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Asymmetric Monetary Policy Transmission in India: Does Financial Friction Matter?

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By

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Abstract

In the context of adoption of flexible inflation targeting regime in India since 2016 and is about to be reviewed soon, it is necessary to understand the effectiveness of monetary transmission mechanism. The paper investigates if there are any asymmetries in the transmission during different regimes, and also verify the role of financial frictions in such asymmetries, if it exists. By using Markov-Switching Vector Autoregression (MS-VAR) models, our results suggest that there are asymmetries in the monetary transmission mechanism during highly volatile and low volatile regimes with respect to both output and inflation. It also finds that financial frictions do influence the extent of policy transmission process in India. From a policy perspective, while the Reserve Bank of India (RBI) may continue to target inflation especially during high volatile regimes, it could have output growth as an additional target especially during the low volatile regimes.

Keywords: Monetary Transmission Mechanism, Financial Frictions, Bank Credit Channel, Interest Rate Channel, Markov-Switching Vector Autoregression (MS-VAR), India

JEL Classification: E52, E44, E58, C32

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Any errors and omissions in the paper are authors' alone.

1. Introduction

Monetary transmission mechanism (MTM) is a process through which changes in monetary policy affects real economic activity such as output and inflation. It has been a very pertinent issue for the researchers (especially for the central banks) across the globe over the last couple of decades when the challenges of monetary policy increased manifolds. The core objective of monetary policy is to minimize the volatility of output and inflation in an economy. In recent times, monetary policy has become more responsive to fluctuations in output and inflation such that macroeconomic stability could last for a longer period (Clarida, et al, 2000). However, the MTM is considered as a "black box" (complex process) as its various channels work simultaneously for achieving the final objectives of monetary policy (Bernanke and Gertler, 1995). Therefore, a regular assessment of MTM becomes utmost important for policymakers to conduct an effective monetary policy design. One of the major determinants of an effective monetary policy is the economic structure and the financial system of an economy (Carranza et al., 2010; Mishra et al., 2013).[3] The existing literature on this issue suggests that the financial intermediaries and financial market frictions play a very crucial role in strengthening/weakening the MTM across countries over different sample periods (Gertler and Kiyotaki, 2010; Quadrini, 2011, and Brunnermeier et al., 2012).[4]

India, being an emerging and one of the fastest-growing large economies, has undertaken various financial sector reforms since the 1990s. All along the Reserve Bank of India (RBI) followed a multiple targeting framework focusing on output, inflation as well as financial stability, with reasonable success. Further, recently, the RBI has been mandated to adopt a flexible inflation targeting framework in 2016 and entrusted it to a Monetary Policy Committee (MPC). While the efficacy of the flexible inflation targeting regime is still under study and would be reviewed, issues in the financial and banking sector continue to pose challenges to the framework. Until the Covid-19 hit the economy, it was often argued that the MTM (especially the interest rate channel) in India is very weak and there is an incomplete pass-through from shock to monetary policy to desired policy objectives. One of the reasons for the low and sluggish transmission of the policy rate on economic activity could be due to

[3] The speed and strength of the MTM could vary from country to country depending upon the financial and liquidity conditions, stage of domestic and the global business cycle, fiscal positions and the health of both banking and non-banking sector.
[4] See section 2 for more details.

presence of financial frictions.[5] Most of the previous empirical literature examined the MTM in India by considering the sample period as homogeneous (one regime). However, the validity of such studies raises concern given the Indian economy has undergone various structural changes due to both external as well as internal shocks such as global financial crisis, demonetaization, inflation targeting, adoption of GST regime, etc. Therefore, from a policy prospective, the MTM could be examined by allowing multiple regimes or non-linearities in a dynamic system. Given the scant literature available on India that introduces regime shifts, there is a need to understand the MTM that addresses the following issues: How does monetary policy transmit to the financial sector and the real economy? Does the change in policy rate have any impact on output and prices? Is the credit channel playing a significant role in the monetary transmission? Do financial frictions have any influence on MTM in India? Has the MTM process in India changed due to various reforms introduced in the country? Are there any asymmetries or non-linearities in the MTM?

The standard literature has broadly identified five channels of MTM, i.e., (I) Traditional money/Interest rate channel, (II) Credit channel, (III) Asset price channel, (IV) Exchange rate channel, and (V) Expectations channel.[6] The RBI (off late the MPC) sets the policy rate (repo rate) for achieving its final objectives through its effect on deposit and lending rates. However, most of the literature has identified the presence of credit channel (Bhaumik et al., 2010; Aleem, 2010; Khundrakpam, 2011; Das, 2015), while some identified the interest rate channel (Al-Mashat, 2003; Singh and Kalirajan, 2007; Kapur and Behera, 2012, Bhoi et al., 2017) in India. Hence, it would be interesting to re-examine the presence of the bank credit channel of MTM in India by introducing financial frictions as it is heavily dependent on banks for its financial operation. Indian financial sector has been characterized by a bank dominated formal credit market with credit-constrained borrowers. These financial intermediaries are the major players for transmitting the monetary policy changes to real sectors in India. However, with the introduction of MPC and with repo rate as the policy instrument, it becomes contextually important to understand the role of the interest rate/credit channel in India. Therefore, our approach is to understand the MTM through both interest rate and bank credit channel because of its importance in the Indian context while also endogenizing financial frictions within the framework. Financial frictions becomes more relevant under credit channel as it is operated

[5] Literature has mentioned various factors like less developed and fragmented financial market, financially excluded population, costly intermediation and policy-driven market distortions for slow and weak MTM (see Acharya, 2017; Banerjee et al., 2018).

[6] It is to be noted that these channels are not mutually exclusive and there is considerable feedback and interaction among these various channels.

through two channels: the bank lending channel[7] and the balance-sheet channel[8] (see Bernanke and Gertler, 1995).[9] The credit channel shows that due to information asymmetry problems in the credit markets, financial frictions generate an external premium (the cost differential between external and internal finance), which helps in explaining the transmission of monetary policy on real variables. It is often argued that the strength of a credit channel depends on the degree of financial frictions of an economy.

Against this backdrop, the broad aim of this paper is to analyze the asymmetries in the MTM in India and to verify the role of financial frictions in the MTM process. The Markov-Switching Vector Autoregression (MS-VAR) with regime-dependent dynamics model is used for this purpose. Monthly data from 2000:M04 to 2020:M03 is used for the empirical analysis. Here it is important to highlight that we believe that using recent data is likely to be much more informative for understanding the MTM process in India. The empirical analysis is carried out at three stages. In the first stage, the MTM is analyzed using an SVAR approach. Then, the regime dependent dynamic analysis is undertaken by using the MS-VAR methods at the second stage. Finally, the role of financial frictions and demonetization in the MTM is tested in the MS-VAR framework. The empirical results find that a shock to the monetary policy rate leads to a decline in growth, inflation, and bank credit through an increase in the bank lending rates in India. Broadly, it supports the interest rate and bank credit channel of the MTM in India.

The contribution of the study is as follows. First, the regime dependent empirical analysis of the MTM has not been carried out before in India. Therefore, this study could be one of the earliest to analyse the asymmetric impact of the MTM in India using the MS-VAR approach especially for recent years. Second, the role of financial friction in the MTM is analysed theoretically using the Dynamic Stochastic General Equilibrium (DSGE) model (Banerjee et al., 2018). Given the well-known limitations of DSGE models, however, the empirical analysis using an appropriate econometric technique has not been examined in the Indian literature. The present study tries to fill this gap in the case of India by examining the role of financial friction in a regime specific framework. Third, the study results find that there

[7] It traces the impact of monetary policy on the supply of bank loanable fund. For example, a contractionary (expansionary) monetary policy can result in a fall (rise) in bank reserves/deposits which will lead banks to reduce (enhance) their credit creation/ lending. As a result, investment of the bank dependent borrowers will fall (rise) which later adversely (favourably) affect the economic activity.

[8] It stresses on how shock to monetary policy leads to fall (rise) in the borrower's financial position in terms of collateral, net worth and cash flow, which hampers(improves) their access to bank credit in the later stage.

[9] In addition to it, a risk-taking channel of monetary policy (a part of credit channel) is mentioned in some literature, especially after the global financial crisis, which postulates that low interest rates lead to lending to riskier borrowers and lower risk premiums (Nicolo et al., 2010; Dell'Ariccia et al., 2010).

is an asymmetric impact of the MTM in both low volatile and high volatile regimes, and measures to minimize financial frictions could help improve the MTM process in India.

The structure of the paper is as follows. Section 2 briefly presents some existing literature on this research issue. Section 3 outlines the analytical framework of the study. The data and the selected methodologies for analyzing the objectives of the study are presented in section 4. Section 5 discusses the empirical analysis, which includes some preliminary results and regime-dependent impulse responses. Finally, section 6 summarizes the empirical findings and interprets them from a policy perspective.

2. Related Literature

In the literature, several studies focused on monetary transmission mechanisms across advanced, emerging, and low-income countries, and especially within the central banks. These studies are undertaken both at the multi-country level and also country-specific ones in the developed countries (Angeloni and Ehrman, 2003; Elbourne and Hann, 2006; Cesa-Bianchi et al., 2020), G-7 countries (Kim, 1999), Sub-Saharan Africa (Saxegaard, 2006; Lungu, 2007; Davoodi et al., 2013), Central and Eastern Europe (Elbourne and de Haan, 2009), Asian countries (Singh and Kalirajan, 2007; Isakova, 2008; Bhoi et al., 2017), the Middle East and North Africa (Neaime, 2008; Ziaei, 2009), and Latin America and the Caribbean (Ramlogan, 2007). An extensive survey of literature on the monetary transmission effectiveness was carried out by Mishra and Montiel (2013) in low-income countries.

