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Deciphering India's Monetary Policy Transmission: A Structural VAR Perspective

Dr. Yateesh Dubey
Assistant Professor, Department of Economics D.A-V. College, Civil Lines, Kanpur
Email: yateeshdubey9@gmail.com
&
Dr. Syed Mohd. Shahzeb
Assitant Professor, IILM University, Greater Noida
Email: syeds6173@gmail.com

Abstract

The question of how monetary measures disturbs the real variables in an economy is still an unsettled question for both researchers and policy makers. Central bank does frame the monetary measures to attain ultimate objective of the policy in terms of economic growth and stable inflation. This study has been taken out to analyse the efficacy and relative efficiency of various channels of monetary measures transmission in India along with their consolidated consequences on real activity in the post-reform period. By using monthly data from 1991M03 to 2019M03 (time series) and tried to examine the lag structure of monetary impulses on different real and financial variables by relying on structural vector auto-regression (SVAR) model. The findings suggest that tightening of monetary policy adversely affect the investment & lead to a decline in output growth of industry. The empirical results also reveal the positive response of inflation to interest rate, that is, a contraction in monetary policy turn in an increase in inflation, which holds up the existence of 'price puzzle' in the Indian economy. With regard to transmission channels the interest rate passage has found dominant in impacting production and prices, which is well supported by the credit channel. However, both the channels support the existence of strong 'price puzzle'. There is evidence of an active exchange rate channel as well. Appreciation of the exchange rate driven by monetary policy lowers oil prices and lowers the cost of importing industrial inputs, which increases the growth of industrial output. Furthermore, a greater exchange rate raises the market's supply of currency, which eventually fuels inflation.

Key Words: Monetary Policy, Monetary Transmission Mechanism, Structural VAR

1. INTRODUCTION

Whether or not monetary measures has an impact on the real variables of an economy is still an unresolved issue for researchers and policymakers. The apex bank does describe the monetary measures in order to attain the final goal of the "policy in terms of" stable "inflation and economic growth; central banks" provide or withdraw reserves from the banking system by controlling the monetary base and shortterm interest rates in the national wealth (economy) (Das, 2015). Whether or not an increase in interest rates and liquidity operations achieve their intended result depends on how the monetary transmission mechanism is functioning in the economy. The "Monetary Policy Transmission describes how policy-induced changes in one or more monetary instruments (e.g., the short-lived nominal interest rate or the nominal Currency in circulation (MS)) affect the real variables aggregate output and inflation.

The classical economists held the classical dichotomy and do not allow any effect of monetary variables on variables like GDP (output) and employment and only say that in case of any change in MS there will be the proportional change in wages and prices. Monetarists, in contrast, are champions of long-run money neutrality. However, They note that short-run impacts of nominal disturbances on prices and real economic variables are core insights of monetarist economists' macroeconomic theory and underlie monetary policy. The New Keynesian framework also favors the short-run efficiency of monetary policy.

In general, the monetary flow mechanism in an economy is largely conditioned by the monetary policy framing, financial system development and structure and condition of the real economy. While extensive empirical literature is available on

transmission mechanisms in developed economies, relatively few empirical studies have studied the same for developing economies. Rapid changes in the economy's structure and underperforming financial markets may be the cause. However, because of structural changes, economic reforms, and the ensuing adjustment to market-oriented regimes, the study of monetary transmission mechanisms in emerging economies—including India—has lately gained prominence.

Any monetary policy's successful deployment relies on its effects on the economy being accurately estimated, including the time span by which the monetary authority must assess the instinct of the monetary measures as inculcate in the nation wealth. Through the available policy tools RBI has to balance multiple policy objectives like economic growth, price stability and curb the exchange rate volatility. This means that the effectiveness of the policy depends on the time span through which the monetary measures affects the actual economy. The exact size and timing lag - short-lived and long-run effect on the economy remains a matter of debate between academicians and policy-makers. Hence, there is an urge for strong and reliable empirical modelling that would allow addressing the diverging opinions in this debate.

Though several new studies are attempting to analyse the problem of monetary transmission in Indian economy context empirically, the literature on the subject is still in its infancy. Most, however, engrossed on studying a specific channel of the pass-through of monetary measues and were consequently inadequate in scope. The impact of policy interest rates, set by the RBI, on real economy and price level continue to be an open question for scholars and government officials. Using a monthly structural VAR technique, this study provided empirical evidence of the transmission of Monetary measures.

This study has been undertaken with a view to capturing and analysing the effectiveness and relative efficiency of dissimilar channels of Monetary measures(policy) pass-through in India and their composite effect on real activity in the post-reform era. Utilising 1991M03 to 2019M03 time-series data, we made an effort to understand the lag structure between monetary impulses and various real and financial variables using the structural vector auto-regression (SVAR model. The analytical framework used assist us to study the impulse response of the macroeconomic variables because of the 'shock' in monetary channels and also estimated the variance decomposition analysis to capture the variable variation.

This paper is further organised in such a way. Section 2 presents an outline of the monetary policy transmission mechanism concept and some associated conceptual issues. Section 3 reviews the related literature, comprising both the theory and empirical evidence in the context of the Indian economy and international perspective, and contributes to the literature of present analysis. In Section 4, Data Analysis, Methodology and Econometric Specification have been endowed. The empirical analysis results derived and their discussions have been bringing up in Section 5. The inference drawn from the analysis has been provided in section 6. Finally, section 7 deals with the conclusion of the study.

2. Monetary Policy Transmission Mechanism: Theoretical Underpinning

The pass-through mechanism of monetary measures to real macroeconomic variables has centre of enormous interest to the economic researchers and policymakers. The term "monetary measures transmission" describes the mechanism by which monetary measures decisions disturb the nation wealth as a whole and the level of prices specifically. The monetary transmission mechanism is often referred to as the famous 'black box[1]' because the various transmission channels can work simultaneously, and also they change over time; consequently, the influence of monetary measures on output and inflation is not certain and precise. There is always indecisiveness about the effect of monetary policy on the real economy and the process of the transmission mechanism.

One way to pursue an effective monetary policy is through a set of policy measures. RBI, Being the apex bank, RBI has multiple policy instruments. Cash Reserve Ratio (CRR) is one of the tools to control the liquidity in the economy and RBI increase it to control by absorbing excess liquidity the inflation levels. The statutory liquidity ratio (SLR), likewise, can likewise be settled on to lessen inflationary weight through speculation Sun (Islam and Rajan, 2011). When the repo rate increases, the banks will have to pay you more for borrowings from RBI. Reverse repurchase rate serves exactly

[1]First used by Bernanke and Gertler (1995).

opposite purpose where increase in reverse repo rate increases the cost to banks of keeping excess funds with RBI, and when combined these rates together helped in curbing inflation. Some other key policy instruments including the bank rate and the open-market operations were also put into effect by the RBI to mop up the liquidity prevailing in the markets.

The RBI's goals have expanded beyond simply controlling inflation to include the ability to intervene in the foreign exchange market due to these multifaceted dynamics and the Indian economy's increased exposure to the world through various liberalisation guidelines. The RBI has a managed floating exchange rate system in place since 1993 and intervenes in the exchange market since its financial liberalisation and to curb severe exchange rate fluctuations. One of the causes of exchange rate volatility is oil price shock, import of gold, monetary stance of advanced economies, etc.

Changes in monetary policy affect the market interest rate in different extents over time, such as bank lending and bank deposit rates. This change in interest rate could lead to the variation in asset prices, which create the wealth effect through the market valuation of financial assets and liabilities as well. The higher rate of interest appreciates the value of domestic currency which induces net exports and consequently enhances the aggregate demand and output. At the same time, statements and policy actions affect the degree of confidence that goes along with predictions about the future direction of the economy.

Regarding the output section, changes in interest rate disturb the behaviour of individuals & firms regarding spending, saving & investment in an economy. In general, higher interest rates promote saving instead of spending while assuming other things being equal. In the same way, the greater worth of the national currency in the overseas exchange market tends to make foreign goods less expensive compared to domestically produced goods, in turn encourage spending. Thus variations in the rate of interest and the rate of exchange both make an impact on the demand of goods and services produced in a country.

