Empirical determination of Monetary-Fiscal Dynamic nexus and their efficiency in India

Executive Summary

of the Ph.D. thesis

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1. Introduction

Monetary and fiscal policies are the two key instruments used by central banks and governments. Monetary policy refers to the actions taken by the central bank to regulate the supply of money and credit in the economy, while fiscal policy is used by the government to control economic activity through spending and taxation.

The main objective of these macroeconomic policies is typically to establish a sustainable macroeconomic climate that features stable and positive growth along with low and stable inflation rates. The essential purpose is to fundamentally guide the economy to prevents economic upswings that can lead to extended periods of low or negative growth and elevated levels of joblessness. A stable economic environment empowers individuals to make confident spending and saving decisions, while businesses concentrate on making investment decisions, meeting their bondholders' coupon payments, and delivering profits to their stakeholders (CFA Institute, n.d.).

It is evident that both of these policies function within the context of macroeconomic goals, such as full employment, price stability, and a sustainable economic growth.However, the primary goal of fiscal policy is to minimize unemployment by fostering a situation where all the available resources of the economy are utilized to produce more output. In contrast, the central focus of monetary policy is price and exchange rates stability to ensure strong macroeconomic fundamentals.

Economic theory postulates that these two goals of the two policies are not mutually exclusive. For instance, while monetarists regard inflation as a purely monetary phenomenon, the Fiscal Theory of the Price Level (FTPL) demonstrates that inflation

can be be a fiscal phenomenon rather than monetary when the inter temporal budget constraint is treated as an equilibrium condition (Bassetto, 2008). The FTPL is based on the concept that the government pledges to a constant and predetermined amount of primary fiscal surpluses, which is a particular instance of an "active" fiscal policy as described by Leeper (1991) and "Non-Ricardian" fiscal regime as explained by Woodford (1995).

Moreover, Sargent and Wallace (1981) in his paper titled “Some unpleasant monetarist arithmetic” have shown that even an independent central bank can lose control over its monetary policy in a fiscal dominant regime. This is indicative of the way in which both policies function within a macroeconomic environment that is characterized by interplay among different policies and macroeconomic variables.

Additionally, the question of the optimal mix and efficiency of the two policies has been a subject of constant debate among macroeconomists with no clear established conclusion. The classical and new classical schools of thought maintain that a free market system operates effectively without policy interventions. Conversely, the Keynesian school of thought advocates for the use of fiscal policy during recessions due to the perceived inefficiency of monetary policy in stimulating economic growth. The monetarist school of thought takes the opposite stance, arguing that monetary policy is a more effective policy instrument.

The debate among economists over the effectiveness of macroeconomic policies has not been limited to just the choice between monetary and fiscal policies. It also extends to the question of whether a rule-based policy is more effective than a discretionary policy. Some economists, such as Barro and Gordon (1983) and

Kydland and Prescott (1977), argue in favor of a rule-based policy as an optimal policy. They suggest that a pre-determined set of rules can lead to better economic outcomes compared to discretionary policies. On the other hand, most Keynesian economists believe that discretionary policies provide more flexibility and allow policymakers to respond more effectively to unforeseen economic shocks.

Furthermore, the interaction between these two policies extends beyond policy goals and into the realm of monetary-fiscal instruments. For example, an expansionary fiscal policy on account of increased government expenditure can possibly lead to increased interest rate as government competes with private sector for the limited funds in the market.

Therefore, it can be stated that the complexity of these policies requires a deep understanding of the interrelationships between economic variables and the efficiency of policy tools, as well as the ability to anticipate and respond to changes in the macroeconomic economic environment.

The discourse surrounding the role of monetary and fiscal policy in economic stabilization and growth has persistently been a focal point of macroeconomic policy research. Nevertheless, the urgency of this discourse has been amplified in recent times, particularly in light of the economic challenges that surfaced following the global financial crisis of 2008-2009. Countries across the globe deployed a blend of expansionary monetary and fiscal policies as part of their economic recovery strategies in response to the subprime crises of 2008. These crisis elicited responses from monetary and fiscal policies collectively than any other economic crisis since

World War II. Accordingly, to grasp the implications of these policy measures, a joint analysis of both monetary and fiscal policies is required (Davig and Leeper, 2011). Nonetheless, the question of whether these policy actions were executed in synchronization or contention is still a topic warranting further inquiry (Arora, 2018) .

