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**Differential impacts of fiscal consolidation policies under alternative monetary regimes: evidence from Indian economy**

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## Differential impacts of fiscal consolidation policies under alternative monetary regimes: evidence from Indian economy

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**Abstract:** The study tried to examine the effects of fiscal consolidation policies under alternative monetary stances in Indian economy. Using structurally adjusted vector autoregression (SVAR) we found that both Monetary and Fiscal-policies interact in cooperative as well as competing manner depending on the type and timing of shocks. Although fiscal policy enjoys a certain degree of superiority, the potency of monetary policy has not waned away. In terms of effectiveness, the study found that the fiscal policy is a better tool of economic stabilisation in the short run but in long and medium run it may harm growth. A consolidation program aimed at infusing fiscal prudence was found to have differential impacts on economic growth depending on whether such a policy is undertaken in an expansionary or contractionary monetary regime. Ironically the fiscal-policy was found to have more influence on inflation than monetary policy pointing towards the fiscal theory of price level; FTPL.

**Keywords:** fiscal policy; monetary policy; GDP; gross domestic product; private investment; private consumption.

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## **1 Introduction**

The two most important policy instruments that assumed importance as tools to economic stabilisation are monetary and fiscal policy. Although, the structure and composition of these policies vary but the ultimate objective is usually the same, i.e., improving the material welfare (Arby and Hanif, 2010). The former is related to monetary conditions in the economy, and the latter is related to fiscal policy rule, usually represented by changes in the budgetary position of the government. The prime focus of the monetary policy is price stability, while the main objective of the fiscal policy is inclined towards higher growth and employment, even at the cost of high inflation (Hanif et al., 2010). This leads to a possible conflict between two policies and at times can lead to a potential confrontation. This necessitates a regulated coordination between a centralised monetary policy and a decentralised fiscal policy (Foresti, 2018).

The interdependence and the consequent coordination have multiple economic arguments to its support. A non-cooperative behaviour by any of the policy instruments renders both the policies ineffective and adversely undermines the credibility of both monetary and fiscal policy (Dixit and Lambertini, 2001). A confrontationist approach by either of the two instruments can adversely impact both income and employment, even in short run. There has been a consistent proliferation of literature assessing the interaction of monetary and fiscal policy and their relative effectiveness in case of both advanced and emerging economies (Goyal, 2002; Van Aarle et al., 2003; Davig et al., 2010; Arby and Hanif, 2010; Raj et al., 2011; Jain and Kumar, 2013; Cevik et al., 2014; Foresti, 2018). This has experienced further acceleration due to global melting of (2008) following the financial crises of the US and its lightning transmission to other integrated economies. Due to the global melting of 2008, economies both advanced and emerging stressed economic stabilisation rather than debt stabilisation by pursuing expansionary monetary and fiscal policies (Cevik et al., 2014). This aggressive and unified monetary and fiscal policy intervention to stimulate the economy is a distinctive hallmark of the modern-day policy response. However, the effectiveness of these policy instruments as tools of economic stabilisation has been an area of intense debate.

Contrary to monetary policy the effectiveness of fiscal policy as a tool to economic stabilisation has been an area of contestations. For instance, the Keynesian school of thought suggest that an expansionary fiscal stance financed by public debt enhances Income and hence demand. On the other hand, the IS-LM doctrine suggests that fiscal stimulus with-out an accommodative monetary rule increases aggregate demand that, in turn leads to an increase in the level of interest rate and hence crowds out private investment (Gali, 1992). Yet the neo-classical school completely deny any stabilisation role for fiscal policy even in short run. Their disbelief in fiscal policy stems primarily from the fact that fiscal deficits crowd out private investment in a one-to-one relation

(Clinton et al., 2011). However, from the empirical perspective, the effects seem to be sensitive to econometric and statistical methodology, and thus the final effects are inconclusive (Cevik et al., 2014). Similarly, there are doubts raised in the literature about the efficiency of a monetary policy rule to effectively stabilise the level of inflation, especially in face of a non-cooperative fiscal policy. Though the monetarist school of thought contends that price stability is purely a monetary phenomenon, but the fiscal theory of price level (FTPL) holds otherwise. It is only effective when the monetary policy enjoys absolute autonomy on price stability in an economy (Reade, 2011).