On the inflation side, internal inflationary pressure will develop and intensify until the level of demand equals up the domestic supply capacity — in the labour market and in other areas. Also, if there is greater demand for a particular labour than the supply, the wages will tend to go up. These firms will pass the wages my point into the bigger cost passed to the end-consumers. Change in exchange rate in turn impacts the internal price of imported goods and services directly and that of the import competing, as well as imported-input-using goods and services indirectly and also affects the components of aggregate inflation in an economy. Since price stability has been the primary goal of the country monetary authority, there have also been notable changes in the way monetary measures is conducted. With the recent advancements in the monetary theory and policy, the way the responses of real variables and prices in the economy are examined depending on the existing monetary transmission mechanism has changed.

2.1 Monetary Policy Transmission Channels:

These channels frequently synergize in service to the goals of monetary policy. The existing literature is marked by disagreement on topical issues such as the definition of the monetary transmission mechanism; whether individual channels or methods may be considered as strong inducing factors with respect to significant macroeconomic variables or policy targets. These nuances may be the reason why in our dynamic economic environment, any attempt to disentangle the impact of a single channel leads economists to call the monetary policy pass-through a "black box."

The pass-through channels in the literature, such as neoclassical and non-neoclassical channels. The neoclassical channels describe the transmission process through interest rate changes, whereas non-neoclassical channels focus on changes in credit supply. The development stage and the economic financial system determine the mode of functioning of these channels. The literature, traditionally, has identified four transmission passage such as interest rate, credit, asset price and rate of exchange channel, while in recent years, inflationary expectations have been emerged as the fifth transmission channel, which has increased importance in the execution of the forward-looking monetary policy (Mohanty, 2012). A brief theoretical setting of some crucial monetary transmission channels is given below.

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2.1.1 Interest Rate Channel:

The interest rate passage is the conventional unit of policy pass-through of monetary policy, which is known as ›Money View‘ in monetary literature. Well, this Keynesian model gives the interest rate channel through which monetary policy affect real variables of the economy. The most significant instrument of this school to illustrate transmission effectiveness through the interest rate channel is Hicks' (1937) IS-LM model. The variation in the interest rate is a result of a change in monetary policy which in turn affects the investment through the change in the cost of capital and affects the consumption decision. Investment and consumption are key components of the "aggregate demand" of an economy. A decrease in interest rate lowers the real cost of borrowings for all prospects thereby motivating investors to up the investment and aggregate demand in the overall economy. To achieve the ultimate effect of contractionary monetary measures, short-run interest rates can be adjusted. Assuming sticky prices in the short-run, the effect of a change in short-run interest rate will have pre-defined effect on real variables such as investment, employment and national income.

2.1.2 The Credit Channel:

This is an vital part of the monetary passage of transmission, which takes place through central banks and is strongly dependent on financial intermediation. This includes two major transmission passage, namely the bank credit channel (narrow credit channel) as well as the balance sheet channel to (broad credit channel) (Anwar & Nguyen, 2018). Both are complemented to each other. The efficacy of bank credit channels is much higher in bank-dominated economies, while the balance sheet channel works more efficiently in financially developed economies. An expansionary monetary policy allows the banks to disburse more money due to an increase in deposits. This increased disbursement leads to higher investment and consumer expenditure, which really impacts aggregate demand. In contrast, transmission through the balance sheet channel of the credit channel operates in various ways. Expansionary monetary policy increases the firms' equity prices, raising the firm's asset and lowering the possibilities of the borrowers' adverse selection by the banks. In a similar manner, monetary policy transmission can influence the bank's lending decisions through the household balance sheet.

2.1.3 Asset Price Channel:

The flow of monetary policy action into stock prices leading to their effect on the macro variable through the wealth effect and Tobin's 'q' is termed as asset price channel. Yes, expansionary monetary policy makes equity price rise and the higher value of their wealth makes a household better off, wealth induces household, and community consumption and at last boosts the aggregate level of output. It behaves through Tobin's 'q' theory as expansion in monetary policy could lead up higher of the equity prices as compared to the firm's replacement cost which could positively influence the overall market value of the firm.Formulation in Terms of Tobin's q:If we consider through the stick of Tobin's 'q', we could say that:_ Tobin's 'q' value is the ratio of a firm's market value to its replacement cost. When 'q' exceeds 1, that is the market value is greater than the replacement cost, then it is profitable to invest, leading to greater investment and output in the economy.

2.1.4 The Exchange Rate Channel:

The rate of exchange channel is vitally important in open economies in the present age of globalization of economies. Hence, when the interest rate increase, this makes the internal currency unattractive than the international currency. Fall in the value of the domestic currency carryover → exchange rate depreciation This reduction in the value of currency makes exports more competitive and serves as a stimulative factor of the aggregate demand in the economy. If import tariffs are passed to domestic prices, it can also lead to a higher inflation rate due to currency depreciation. Running the other way, an expansionary monetary policy that causes national currency depreciation may surge the company's overseas liability in issues, destabilize the investment and negatively influence the output of the country.

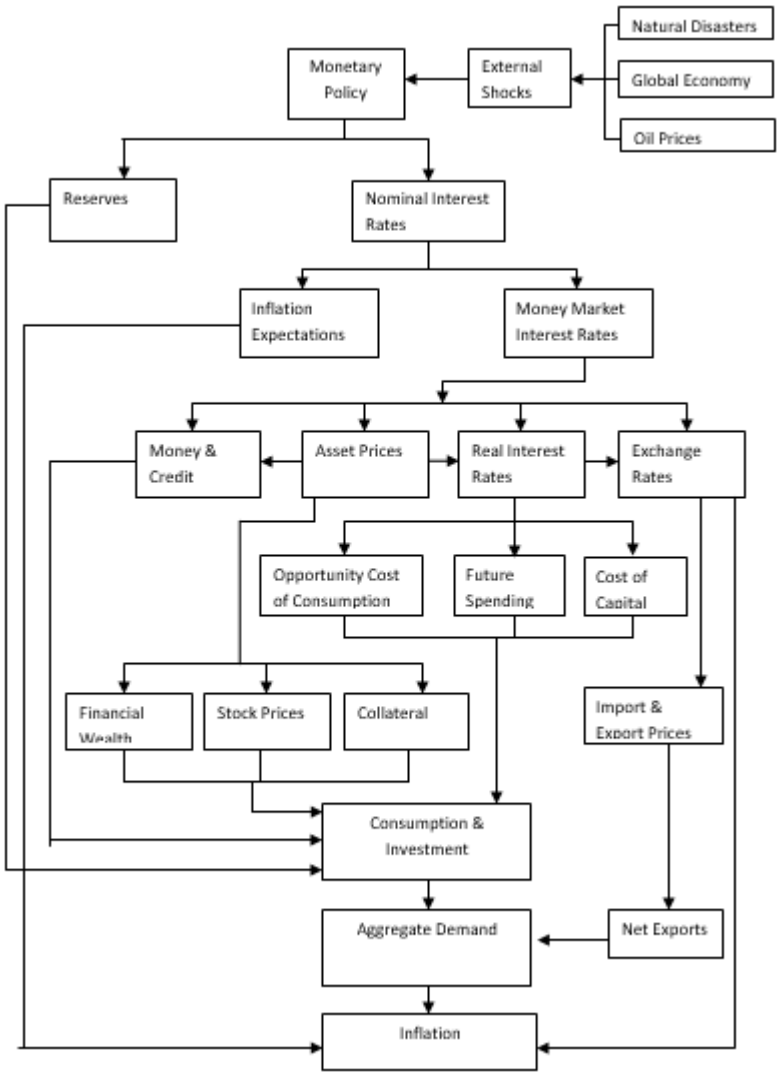
2.1.5 The Expectation Channel:

An additional passage of monetary pass-through that has been previously documented in the literature that we highlight is the expectations channel. The sensible agents in the economy form their prospects based on potential future shocks

and projected future policies of the central banks. In this sense, expectations formation is greatly dictated by the credibility of central banks as earned through commitment to deliver on policy promises. Expectations have become organized based on people's experiences with central banks over the past. If that fails to work to guide real variables, they will not amend their expectations if central banks make policy announcements with no real-world consequences attached. So the effectiveness of the money policy also relies on the beliefs of the public regarding the reliability of the apex bank in the economy.

The above analysis suggests that the monetary policy transmission must go through diverse channels, but these channels do not always operate independently, and have significant feedback and interaction with each other. Nonetheless, the proportional significance of a certain channel may vary depending on the economy. It will depend on the structural characteristic of the economy, such as the degree of monetisation, state of fiscal markets, availability of monetary measures instruments, stance of the fiscal policy and degree of openness. Hence the aggregate transmission of the monetary policy to the macroeconomic variables can be regarded as the joint effects of all these mechanisms of transmissions. The above-mentioned transmission channels in isolation might not describe the monetary transmission mechanism. Thus, it will be more beneficial to unravel the determinants from each specific monetary transmission channel and merge them together to create a macro system which may outline the macroeconomic dynamics first behind monetary transmission.