Additionally, the eurozone debt crises that emerged in 2015 underscored the criticality of a viable and sustainable fiscal policy framework in a monetary union (Wickens, 2016).The crises demonstrated that a lack of such framework could lead to financial instability. Furthermore, since the fiscal variables can significantly influence the monetary policy reaction function, understanding the impact of fiscal policy variable becomes a key consideration for policymakers.

Therefore, effective coordination of monetary and fiscal policies is essential for achieving these objectives, and policymakers must carefully balance the trade-offs and potential risks associated with each policy tool. In the absence of coordination, the result can be a prisoners' dilemma type outcome where higher inflation and lower growth leading to reduction in the welfare of both parties (Goyal, 2018). Thus, making it important understand and study the dynamics between monetary and fiscal variables.

In India, both these policies are critical tools for the attainment of macroeconomic objectives. The Reserve Bank of India (RBI) formulates and implements monetary policy, while the Ministry of Finance manages fiscal policy through its budgetary policies.

In terms of the monetary and fiscal policy interactions, India makes an interesting case as it has experienced continuously evolving dynamics between monetary and fiscal policies.

The Balance of Payment cases of 1991 reflected the serious implication of high fiscal deficit on the economy. To address this issue, India implemented various economic reforms and moved towards an open economy redefining the exchange rate management role of monetary policy. Subsequently, reforms like elimination of automatic monetization of debt, deregulation of interest rate, shift to Liquidity Adjustment facility (LAF) and adoption of FRBM, Act 2013 have said to have decreased the fiscal dominance in India.

Further, India, being an emerging market economy, provides a rich economic environment to study the interaction between fiscal and monetary policies. India's economic growth, inflation, exchange rate, and balance of payments are some of the macroeconomic variables that are impacted by both fiscal and monetary policies.

Therefore, studying the effectiveness of these policies in India can provide valuable insights for policymakers to design effective policies that can achieve their objectives.

Furthermore, India's experience can also contribute to the academic literature on the effectiveness of fiscal and monetary policies in emerging market economies. As the research on monetary-fiscal interactions, both theoretical and empirical, has provided no definite conclusion and indicates diverse outcomes.The broad objective of this study was to empirically analyse the nexus between the

The monetary and fiscal variables and their impact of key macroeconomic variables in India. The study had two objectives. Firstly, to examine the response and interaction of monetary and fiscal policy towards specific macro-variables. Secondly, to investigate the reaction of macro-variables to macro policy shocks while considering the various policy interactions occurring in the background. Further, based on the interaction between monetary and fiscal policy, this study has examined their efficiency.

1.1 Objective of the study

The 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 situation such as in case of aggregate demand and aggregate supply shock on monetary policy variable .
6. Impact of macroeconomics situation such as in case of aggregate demand and aggregate supply shock on fiscal policy variable.
7. Examine whether the monetary policy variable respond differently to tax shock vis-a-vis spending shock.
8. Understanding the fiscal policy variable and exchange rate dynamics and its implication for monetary policy.
9. Understanding the efficiency of the two policies.

1.2 Research Questions

Q1. How does monetary (interest rate) and fiscal policy variable (taxes and government spending) react to each other?

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

Q3. What is the impact of monetary policy shock (ie. interest rate shock) on macroeconomics variable ?

a. What is the impact of interest rate shock on output?

b. What is the impact of interest rate shock on inflation?

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

a. What is the impact of tax shock on output?

b. What is the impact of tax rate shock on inflation?

c. What is the impact of government spending shock on output?

d. What is the impact of government spending on inflation?

Q5. What is the impact of different macroeconomics situation on monetary policy variable?

a. What is the impact of an aggregate demand shock on interest rate?

b. What is of the impact of an aggregate supply shock on interest rate ?

