EMPIRICAL DETERMINATION OF MONETARY-FISCAL DYNAMIC NEXUS AND THEIR EFFICIENCY IN INDIA

SYNOPSIS OF PHD THESIS

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1. Introduction:

The primary mandate of macroeconomic policy is maintaining stable and sustainable economic environment which is conducive for stable economic growth. Fiscal and Monetary policies are the two major tools of macroeconomic policy. Fiscal policy is essentially related to taxation and spending decisions of government, while monetary policy encapsulates those decisions bordering on money supply and interest rate in a given economy. The overarching objective of fiscal policy is to reduce unemployment by creating an environment where all available resources in the economy will be gainfully employed to produce more output. With regards to monetary policy, the overriding objective is to maintain price and exchange rate stability by ensuring that money supply growth does not go out of control in relation to macroeconomic fundamentals.

In many countries central banks choose monetary policy with a certain degree of independence with literally no direct control from government. On the other hand fiscal policy is chosen by governments using the tax levels and government spending. However, the ultimate objective of both policies is to maximize the overall welfare of the society which can be achieved by keeping inflation low and employment at its potential level. Economic theory postulates that these two objectives are not mutually exclusive since the attainment of one has implications for the attainment of the other.

The main sphere of interaction between fiscal and monetary policy relates to the financing of the budget deficit and monetary management. The particular stance of monetary policy affects the capacity of the government to finance the budget deficit by changing the cost of debt service. At the same time, the financing needs of the government and its funding strategy will place constraints on the operational independence of the monetary authority.

Macroeconomic effects of each policy are affected by such interaction between the two policies. These interaction between the two policies have important consequences for key macroeconomic aggregates.Therefore, the interaction between monetary and fiscal policies play an important role in understanding and managing macroeconomics policies. Hence, examining of this interaction has gained great interest both in advanced and emerging markets.

The existence of diverse literature and different school of thoughts on optimal mix , efficacy and interaction and macroeconomics impact of the policies has led to no clear consensus.

Therefore, this study undertakes empirical investigates interactions between monetary and fiscal Policy in India and their impact on key macroeconomic variables.

2. Monetary and Fiscal Policy Interface in India:

The framework of monetary and fiscal policy interface in India stems from the provision of the Reserve Bank of India Act, 1934. In terms of the Act, the Reserve Bank managed the public debt of the Central and the State Governments and also acts as a banker to them.

The interface between these two policies, however, has been continuously evolving.
In the post-Independence period, the monetary-fiscal interface evolved in the context of the emerging role of the Reserve Bank. Given the low level of savings and investment in the economy, fiscal policy began to play a major role in the development process under successive Five-Year Plans beginning 1950-51. Fiscal policy was increasingly used to gain adequate command over the resources of the economy, which the monetary policy accommodated. Beginning the Second Plan, the Government began to resort to deficit financing to bridge the resource gap to finance plan outlays. Thus, the conduct of monetary policy came to be influenced by the size and mode of financing the fiscal deficit. Consequently, advances to the Government under the RBI Act, 1934 for cash management purposes, which are repayable not later than three months from the date of advance, in practice, became a permanent source of financing the Government budget deficit. Whenever government's balances with the Reserve Bank fell below the minimum stipulation, they were replenished through automatic creation of ad hoc Treasury Bills. Though the ad hocs were meant to finance Government's temporary needs, the maturing bills were automatically replaced by fresh creation of ad hoc Treasury Bills. Thus, monetization of deficit of the Government became a permanent feature, leading to loss of control over base money creation by the Reserve Bank.

In addition to creation of ad hocs, the Reserve Bank also subscribed to primary issuances of government securities. This was necessitated as the large government borrowings for plan financing could not be absorbed by the market. This, however, constrained the operation of monetary policy as it led to creation of primary liquidity in the system and entailed postponement of increases in the Bank Rate in order to control the cost of Government borrowings. The Reserve Bank Act, therefore, was amended in 1956 empowering the Reserve Bank to vary the cash reserve ratio (CRR) maintained by banks with it to enable control of credit boom in the private sector emanating from reserve money creation through deficit financing.