The relationship between financial structure and monetary transmission was examined by Elbourne and Hann (2006) and they found no systematic relation between financial structure and monetary transmission among some transition economies of the Euro area. Using both VAR and ARDL approach, Isakova (2008) confirmed a strong exchange rate pass-through and a weak interest rate channel of MTM in Central Asia for the period 1995 to 2006. A study by Chang et al. (2014) confirmed the cost channel of monetary policy in Taiwan, where interest rate pass-through was operated through a supply-side transmission mechanism associated with a firm's marginal cost of working capital. Barnea et al. (2015) showed that effectiveness on monetary policy would depend on financial stability tools (capital adequacy ratio) as well as on regulatory and institutional constraints. Using panel data from 41 countries, Ma and Lin (2016) revisited the issue of whether financial development influences the effectiveness of monetary policy and found that the effectiveness of monetary policy would decline with more developed financial systems of an economy. They also indicated that the effect of monetary

policy on output was low in developing countries while its impact on inflation was relatively higher with financial development in advanced economies.

Lombardi et al. (2018) compared the MTM of four major economies, namely, China, the US, the Eurozone, and Japan. Broadly, the study identifies the level of the financial sector as the key factor for differences in the extent of transmission mechanism across the four economies. Mahathanaseth and Tauer (2018) confirmed that in addition to the interest rate channel, the MTM was operated through the bank lending channel in Thailand. The study further confirms that small banks were shown a greater degree of loan contraction due to an increase in policy rate than larger banks. Using an SVAR framework, Cesa-Bianchi et al. (2020) investigated the effectiveness of the monetary policy on both financial and real variables in the UK. They found that a shock to monetary policy (tightening) lead to a decline in growth, inflation, bank credit, and an increase of bonds spread and appreciation of the exchange rate in the UK.

The role of financial frictions in affecting macroeconomic and financial variables (business cycle fluctuations) is discussed extensively in the literature. Financial frictions are studied in the form of agency problem between the borrower and lender (Bemanke, and Gertler, 1989; Carlstrom and Fuerst, 1997), as collateral/credit constraint (Kiyotaki, and Moore, 1997; Iacoviello, 2005; Guerrieri and Iacoviello, 2017), external finance premium (Carlstrom and Fuerst, 1997; Brzoza-brzezina, and Kolasa, 2013). Aysun et al. (2013) confirmed that financial frictions did augment the efficacy of monetary transmission across 56 sample countries and found evidence for the presence of a credit channel. Ordonez (2013) justified that the asymmetric movements of economic variables such as lending rates, investment, and output over the business cycle (sudden and sharp during crises but slow and gradual during recoveries) were stronger in countries with less developed financial systems and greater financial frictions. The role of financial frictions and intermediaries in the MTM was surveyed extensively by Beck et al. (2014). By building a two-country DSGE model, Palek and Schwanebeck (2017) found that the efficiency of monetary policy in controlling inflation could decrease with the presence of financial frictions. Ozdagli (2018) revealed that greater financial friction (information friction) reduced the effect of monetary policy on the stock prices of firms. While examining the asymmetric impact of monetary policy in the U.S., Cover (1992) found that a positive money supply shock did not have effects on output, while a negative shock to money supply did have an impact on output.

There are a few studies that examine the issue of MTM for India. Most of the literature provided evidence for supporting either interest rate channel (Singh and Kalirajan, 2007; Kapur

and Behera, 2012, Bhoi et al., 2017) or bank credit channel (Aleem, 2010; Khundrakpam, 2011; Das, 2015) and few supported both the channels. Using quarterly data from 1980 to 2002 with an SVAR framework, Al-Mashat (2003) supported that MTM was operated through the interest rate and exchange rate channel in India. RBI (2004) finds that a shock to the bank rate had a negative and significant effect on output and inflation. Pandit et al. (2006) showed the existence of the bank lending channel with the severity of impact felt by small banks was more than that of large banks. Using data of banks from 2000 to 2007, Bhaumik et al. (2010) supported the bank lending channel and mentioned that it was more effective under a tight monetary policy than easy monetary policy period. Using a panel regression framework, Pandit and Vashisht (2011) provided evidence of the credit channel for India and other emerging market economies. Bhattacharya et al. (2011) found a strong exchange rate channel and a weak interest rate channel of the MTM in India. In contrast, employing an SVAR framework for the period 1996:Q1 to 2011:Q1, Khundrakpam and Jain (2012) found evidence for interest rate channel, credit channel, and asset price channel while exchange rate channel found to be weak. Banerjee et al. (2018) supported a slow and weak transmission through both interest rate and bank lending channels.

Overall, the empirical literature on the MTM is mixed and inconclusive. Broadly, the literature finds that the monetary policy shocks have a strong and significant effect on both output and inflation in advanced and emerging countries, while the same is relatively weak and less reliable in low-income countries. The role of financial friction, a major obstacle for slow transmission mechanism, has not been addressed in the previous literature in India.[10] The regime dependent monetary policy shock has also not been covered in the Indian literature. This study tries to fill this gap using a non-linear approach (asymmetric impact) by using monthly data from 2000:M04 to 2020:M03. The next section describes the analytical framework of the study.

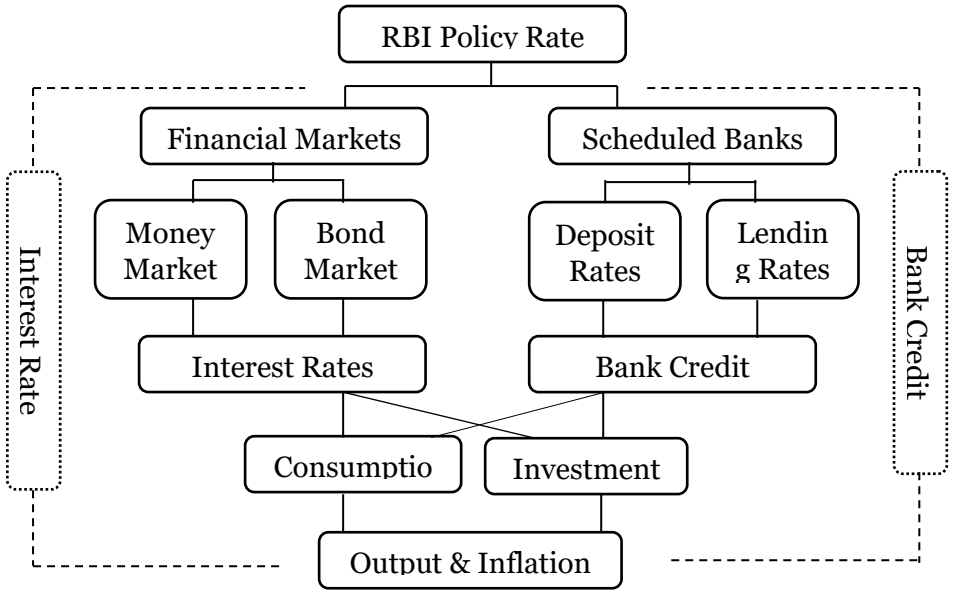
3. Analytical Framework

It is observed from the previous section that majority of the studies on India suggested that bank credit channel is reasonably efficient while some have suggested for the presence of interest rate channel and a few have found the validity of both the channels. However, the findings appear to differ mainly due to the difference in the time coverage and methodology adopted in these studies. In a sense, the findings appear to be time-varying. Therefore, in this

[10] Exception is Banerjee et al. (2018), which studied the issue using DSGE framework (linear framework).

study, we try to address this time-varying issue by introducing some non-linearities in the estimations as well as other shocks to the model. Further, here we try to understand the issue under these two crucial channels, which is depicted in Figure 1. It shows that the change in policy rate tends to transmit first to the short-term interest rate of both money and bond markets. Then, variation in short-term interest rates impacts the entire spectrum of long-term interest rates which influence aggregate demand by altering both private and government consumption and investment. Finally, it could affect the aggregate output and prices of an economy.

Figure 1: The MTM through Interest Rate and Bank Credit Channel in India



Source: Authors Interpretation

Similarly, the credit channel states that change in policy rate influences the quantity of credit availability, which later affects the aggregate output and price. For instance, after a monetary policy shock, the commercial banks adjust their lending and deposit rates, which later affect the balance sheets of both lenders and borrowers, credit demand and supply, consumption and investment decisions of bank-dependent borrowers, and finally the output and prices of an economy. For this purpose, we have included bank lending rates and bank credit to the private sector among the endogenous variables in our empirical analysis. The credit channel can be operated through two stages. In the first stage, we have to check whether shock to policy rate has any significant effect on the lending rate or the bank credit. Then, to verify whether shock to lending rate or the bank credit has a significant effect on the aggregate demand in the second stage.

Based on this framework, we have examined the monetary transmission process by using six major variables, i.e., output, price, money supply, the repo rate, lending rate, and bank credit.[11] It is expected from the standard macroeconomic theories that a rise in repo rate and lending rate leads to a decline in output and price, whereas an increase in bank credit and money supply have a favorable influence on output and might be an ambiguous impact on inflation. As the focus of this paper is to understand the transmission in the presence of financial frictions, this paper uses two measures for financial frictions.[12] In the next section, the data and methodology of the study are discussed as follows.

4. Data and Methodology

4.1 Data Description

The empirical analysis is executed by using monthly time series data from 2000:M04 to 2020:M03. Based on the existing literature, major variables are selected for the empirical analysis. The variables include repo rate (REPO), lending rate (LENDR), bank credit (BANCR), money supply (MSUPL), economic growth (GRWTH), inflation rate (INFLA), financial friction1 (FINFL), and financial friction2 (FINFM). Except for GRWTH and LENDR, all other selected variables are sourced from the Handbook of Statistics on the Indian Economy (HBSI), RBI. Due to the unavailability of monthly data on Gross Domestic Product (GDP) in India, the study has used the growth rate of the Index of Industrial Production (IIP) as a proxy for economic growth. Data on IIP is collected from the National Statistical Office (NSO), Government of India. The prime lending rate of the State Bank of India, the largest bank in India, is used as a proxy for lending rate[13] and it is compiled from the State Bank of India while the inflation rate is computed from the Consumer Price Index (CPI).[14] Bank credit is derived from the growth rate of bank credit to the commercial sector. Similarly, growth rate of broad money supply (M3) is used for money supply. For checking the robustness, the study has used two separate financial frictions data, i.e., financial friciton1 (FINFL) and financial friciton2 (FINFM). FINFL is measured from the difference between the yields on 10-year Government of India dated securities and the 15–91 days Treasury bill rate, while FINFM is

[11] The details of these variables are discussed in the next section. Due to insufficient observations and the selected methods, we have not considered the additional variables to capture other channels like exchange rate channel, asset price channel and expectation channel. This issue will be addressed in our future work.
[12] The details of the financial frictions are explained in the next section.
[13] This is because of the data on the monthly Weighted Average Lending Rate (WALR) on outstanding loan is only available from February 2012 in the data base of Reserve Bank of India.
[14] As the historical data on CPI are not available prior to the year 2011, the same are spliced using the CPI for Industrial Workers (CPI-IW).

constructed from the difference between the yields on 5-year Government of India dated securities and the 15–91 days Treasury bill rate. The detailed description of the selected variables is given in Table 1, and the descriptive statistics are reported in Table 2. The BANCR (6.45) and GRWTH (5.03) are appeared to be more volatile than other variables indicated by their high standard deviations. Higher kurtosis and non-zero skewness imply that the selected variables do not follow a normal distribution and it is further strengthened by the Jarque-Bera test. The time trends of these variables are plotted in Figure 2, which clearly shows that variables have breakpoints during the sample periods. Thus, a non-linear method may be appropriate for empirical analysis.