Q6. What is the impact of different macroeconomics situation on fiscal policy variable?

a. What is the impact of an aggregate demand shock on taxes ?

b. What is the impact an aggregate demand shock on government spending ?

c. What is the impact of an aggregate supply shock on taxes ?

d. What is the impact of an aggregate supply shock on government spending ?

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

a. What is the impact of tax shock on interest rate ?

b. What is the impact of government spending on interest rate?

Q8. Which policy is better at stimulating the output ?

a. What is the impact of interest rate shock on output?

b. What is the impact of tax shock on output?

c. What is the impact of government spending shock on output?

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

a. What is the impact of tax shock on output?

b. What is the impact of government spending shock on output?

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

a. What is the impact of tax shock on exchange rate ?

b. What is the impact of government spending on exchange rate?

c. What is the impact of interest rate shocks on exchange rate?

1.3 Research Hypothesis :

1. Fiscal policy instruments (Taxes and spending) have significant impact on monetary policy instrument (interest rate).

1. a. Government spending has significant impact on interest rate.

1. b. Taxes have significant impact on interest rate.

2. Monetary policy instrument (interest rate) has significant impact on fiscal policy instrument (Taxes and Spending).

2. a. Interest rate has significant impact on Taxes.

2. b. Interest rate has significant impact on government spending

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

3.a. A tax shock has significant impact on output.

3.b. A government spending shock has significant impact on output.

3.c. A tax shock has significant impact on inflation.

3.d. A government spending shock has significant impact on inflation.

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

4.a. An interest rate shock has a significant impact on inflation.

4.b. An interest rate shock has a significant impact on output.

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 .

6.a. An Inflation shock has significant impact on interest rate.

6.b. An output shock has significant impact on interest rate.

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

7.a. An inflation shock has significant impact on taxes.

7.b. An inflation shock has significant impact on government spending.

7.c. An output shock has significant impact on taxes.

7.d. An output shock has significant impact on government spending.

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 .

10.a. A tax shock has significant impact on exchange rate.

10.b. A government spending shock has significant impact on exchange rate

2. Research Methodology:

2.1 Data:

The study utilized key macroeconomic variables such as interest rate, inflation, government expenditure, government taxes, output gap, and exchange rate. The call money rate was used as a proxy for interest rate, which is a money market variable. Inflation was calculated based on the Wholesale Price Index (WPI), while government expenditure and net taxes were converted into real terms using the Gross Domestic Product (GDP) deflator. The output gap was extracted using the Hodrick-Prescott (HP) filter from the GDP series, and the real effective exchange rate was used as a measure of the exchange rate. The interest rate was considered the monetary policy instrument, while government expenditure and taxes were regarded as the fiscal policy instruments.

Description of the Data:

Variables	Type of Variable	Description	Source
Output Gap	Real	Difference between potential and actual output extracted using HP filter from real GDP series, Non - policy instrument,	www.rbi.org.in Reserve Bank of India website
Government Taxes	Real	Total government net tax revenue , Fiscal policy instrument converted to Log form	www.rbi.org.in Reserve Bank of India website
Government Expenditure	Real	Total government expenditure , Fiscal Policy instrument converted to Log form	www.rbi.org.in Reserve Bank of India website

Inflation	Nominal	Wholesale Price Index Non-policy instrument converted to Log form	www.rbi.org.in Reserve Bank of India website
Interest rate	Nominal	Call money rate Monetary policy instrument converted to Log form	www.rbi.org.in Reserve Bank of India website
Exchange rate	Real	36 currency based Real Effective Exchange rate (trade weighted), Non - policy instrument	https:// fred.stlouisfed.org/

2.2. Theoretical Framework:

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

The existing literature shows that utility functions for monetary and fiscal authorities are commonly developed with three variables: inflation, unemployment, and potential output growth. However, studies by Andlib et al. (2012) and Raj et al. (2011) have shown that the weights assigned to each macroeconomic variable differ between these authorities, reflecting their distinct preferences for macroeconomic outcomes. Fiscal authorities tend to prioritize low unemployment over inflation, while monetary authorities give greater weight to reducing inflation. This difference in weighting can be attributed to the central bank's primary objective of maintaining price stability, whereas the fiscal authority is responsible for promoting output growth, which in turn impacts employment levels. In India, the dominant objective of monetary policy has been price stability Mohanty, D. (2011).