The Statutory Liquidity Ratio (SLR) under the Banking Regulation Act, 1949 was originally conceived as a prudential requirement to ensure availability of sufficient liquid resources in relation to the liabilities by banks for meeting sudden drain on their resources. However, through a gradual hike the SLR became essentially an instrument to secure an increasing captive investor base for government securities to finance the increasing expansion in the government's fiscal deficit,

particularly after the nationalisation of banks in 1969.

With the fiscal policy laying greater emphasis on social justice and alleviating poverty in the 1970s, monetary policy shifted from ‘physical planning’ in the financial sector to ‘credit planning’ in terms of direct lending and credit rationing. This altered the nature of relationship between the Reserve Bank and the Government, with the former playing a limited role in the structure of the financial system and use of the interest rate as a monetary policy instrument. The single most important factor influencing monetary policy in the 1970s and the 1980s was the phenomenal growth in reserve money due to Reserve Bank’s credit to the government. With little control over this variable, monetary policy focused on restricting overall liquidity by raising the CRR and the SLR to high levels.

In pursuance of the recommendations of the Chakravarty Committee (1985), the monetary policy strategy shifted from the credit planning approach to a monetary targeting approach from 1986-87. This entailed clear assessment of primary liquidity creation consistent to achieve broad money supply (M3) - the target under the monetary targeting framework. The exercise of setting monetary targets was taken up immediately after the presentation of the Union Budget, which provided the magnitude of budget deficit and the level of market borrowing program.

The balance of payment crisis of 1991 recognized the fiscal deficit as the core problem. It, therefore, necessitated a strong and decisive coordinated response on the part of the Government and the Reserve Bank. Assigning due importance to monetary management, fiscal consolidation was emphasized and implemented in 1991-92. An important step taken during the 1990s with regard to monetary-fiscal interface was phasing out and eventual elimination of automatic monetisation through the issue of ad hoc Treasury Bills. Through Supplemental Agreements between the Reserve Bank and the Government of India, beginning September 1994, creation of ad hocs was completely phased out from April 1997. Thus, the recourse to monetisation was substantially lowered during 1990-91 to 1996-97. This enabled the Reserve Bank to bring down the CRR and the SLR, thereby freeing resources of the banking system for the commercial sector and set the stage for the Reserve Bank to reactivate its indirect instruments of monetary policy. The Reserve Bank used the Bank Rate as an instrument of monetary policy after a decade in 1992, reactivated OMO as an instrument of monetary management, introduced auctioned system for primary issuance of government securities and instituted a liquidity adjustment facility to manage day to day liquidity in the banking system.

Although with phasing out of automatic monetisation through the ad hoc Treasury Bills reduced the fiscal dominance on monetary policy considerably, it did not eliminate the dominance altogether. In

view of underdeveloped stage of the G-Sec market, for some years beginning the latter half of the 1990s, the Reserve Bank had to adopt a strategy of undertaking private placement/devolvement of government securities in the face of adverse market conditions and offloaded them through open market sales when conditions became more conducive. However, with the enactment of FRBM Act, 2003, the Reserve Bank has been prohibited from subscribing to government securities in the primary market from April 1, 2006. This provided the Reserve Bank provided with a greater flexibility in its conduct of monetary policy.

Regime shifts, have considerably enhanced the degree of freedom for monetary policy setting in India. However newer challenges have emerged for fiscal – monetary co-ordination under the new regime that requires attention on (I) the inflationary potential of large fiscal deficits even without conventional monetization and ,(II) debt dynamics causing crowding out of private investments and impacting monetary management.

Fiscal dominance of monetary policy goes beyond monetization issue. It occurs in several forms large fiscal deficits have inflationary consequences even when they are not financed by the central bank. For instance, suppressed inflation remains a significant drag on the inflation management even after the government has taken some steps to deregulate administrated prices in the energy sector. At the first stage, suppressed inflation feeds into inflation as the subsidies necessitated by the price rigidity widen the fiscal deficit. At the second stage, as subsides become unsustainable, they sooner or latter necessitate large discrete price adjustments that feeds into inflation expectations.