Figure 1: Different Channels of Monetary Policy Transmission Mechanism



Note: *Authors' compilation based on monetary theories and literature*

Theoretical framework of the monetary pass-through framework in the form of a flowchart (illustrating the relationships between various macroeconomic variables through different channels) is shown in figure 1. This gives a summary of individually transmission mechanism and its effect on key macroeconomic factors like national income and inflation. A transmission of monetary policy shocks occurs along five main passage: interest rate, credit, asset price, rate of exchange and predictions. These channels impact various economic variables and, in turn, aggregate demand and inflation. Besides, the process of transmission emphasizes the relations between variables across the channels, and reflects a dynamic way of working and.

3. Literature Review

Bernanke and Blinder (1992) Arguably, the interest rate on Federal funds is among the most informative variable concerning future adjustments of real macroeconomic variables. Indeed, the funds rate is actually a pretty good proxy of how monetary policy implements monetary action, since the funds rate sensitively captures shocks to the supply of bank reserves. They also stated that the way that monetary policy is conveyed would be better conveyed by funds rate. Monetary policy has effects through these components which, in theory, respond endogenously to monetary policy, because of innovations, hence the types of 'credit' and 'money' in the world.

Taylor (1995) empirically compared the development of monetary policy transmission mechanism models for the last 25 years since Milton Friedman (1970) observedthe monetary policy transmission mechanism. He found substantial progress in various ways. The exchange rate is a key factor for the monetary measures pass-through and analysed explicitly for both fixed exchange rate and flexible exchange rate. Real interest rates and market interest rates are differentiated quantitatively through rational expectations absent in Friedman's statement. He suggested the need for comprehensive study on the role of financial intermediaries and credit may deliver an enhanced version of the empirical framework and better estimate parameters.

Mallick and Sousa (2012) explored the monetary policy transmission for BRICS countries and concluded that monetary policy tightening shock has an intense negative impact on output while such shock is likely to stabilize the inflation in the shortrun. It also produces a strong negative impact on real equity prices and generates an appreciation of the domestic currency.

Kelikume (2014) tested the stickiness of interest rate in achieving the macroeconomic policy goals in Nigeria for the period 1996:Q1 to 2013:Q3.Interest rate negatively influences the long-run output through its effect on aggregate consumption and investment. The results exhibit that a 10 per cent increase in interest rate decreases the output by 0.8 per cent. Though, the long-term dynamic between the rate of interest rate and output is unstable.

Anwar and Nguyen (2018) showed the achievement of the State Bank of Vietnam's (SBV) monetary policy and policy transmission channel. They examined the dynamic response of the Vietnamese economy to the shocks of exchange rate, interest rate and foreign factor. Applying the structural vector auto-regression (SVAR) model, they argued that output is likely much more sensitive to monetary shocks than monetary policy is to international shocks. In the short run money supply does have an important role in economic growth. Exchange rate is influenced much more by interest rate and cash in circulation in the economy and external factors. When the economy is overheated also price level respond rapidly to monetary tightening and declines sharply. The interest rate channel is not much effective.

In the environment of the growing integration of financial markets, after the liberalization in the early 1990s, **Ray *et al.* (1998)** explored the various facets of the monetary policy transmission mechanism in India in the context of the role of interest rates and exchange rates in the conduct of monetary policy and compared it with pre-liberalization era. VAR and Johansen co-integration methods are used for April 1984 to March 1991 and April 1992 to March 1997 for pre-reform and post-reform periods. They found that interest and exchange rates are key components of monetary policy conduct in the post-liberalisation phase. Both interest rate and exchange rate are endogenous factors, and the transformed process of operating targets is in consonance with this. The monetary shocks and exchange rate variations are endogenously related in the post-liberalization period, while in the pre-liberalization era, the exchange rate was marginally exogenous to the monetary system.

Singh and Kalirajan (2007) have made an attempt to evaluate whether the monetary policy works through the interest rate channel in the post-liberalization period in India by employing co-integrated VAR with generalized restrictions. They argued that long-run relationships and short-run dynamics play a vital role in the interest rate and behave reasonably. The role of CRR is complementary, and that becomes an obstacle for the interest rate to play a definite character. Moreover, the monetary targeting has been irrelevant in the present scenario. RBI's monetary policy is in the right direction by taking into account the interest rate as the primary instrument of the monetary policy.

Bhattacharyya and Sensarma (2008) examined whether these alternative instruments are effective and robust in transmitting signals impinging monetary policy and in some specific impacts in terms of its effects on segments of financial market viz money market, government securities market, foreign exchange market and the stock market. Based on the SVAR model, they indicate that in the pre-LAF period, quantity adjustment via CRR plays a crucial role in influencing the financial market and rate instruments. These signalling instruments are restricted to the money, bond and foreign exchange markets and have a muted impact in the stock market. Moreover, while the exerted noise became muted in the post-LAF period, the financial market shows asymmetric response to the monetary policy announcements.

Bhattacharya *et al.* (2011) estimate VECM from 1997 to 2009 to look for a joint treatment of monetary policy transmission and exchange rate pass-through to comprehend this context. The study finds that the monetary policy transmission mechanism in a developing economy like India is weak. The complete exchange rate pass-through is incomplete, but statistically significant. This reveals there was not any trade-off between inflation and output, as changes in interest rates do not affect aggregate demand. The interest rate can influence inflation through the exchange rate, even though the exchange rate pass-through is not complete.

Using SVAR models, **Pramik and Kamaiah (2014)** explored the impact of monetary measures stances on the macrovariables in India, laying emphasis on universal factors, price of crude shocks & universal financial environments. Their underlying approach (using monthly data from 1992m04-2012m12) found that Tightening monetary measures has a large effect on total output (via a decline in investment) that lasts for a year. However, the study spotted a "price puzzle" in which the same policy action first causes inflation to rise over the first eight months instead of falling. Furthermore, monetary policy appreciate the exchange rate (meaning: foreign capital inflows) hit the price level, suppressing industrial production. Additionally, a sudden rise in the US federal funds rate results in a temporary slowdown in the development of Indian sectors' production.

Das (2015) estimated two-step vector error correction models and presented evidence on India's credit channel of monetary policy transmission. The analysis assessed the pass-through from monetary policy changes to the operating targets as well as from the target rate to both the lending and deposit rates. The analysis argues that there is a significant, albeit slow, pass-through of a policy rate change to the bank interest rates and the presence of asymmetric adjustment to monetary policy[2]. The intensity of pass-through to deposit rates is greater than the lending rate, and the deposit rate adjusts more quickly in response to changes in the policy rate.

In India, so far there is lack of empirical consensus on the defined functioning and relative importance of various channels. Although interest rate channel is found to play an important role of MPT in the existing literature on monetary transmission in India, the banks are the conduit of monetary policy and play an significant part in monetary measures transmission through credit effect although very little evidence of exchange rate channel working have been found.

[2]The RBI Working Group on Monetary Policy Operating Procedures discovered that the influence of the interest rate channel of monetary transmission varies among financial market categories, although it is highest in the money market. A 100-basis point change in the policy repo rate results in an 80 basis point change in the weighted average call money rate.

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4. Data Analysis and Methodology

4.1 Data Sources and Analysis

The selection of variables for framing the econometric model comprehensively depends upon the availability of data. Though, due to scarcity of alternatives, the selection of proxy variables for macroeconomic modelling is a matter of some level of criticism. However, the present analysis tries to do fair dealing while selecting the variables following a pragmatic approach.

The description of variables selected for the analysis has stated in Table 4.1.

Table 4.1: Raw Data Description and Sources

Variable	Description	Source
Oil Prices	Crude Oil prices (nominal US$ per barrel, average of Brent, Dubai and WTI)	International Monetary Fund (IMF)
(Output)	Index of industrial production with the base of 2004-05 (IIP)	Ministry of Statistics and Programme Implementation (MoSPI)
Inflation	Wholesale Price Index of all commodities at base 2004-05 (WPI)	Reserve Bank of India (RBI)
(Interest Rate)	CMR - Weighted call money rate − The weighted average call lending rate at which banks lend overnight or very short term funds to other banks.	Reserve Bank of India (RBI)
Monetary Aggregate	M3 = Currency with the public + Demand deposits with the banking sector + Other Deposits with the RBI + Time deposits with the banks	Reserve Bank of India (RBI)
Exchange Rate	REER - Real Effective Exchange Rate (36 Currencies-Trade Based Weight) at 2004-05 base	Reserve Bank of India (RBI)

Table 4.1 contains an explanation of the variables and their sources. The data come from a variety of sources, including the Ministry of Commerce and Industry, the Reserve Bank of India (RBI) (Database on Indian Economy), the Ministry of Statistics and Programme Implementation, Government of India, and the International Monetary Fund (IMF) (International Financial Statistics).