Table 1: Variable Description

Variables	Symbol	Description	Source
Economic Growth	GRWTH	The growth rate of Index of Industrial Production (IIP)	NSO-GOI
Inflation	INFLA	The growth rate of the consumer price index	HBSI-RBI
Repo rate	REPO	The rate at which the RBI lends money to licensed commercial banks	HBSI-RBI
Lending rate	LENDR	Prime Lending Rate of State Bank of India	State Bank of India
Bank credit	BANCR	The growth rate of bank credit to the commercial sector	HBSI-RBI
Money Supply	MSUPL	The growth rate of broad money supply (M3)	HBSI-RBI
Financial friction1	FINFL	Difference between the yield on 10-year Government dated securities and 15-91 treasury bill rate	HBSI-RBI
Financial friction2	FINFM	Difference between the yield on 5-year Government dated securities and 15-91 treasury bill rate	HBSI-RBI
Demonetization	DDUMM	Dummy variable equals 1 from November 2016 to November 2017 and the rest is 0	Authors interpretation

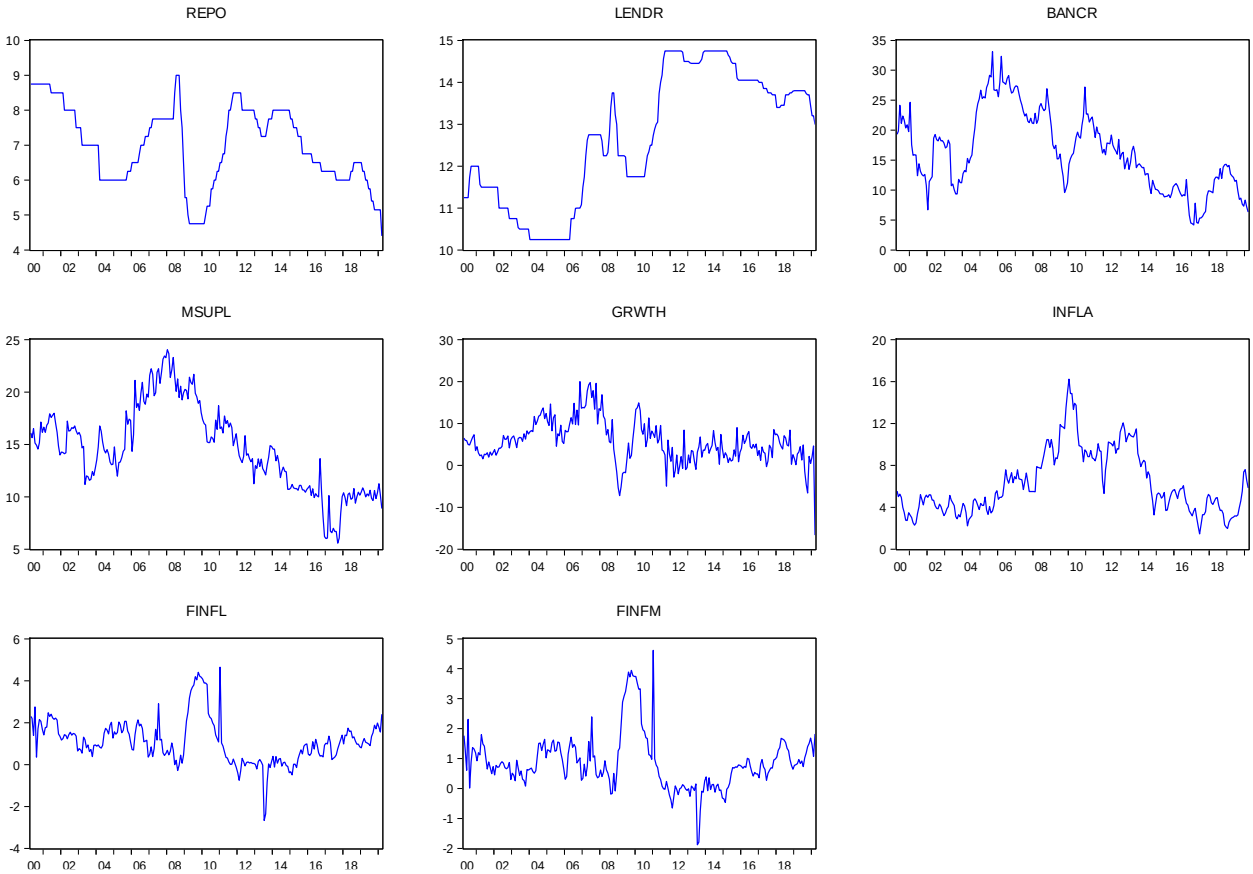
Notes: HBSI-RBI = Handbook of Statistics on the Indian Economy, Reserve Bank of India.

Table 2: Descriptive Statistics

Statistics	REPO	LENDR	BANCR	MSUPL	GRWTH	INFLA	FINFL	FINFM
Mean	6.99	12.67	16.34	14.60	5.62	6.26	1.11	0.88
Maximum	9.00	14.75	33.10	24.03	19.97	16.22	4.64	4.61
Minimum	4.40	10.25	4.16	5.56	-16.66	1.46	-2.67	-1.88
Std. Dev.	1.13	1.57	6.45	4.07	5.03	3.01	1.07	0.92
Skewness	-0.19	-0.17	0.30	0.16	0.07	0.89	0.69	1.25
Kurtosis	2.14	1.60	2.26	2.48	4.70	3.13	4.94	6.19
Jarque-Bera(JB)	8.78	20.78	9.01	3.75	29.08	31.86	56.56	164.66
P-value(JB)	0.01	0.00	0.01	0.15	0.00	0.00	0.00	0.00
Observations	240	240	240	240	240	240	240	240

Source: Authors computation

Figure 2: Trends of the Selected Variables



Source: Authors computation

4.2 Methodology

4.2.1. Preliminary Analysis using the SVAR Model

Initially, SVAR methodology is adopted to understand the transmission mechanism in India. SVAR framework can be represented in vector form as follows:

$$B_0 Y_t = \alpha_0 + A_1 Y_{t-1} + A_2 Y_{t-2} + \cdots \ldots\ldots\ldots\ldots + A_p Y_{t-p} + U_t \ldots\ldots\ldots\ldots\ldots (1)$$

The corresponding reduced form is:

$$Y_t = \mu_0 + \beta_1 Y_{t-1} + \beta_2 Y_{t-2} + \cdots \ldots\ldots\ldots\ldots + \beta_p Y_{t-p} + \epsilon_t \ldots\ldots (2)$$

Where, $Y_t = (REPO, LENDR, BANCR, MSUPL, GRWTH, INFLA)$, the selected endogenous variables; $\mu_0 = B_0^{-1}\alpha_0$ is the vector of constant; $\beta_i = B_0^{-1}A_i, i = 1,2, \ldots p$ is the vector of VAR coefficients; $\epsilon_t = B_0^{-1}U_t; \varepsilon_t$ is the vector of VAR residuals and U_t is the vector of structural shocks. The structural innovation U_t is assumed to be orthonormal, i.e., its covariance matrix is an identity matrix, $[E[U_t U_t'] = I$. Here, the relationship between U_t and ϵ_t can be expressed as follows. $U_t = B_0\epsilon_t$. The following restrictions are imposed in this study for identifying the effects of structural shocks.

$$\begin{bmatrix} U_t^{REPO} \\ U_t^{LENDR} \\ U_t^{BANCR} \\ U_t^{MSUPL} \\ U_t^{GRWTH} \\ U_t^{INFLA} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ \beta_{LENDR}^{REPO} & 1 & 0 & 0 & 0 & 0 \\ \beta_{BANCR}^{REPO} & \beta_{BANCR}^{LENDR} & 1 & 0 & 0 & 0 \\ \beta_{MSUPL}^{REPO} & \beta_{MSUPL}^{LENDR} & \beta_{MSUPL}^{BANCR} & 1 & 0 & 0 \\ \beta_{GRWTH}^{REPO} & \beta_{GRWTH}^{LENDR} & \beta_{GRWTH}^{BANCR} & \beta_{GRWTH}^{MSUPL} & 1 & 0 \\ \beta_{INFLA}^{REPO} & \beta_{INFLA}^{LENDR} & \beta_{INFLA}^{BANCR} & \beta_{INFLA}^{MSUPL} & \beta_{INFLA}^{GRWTH} & 1 \end{bmatrix} \begin{bmatrix} e_t^{REPO} \\ e_t^{LENDR} \\ e_t^{BANCR} \\ e_t^{MSUPL} \\ e_t^{GRWTH} \\ e_t^{INFLA} \end{bmatrix} \quad \ldots\ldots\ldots\ldots\ldots(3)$$

Where, the coefficient of β_{LENDR}^{REPO} is the response of lending rate due to unexpected shock of repo rate, β_{BANCR}^{REPO} and β_{BANCR}^{LENDR} are the response of bank credit due to structural shock of repo rate and lending rate respectively. β_{MSUPL}^{REPO}, β_{MSUPL}^{LENDR}, and β_{MSUPL}^{BANCR} are the response of money supply due to structural shocks to the repo rate, lending rate, and bank credit respectively. β_{GRWTH}^{REPO}, β_{GRWTH}^{LENDR}, β_{GRWTH}^{BANCR}, and β_{GRWTH}^{MSUPL} are the response of economic growth due to structural shocks to the repo rate, lending rate, bank credit, and money supply respectively. β_{INFLA}^{REPO}, β_{INFLA}^{LENDR}, β_{INFLA}^{BANCR}, β_{INFLA}^{MSUPL}, and β_{INFLA}^{GRWTH} are the response of inflation due to structural shocks to the repo rate, lending rate, bank credit, money supply, and economic growth, respectively.