Using the methodology described by Nordhus (1994), as outlined in Andlib et al. (2012), the following utility functions are specified based on the underlying assumptions:

$$U^M = f(\mu, \hat{\pi}, \theta) \quad 3.1$$

$$U^F = f(\hat{\mu}, \pi, \theta) \quad 3.2$$

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.

The unemployment gap is a closely linked with the output gap in economic literature. The difference between the unemployment rate and the non-accelerating inflation rate of unemployment

(NAIRU) is connected to the deviation of actual output from its potential level as explained by long run Philips curve. Additionally, Okun's law establishes a negative relationship between changes in gross domestic product (GDP) and unemployment that remains relatively stable over time (Jahan and Mahmud, 2017). Therefore, Okun's law can be used to represent the unemployment rate in terms of the output gap. Both fiscal and monetary policies have an impact on the output level in the economy, as demonstrated in the IS-LM analysis. Thus, the output gap can be modelled as a function of the two policies - interest rate (r) and fiscal balances (s). The current fiscal balance is calculated as the difference between current revenue and current expenditure. Accordingly , fiscal balance depends upon the two tools of the fiscal

policy (ie. taxation (t) and expenditure (g)). Therefore, unemployment can be modelled as a function of interest rate and fiscal balance. That is, $\mu = g(r,s)$

Thus, equations (3.1) and (3.2) can be rewritten as:

$$U^M = f(r,s,\hat{\pi},\theta) \quad 3.3$$

$$U^F = f(r,s,\pi,\hat{\theta}) \quad 3.4$$

The utility functions of the monetary and fiscal authorities, as represented in equations (3.3) and (3.4), respectively, are influenced by policy targets and instruments. Equation (3.3) demonstrates that when policy instruments are used in place of the unemployment rate, fiscal authorities display a preference for potential output growth, as denoted by the hat on q.

The fiscal authorities encounter a growth maximization problem that is limited by constraints originating from the external and monetary sectors of the economy (as seen in IS-LM-BP analysis). In contrast, the monetary authorities are confronted with the challenge of minimizing inflation, subject to constraints arising from the external (as shown in IS-LM-BP analysis) and fiscal sectors (as seen in non- ricardian assumption of FTPL, Christ (1968) macroeconomic model).

The above mentioned constrained can be expressed as the reaction function of both the authorities:

$$r = h(\pi,s,e,v) \quad 3.5$$

$$s = h(r,\theta,g,t) \quad 3.6$$

where equation (5) can be defined as monetary policy reaction function with interest rate (monetary policy variable) is a function of inflation, fiscal balance (s) ,

exchange rate depreciation/ appreciation (e) and external reserves/ GDP growth. Here s captures the effect of fiscal policy variables on the monetary policy variables. To incorporate concerns regarding fluctuations in the exchange rate and external reserves in a managed-float regime, e and v are taken into account when developing the monetary policy reaction function. On the other hand, equation (6) defined the fiscal policy reaction with fiscal balance as function of interest rate (r) , output gap (θ) , government expenditure (g) and government taxes (t). Here interest rate captures the effect of monetary policy variable on the fiscal variable.

By optimizing the utility functions of both monetary and fiscal authorities in terms of inflation and potential output, respectively, while accounting for their policy constraints (as represented by their respective reaction functions), the following equation is derived:

$$\theta = F(r, g, t, \pi, \lambda) \quad 3.7$$

$$\pi = F(r, g, t, \theta, e, \lambda) \quad 3.8$$

Equation (3.7) states that potential output in the economy is a function of interest rate , government expenditure , government taxes and inflation.

Equation (3.8) states that equilibrium inflation rate is a function of interest rate , government expenditure , government taxes, exchange rate and output growth.

The constraint coefficient lambda (λ) in equations (3.7) and (3.8) refers to the marginal utility of adjusting policy instruments and serves to constrain the utility functions of both equations.