To begin with, except call money rate (CMR), all the variables are converted into natural logarithms to minimize the data fluctuations. It has been observed that most of the variables have a considerable deviation from normality. Log transformation reduces skewness and unusual volatility in the series to a large extent. Based on these advantages, the time series are log-transformed at levels. The seasonal adjustment has been made in the case of the index of industrial production (IIP), wholesale price index (WPI) and broad money (M3) with the X-12 ARIMA method. Software Eviews 11 has been employed for data analysis.

4.2 Rationale for the Period of the Study

This study utilises high-frequency monthly data from **April 1991 to March 2019** to analyse the desired objective. There are various aspects for choosing the study's period, such as shifts in the policy regime, availability of data, and relevance. A general model proposed to express the transmission process in the Indian economy cannot ignore the crucial years of the early nineties. This analysis focuses on the liberalized regime, which signifies the period from 1990-91.

The major segments of the industrial sector witnessed severe recession. In the year 1991-92 ,the IIP grew by less than one per cent. The main reason for the low industrial growth was the strict restrictions on imports for the period of the crisis. The 1991 crisis also led to a firm disruption and volatility in the money market interest, which was particularly boosted during the crisis period.

On the inflation front, the early 1990s witnessed a sudden surge in inflation. The decade started by double figure inflation caused the high fiscal deficit and interruption of industrial production. There was also a large contraction in credit availability to check inflation through a restriction on reserve own credit to the domestic sector.

In order to escape from the balance of payment crisis, the RBI devalued Indian Rupee in the 1990s. The interest rate structure dismantling had started in the year 1990-91. The economic reforms were also initiated in the same year. Since liberalization is a continuous and slow process, it is still in progress in the Indian economy.

Another cause for the selection of the study period is that most of the data sets available on macroeconomic variables were revised and updated after the 1990s. Therefore, it is impossible to find the same series for some of the variables for the previous decades. The difference took place due to the base shifts. A more complicated issue regarding the base shift is changing the number of items associated with index measures in the basket while the updated series includes the various new items as well.

4.3 *Methodology*

A descriptive analysis of the macroeconomic conditions and monetary policy framework provides the background for analysing the monetary transmission in India; moreover, a comprehensive review of existing literature guides for the selection of the empirical methodology.

The primary objective of this paper is to examine the pass-through of monetary measures to the macro-economic variables in the Indian economy by studying the dynamic response of the former on the latter. On the basis of a literature review, the following analysis uses one of the most convenient and common (it is generally accepted - red.) method to analyze the monetary policy pass-through process from the lens of the Structural Vector Auto-regressive (SVAR) methodology.

4.3.1 Steps involved in analysis are as followed:

1. The stationarity of variables are tested by the Augmented Dickey-Fuller (ADF) unit root tests and Phillips-Peron unit root tests and the original VAR model is estimated.
2. Using multiple criteria to determine the right lag length.
3. Testing of the stability of the model using inverse roots of the characteristic polynomials.
4. Based on literature review and economic theory, imposing the restrictions
5. IRF (Impulse Response Functions) Plot: To analyze the dynamic response of the endogenous variables in a given model to a unit standard deviation shock of specific variables in the model over time.
6. Performing Variance Decomposition to determine the significance and impact of each exogenous shock in explaining the forecast error variance for each variable.

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5. Econometric Specification

The system of equations representing the SVAR of order p has the following specification:

$$\mathbf{AX_t = A_0 + A_1X_{t-1} + A_2X_{t-2} + \ldots\ldots\ldots\ldots + A_pX_{t-p} + e_t} \quad \textbf{or} \quad \boldsymbol{AX_t = A_0 + \sum_{i=1}^{p} A_iX_{t-i} + e_t} \qquad \textbf{(1)}$$

Where Xt is a (n x 1) column vector of endogenous variables. A_0 is a (n x 1) vector of constants; e_t represents the (n x 1) structural disturbances vector.A_i's are invertible (n x n) matrices of coefficients of contemporaneous relations on endogenous variables. The disturbances e_t are serially and mutually not uncorrelated, whereas p represents the number of lags.

The matrix A is defines as:

$$\mathbf{A} = \begin{bmatrix} 1 & A_{12} & \ldots. & A_{1n} \\ A_{21} & 1 & \ldots. & \vdots \\ \vdots & \vdots & \ldots. & \vdots \\ A_{n1} & A_{n2} & \ldots. & 1 \end{bmatrix}$$

Reduce form of equation (1) can be obtained by multiplying both sides by (A^{-1}).

$$\mathbf{X_t = A_0^* + A_1^*X_{t-1} + A_2^*X_{t-2} + \ldots\ldots\ldots\ldots + A_p^*X_{t-p} + u_t}$$

or

$$\boldsymbol{X_t = A_0^* + \sum_{i=1}^{p} A_1^*X_{t-i} + u_t} \qquad \textbf{(2)}$$

Where,

$$\mathbf{A_0^* = A^{-1}A_0}$$

$$\mathbf{A_s^* = A^{-1}A_s \text{ , for s = 1, 2, 3, ...p}}$$

$$\mathbf{u_t = A^{-1}e_t}$$

Here, u_t denotes the reduced form VAR residual vector uncorrelated with Xt variables and normally independently distributed with the variance-covariance matrix. But this reduced form of the model, represented in Equation (2), does not concerned about the contemporary relations among the variables since only lagged terms are denoted on the right-hand side of the equation, and if, moreover, current terms are included, the problem of cross-correlation among the residuals may arise.

The solution, therefore, is attained through another relation between Equations (1) and (2) as follows:

$$\mathbf{A^{-1}e_t = u_t}$$

$$\mathbf{e_t = Au_t} \qquad \textbf{(3)}$$

SVAR models are more compatible with tracing and identifying structural shocks, as mentioned by Chuku*etal.* (2011), in accordance with underlying economic theory. Thus, it is essential to impose appropriate restrictions on the system of equations. The model should be either exactly identified or over-identified for the estimation of structural form equations parameters. Therefore, it is necessary to impose certain restrictions on matrix A to identify structural form parameters. We have to impose n (n – 1)/2 restrictions from the identification method, where n is the number of variables in the

system. Since this analysis uses six endogenous variables, there is a need to impose 15 additional restrictions for the identification.

5.1 Structural VAR model with Contemporaneous Restrictions

The SVAR model comprises six endogenous variables in order, which the following vector can represent:

$$\mathbf{X_t = (OP, IIP, WPI, M3, CMR, REER)}$$

Where,

OP is an oil price index, IIP is the index of Industrial Production used as a proxy of domestic output. The domestic price level is expressed as wholesale price index (WPI), while M3 represents broad monetary aggregate and CMR is call money rate, a proxy of monetary policy interest rate. Finally, the exchange rate is taken as a real effective exchange rate (REER).

5.2 Identification

The limitations imposed should ideally come from a fully described macroeconomic framework in order to identify an SVAR model. In reality, though, this is rarely carried out. Rather, the most popular method of enforcing identification limitations is to base them on economic literature and reasonable results. In general, the metric is used so that the behaviour of the dynamic responses of the model should be according to economic literature. Determination of restrictions may be applied in a number of ways given a collection of relevant data and model selection principles. The most common approach involves restrictions on A or A^{-1}.

We have six endogenous variables. Therefore, we need to impose 15 additional restrictions for identification. Structural parameters are retrieved by estimating reduced form VAR with the set of short-run constraints on contemporaneous coefficients. The SVAR model has been developed by imposing the following restrictions on the contemporaneous structural parameters.