4.2.2. Markov-Switching Vector Autoregressive Models

In the next stage, a Markov Switching Vector Autoregression (MS-VAR) model is used, which is a generalized framework of the VAR model whose parameters are, at least partly, time-varying depending on discrete regimes. Different from VAR models, it has been proposed as an alternative to the estimation of constant parameter and linear time series models. It provides a very flexible framework to analyze time-series data subject to change in regimes. The general form of the MS-VAR model of a *p*-th order and *M*-state can be expressed as:

$$y_t = \alpha(s_t) + \beta_1(s_t)y_{t-1} + \cdots \ldots\ldots\ldots\ldots + \beta_p(s_t)y_{t-p} + \epsilon_t \ldots\ldots\ldots\ldots\ldots (4)$$

Where, $y_t = \left(y_{1t,} y_{2t,} \ldots\ldots\ldots y_{nt,}\right)$ is an n-dimensional time series vector, s_t is the regime variable, $\alpha(s_t)$ is the regime dependent intercept, $\beta_1(s_t) .. \beta_p(s_t)$ are the regime dependent autoregressive coefficients, ϵ_t is a Gaussian error term conditioned on s_t: $\epsilon_t \sim N(0, \sum(s_t))$.

The unobservable regime s_t is assumed to follow a first-order Markov process with transition probabilities:

$$\Pr(s_t = j | s_{t-1} = i) = P_{ij}, \quad \sum_{j=1}^{M} P_{ij} = 1 \text{ for all } i, j = 1, \ldots . M \quad \ldots\ldots(5)$$

Where P_{ij} is the probability that event i is followed by event j and all the elements of the transition matrix can be denoted as: $\begin{bmatrix} P_{11} & \cdots & P_{1M} \\ \vdots & \ddots & \vdots \\ P_{M1} & \cdots & P_{MM} \end{bmatrix}$ …….. 6)

The MS-VAR model can generally be estimated by the maximum likelihood estimation via an expectation-maximization algorithm.[15] Then regime-dependent impulse response functions can be derived to reveal the dynamic relationship among the variables in the MS-VAR model (Ehrmann et al., 2003).[16]

To be specific, the MS-VAR is estimated by assuming two states, i.e., high volatile and low-volatile regime. The estimations are done by using Markov-switching intercept specification as it assumes a shift in regime causes a smooth and dynamic change of the dependent variable.[17] Although all parameters in the MS-VAR model can be regime-dependent, for the empirical applications, it is preferable to consider only some parameters that will be regime dependent.[18] Therefore, in the final estimation, it has assumed a regime dependent autoregressive parameters and error covariance structures. As the MS-VAR model is non-linear, a Generalised Impulse Response Function (GIRF) is more suitable than Cholesky decompositions to identify the system.[19]

5. Empirical Analysis

This section presents the empirical findings based on unit root tests, the BDS test, the SVAR, and the MS-VAR analysis.

5.1. Unit Root Tests & the BDS Test

The stationarity (unit root) property of the selected series is examined using Augmented Dickey-Fuller (ADF), Phillips-Perron (PP), and Zevot–Andrew (ZA) unit root tests (Table 3).

[15] First, the hidden Markov chain is inferred from the expectation step for a given set of parameters. Then, the parameters are re-estimated in the maximization step. These two steps are repeated until parameters estimates are converged.

[16] It depicts the relationship between endogenous variables and fundamental disturbances within a regime. It is conditional on the prevailing regime at the occurrence of shock and on the entire horizon length.

[17] An alternative representation is obtained by mean switching specification in which a change in regime leads to an immediate adjustment in the dependent variables to new levels (one-time jump). Thus, given the Indian scenario, Markov-switching intercept specification seems to be more preferable because in it the means approach smoothly new levels after a regime shift.

[18] By allowing all parameters to be time-varying leads to an estimation of a large number of parameters depending on the VAR structure, which consequently reduces the number of observations usable for the estimation of the regime dependent parameters.

[19] The ordering of variables do matter in the cholesky decompositions while it does not have any relevance in GIRF.

The null hypothesis of no unit root is rejected at their levels for GRWTH, FINFL, and FINFM by the ADF and PP tests. In the presence of a structural break, when the alternative hypothesis of "stationary" is true and the structural break is ignored, the power of the non-stationary decreases. To overcome this issue, the study has applied ZA sequential one trend break model to inspect the order of integration of the selected variables. The results of ZA unit root test do reject the null of a unit root at their levels for all the selected variables. Thus, these variables are stationary and integrated of the same order, i.e., I (0).

Table 3. Results of Unit Root Tests

Variables			ZA test		Decision
	ADF test	PP test	Break Point	Test statistic	
GRWTH	-3.42**	-4.91***	2008M07	-5.62***	I(0)
INFLA	-2.36	-2.08	2008M03	-4.88**	I(0)
REPO	-2.42	-2.16	2011M03	-3.64**	I(0)
LENDR	-1.40	-1.35	2010M08	-3.60***	I(0)
BANCR	-2.52	-2.46	2004M08	-4.90**	I(0)
MSUPL	-2.37	-2.39	2006M02	-4.16**	I(0)
FINFL	-3.19**	-3.83***	2011M02	-5.24***	I(0)
FINFM	-3.15**	-4.23***	2011M02	-5.74***	I(0)

Note: *, **, and *** shows significance levels at 10%, 5% and 1% respectively. ADF: Augmented Dickey–Fuller; PP: Phillips–Perron; ZA: Zevot–Andrew.
Source: Authors computation

After verifying the stationary properties, the distributional pattern of the selected series is investigated using the BDS test proposed by Broock et al (1996). It is used to check the spatial independence and non-linear structure of a time series. It can be applied to verify whether a time series is an independent and identically distributed process. Results of the BDS test show the rejection of the null hypothesis of independent and identical distribution for all the selected variables at a one percent significance level (Table 4). Thus, it implies that there is a presence of non-linear structure in all the selected variables, i.e. economic growth, inflation, the repo rate, bank credit, lending rate, money supply, and proxies of financial frictions. It justifies using MS-VAR methods for empirical analysis.

Table 4: The Results of BDS Tests

Variables	m→	2	3	4	5	6
GRWTH	ε_{GRWTH}	0.092	0.167	0.211	0.234	0.248
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
INFLA	ε_{INFLA}	0.168	0.284	0.359	0.408	0.439
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
REPO	ε_{REPO}	0.195	0.319	0.395	0.441	0.465
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LENDR	ε_{LENDR}	0.199	0.337	0.431	0.493	0.534
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
BANCR	ε_{BANCR}	0.162	0.272	0.345	0.389	0.415
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
MSUPL	ε_{MSUPL}	0.155	0.265	0.342	0.389	0.418
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FINFL	ε_{FINFL}	0.129	0.217	0.268	0.296	0.308
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FINFM	ε_{FINFM}	0.128	0.213	0.261	0.286	0.297
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Note: The entries are BDS test statistics and the figures in the parentheses are p-values. The parameter m is the embedding dimension and ε is epsilon values for close points.
Source: Authors computation

5.2. Preliminary Analysis using The SVAR Model

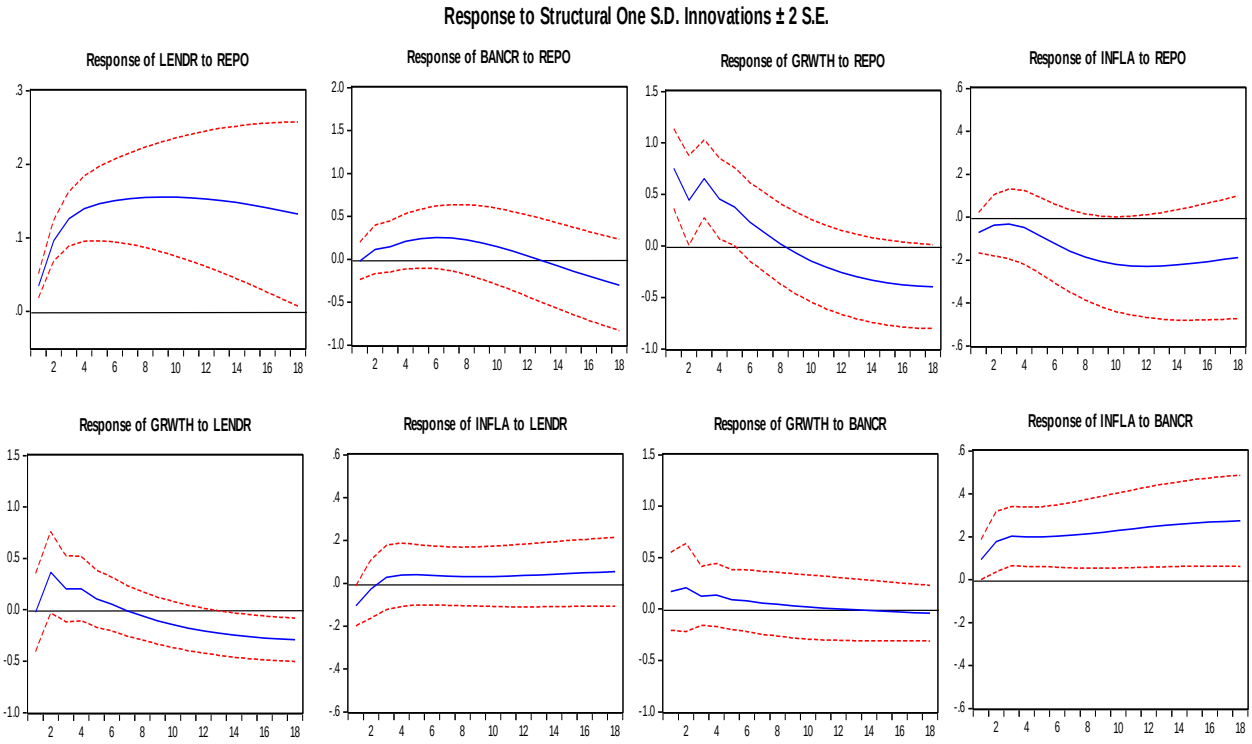
As discussed in the introduction, a preliminary analysis is carried out using the SVAR methodology.[20] The Impulse Response Functions (IRFs) are presented over 18-period (months) horizons allowing the lagged transmission mechanism (Figure 3). The effects of structural shocks on the endogenous variables can be traced by using the IRFs. The optimum lag of two for the SVAR model is chosen by following the Akaike information criterion (AIC), Final prediction error (FPE), and Hannan-Quinn information criterion (HQ).[21]