The fiscal policy institutions have moved away from discretionary fiscal stance towards fiscal rules - the efficacy of fiscal authorities to keep the deficits within the numerical threshold level of deficits normalized to GDP. Recently, the monetary policy authorities have begun the policy rules to ‘inflation targeting’ and ‘central bank independence’ in India (Urjit Patel Committee recommendations, Reserve Bank of India, 2014 and the ‘new monetary framework’, signed between Government of India and Reserve Bank of India, February 2015).

Fiscal dominance of monetary policy has moderated in India as a result of fiscal and monetary reforms undertake over the past two decades. The most notable of there were (I) moving to a market - determined interest rate system by introducing auctions of government debt , (ii) phasing out of the automatic monetisation of fiscal and deficit through the two supplemental agreements between the government of India and the Reserve bank of India, and (iii) curbing the monetisation of debt by enacting the fiscal responsibility and budget management (FRBM) ACT, 2003 that prevented the Reserve Bank of India from subscribing to primary issuances of government securities from April 1, 2006. These landmarks steps believed to have considerably reduced the fiscal dominance of monetary policy.

3. Literature Review :

3.1 Theoretical:

Sargent and Wallace (1981) in their paper “Unpleasant Monetarist Arithmetic” showed that even in a pure monetarist economy, unbounded fiscal policy has a negative effect on the monetary policy and therefore inhibits the ability of the monetary policy to control inflation.

They argue that in the presence of monetary dominance, the monetary authority is independently able to determine its growth rate of money and hence the amount of revenue to supply to the fiscal authority through seignorage. The fiscal authority is constrained and must therefore set its budget so that the deficit can be financed by the combination of seignorage supplied by the monetary authority and the bond sales to the public. In this case, the monetary authority is able to control inflation. If the fiscal policy dominates, it independently sets its budgets, announces current and future deficits and surpluses and hence determines the amount of revenue that must be raised through bond sales and seignorage. The monetary authority therefore faces the constraint imposed by the demand for government bonds since it must finance the difference between revenue demanded and the amount of bonds that can be sold to the public through seignorage. In this case the monetary policy is less effective in controlling inflation than when the monetary policy dominates.

The quantity theory of money (QTM) is one of the well-known macroeconomic theories that explain the relationship between the money circulation and level of prices of goods and services in the economy. The proposition of the theory is that changes in the quantity of money lead to, other factors remaining the same, a proportionate change in the price level. Milton Friedman summarizes this conception in the famous statement that “inflation is always and everywhere a monetary phenomenon” (Friedman 1963, restated in Friedman 1992).

Leeper (1991), Sims (1991, 1997 and 2001) and Woodford (1994, 1995, 1998 and 2000) developed the Fiscal Theory of Price Level (FTPL). It was based on the tenet that monetary policy alone does not provide the nominal anchor for an economy but the pairing of monetary policy with fiscal policy that determines the path of the price level. Therefore, fiscal policy has an effect on the price levels in the economy. In the Ricardian regime, monetary policy is dominant and fiscal policy fails to play any role in price level determination. In a “Non- Ricardian” regime the equilibrium prices have to adjust to ensure government solvency since the path of government debt, expenditure and taxes does not consider the government's inter- temporal solvency constraint. Non-Ricardian fiscal policy in this case affects the stability conditions associated with the central bank's interest rate policy.

Woodford (1995) observes that fiscal policy affects the equilibrium price level because an increase in the price level reduces the real value of the net assets of the private sector, or the net government liabilities. The reduction of private-sector wealth naturally reduces private-sector demand for goods and services through the wealth effect. As a result, there will be only one price level that results in aggregate demand that equals aggregate supply. Woodford states that an increase in the government outstanding liabilities or in the size of budget deficits expected at some future dates is inconsistent with equilibrium at the existing price level. Either change causes households to believe that their budget set has expanded and so they demand additional consumption immediately. The consequence would be an excess demand for goods and the price level will therefore be forced up. Therefore, fiscal policy plays a crucial role because the effects of price-level changes on aggregate demand depend on the size of the outstanding nominal government debt.