It should be noted that the objectives of equations (3.7) and (3.8) are different. While the former aims to maximize potential output growth, the latter seeks to minimize the rate of inflation. To convert both equations into minimization problems, equation (7) can be rewritten by substituting output gap for potential output growth. This reduces the problem to determining the optimal values for interest rate, government spending and taxes, inflation, changes that minimize the output gap. Based on the optimisation problem and the research objective the study used six variables- interest rate (monetary policy instrument) , government expenditure and taxes (fiscal policy instrument), inflation , output gap , exchange rate.

2.3 Empirical Model:

The study employed the Structural Vector Autoregression (SVAR) methodology with cholesky decomposition and sign and zero restrictions. The impulse response obtained from the model was used to analyze the interactions between the macroeconomic variables. The Variance decomposition obtained from Cholesky decomposition was used to identify the variation in the macroeconomic variables on which sign restrictions were placed. Prior to the SVAR analysis, the variables were transformed into stationary form using the difference method.

Structural Vector Autoregressive Model:

Structural Vector Autoregression (SVAR) is a widely used statistical model in macroeconomics and finance, allowing for the identification and analysis of the underlying shocks that drive the dynamics of the system. The SVAR framework

involves a system of equations that are simultaneously estimated, with the aim of uncovering the structural relationships between the endogenous variables of interest.

A general form SVAR appears in the following format:

$$B_o y_t = B_1 y_{t-1} + \ldots\ldots + B_p y_{t-p} + w_t \qquad 3.10$$

where y_t is the k x1 vector of observed time series data $(y_{1t}, \ldots y_{kt})'$, t= 1,…,T. It contains endogenous variables.

For this study the set of endogenous variables are government expenditure, government taxes, interest rate, inflation rate, output gap and exchange rate.

y_t = {government expenditure, government taxes, interest rate, inflation rate, output gap and exchange rate}

B_0 is a k x k matrix, which reflects the contemporaneous relationship between the variables.

Further, B_i , $i = 1,...,p$, is a k x k matrix of autoregressive slope coefficients where the cross-variable coefficients captures the interaction between the variables.

B_o^{-1} captures the impact effects of each of structural shock on each of the variables in the model. w_t is serially uncorrelated and has a diagonal covariance matrix

$\sum_w$ of full rank. The structural shocks can be recovered from the reduced - form representation.

Equivalently the model can be written as

$$B(L)y_t = w_t \tag{3.11}$$

where $B(L) = B_0 - B_1L - B_2L^2 - \ldots - B_pL^p$ is the autoregressive lag polynomial.

The problem with form of SVAR model shown in equation (3.10) is that it cannot be estimated using standard estimation technique such as OLS. The inherent feedback in the system prevents direct estimate of these equations, as the variables of interest (y_t) are associated with the error term (w_t). This correlation poses a challenge, as the standard estimation techniques are based on the assumptions that the regressors are uncorrelated with the error term ie. $cov(y_{it}, w_{it}) \neq 0$ (Enders, 2010).

Therefore, in order to estimate the SVAR model and to obtain its true structural parameter requires transforming the primitive system into its standard reduced form VAR model. This reduced form model can be obtained by premultiplying both sides of the equation (3.10) by B_0^{-1}.

Thus, reduced form representation of the model can be written as

$$y_t = A_1y_{t-1} + \ldots\ldots + A_py_{t-p} + u_t \tag{3.12}$$

where $A_i = B_0^{-1}B_i$ and $u_t = B_0^{-1}w_t \sim (0, \sum_u$. Equivalently the model can be represented by:

$$A(L)y_t = u_t \tag{3.13}$$

where $A(L) = I_K - A_1L - A_2L^2 - \ldots - A_pL^p$ is the autoregressive lag polynomial.

The coefficients of this reduced form can be estimated through either Ordinary Least Squares (OLS) or Maximum Likelihood (ML) estimation methods, since only predetermined variables are expressed as a function of y_t. Similarly, this would also generate the residuals u_t.