The results in figure-3 show that one standard deviation shock to the repo rate has a positive and significant impact on the lending rate and such impact is also persistent for a longer period. However, a shock to repo rate on bank credit has a negligible impact and after almost one year it has an adverse impact on it. Similarly, a shock to the repo rate on growth shows a negative response after nine months period. The impact of the repo on inflation is negative but insignificant. The IRF result also shows that a shock to the lending rate has a negative impact

[20] We have also performed the simple VAR analysis and the results are almost similar and can be available from authors. We have performed granger causality test to detect more exogenous variables and accordingly the ordering of the VAR is fixed based on the results. The results can be obtained from authors.
[21] The results of lag selections can be available from the authors.

on economic growth after six months but it takes almost one year to have a significant negative impact on economic growth. A shock to the lending rate does not have any significant impact on the inflation rate. However, one standard deviation shock to bank credit has a positive impact on the inflation rate while it has a very negligible impact on economic growth. Therefore, it is found that the results of SVAR analysis are ambiguous especially the channels through which a shock to policy rate affects the economic growth and inflation rate. Does the linear specification of the SVAR model unable to capture the MTM? Is there any regime specific behavior attached to the MTM in India? These are some issues that are addressed in the next section using MS-VAR, a non-linear method, with other crucial factors.

Figure 3: Impulse Response Function of the SVAR



Note: Repo: Repo rate; LENDR: lending rate; BANCR: Bank credit; GRWTH: Economic growth; INFLA: Inflation rate.
Source: Authors computation

5.3. The MS-VAR Results

After a preliminary analysis using the SVAR approach, the MS-VAR results are presented in this section.[22] In this study, it would be interesting to verify the differences in the reactions of selected variables to a shock to policy rate among different regimes. The state-dependent analysis requires the specification of the MS-VAR model with parameters that vary across

[22] The results of BDS test confirmed the presence of non-linear structure in the selected series. Thus, this method is applied to check the regime specific behaviour of the selected variables.

regimes. We have chosen a regime dependent variances and autoregressive coefficients, i.e., MSAH (2)-VAR (1) as our objective is to verify the differential impact of policy shock across regime. The lag length p=1 of the MS-VAR is chosen based on the Schwarz Information Criterion (SIC).[23] We have chosen two regimes to identify high and low volatile regimes. The estimation results of the selected MS-VAR models are reported in Table 5. The standard deviation for the growth is smaller (8.79) in regime-1(R1) than the standard deviation in regime-2(R2) (14.09).[24] Thus, R1 is considered a low volatile state while R2 is treated as a high volatile state in this study. Generally, the coefficients of autoregressive parameters of the MS-VAR cannot clearly describe the complicated dynamic relationships in the system. Therefore, in the next section, the impulse response functions are considered to trace the response of the endogenous variables to any shocks in the system. The chosen model proves its robustness by the negative log-likelihood value and positive AIC/SBC values.

The matrix of transition along with constant expected durations are reported in Table 6. Here, P11 refers to the probability of staying in R1, while P22 shows the probability of being in R2. Similarly, P12 implies the transition probability from R1 to R2, while P21 is the transition probability from R2 to R1. It finds that the transition probability of staying in a low volatile state (P_{11}) is 81%, which confirms that R1 is quite persistent. Similarly, the transition probability of staying in a high volatile state (P_{22}) is 57%. Thus, it implies that a high volatile state is less persistent than a low volatile state in India. The result also shows that the series switch from R1 to R2 is only 19% while the transition probability of moving from R2 to R1 is estimated as 43%. Therefore, the probability of switching from a highly volatile state to a low volatile state is much higher than the low to high volatile state in India. As per the results, the average expected duration of being in the R1 is more than 5 months while that for R2 is less than 2 & a half months. It has an interesting implication that suggests once the Indian economy enters the low volatile state, it is more likely to remain in this state for a longer period, and there is a larger tendency to move from a high volatile state to a low volatile state in India. The IRF results of the selected models are presented in the next section

[23] The MS_VAR model is extremely computationally intensive as an increasing the number of lags lead to a substantial increase in parameters. Due to small number of observations, the MS-VAR model with lag 2 cannot estimate the parameters across regimes.

[24] After considering financial fricitons1, we have also got similar conclusions regarding the Regimes.

Table 5: MS-VAR VAR based on MLE results

	MS-VAR without Financial Friction		MS-VAR with Financial Friction1	
Regime 1	**GRWTH**	**INFLA**	**GRWTH**	**INFLA**
REPO(-1)	-0.77	-0.15	-0.53	-0.05
	[-1.78]	[-1.56]	[-1.67]	[-0.61]
LENDR(-1)	0.43	0.20	-0.26	0.11
	[0.72]	[1.63]	[-0.39]	[0.84]
BANCR(-1)	0.07	0.01	0.02	0.01
	[1.10]	[0.55]	[0.22]	[0.31]
MSUPL(-1)	0.20	0.06	0.12	0.03
	[1.39]	[1.86]	[1.08]	[1.08]
GRWTH(-1)	0.72	0.00	0.69	-0.01
	[11.81]	[-0.26]	[11.38]	[-0.54]
INFLA(-1)	-0.16	0.90	0.01	0.93
	[-0.88]	[22.82]	[0.04]	[23.91]
SIGMA-GRWTH	8.79		8.00	-0.12
	[5.78]		[8.67]	[-0.68]
SIGMA-INFLA		0.60		0.56
		[6.99]		[8.62]
Regime 2				
REPO(-1)	0.42	-0.23	0.23	-0.20
	[0.85]	[-2.42]	[0.41]	[-1.79]
LENDR(-1)	-0.12	0.20	-0.59	0.14
	[-0.26]	[2.07]	[-1.14]	[1.38]
BANCR(-1)	0.18	-0.01	0.22	-0.01
	[1.12]	[-0.36]	[1.40]	[-0.34]
MSUPL(-1)	0.00	0.13	-0.12	0.11
	[0.00]	[3.22]	[-0.59]	[2.78
GRWTH(-1)	0.66	-0.02	0.62	-0.02
	[5.55]	[-0.84]	[5.07]	[-0.82]
INFLA(-1)	-0.24	0.89	-0.18	0.91
	[-1.05]	[20.14]	[-0.80]	[20.79]
SIGMA-GRWTH	14.09		14.15	
	[6.04]		[5.99]	
SIGMA-INFLA		0.53		0.54
		[6.05]		[5.99]
Common Coefficients				
C	-1.46	-1.77	7.09	-1.20
	[-0.22]	[-1.37]	[0.83]	[-0.71]
FINFL			-0.29	0.08
			[-0.68]	[0.87]
Transition Matrix Parameters				
P11-C	1.438[7.32]		1.44[7.31]	
P21-C	-0.283[-1.19]		-0.27[-1.14]	
Diagnostic Statistics				
Resid covariance	0.011		0.010	
Log likelihood	-81.04		-173.19	
AIC/SBC	1.71/3.50		2.52/4.38	
Number of coefficients	123		128	

Note: Authors Estimates. Figures indicated in parenthesis are Z-statistics

Table: 6 Transition probabilities and expected duration matrix

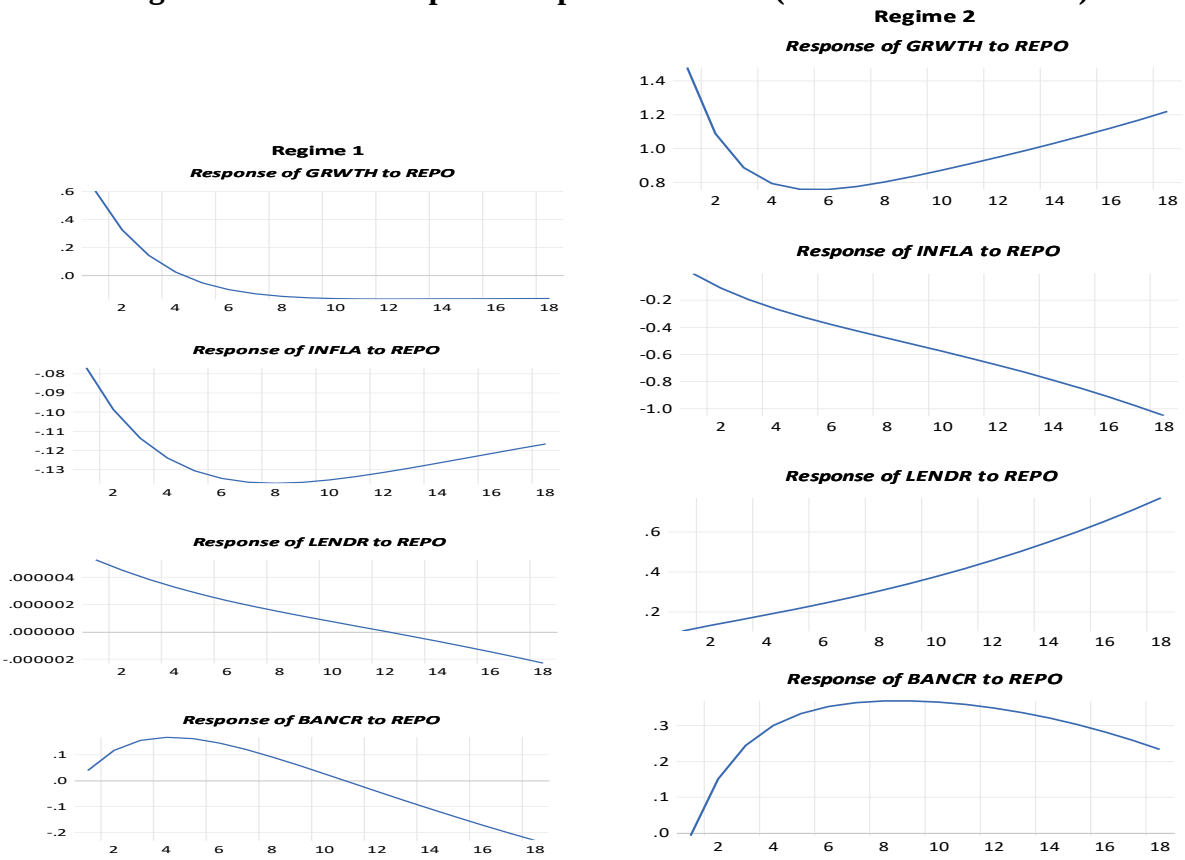
MS-VAR without Financial Friction				MS-VAR with Financial Friction1			
	Regime 1	Regime 2	Duration		Regime 1	Regime 2	Duration
Regime 1	0.81 (P_{11})	0.19 (P_{12})	5.21	**Regime 1**	0.81 (P_{11})	0.19 (P_{12})	5.22
Regime 2	0.43 (P_{21})	0.57 (P_{22})	2.33	**Regime 2**	0.43 (P_{21})	0.57 (P_{22})	2.31