3.2 Empirical:

Tabellini (1986) analyzes the coordination of monetary and fiscal policies in the context of a differential game modeled for a single country, where the target variable is the path of government debt across time. The study shows that policy coordination increases the speed of convergence to the steady state and leads the economy closer to the planned target as compared to the outcome of the non-cooperative game. He also shows that increasing the weight that each policymaker assigns to its own private objectives slows down the adjustment process and places more burden on the opponent, but has ambiguous effects on the steady state value of public debt. However, Buti, Roeger and Veld (2001) suggest that the specific form of interdependence between fiscal policy and monetary policy, i.e. the alternative between strategic substitutability and complementarity, should not necessarily be interpreted in terms of conflict or cooperation, and might be shock dependent. In their model, the bank targets inflation and nominal interest rate objectives, whereas the fiscal authority pursues output and deficit targets. Supply shocks unambiguously induce conflicting policies, whereas the opposite holds true for demand shocks.

Chowdhury (1986) used modified form of St Louis equation to test the impact of monetary and fiscal actions in India. He found that growth in government expenditure had a greater impact on changes in nominal income than the growth in monetary base. The long-term effects of a change in the growth rates of the monetary and fiscal policy variables were also different. The effects of a change in the growth rate of government expenditures on nominal income last for a longer period of time compared to a change in the growth rate of monetary base. Moreover, the magnitude of the effect was also greater in case of the fiscal policy.

Kaur (1995) tested empirically the relative effectiveness of fiscal and monetary policies in India for the period 1950-1 to 1990-1. She found that fiscal policy influences were stronger, faster, and more predictable than the monetary influences. The relative speed of monetary or fiscal influences can be measured by observing which variable has stronger time lag in influencing economic activity. As observed, fiscal variable was stronger at the current time period than with the lag of one year. The reverse was true for monetary policy. Thus fiscal policy works faster than the monetary policy in India.

Dhanasekaran (1996-97) found that the rate of growth of money supply primarily determined the rate of growth of (nominal) GNP and the rate of growth in government expenditure. He also found that monetary variables were more important than the fiscal variables in explaining subsequent changes in GNP. Lastly, he proved that monetary action had stronger, more predictable, and faster impact on nominal GNP than fiscal actions. Therefore, he concluded that monetary policy is more effective when it is supported by government expenditure.

Dahan (1998) develops a simple framework to examine budgetary implications of monetary policy. Dahan outlines various channels of influence that tight monetary policy, and consequent higher interest rate, may have on the budget deficit including price, expenditure, revenue, debt, sterilization, and swapping effects. Most of these effects tend to increase the budget deficit as a result of tight monetary policy. The reaction of the government to recession might be an increase in the budget deficit that may affect overall policies' credibility. The reaction function of the government may impair the monetary policy. Thus, he argues, there is a strong need for the monetary and fiscal policies coordination.

Melitz (1997) uses panel data and VAR for 15 member states of the EU and 5 other OECD countries. The study concludes that the two policies acted as strategic substitutes (i.e. easy fiscal policy leads to tight monetary policy and easy monetary policy to tight fiscal policy.) Similar results were obtained by Wyplosz (1999).In contrast, von Hagen, Hughes-Hallett and Strauch (2001) find that the interdependence between the two policymakers is asymmetric: looser fiscal stances matching monetary contractions, whereas monetary policies broadly accommodate fiscal expansions.

Smaghi and Casini (2000), however, undertake an investigation on the cooperation between the monetary and fiscal institutions. They compare the situations prior to EMU and in the first year of EMU and find that something has been lost when the Euro-area countries moved into the EMU. In particular there is some scope for further improving the dialogue and cooperation between budgetary and monetary authorities in the EMU.

Lambertini et al. (2001) argue that the central banks normally prefer that the fiscal stance is set taking into account also the goal of monetary policy instead of concentrating on the output stabilization. Analyzed within the EMU framework, their argument is that fiscal policies by member countries need to be disciplined and in some instances overruled by monetary policies to reduce the inflation and interest rates volatility around its target.

Muscatelli et al. (2002) use Bayesian VAR models to estimate the strategic interdependence between fiscal and monetary policy for the G7 countries and conclude that while monetary and fiscal policies were increasingly being used as strategic complements in the US and UK, there was no significant monetary reaction to fiscal expansionary shocks in Italy, Germany and France. They also observe that the responsiveness of fiscal policy to the business cycle had decreased since the 1980s.