Once A_i matrix and the residuals u_i are estimated , from $A_i = B_0^{-1}B_i$ $u_t = B_0^{-1}w_t$ the structural parameters B_i and and structural shocks w_t can be estimated. However, to recover the parameters of the structural model requires the knowledge of the structural impact multiplier matrix B_0^{-1}. The estimation of B_0^{-1} or B_0 requires economically credible restrictions be imposed on B_0^{-1} or B_0 to identify the structural shocks. Given these restrictions and data, if B_0^{-1} or B_0 can be solved, it can be confirmed that the parameters of the structural VAR model, denoted as (B_0 , B_1 , . . . Bp, $\sum_w$), have been

identified (Kotzé).]

Alternately, we can state that structural shocks, denoted by $w_t = B_0 u_t$, have been identified. Identification of structural shocks from reduced form residual is the essence of SVAR. This study used the household transformation approach by Rubio-Ramirez, Waggoner, and Zha for identification of shocks using zero and sign restrictions .

The study utilises Impulse Response Functions (IRFs) and Variance Decomposition for the evaluation of SVAR analysis results. IRFs offer a dynamic representation of the effect of a shock on a chosen variable over time, allowing examination of the shock's direction, size, and persistence. This technique aids in comparing the importance of different shocks and assessing the effectiveness of policy responses to these shocks.

To calculate an IRF in SVAR, the model was estimated using identified structural shocks. Then a one-unit shock was applied to a specific variable, keeping others constant. The impulse response function is computed by tracking how each endogenous variable reacts to this shock over time. The function is obtained by applying the restrictions recursively to the model's estimated coefficients. This tool's graphical representation was used to study the dynamic effects of a shock, facilitating informed policy decisions.

Further, Variance Decomposition was used in SVAR analysis to quantify the contribution of each shock to the variation in the endogenous variables over a specific time horizon.

2.4. Identification:

The sign restriction method is a partial identification technique that does not require restrictions to be placed on every variable. Rather, it is used solely to identify the structural shock that the study seeks to investigate, in order to achieve its research goals.

The sign restrictions and zero restriction imposed on the variables in the study are as follows:

1. A positive monetary policy shock, which involves an increase in interest rates, is identified with a negative effect on both the output gap and inflation.
2. A tax shock was identified as having a positive impact on tax revenue and negative impact on output gap.
3. An expenditure shock was identified with a positive impact on both expenditure itself and the output gap.

4. The identification of aggregate demand and aggregate supply shocks is based on the Keynesian aggregate demand and supply analysis. Aggregate demand gap is identified by a positive impact on both output and inflation.
5. An aggregate supply gap is identified on the basis of positive impact on output but negative impact on inflation.

3. Key Findings

The objective of the study was to examine the interplay between monetary and fiscal policies in India, given different policy alternatives. Various structural shocks in the economy were identified and evaluated for their impact on policy and non-policy macroeconomic variables. The study found that the relationship between these policies was complex, as there were numerous interactions between their variables.

The key findings from the impulse response function and variance decomposition are as follows:

1. A positive interest rate shock lead to a decrease in government taxes and an increase in government expenditure, suggesting a differential response from fiscal policy tools to monetary policy instrument.

2. In response to a positive tax shock not accompanied by an increase in government spending, the monetary policy responds with an expansionary action, while in cases of increased government spending not accompanied by tax rise, the monetary policy response is contractionary.

3. The interaction between monetary and fiscal policy varied in response to different shocks.

4. In the case of tax shock, aggregate demand and aggregate supply shocks, both fiscal and monetary policies act as complements. This means that these policies can work together to achieve the goals of price stability and economic growth. However, in the case of monetary policy shock and expenditure shock, the two policies behave as substitutes. In such cases, the effectiveness of one policy is affected by the other, which can be detrimental to overall macroeconomic stability.

5. A monetary policy action is effective in reducing the inflation rate and stabilising the output gap. However, the expansionary fiscal policy stance has a prolonged

effect on stabilising the output gap. Further, the effectiveness of monetary policy in reducing inflation and stabilising output is influenced by fiscal policy actions.

6. Tax shock is more effective in stabilizing the economy compared to expenditure shock.

7. The fluctuation in output gap in long run are mainly caused due to expenditure and depend the least on interest rate changes. Additionally, the most fluctuation in long run in case of inflation is also due to expenditure.