Note: Authors own calculation. P11…P22 are transition probabilities.

5.3.1. MS-VAR Impulse Response Function

The IRF results of MS-VAR specifications are presented at three stages. First, the IRF of the base MS-VAR is presented (Figures 4 & 5). Then, the IRF of MS-VAR with financial frictions ((Figures 6, 7, 8, and 9) is discussed. Finally, the IRF of MS-VAR with demonetization (including financial friction) is analyzed for understanding the MTM in India (Figure 10 & 11).

Figure 4: MS-VAR Impulse Response Function (Innovations to REPO)

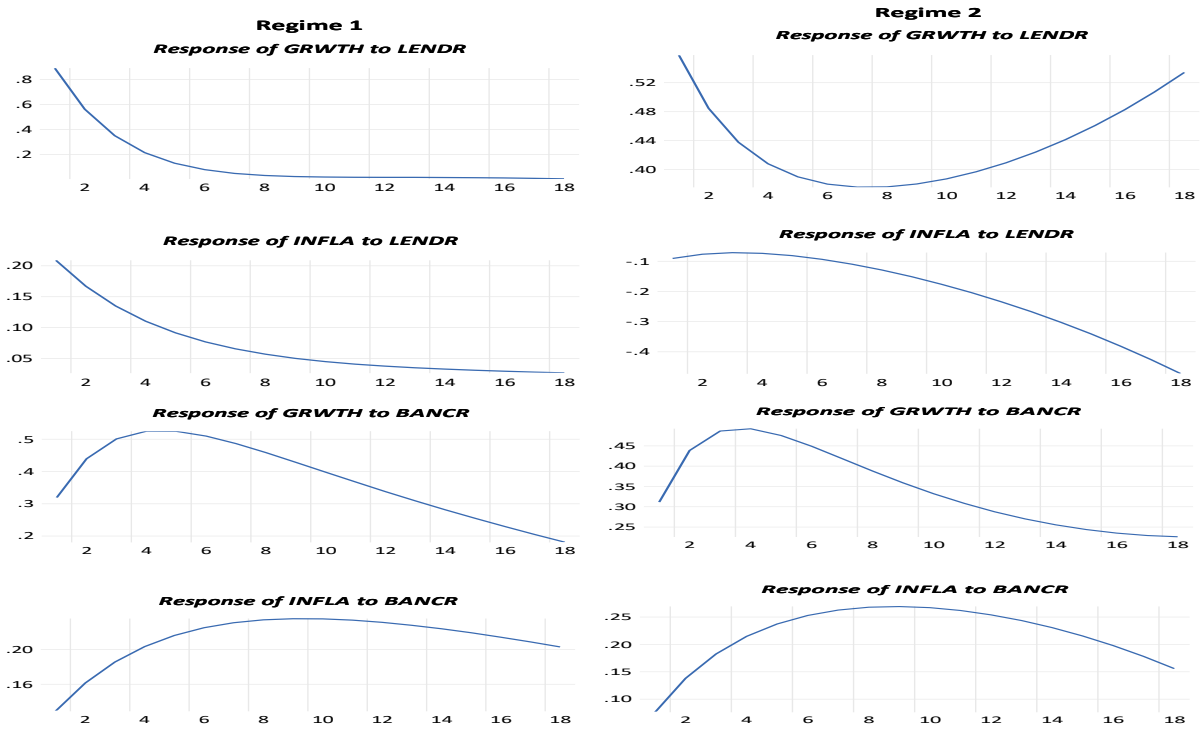


Source: Authors estimation

The results of figures 4 & 5 (without financial frictions) show that a shock to the policy rate has an adverse impact on the inflation rate in both low (R1) and high volatile (R2) periods.

However, it has a persistent effect on inflation in the R2. On growth, the adverse impact is felt after the 5th period and the peak impact is felt after 1 year in R1. In R2, the impact on growth is ambiguous. Similarly, the policy rate has a positive impact on the lending rate in both the regimes and a negative impact on bank credit after 11 months in the R1 while its impacts on R2 are not clear. The response of growth and inflation to the lending rate is ambiguous though declining in both regimes. The shock to the lending rate on inflation is persistent in R2. However, a shock to bank credit has a symmetrical positive impact on both growth and inflation in both regimes. Thus, the results without controlling for financial frictions suggest that the bank lending channel is at best ambiguous. In the next step, we introduce financial frictions in the model and the results are discussed below.

Figure 5: MS-VAR Impulse Response Function (Innovations to LENDR and BANCR)



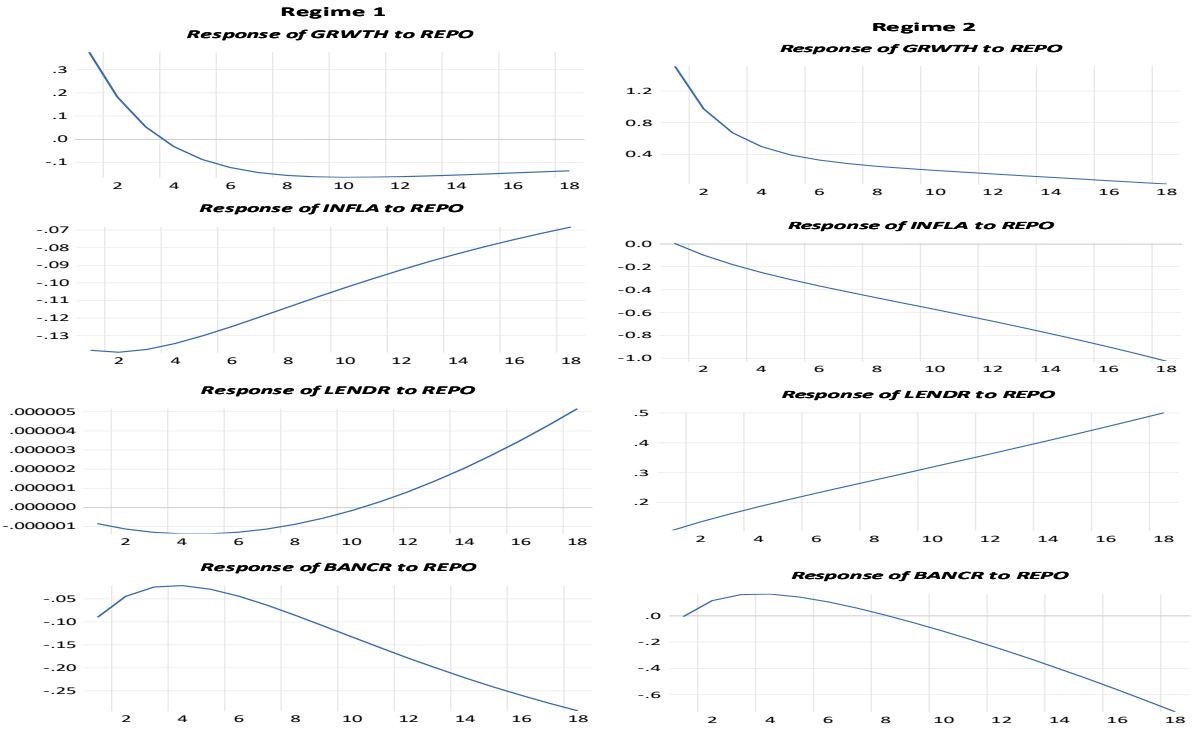
Source: Authors estimation

5.3.2. Does Financial Friction Matter for MTM?

Financial frictions generate costs due to information asymmetry, especially in the credit markets. It is studied as collateral constraint, agency problem, external finance premium, credit constraint, etc. in the literature. As discussed before, financial market frictions play a dominant role in determining the nature and degree of pass-through of the monetary shocks in an economy. Acharya (2017) identified some factors like a large segment of the financially

excluded population, collateral constraints, administered interest rate structure on small savings, a high share of liabilities on fixed interest rate deposits, high Statutory liquidity ratio (SLR), low-quality assets, and unexpected loan losses in bank credit portfolios that could lead to frictions in the Indian economy. Therefore, the crucial question is how does the presence of financial frictions affect the conduct of monetary policy transmission in India, which, in this section, we try to examine. However, it is very difficult to find a suitable measure for capturing financial friction due to its wide scope. Following Hall (2011), financial friction is computed by using the term spread between the short-term and long-term bond yields. Following this and for the robustness check, here we use two separate financial frictions, i.e, FINFL, and FINFM.[25] A larger spread implies the degree of financial friction is higher. The results of MS-VAR models adding financial frictions as an exogenous variable with the previous models are presented in Figure 6 to Figure 9.