Muscatelli (2003)uses the New Keynesian dynamic general equilibrium model for the US. In contrast to the previous work, he finds that the strategic complementality or substitutability of fiscal and monetary policy depends on the type of shock hitting the economy and on the assumptions made about the underlying structural model. He argues that the greater complementarily in the 1990s compared to the 1980s was due to the changing nature of the underlying shocks.

Semmler and Zhang (2003) explored the monetary and fiscal policy interaction in the Euro area. They firstly undertook some estimation with VAR models for France and Germany to test fiscal regimes. Their results indicate that the two countries had implemented non-Ricardian fiscal policy. They also undertook Granger causality tests for the fiscal policy and inflation and found that the fiscal policy does not seem to Granger-cause the inflation, but the inflation Granger-causes the fiscal policy to some extent. Another problem they discussed was how monetary policy and fiscal policy interacted over time. They apply State-Space model with macro switching to estimate time-varying parameters of a simple model. The evidence indicates that the monetary and fiscal policies had been complementary to each other in France most of the time, especially at the beginning of 1970s, 1980s, and 1990s. For Germany, they did not find significant interactions between monetary and fiscal policies. The two policies might had been weak strategic substitutes and switched between weak complements and substitutes. The last problem they discuss--whether the fiscal policy had taken into account the expectations of the future monetary policy--did not seem to have affected the current fiscal policy greatly.

Kaur& Sarabjit(2008) tested empirically the relative effectiveness of the two policies empirically in Indian context during pre-(1980to1991) and post-reforms (1991 to 2004) period using three

variables--gross national product (GNP), money supply (M3), and government expenditure in VAR model. Granger causality test showed that fiscal policy is more effective in pre-reforms period whereas monetary policy is more effective in post-reforms period.

Aktas, Kaya & Özlale (2010) studies the coordination between monetary and fiscal policy especially for an inflation targeting emerging market. The study takes Turkish economy as laboratory for the study and finds that dynamics in fiscal policies plays a very important role in effective implementation of the monetary policies.

Canzoneri, Cumby, & Diba (2010) discusses about different theories related to the optimal policy of the economy. The study focuses to know best combination of monetary and fiscal policies to stabilise the economy by looking to both positive and normative aspects of interaction between monetary and fiscal policy.

Raj, Khundrakpam & Das (2011) also empirically studies the interaction of monetary and fiscal policy for India from the period of 2000Q2 to 2010Q1 by using quarterly data of inflation rate (WPI), change in gross fiscal deficit, policy rate and output gap. As a result, they found that reaction of monetary and fiscal policies to any shocks in inflation and output are opposite. Fiscal policy reacts in a pro-cyclical way while monetary policy reacts in a counter-cyclical way. The study suggests that fiscal policy is effective in increasing the level of output in short run and decreases the level of saving and investment in the medium term.

Moreira, Soares, Sachsida, & Loureiro (2011) empirically analyse the interaction between monetary and fiscal policies in case of Brazil from the period of 1995:Q1 to 2008:Q3 and especially focus on whether fiscal policies are active or passive in this time span. The study gets quite confusing result. According to Lepper model fiscal policy was active and monetary policy was active, while in case of Ricardian regime monetary policy was active and fiscal policy was passive but again in case of non- Ricardian regime fiscal policy was active and monetary policy was passive.

Kuncoro & Sebayang (2013) try to find out the dynamic interaction between monetary and fiscal policies for Indonesia from the period of 1999-2010. The study finds interest rate and primary balance surplus are the main determinant of interaction between both the policies and monetary policy is more dominant than fiscal policy in case of Indonesia.

Afonso & Balhote (2014) try to examine the interaction between monetary and fiscal policies for 14 EU countries using panel data from the period of 1970 to 2012 but the study do not get any evidence related to central bank's response to fiscal policy

Bertella et al. (2015) examines the interaction between fiscal and monetary policy in a dynamic nonlinear model. The study separately studies the interaction between two policies for inflation targeting and growth targeting economy. As a result, find that stable equilibrium is more restrictive

in inflation targeting economy than growth targeting economy. Sufficient conditions of maintain stable equilibrium in growth targeting economy are not sufficient for inflation targeting economy.