The equations shown below summarise the identification method based on equation (3), i.e., $\mathbf{e_t = Au_t}$

$$\begin{bmatrix} e^{OP} \\ e^{IIP} \\ e^{WPI} \\ e^{M3} \\ e^{CMR} \\ e^{REER} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ A_{21} & 1 & 0 & 0 & 0 & 0 \\ A_{31} & A_{32} & 1 & 0 & 0 & 0 \\ 0 & A_{42} & A_{43} & 1 & A_{45} & 0 \\ A_{51} & 0 & A_{53} & A_{54} & 1 & A_{56} \\ A_{61} & A_{62} & A_{63} & A_{64} & A_{65} & 1 \end{bmatrix} \begin{bmatrix} u^{OP} \\ u^{IIP} \\ u^{WPI} \\ u^{M3} \\ u^{CMR} \\ u^{REER} \end{bmatrix} \quad \textbf{(4)}$$

Here, e_t is the vector of structural shocks, while u_t represents the vector of residuals from the reduced form equations and $e^{OP}, e^{IIP}, e^{WPI}, e^{M3}, e^{CMR}$ and e^{REER} stand for structural shock in oil prices, output, inflation, monetary aggregate, interest rate and exchange rate respectively, while $u^{OP}, u^{IIP}, u^{WPI}, u^{M3}, u^{CMR}$ and u^{REER} are indicating the reduced form residuals.

This model is over-identified by housing 16 restrictions instead of the 15 that allow it to be identified (exactly). The structural model first equation reveals that oil price does not depend on any other variables. Since prices in an emerging economy such as India are profoundly driven by oil prices, this part of prices is incorporated in the forward-looking monetary policy framework. The second equation reflects how oil prices affect the output fluctuations. The third equation shows that domestic inflation is linked with oil prices shocks and output fluctuations. The following equation defines the normal money demand function of the Indian economy. Mathematically, the oil price shocks interest rate equation is as follows: oil price shocks + inflation coefficient + money multiplier + exchange rate = interest rate movement. Lastly, the exchange rate depends on everything else in the model.

These identifying restrictions are needed for contemporaneous relation, and in the VAR framework, each variable affects other variables with a lag. The variance decomposition analysis, the estimated structural model, and impulse response analysis have been carried out to understand the transmission process.

5.3 Identification Strategy

The restrictions on coefficients, in the context of SVAR framework, are meant to generate a complete macroeconomic model but this is less likely to be the case in practice. The other empirical contributions are Gali (1992), Garratt et al. (1998), Huh (1999), and Sims and Zha (1998b), have filled this gap. These studies use SVAR structures for which the identification restrictions are based on economic theories and, in some cases, guided by behavioral assumptions and prior domain knowledge.

The identification strategy of this analysis is strongly influenced by Sims and Zha (1998), Kim & Roubini (2000), Kim (2001), and Ghosh (2016). The oil price shock is 'contemporaneously' exogenous in the Indian context. Although oil price cannot be influenced contemporaneously by any domestic variable but it can be over time. Since certain variables respond slowly to the fluctuations in financial and policy variables, a different type of behavioural restriction has been frequently imposed. Thus, due to the occurrence of the greater cost of adjustment in production, output and inflation do not respond instantaneously to the adjustment in domestic monetary variables and exchange rate. Though, the oil price shocks intensely influence industrial production and prices in developing economies. The price level is also affected by the contemporaneous shocks in output; however, the output is influenced contemporaneously only by changes in oil prices. It has been assumed that the money supply is also influenced by the domestic interest rate along with the output and prices.

Further, it has assumed that monetary authority responds promptly to the movements in the current interest rate, the value of money supply, price level and exchange rate while the response to output is slow. Moreover, in an open economy, monetary authorities cannot ignore the exchange rate fluctuations and keep an eye on the global economic movements such as oil price shocks in setting the interest rate. Finally, the real exchange rate is a highly volatile variable in the model and promptly reacts to almost all shocks in other variables.

6. Results and Discussion

The results are illustrated in two sets. The first set consists of the preliminary tests required to carry on with the SVAR model. It includes the Unit Root Test, the Maximum Lag Selection and the test of Inverse Roots of AR. The second set comprises the main results, including impulse response functions that trace out the effects of a shock to one endogenous variable on the other variables and the variance decomposition, which explains the relative importance of each random innovation in affecting the variables in the VAR. The residual test results are also reported in the appendix.

6.1 Preliminary Tests

6.1.1 Unit Root Test

The variables IIP, WPI and broad money (M3) are seasonally adjusted, and except call money rate, all other variables have been log-transformed as well. Before estimating the impulse response functions and the variances decompositions, the order of integration of the variables has been checked. The Augmented Dickey-Fuller (ADF) and Phillips-Peron (PP) tests have been employed to check the stationarity of the time-series data.

Table 6.1: ADF Test & Phillips-Perron (PP) Test

Variable	Levels		1st Difference	
	ADF	**PP**	**ADF**	**PP**
Ln (OP)	NS	NS	S	S

Ln (IIP)	NS	NS	S	S
Ln (WPI)	NS	NS	S	S
Ln (M3)	NS	NS	S	S
CMR	S	S		
Ln (REER)	S	S		

Note: NS: - Non-stationary, S: - Stationary, Ln:- Log

From the above tables, the results of the ADF test and Phillips-Peron (PP) test are pretty similar. We find that, for oil price and IIP, we fail to reject the null hypothesis of a unit root for both with intercept and with intercept & trend at levels though it becomes stationary at first difference with 1 percent level of significance. As far as WPI and M3 are concerned, at levels, both are stationary with intercept only, at 1 percent level of significance and have unit root with both intercept & trend, while at first difference both WPI and M3 turns out to be stationary with 1 percent level of significance. CMR[3] is stationary at levels for both intercepts and with intercept & trend at 1 percent level of significance. At levels, REER is stationary with an intercept at 5 percent and with intercept & trend at 1 percent level of significance.

Thus the results exhibit that the variables are a mix of I (0) and I (1), and none of the variables is I (2).

6.2 SVAR Model Specification Results

A Structural VAR has been constructed for the six endogenous variables. The SVAR model has been framed by imposing restrictions on the contemporaneous structural parameters. Zero restrictions are imposed on contemporaneous structural parameters, while no restrictions are imposed on lagged structural parameters. Equation (4) summarise the identification scheme based on equation (3), i.e., et = $\mathbf{Au_t}$

6.2.1 The Impulse Responses

Impulse responses explain the functioning of various transmission channels of monetary policy in the Indian economy.

6.2.1.1 Interest Rate Channel

Change in interest rate influences the cost of capital, leading to the change in the demand for money and investment. The impact of interest rate shock on investment followed by output is the basic mechanism that describes the interest rate channel.

The red lines in Figure 6.1 show the responses of these variables (IIP, WPI, M3, REER) to a one-standard-error shock in the policy rate (the call money rate) over a 12-month horizon. Dotted lines show the two-standard-error confidence bands for all responses.Response function indicates that after a positive shock to the policy rate (call money rate), output is initially increased for a few periods and tends to decline and decays after seven periods. The raising of the policy rate has negative effects on investment and slows down industrial production growth. The analysis also finds the presence of the 'price puzzle' phenomenon in Indian economy, which refers to a situation where an increase in policy rates results in rise in inflation in the early periods and sustains until the third period. This result is the opposite of what would occur under contractionary monetary policy, which ought to suppress inflation.One reasonable interpretation of this