8. In the case of an aggregate demand shock that increases output and inflation, the monetary policy responds with a contractionary policy action by increasing the interest rate. Conversely, in the case of a positive aggregate supply shock that increases output but decreases inflation, the monetary policy responds with an expansionary policy action by lowering the interest rate. This suggests that the monetary policy in response to supply and demand shocks is counter-cyclical in nature.

9. The response of fiscal policy to aggregate demand and supply shocks can be characterized as initially contractionary, with different magnitudes of impact depending on the nature of the shock. In the case of an aggregate demand shock that led to increased output and inflation, fiscal policy responded with an initial increase in taxes and decrease in expenditure.

10. In the case of a positive tax shock, where there is no accompanying increase in government expenditure, the monetary policy responded with an expansionary policy action by decreasing the interest rate. On the other hand, in the case of a positive expenditure shock where there is no accompanying increase in taxes, the monetary policy acted in a contractionary way.

11. The impact on exchange rate dynamics depends on the combination of fiscal and monetary policy shocks.

12. The empirical analysis from the impulse response found that the effectiveness of monetary policy in achieving its goals hinges on the type of fiscal policy shock in question. Monetary policy serves the objective of economic expansion when tax shocks are prevalent in the system vis-à-vis expenditure shocks.

13. Regarding the efficiency of fiscal policy tools, the study found that tax shocks are more effective than expenditure shocks in stabilizing the economy and achieving macroeconomic stability along with monetary policy. Policymakers should, therefore, focus on tax policies to achieve their policy objectives.

4. Conclusion

The study conducted an in-depth examination of the interactions between monetary and fiscal policies in India, considering various structural shocks and their impacts on policy and non-policy macroeconomic variables. It found that the relationship between these two policies is complex due to numerous interactions, and monetary policy actions can be influenced by the type of fiscal policy shock, indicating a potential dominance of fiscal policy.

Consistent with prior research, the study asserting that fiscal policy still has sway over monetary policy despite fiscal sustainability efforts like the FRBM Act of 2003. The research stressed the necessity of adherence to fiscal policy rules for the effectiveness of monetary policy, particularly in the context of India's inflation targeting policy approach. Furthermore, it emphasised the need for policy coordination for achieving macroeconomic stability and sustainable growth, accounting for the interdependence of fiscal and monetary policies.

It was also found that the effectiveness of monetary and fiscal policies depends on whether they act as complements or substitutes, which in turn is determined by the type of shock to the economy. The study additionally discovered that tax shocks are more effective than expenditure shocks for stabilizing the economy in combination with monetary policy.

In summary, the study underscores the importance of considering both fiscal and monetary policy actions for achieving macroeconomic stability and policy objectives, providing valuable insights to policymakers and analysts about the complex macroeconomic environment in India.

5. Policy Implication and Recommendation

I. The different responses of monetary policy to various fiscal policy variables highlight the remaining impact of fiscal policy on monetary policy.
II. With India's recent move towards inflation targeting and the establishment of a monetary policy committee, it is crucial to stick to fiscal rules to maintain the effectiveness of monetary policy.
III. A tax shock can potentially mitigate the inflationary effects of an expansionary fiscal policy, thereby allowing monetary policy to concentrate on growth objectives.
IV. The study indicates that policy responses vary depending on the shock, emphasizing the need for policy coordination to achieve macroeconomic stability.
V. Coordinated response to shocks results in fewer fluctuations in the economy.
VI. Adherence to fiscal policy rules is essential for sustainability, ensuring the optimal function of the inflation targeting regime.
VII. India's fiscal policy, driven by populist measures, demonstrates the importance of compliance with fiscal rules.

6. Limitation of the study:

I. This study, focusing on India from 1991 to 2016, is specific to the country's unique policy regimes and institutional frameworks; thus, its results can't be generalized to other nations.
II. The study employs a SVAR approach with sign and zero restriction to identify structural shocks. This empirical method has some limitations, as it may not fully capture the complexities of policy interactions and impacts due to the intricacies of time series data.
III. The study is based on a specific set of variables. The inclusion of more variables could shed light on new interactions and relationships between policy tools, but the SVAR approach used in this study limits the number of variables that can be included.

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