4. Need for the study:

Despite monetary and fiscal policy being implemented by two different institutions, the policies are not independent of each other.The action of one usually affects the attainment of objectives by the other. In addition to that, the presence of competition economic theories with regard to monetary and fiscal policy interaction and their impact on other macroeconomic variable has motivated a large body of empirical investigation from a very long time. Most of the empirical work has been carried out in the advanced economics. The validity of such studies for understanding the interaction of monetary - fiscal policy and their impact on macroeconomics variable in emerging market economics such as India is questionable. Since, each of the economies have different institutional structure and arrangement , legal framework and market design with regard to the two policies and their implementation. In such cases, country specific studies become important. India, makes an interesting case study with its ever-changing policy dynamics.Additionally, due to evolving econometric techniques there is no consensus regarding such interactions.

5. Objective of the study:

The broad objective of this study is to empirically analyse the interaction between the monetary and fiscal policy and the in India

The specific objectives of the study are listed below:

1. To understand the reaction of monetary and fiscal policy variables to each other.

2. Examine whether the policies are complementary or substitutes to each other under different macroeconomics shocks.

3. Impact of monetary policy shock on macroeconomic variables .

4. Impact of fiscal policy shock on macroeconomic variables.

5. Impact of macroeconomics (non policy) variables such as inflation and output on monetary policy variable .

6. Impact of macroeconomics (non policy) variables such as inflation and output on fiscal policy variable.

7. Examine whether the monetary policy variable respond differently to tax shock vis-a-vis spending shock.

8. Examine the impact of anticipated and unanticipated effect of fiscal policy variable.

9. Understanding the fiscal policy variable and exchange rate dynamics and its implication for monetary policy.

6. Research Questions:

Q1. How does monetary and fiscal policy variable react to each other?

Q2. Are the policies are complementary or substitutes to each other?

Q3. What is the impact of monetary policy shock on macroeconomics variable?

Q4. What is the impact of fiscal policy shock on macroeconomics variable?

Q5. What is the impact of macroeconomics (non policy) variable on monetary policy variable?

Q6. What is the impact of macroeconomics (non policy) variable on fiscal policy variable?

Q7. Does the monetary policy variable respond differently to tax shock vis-a-vis spending shock ?

Q8. Which policy is better at stimulating the output ?

Q9. Which one of the fiscal instrument- tax or spending is better at stimulating output?

Q10. What is the effect of fiscal policy instrument on the exchange rate and monetary policy dynamics?

7. Research Hypothesis :

1. Fiscal policy instruments has significant impact on monetary policy instrument.

2. Monetary policy instrument has significant impact on fiscal policy instrument.

3. Fiscal policy shock has significant impact on macroeconomic variable.

4. Monetary policy shock has significant impact on macroeconomic variables.

5. Complementarity or substitutability of the policy variable depends upon the type of shock.

6. Macroeconomic variable (non policy shock) has significant impact on monetary variable .

7. Macroeconomic variable (non policy shock) has significant impact on fiscal variable .

8. There is significant difference in impact of tax shock vis-a vis spending shock on monetary variable.

9. Efficiency of policy in terms of stimulating output depend upon the type of shock.

10. There is significant impact of fiscal variable on exchange rate .

8. Theoretical Framework:

The theoretical framework of the model is derived from the objectives of monetary and fiscal policies.

Objectives of the both policies are functions of inflation, unemployment and potential output gap.

The utility functions for fiscal and monetary authorities in the literature (Andlib, et al, 2012, Raj, et al, 2011) are usually functions with three arguments namely unemployment, inflation and potential output growth.

The difference between the utility functions of the two policy institutions stems from the fact that while the fiscal authorities assign more weight to unemployment than inflation, monetary authorities are biased towards inflation by assigning greater weight to it than unemployment.