Figure 6: MS-VAR Impulse Response Function with Financial Friction1 (Innovations to REPO)



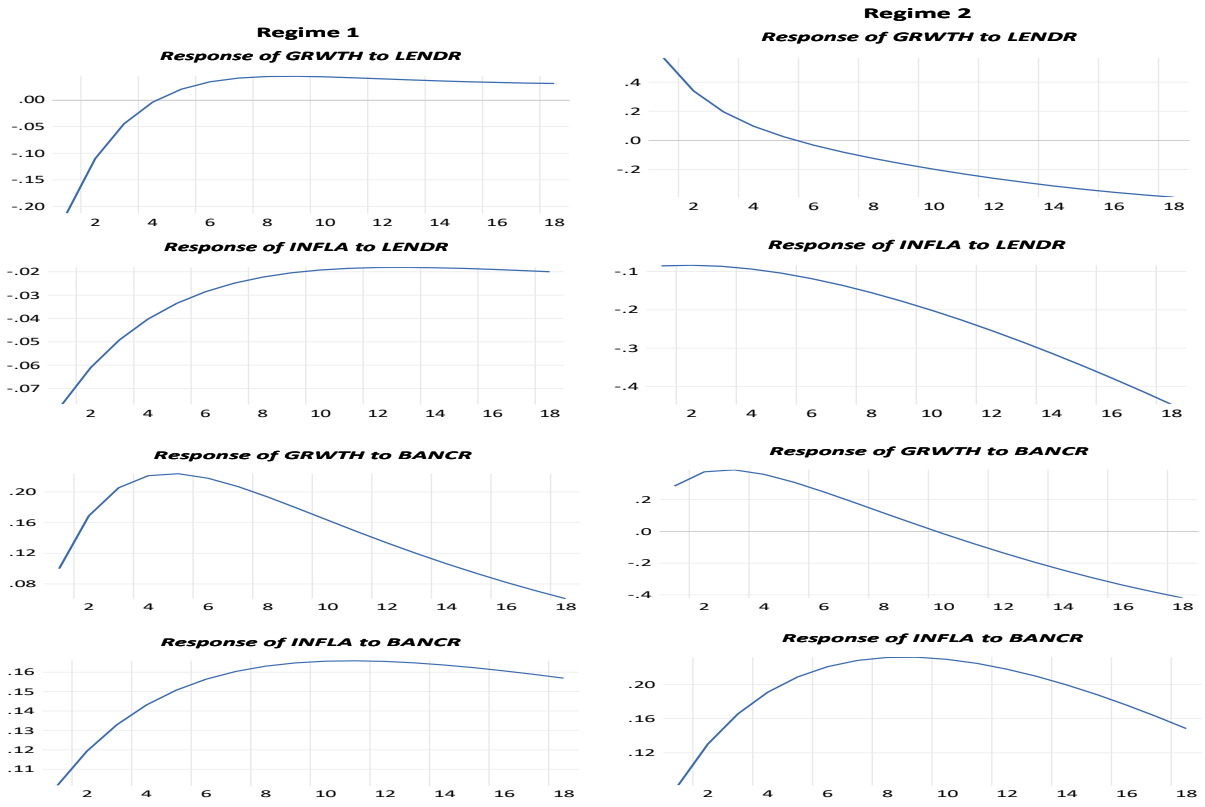
Source: Authors estimation

After controlling financial friciton1 in the model (Figure 6 & Figure 7), we find that the policy rate has a negative impact on inflation in both the regimes having a greater impact in

[25] See section 4.2 for their description.

the highly volatile period. The adverse impact on growth is felt in the 4th month in the low volatile period while the adverse impact is less severe in the highly volatile period. The lending rate does respond to policy rate positively in both regimes with a sharper impact felt in R2 than R1. Bank credit decreases in response to the policy rate in both regimes. It has a more adverse impact on R2. It further shows that a shock to the lending rate leads to a reduction in both growth and inflation in both regimes having a much severe impact in the highly volatile period. However, a positive shock to bank credit has an almost symmetrical positive impact on growth and inflation in both regimes. The peak impact on growth arises around 4-5 months while on inflation, it is felt after 9-11 months. Thus, by controlling financial frictions in the model, the degree of transmission has enhanced and the bank credit/lending channel is stronger.

Figure 7: MS-VAR Impulse Response Function with Financial Friction1 (Innovations to LENDR and BANCR)

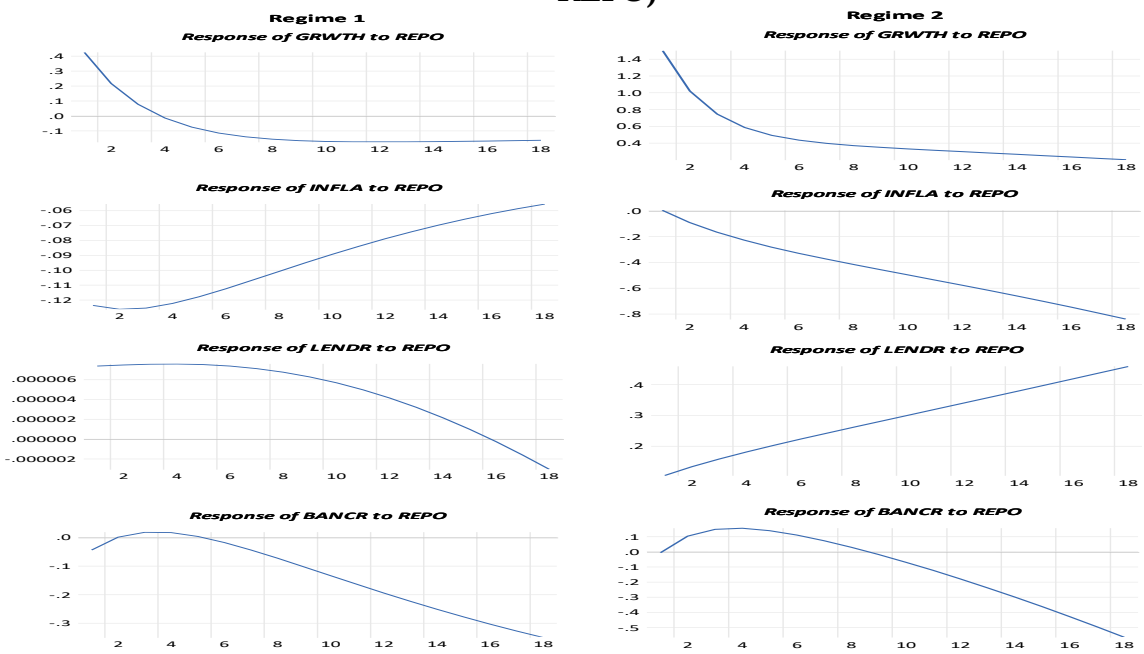


Source: Authors estimation

For checking the robustness of our findings, the second proxy of financial friction, i.e., financial friciton2 is used in our base MS-VAR model. The IRF results are plotted in Figures 8 & 9 and may be noted that the results are almost similar to earlier discussed results. For example, a shock to policy rate has an adverse impact on growth, inflation, bank credit while it has a favorable impact on the lending rate. Similarly, bank credit has a positive impact on

growth and inflation while the lending rate has a negative impact on growth and inflation. The overall MTM process is more persistent in the highly volatile period than the low volatile period.

Figure 8: MS-VAR Impulse Response Function with Financial Friction2 (Innovations to REPO)