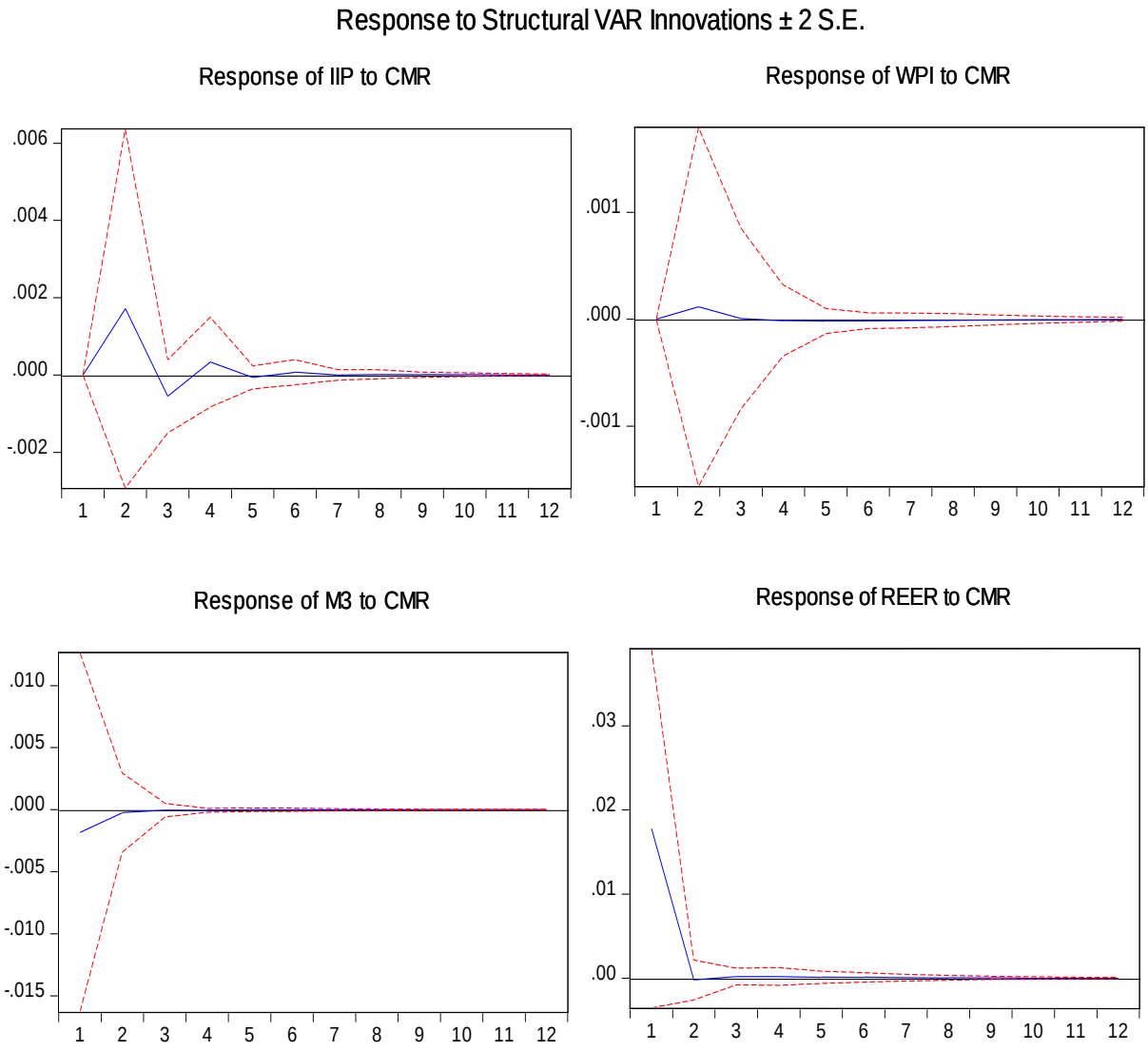
[3]A SVAR in differences, according to Brooks (2002), would result in the loss of information on the co-movement of the variables, which is our major concern. According to Sims, Stock, and Watson (1990), VARs with non-stationary variables suffer some loss in estimator efficiency but not consistency. Even if there is a loss in estimate efficiency, Sims (1980) advises avoiding differencing the variables because the purpose of VAR analysis is to explore inter-relationships, not to develop efficient estimates. Furthermore, in our instance, defining variances in certain financial market rates but not others while examining their interrelationships would be economically insignificant. This might have been an issue since, in the Indian example, call money rates were discovered to be stationary, unlike the other rates which are non-stationary (Bhattacharyya &Sensarma, 2005).

discrepancy in the SVAR model is omitted variable bias (Sims, 1992) as unobserved variables may affect future inflationary expectations.

On the other hand, the money supply decreases in response to a positive one standard deviation shock to the call money rate. This is in accordance with economic theory; as the interest rate rises, people tend to save more and consume less, which in turn reduces demand and supply of money. The response function shows that the exchange rate appreciates in response to monetary policy shock. When the interest rate rises, the domestic currency becomes more lucrative as compared to foreign currency. Carryover to increase in the value of domestic currency causes exchange rate appreciation. This is evident in the theoretical assumption that tightening of monetary policy leads to an appreciation of the domestic currency.

In conclusion, the SVAR impulse responses illustrate that interest rate shock has an adverse effect on both output and money supply. These responses are falling in line with the cost of capital arguments that people would prefer to hold less amount money when the cost of holding it is high. An increase in policy rates pushes inflation, and the 'price puzzle1' exists in the Indian economy. The responses present apparent evidence for the operating of a strong interest rate channel in the Indian economy(Paramanik & Kamaiah, 2014).

Figure 6.1: Impulse Response to shock in Monetary Policy Rate (CMR)



European Economic Letters
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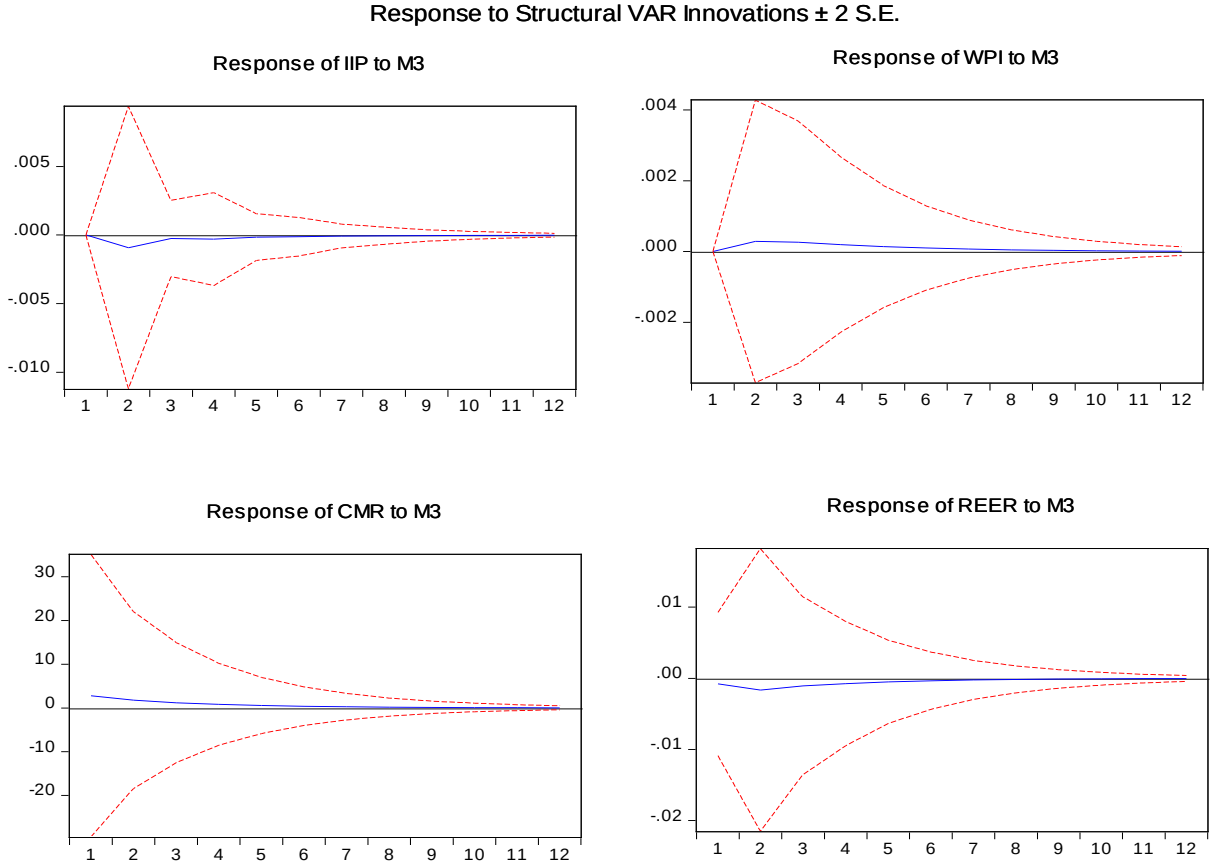
http://eelet.org.uk

6.2.1.2 The Credit Channel

As per the credit channel, an increase in money supply leads to a mild decrease in output for initial periods; later, it reverts to the previous level. Impulse response from the SVAR model shows that money supply shock produces a positive response in inflation as the increase in money supply reduces the value of money. The interest rate also responds positively with a positive shock in money supply, indicating the existence of bidirectional causality as interest rate also influences the money supply. On the other hand, a positive shock in the money supply leads to a fall in the exchange rate and currency depreciation.

Figures 6.2: Impulse Response to shock in Money Supply (M3)



6.2.1.3 Exchange Rate Channel

The impact of exchange rate appreciation on net exports is the basic reaction in the exchange rate channel, which leads to an increase in output. Impulse responses show that exchange rate appreciation enhances both output and inflation. Moreover, inflation positively responds with greater extant. It exhibits the working of an exchange rate channel in the Indian economy.