The utility functions are specified as follows:

$U^F = f(\hat{\mu}, \pi, \theta)$ -------- 1

$U^M = f(\mu, \hat{\pi}, \theta)$ -------- 2

where $U^F$and $U^M$are the utility functions of fiscal and monetary authorities respectively; μ, π and θ are unemployment rate, inflation rate and potential output growth respectively.

Using Okun's law, the unemployment can be represented by the output gap. Among other factors such as the capital stock, level of technology and foreign output, unemployment is a function of the two policies, i.e. interest rates and fiscal balance (government taxes and spending). Therefore, unemployment can be modeled as a function of interest rate and fiscal deficit (r, s).

That is, m = f (r, s). Thus, equations (1) and (2)

$U^F = f(r, s, \pi, \hat{\theta})$ ……3

$U^M = f(r, s, \hat{\pi}, \theta)$……..4

Equations (3) and (4) state that the utility functions of both fiscal and monetary authorities depend on policy instruments and policy targets. When policy instruments enter the utility function in place of unemployment rate, the fiscal authorities' bias shifted to potential output growth, hence, the hat on q in equation (3).

While the fiscal authorities face a growth maximisation problem subject to constraints emanating from monetary and external sectors of the economy, monetary authorities are faced with inflation minimisation problem with constraints from the fiscal and external sectors. The constraints of the two policy institutions can be formulated as reaction functions as follows:

$s = f(i,q,g,d)$.....(5)

$r = f(s,p,e,v)$.....(6)

where i, g & d in equation (5) are defined as interest rate, government expenditure/ GDP growth and public debt/GDP growth, respectively; and e &v in equation (6) refer to exchange rate depreciation/ appreciation and external reserves/GDP growth.

In the fiscal policy reaction function, interest rate is expected to capture adjusting in the monetary base, while public debt/ GDP captures the fiscal space available to the fiscal authorities. Government expenditure/GDP growth is also considered a key determinant of fiscal deficit assuming that government revenue/ GDP growth remains fairly constant since revenue mobilisation depends largely on existing tax laws and structures which do not change much over the years. On the other hand, exchange rate and external reserves fluctuations are also issues of concerned to the monetary authorities especially in a managed-float regime, hence, they are factored into the monetary policy reaction function.

Maximising the utility functions of the fiscal and monetary authorities with respect to potential output and inflation, respectively, and subject to the fiscal and monetary policy constraints (reaction functions) gives

$q = f(r,s,p,d,l)$.....(7)

$p = f(r,s,q,e,v,l)$.....(8)

Equation (7) states that the equilibrium potential output growth in the economy is a function of interest rate, fiscal deficit, inflation, and public debt.

According to equation (8), the equilibrium inflation rate has its arguments as base money supply growth, fiscal deficit, potential output growth, exchange rate depreciation and external reserves.

Lambda (l) in both equations (7) and (8) represents constraint coefficient which captures the marginal utility of adjusting policy instruments.

It must also be noted that while adjustments in the arguments of equation (7) are expected to maximise potential output growth, those of equation (8) are expected to minimise the rate of

inflation.

Converting both equations as minimisation problems, equation (7) can be transformed by writing potential output growth as output gap. In this way, the problem reduces to how to choose interest rate, fiscal deficit, inflation and public debt changes to minimise the output gap (that is, minimising fluctuations in output gap so as to keep output (GDP) close to its potential level).

9. Empirical Methodology:

In order to conduct empirical investigation of interaction between monetary and fiscal policy variables and identification of monetary and fiscal (policy) and macroeconomic shocks , the study makes use of Structural Vector Autoregressive (SVAR) model applied to a set of fiscal , monetary and macroeconomic variables identified from the theoretical framework.

Structural vector autoregression model can be written as
[using notation as in Rubio-Ramirez et. al (2010) and Arias et.al (2018)]

$$y_t'A0 = \sum_{i=1}^{N} y'_{t-1}Ai + c + \boldsymbol{\varepsilon}_t' \qquad for\ 1 \le t \le T \qquad (1)$$

where,
y_t is n X 1 vector of endogenous variables
c = 1 X n vector of parameters
$\boldsymbol{\varepsilon}_t$ = n X 1 vector of exogenous structural shocks.
N = Lag length
T = sample size.