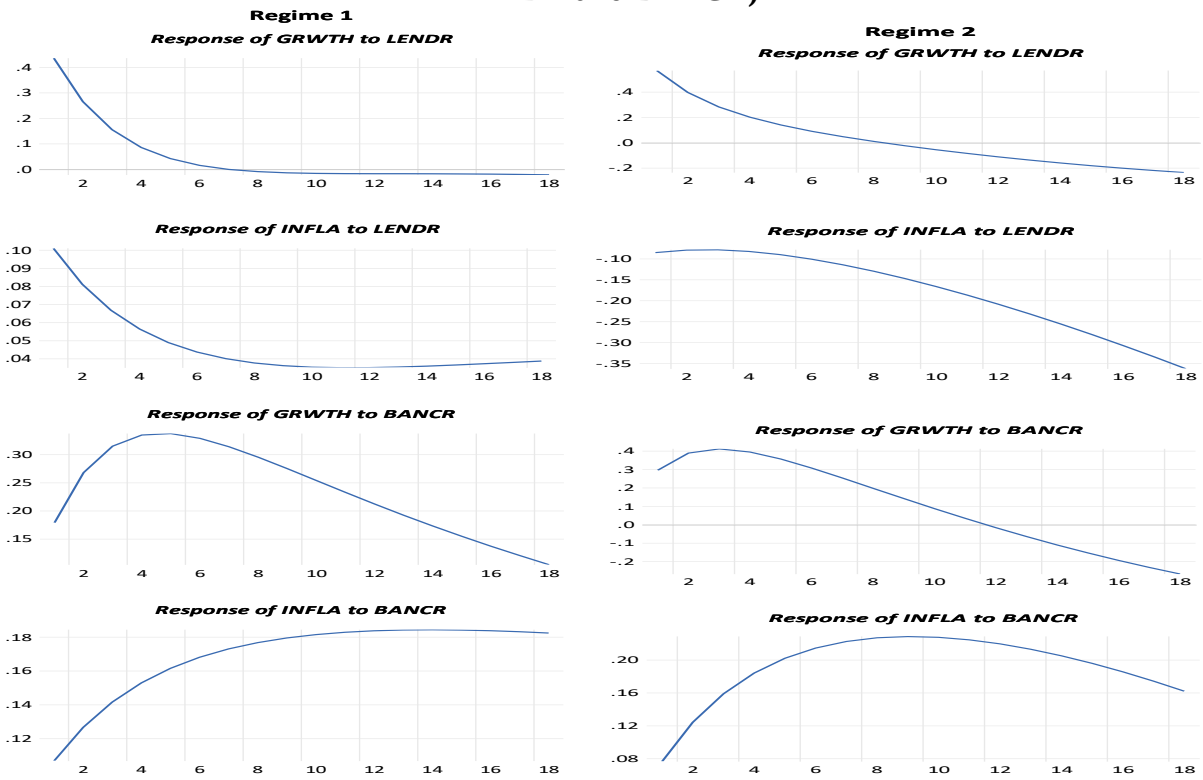


Source: Authors estimation

5.3.3. Robustness Check with Demonetisation Shock

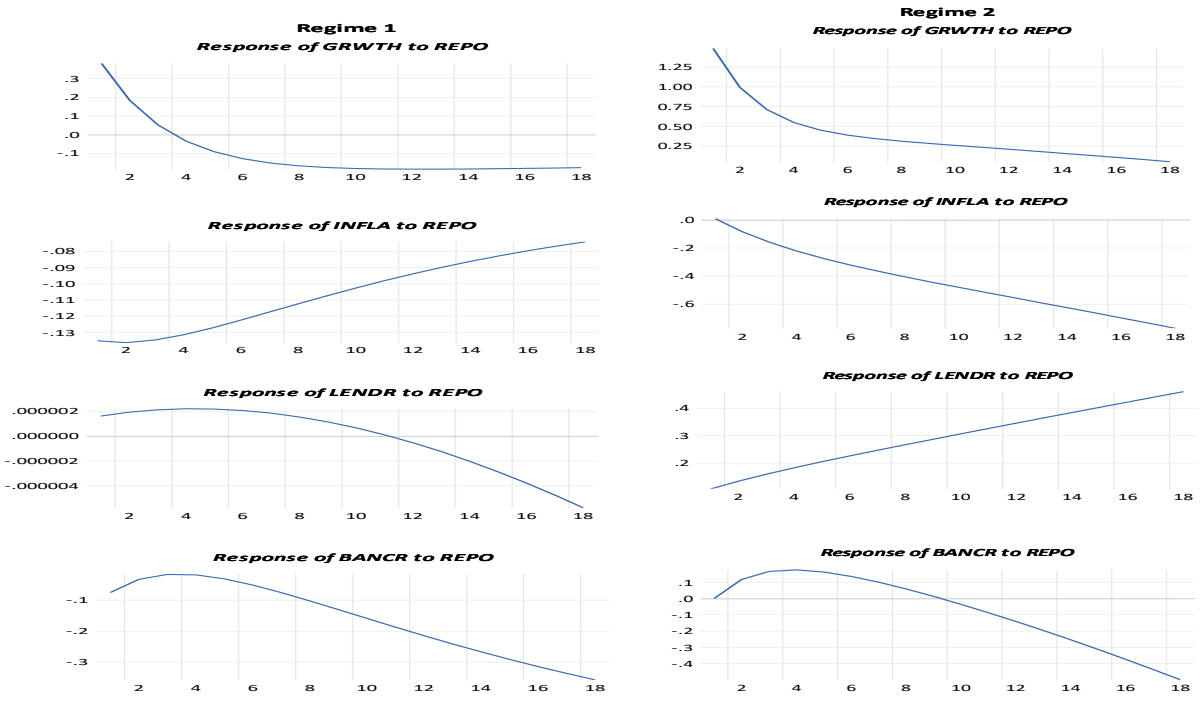
Further, for a better understanding of the complex process of the MTM and also for checking the robustness of our findings, we have controlled the model with demonetization along with the financial friction added in the MS-VAR model. Demonetisation was a major monetary policy shock that affected the Indian economy in the recent past (in 2016). Thus, by controlling it, we would like to understand how the MTM process responds because of demonetization. The impulse response plotted in Figures 10 & 11 suggests that the adverse impact on growth is felt in the 4th period and the peak impact is observed in the 12th period in R1. Inflation starts falling after 1-2 periods of lag and its effect persists for a long period having a higher adverse impact in the high volatile regime. A shock to policy rate tends to decline bank credit in both regimes although it takes a long lag in the highly volatile regime. The lending rate tends to increase due to a shock in the policy rate in the R1 up to one year while it persists for a longer period in the R2. Shock to lending has a dampening effect on growth and inflation with a certain lag. As previously found, bank credit has a symmetric positive impact on growth and inflation in both regimes.

Figure 9: MS-VAR Impulse Response Function with Financial Friction2 (Innovations to LENDR and BANCR)



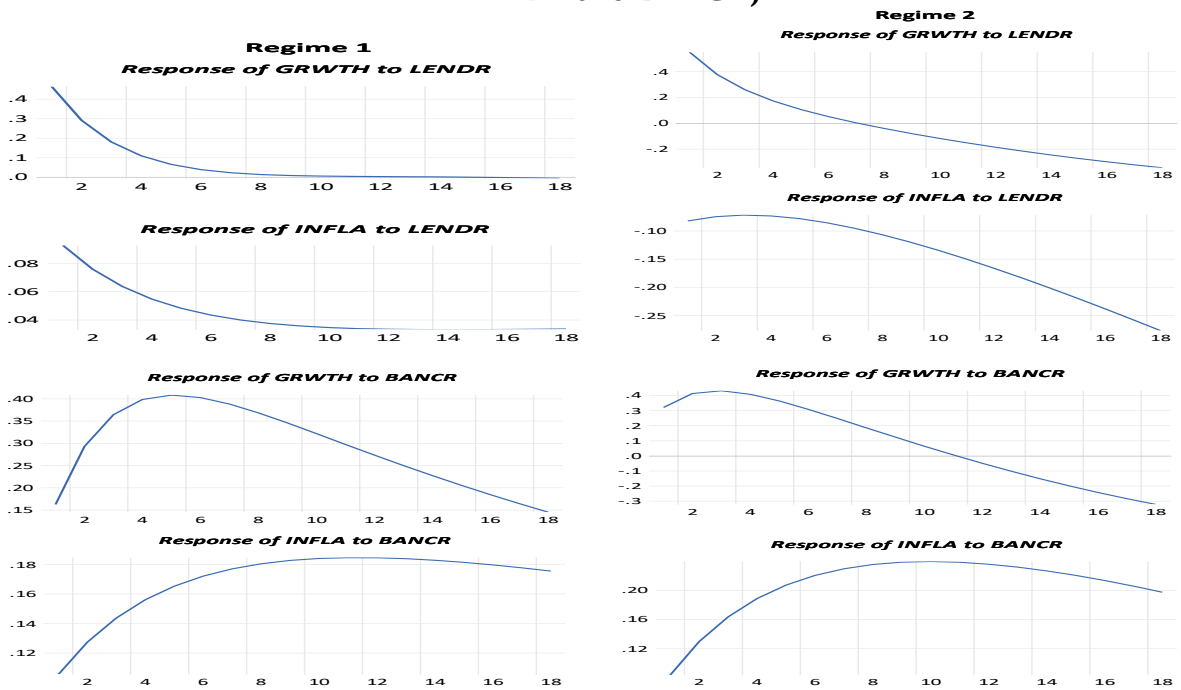
Source: Authors estimation

Figure 10: MS-VAR Impulse Response Function with Demonetisation (Innovations to REPO)



Source: Authors estimation

Figure 11: MS-VAR Impulse Response Function with Demonetisation (Innovations to LENDR and BANCR)



Source: Authors estimation

Overall, our results support the earlier findings that in India both interest rate and bank credit channels of the monetary transmission mechanism are valid. However, unlike other studies, these findings are more robust when different regimes are introduced in the analysis. After controlling for financial frictions, the transmission process appears to be effective and smooth in affecting both output and inflation. Further, our results suggest that the effect of policy rate on inflation rate is stronger and quicker in a high volatile period than in a low volatile period. Its impact on growth, although relatively weak, faster in a low volatile period. Bank credit has a symmetric impact on both growth and inflation in both low and high volatile periods. The transmission of shock to lending rate on inflation takes a longer period in a high volatile period than in low volatile period. As a robustness check, after introducing the demonetisation effect into the model, our results were found to be almost similar. To sum up, it is necessary to understand that there are clear non-linearities with respect to understanding the effectiveness of various channels of the monetary transmission mechanism. And, further, while targeting growth and inflation, monetary authorities do also need to keep financial frictions under control to reduce its policy transmission lags. Besides, our results also suggest that during the high

volatile period, the central bank could target inflation more effectively than the output and during the low volatile period, it could target output more rather than focusing on inflation.

6. Conclusion and Policy implications

The effectiveness of monetary policy in achieving the macroeconomic objectives of managing inflation with stable output depends on the strength of monetary policy transmission as well as the understanding of channels through which such objectives could be achieved. However, the working of various channels could depend on the size and depth of financial markets as well as the structure of the economy. Given that the validity of transmission channels is time-varying, here in this paper, an attempt has been made to understand the working of the monetary transmission mechanism in India by introducing non-linearities as well as financial frictions in the analysis. With the help of a Markov Switching-VAR model and by using monthly data since the beginning of the year 2000, this paper finds the presence of interest rate as well as the bank credit channel in India. Further, the analysis suggests there exist some non-linearities with the effectiveness of monetary policy differs with the extent of volatility. In a high volatility regime, the effect of interest rate shock on inflation appears to be higher and faster compared to a low volatility regime. Similarly, the effectiveness of monetary policy appears to be higher when there are less financial frictions.

Our results suggest that as the validity of channels of transmission of monetary policy shocks to the real economy is time-varying, there is a need to assess this issue on a regular basis. Further, to make the transmission effective, it is important to minimize the financial frictions in the economy. In this paper, we have considered only one measure of financial friction. However as discussed earlier, there are various ways to define financial frictions and those could be considered while this study is extended. As the literature suggests for other channels such as the exchange rate channel, expectations channel, and asset price channel, this study could also be extended by considering these additional channels. In terms of the policy, our results help in understanding the limitations as well as conditions under which the monetary policy transmission could be effective in India. While during the high volatile period the RBI could target inflation, it could have limitations in affecting output growth. However, the RBI measures could have a positive impact on output during a less volatile period. In sum, while the RBI could continue to target inflation, to make the monetary policy more effective, the ensuring of the stability of financial markets could significantly complement the policy transmission.

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