The exchange rate appreciation leads to a higher path of industrial output growth in the long run, as shown in Figure 6.3. Because the appreciation of the exchange rate lowers the price of oil and the cost of importing inputs for industrial production. Such an increase in inflation following the appreciation of the exchange rate is also consistent with economic theory. You have no experience from the time that the authorities would have been forced to let the exchange rate rise, leading to an over supply of currency in the system and an upward spiral of inflation. Positive exchange rate shock inversely affects call money rate response. With an expansionary monetary policy, RBI encourages production and the development of export competitiveness.

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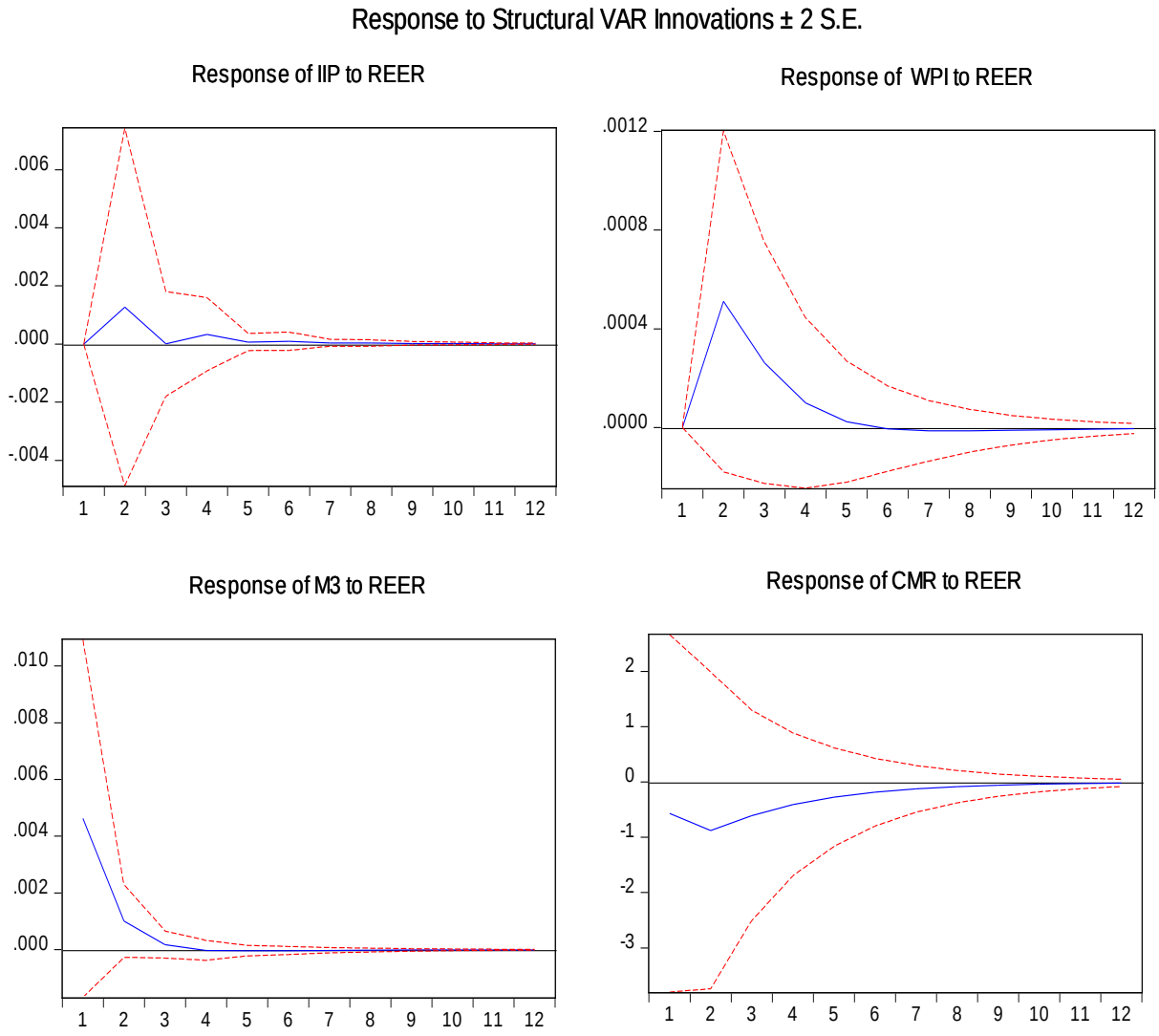
Figures 6.3: Impulse Response to shock in Exchange Rate (REER)



6.2.2 Variance Decomposition

While impulse response functions show how a shock in one endogenous variable affects the other variables in a VAR, the variance decomposition decomposes the variation in an endogenous variable into component shocks. Therefore, the variance decomposition gives insight into how much individual random innovations of the VAR impact the variables concerned.

The forecast error variance decomposition explains the proportion of the movements in a variable due to shocks to its own and other variables. Tables 6.5 and Table 6.6, discusses the decomposition of output and price fluctuations driven by a range of macroeconomic shocks. The forecast error variance decomposition has been presented for 24 months

6.2.2.1 Variance Decomposition of IIP

Decomposition of fluctuations in output caused by the various macroeconomic shocks initially shows that their own shock explains around 99 percent of the variations in output. Apart from this oil price explains 0.88 percent. During the 6th-period output, shock explains little lesser and becomes 97.38 percent, while other macro variables oil price, inflation, money supply interest rate and exchange rate explain the variation in output by 0.78 percent, 0.39 percent, 0.25 percent, 0.80 percent and 0.41 percent respectively. This percentage explanation of output variation by of different macro variables remains approximately the same for 24 periods. The interest rate is the highest contributor to output variation, followed by oil price and inflation. The role of money and exchange rate in explaining output variations remains small.

Table 6.2 Decomposition of fluctuation caused in output

Period	S.E.	OP	IIP	WPI	M3	CMR	REER
1	0.018661	0.879546	99.12045	0.000000	0.000000	0.000000	0.000000
4	0.020570	0.776935	97.39040	0.386663	0.238454	0.796536	0.411008
7	0.020578	0.778071	97.37473	0.386474	0.248661	0.797959	0.414105
10	0.020579	0.778061	97.37307	0.386506	0.249847	0.798049	0.414463
13	0.020579	0.778060	97.37292	0.386514	0.249966	0.798053	0.414490
16	0.020579	0.778060	97.37290	0.386515	0.249979	0.798054	0.414493
19	0.020579	0.778060	97.37290	0.386515	0.249980	0.798054	0.414493
22	0.020579	0.778060	97.37290	0.386515	0.249980	0.798054	0.414493
24	0.020579	0.778060	97.37290	0.386515	0.249980	0.798054	0.414493

6.2.2.2 Variance Decomposition of WPI

Although a shock in price itself explains the predominant share of the variations in prices, the second most influential factor is the oil price which explains approximately 10 percent of variations in prices. Thus, domestic prices are vastly affected by global factors, and the liberalization of the economy plays a significant role. On the other, the interest rate explains 0.04 percent, the least part of the variation in inflation. Moreover, the exchange rate, credit and output explain approximately 1.04 percent, 0.70 percent and 0.22 percent variation in inflation, respectively. The contribution of these macroeconomicvariables almost remains stagnant over the periods.

Table 6.3 Decomposition of fluctuation caused in Inflation

Period	S.E.	OP	IIP	WPI	M3	CMR	REER
1	0.005051	8.984230	0.223195	90.79258	0.000000	0.000000	0.000000
4	0.005691	10.05665	0.219269	88.04622	0.587593	0.041476	1.048788
7	0.005701	10.05662	0.218829	87.94165	0.691741	0.043551	1.047603
10	0.005702	10.05505	0.218798	87.92989	0.703580	0.044016	1.048657
13	0.005702	10.05488	0.218797	87.92854	0.704839	0.044074	1.048870
16	0.005702	10.05486	0.218797	87.92839	0.704971	0.044081	1.048896
19	0.005702	10.05486	0.218797	87.92838	0.704985	0.044081	1.048899
22	0.005702	10.05486	0.218797	87.92838	0.704986	0.044081	1.048899
24	0.005702	10.05486	0.218797	87.92838	0.704986	0.044081	1.048899

Variance decompositions provide evidence of the growing influence of external factors in the economy. It emphasizes the greater integration of the Indian economy to the rest of the world economy after post-liberalization. Moreover, the contribution of interest rate and money supply in output variation and inflation variation confirms the existence of monetary measures mechanism in the Indian economy. Interest charge channel of transmission is the strongest, followed by the credit channel.