The compact form equation is rewritten as :

$$y_t'A0 = x_t'A_+\boldsymbol{\varepsilon}_t' \qquad for\ 1 \le t \le T \qquad (2)$$

where,
A+ = [A1 A2…….Ap c] is matrix of structural parameter on lagged endogenous variables.
xt = [yt-1 yt-2…….yt-p 1]

Given the structural parameters the impulse response function (IRF) at a finite horizon h (Arias et al. 2010) is given by

$$L_h(A_0, A_+) = \left(A_0^{-1}J'F^hJ\right)' \qquad (3)$$

Where

$$F = \begin{bmatrix} A_1A_+^{-1} & I_n & .. & .. & 0 \\ : & : & & & : \\ . & . & . & . & . \\ A_{p-1}A_0^{-1} & 0 & .. & . & In \\ A_pA_+^{-1} & 0 & .. & . & 0 \end{bmatrix} \quad and \quad J = \begin{bmatrix} I_n \\ 0 \\ : \\ . \\ 0 \end{bmatrix}$$

On estimation of VAR , 'n' estimated shocks are obtained. Next step is the identification of structural shocks , ε_t- hat that are uncorrelated. Different techniques have been proposed in the literature for the same- short run , long run and sign restrictions. Short run restrictions aims at constraining the contemporaneous behaviour of the variable. Choleksy decomposition is one of the most common way of imposing these restrictions.Long run restriction approach involves imposing restrictions on the long run behaviour of the variables.Sign restrictions is based on providing expected sign of a variable in response to an exogenous shock. The identification strategy employed in the study is a combination of magnitude and sign restriction (Rubio-RamiRez, Waggoner and Zha (2010), Dungey and Fry(2009) , Uhliq (2005) consistent with economic theory. Combination of different identification strategies to overcome the disadvantage associated with one approach.Based on zero and sign restriction approach fiscal, monetary and macroeconomics shocks are identified. In the study, the contemporaneous matrix (A0) and variance covariance matrix is estimated first, then SVAR is identified . Model is stimulated and responses satisfying the restrictions are stored.

Further, Impulse response function and variance decomposition obtained from estimated SVAR is used to study the impact and transmission of macroeconomic and policy shocks .

10. Data and Variable:

The study uses secondary data set covering the period between 1991Q1 to 2016Q2 for Indian economy. The study employs both policy and non policy variables. Variables such as interest rate , output, inflation rate, exchange rate , government tax revenue, government debt are used. All the variables are checked for stationarity using Augmented Dickey fuller test before SVAR estimation. GDP deflator is used to convert nominal series into real terms.

11. Conclusion:

The study analyses the interactions between Indian monetary and fiscal policy. Since most studies in literature mostly focus on monetary policy shock because of difficulties in identification of fiscal policy shock . Fiscal policy shocks are difficult to identify because of high correlation found

inherently between the fiscal policy instrument- taxes and spending.However, recent development in identification method allows for better identification of fiscal policy shocks. Therefore, this study makes an important contribution to literature since along with monetary policy shocks it also takes into account fiscal policy shocks.The result of the study is compared with other similar studies done in both advanced and developing countries for better understand of interaction and impact on macroeconomic environment. In case of India, given a certain degree of fiscal dominance it is expected that the monetary policy may be responding to accommodate fiscal policy whereas same might not be true for fiscal policy. Policy interactions might be differ in case of different fiscal shocks. The response of macroeconomics and policy variables to each other differ for India when compared with other studies.

The findings of the study have to be seen in the light of some limitations. Firstly , it is a country specific study and conducted for a particular period. Therefore, generalisation of the empirical results must be done with great caution. Secondly, since it is an empirical study focus has been give more to empirical analysis rather than the theoretical aspect.

12. Tentative structure of dissertation:

CHAPTER 1	INTRODUCTION
CHAPTER 2	MONETARY AND FISCAL POLICY INTERFACE IN INDIA
CHAPTER 3	REVIEW OF LITERATURE
CHAPTER 4	RESEARCH METHODOLOGY
CHAPTER 5	DATA ANALYSIS AND RESULT
CHAPTER 6	CONCLUSION
	REFERENCES