**
9	0.116050	**0.390975**	**0.703103**	**31.88873**	0.196856	**0.619103**	**16.45638**	**30.46052**
10	0.118731	**0.377537**	**0.625239**	**29.15589**	0.208447	**0.586425**	**16.06382**	**28.60707**

Cholesky Ordering: RGDP CPI FX RESERVES LRATE AGRIC BUILDING MINING TRADE MANFG TRANSPORT RESTATE HOUSEHOLDS FINANCE DURABLES BUSINESS NER

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19. In this case, a credit shock is assumed to be an outcome of both a demand and supply shock.

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