1. CONCLUSION

Though the transmission of variations in the policy rate to the different segments of the financial sector is the initial effect of a monetary policy shock, the final intended effect is the impact on the real variables in the economy, that is, output and prices. This impact takes place through the various transmission channels identified in the economic theories. There are possible inter-linkages between the transmission channels. However, each monetary transmission channel distinctively influences the real economy, through which they may enhance or offset the impact of other channels in the process of monetary transmission.

The effectiveness of various transmission channels varies and evolves, depending on the financial market structure and the economy's stage.

Empirical evidences assert that the most important transmission channel in advanced economies is the interest rate channel with developed financial markets. In contrast, in emerging market economies, Credit lending and Monetary transmission via exchange rates are the more effective route of monetary pass-through. Moreover, with Floating exchange rates, the exchange rate channel becomes utmost significant in small open economies, where the Monetary policy rate channel is relatively weak.

Study has intended to establish a perspective on the comparative efficacy of the Central bank policy mechanism channels for the India's financial landscape. Inline to accomplish this broad objective, this paper has examined the three main channels, namely, interest rate, credit and foreign rate pathways of Monetary Policy pass-through Mechanism. The assessment of the relative strength of these channels helps in realizing each channel's efficacy in addressing the key target variables, that is, economic growth and price stability.

Empirical evidence shows that a tightening of monetary policy via higher policy rates has a negative impact on investment and industrial output growth. The asymptotic reaction of output to the interest rate is compatible with verstand economy. They also show the response of inflation to the interest rate is positive. To put it in another way, a contractionary monetary policy implies higher inflation. This no denying the presence of the 'price puzzle' for Indian economy. Although other channels could generate the same result, such as monetary policy-induced exchange rate appreciation lowers the oil prices and the cost of importing inputs in use of industrial production.(1) In addition, the higher exchange rate leads to excessive supply of currency in the market, which exacerbates inflation." In addition to these, the external shocks, i.e., oil price shock, significantly affected the growth of industrial production negatively and gave rise to inflation.

With regard to transmission channels, the interest rate channel has been found dominant in impacting output and prices, which is well supported by the credit channel. However, both the channels support the existence of strong 'price puzzle'. The SVAR model analysis also shows the evidence of an active exchange rate channel.

The overall results illustrate that relative price mechanisms like bank rate (intrest) and forex rate changes have a greater impact on the national economy of India. The interest charge, money supply and forex rate channels are working in the Indian economy. While considering the shifts in the policy regime, the policy transmission mechanism has not reflected many changes. However, in the liberalised regime, the impact of single variable is moderate.

REFERENCES

2. Aleem, A. (2010). Transmission mechanism of monetary policy in India. *Journal of Asian Economics*, *21*(2), 186–197. https://doi.org/10.1016/j.asieco.2009.10.001
3. Anwar, S., & Nguyen, L. P. (2018). Channels of monetary policy transmission in Vietnam. *Journal of Policy Modeling*, *40*(4), 709–729. https://doi.org/10.1016/j.jpolmod.2018.02.004
4. Barnett, W. A., Bhadury, S. S., & Ghosh, T. (2016). An SVAR Approach to Evaluation of Monetary Policy in India: Solution to the Exchange Rate Puzzles in an Open Economy. *Open Economies Review*, *27*(5), 871–893. https://doi.org/10.1007/s11079-016-9403-2
5. Bernanke, B. S., & Blinder, A. S. (1992). The federal funds rate and the channels of monetary transmission. *American Economic Review*, *82*(4), 901–921. https://doi.org/10.2307/2117350
6. Bhattacharyya, I., &Sensarma, R. (2008). How effective are monetary policy signals in India? *Journal of Policy Modeling*, *30*(1), 169–183. https://doi.org/10.1016/j.jpolmod.2007.07.003
7. Bhoi, B. K., Mitra, A. K., Singh, J. B., &Sivaramakrishnan, G. (2017). Effectiveness of alternative channels of monetary policy transmission: some evidence for India. *Macroeconomics and Finance in Emerging Market Economies*, *10*(1), 19–38. https://doi.org/10.1080/17520843.2016.1188837
8. Das, S. (2015). Monetary Policy in India: Transmission to Bank Interest Rates. *IMF Working Paper*.
9. John, J., & Mitra, A. K. (2017). Asset Quality and Monetary Transmission in India. *Reserve Bank of India Occasional Papers*, *37*(1), 35–62.

10. Kelikume, I. (2014). *KenhTruyen Tai Lai Suat.Pdf*. *8*(4), 97–108.
11. Kim, H. J. (2021). Bank Lending Channel of Monetary Policy Before and After the Global Financial Crisis. *Journal of Korean Economics Studies*, *39*(1), 37–62. https://doi.org/10.46665/jkes.2021.3.39.1.37
12. Kubo, A. (2009). The effects of a monetary policy shock: Evidence from India. *Economics Bulletin*, *29*(3), 1543–1554.
13. Kumar, J. (2013). Monetary Policy Transmission in India : A Peep Inside the Black Box RBI WORKING PAPER SERIES Monetary Policy Transmission in India : A Peep Inside the Black Box. *Munich Personal RePEc Archive Monetary*, *51136*.
14. Mallick, S. K., & Sousa, R. M. (2012). Real effects of monetary policy in large emerging economies. *Macroeconomic Dynamics*, *16*(SUPPL. 2), 190–212. https://doi.org/10.1017/S1365100511000319
15. Mishra, P., Montiel, P., & Sengupta, R. (2016). Monetary Transmission in Developing Countries: Evidence from India; by Prachi Mishra, Peter Montiel, and Rajeswari Sengupta; IMF Working Paper WP/16/167; August 2016. *IMF Working Paper*.
16. Mohanty, D. (2012). Evidence on Interest Rate Channel of Monetary Policy Transmission in India. *Second International Research Conference at the …*, *May*, 1–52. http://sirc.rbi.org.in/downloads/SIRCPaper.pdf
17. Naveed et al. (2013). [WIP] Mp r a. *Economic Policy*, *2116*, 0–33.
18. Paramanik, R. N., &Kamaiah, B. (2014). A Structural Vector Autoregression Model for Monetary Policy Analysis in India. *Margin*, *8*(4), 401–429. https://doi.org/10.1177/0973801014544580
19. Patnaik, I., Shah, A., & Bhattacharya, R. (2011). Monetary Policy Transmission in an Emerging Market Setting. *IMF Working Papers*, *11*(5), 1. https://doi.org/10.5089/9781455211838.001
20. Ray, P., Joshi, H., & Saggar, M. (1998). New Monetary Transmission Channels: Role of Interest Rates and Exchange Rate in Conduct of Indian Monetary Policy. *Economic and Political Weekly*, *33*(44), 2787–2794. http://www.jstor.org/stable/4407328
21. Salunkhe, B., & Patnaik, A. (2017). The impact of monetary policy on output and inflation in India: A frequency domain analysis. *Economic Annals*, *62*(212), 113–154. https://doi.org/10.2298/EKA1712113S
22. Sengupta, N. (2014). Sectoral Effects of Monetary Policy in India. *South Asian Journal of Macroeconomics and Public Finance*, *3*(1), 127–154. https://doi.org/10.1177/2277978714525309
23. Sethi, M., Baby, S., & Dar, V. (2019). Monetary policy transmission during multiple indicator regime: A case of India. *Journal of Asian Finance, Economics and Business*, *6*(3), 103–113. https://doi.org/10.13106/jafeb.2019.vol6.no3.103
24. Shahidul, Islam, Rajan, R. (2011). Bank lending channel of monetary policy transmission: India and the global financial crisis. *Int. J. Economics and Business Research*, *3*(557–575).
25. Singh, K., &Kalirajan, K. (2007). Monetary transmission in post-reform India: An evaluation. *Journal of the Asia Pacific Economy*, *12*(2), 158–187. https://doi.org/10.1080/13547860701252371
26. Taylor, J. B. (1995). The Monetary Transmission Mechanism: An Empirical Framework. *Journal of Economic Perspectives*, *9*(4), 11–26. https://doi.org/10.1257/jep.9.4.11
27. Taylor, M. P. (1999). Real interest rates and macroeconomic activity. *Oxford Review of Economic Policy*, *15*(2), 95–113. https://doi.org/10.1093/oxrep/15.2.95