Since the oil price shock of the 1970s and the consequent stagflation, monetary policy has received a great deal of attention from both economists and policymakers. However, post-global financial melting there has been a shift of focus from monetary to fiscal policies, if not biased but at least balanced (Reade, 2011). Thus, instead of using monetary and fiscal policy tools individually in an independent manner, it pays to use both in a cooperative and accommodating manner (Lima et al., 2012). However, this coordination should not be used as a means to put monetary policy subordinate to fiscal policy, and there should not be an institutional overlap as has been the case in most emerging market economies like India, Pakistan during 1990s (Hanif et al., 2003; Raj et al., 2011). Such subordination will not only compromise on the principles of efficiency but will also undermine the legitimacy of monetary policy in the economy. This often leads to undesired departure from the golden rule of price stability, especially due to forced monetisation of debt (Franta et al., 2012).

## **2 Fiscal-monetary interaction in the Indian context**

It has been a long practice in emerging market economies to borrow the lessons from the experience of advanced economy. Most of the time these experiences of advanced economies are accepted as golden rules without paying much attention to their design and validity. In most of the cases no attention is paid to the institutional structures and market designs prevalent in emerging economies which at times are diametrically opposite to advanced economies. For instance, the 3% fiscal deficit limit proposed under the FRBM act has been an area of intense debate. Roy et al. (2018) argued against the use of a symmetry debt ratio for centre and states given their divergent debt levels. They empirically established that states should not be allowed to run fiscal deficits more than 2% for their debt to stabilise around a debt to SGDP ratio of 20%. So, the studies undertaken for advanced economies and their results need not be imposed on emerging market economies for policy analysis. This necessitates the need for country specific studies for better policy making. This study in essence is a step in this direction with an explicit thrust to investigate fiscal-monetary interaction for Indian economy.

In India, like any other emerging economy, it is contended that there is complete fiscal dominance and monetary policy acts as merely a servant to the fiscal requirements (Raj et al., 2011). This interjection of fiscal policy in the domains of monetary operations is primarily attributed to three reasons. First, there are huge deficiency of the physical infrastructure in Indian economy that are to be supplied primarily by the government, justifying fiscal activism (Khoja and Khan, 2019). Second, in face of increasing population pressure there is increasing demand for the provision of public utilities in the

form of public health and education (Rao, 2017). Third, monetary policy in Indian economy has been mostly confined to the organised sector (Goyal, 2018). With 2/3rd population of India residing in villages and largely unorganised, the efficacy of monetary policy as a tool to economic stabilisation is put to question. But an unchecked fiscal activism can breed fiscal mess due to potential tendency towards electoral populism (Goyal, 2002). This necessitates the need of strict fiscal rules to maintain check on the fiscal expansion to avoid any compromise with long run economic growth. To introduce the clutches to check the fiscal over-activism various initiatives were undertaken. Under Fiscal Responsibility and Budgetary Management (FRBM) act, the RBI was prohibited to undertake monetisation of debt. The treasury bills were phased out to a large extent. All these policy reforms were introduced to keep check on the fiscal policy and to minimise its dominance on the monetary policy. It needs to be mentioned that these measures to a large extent were able to bring discipline in Indian fiscal operations and to a large extent monetary policy independence was preserved. But the potential of fiscal policy to dictate monetary authority could not be completely eliminated. In this backdrop it is imperative to analyse how alternative monetary policy stances impact the outcome of fiscal policies.

The current study is an addition to the literature encompassing the interaction between monetary and fiscal policy for the Indian economy. However, the study will differ from the existing literature, at least in one important aspect. The usual practice in the literature on Indian economy has been to address the monetary-fiscal interaction using alternative scheme of shocks independently. For instance, in case of Arora (2018) three alternative shocks namely tax rebate shock, spending shock and interest rate shock were administered independently. However, it needs to be established if these results hold in case of integrated policy shocks rather than converse. This is because the policy makers most of the time administer these shocks jointly in an integrated manner rather than individually. In this study we tried to integrate the fiscal and interest rate shocks jointly and tried to test their macroeconomic impacts. The fiscal shock is taken as reduction in gross fiscal deficit (GFD) mainly financed by expenditure compression. The monetary shock is taken as a 1% point shock to the prime lending rate PLR.

To be precise the study tried to answer the following questions:

- Which policy is more effective as a tool for economic stabilisation: monetary or fiscal?
- Do fiscal shocks have differential macroeconomic effects under alternative monetary stances?

The rest of the study is structured as: Section 2 will cover review of literature; Section 3 will cover data and methodology; Section 4 will encompass the econometric and statistical estimation and will be followed by Section 5 citing the policy implications and conclusion of the study.

### 3 Literature review

We will provide a brief revisit of literature assessing the interaction between fiscal and monetary policies in case of both advanced and emerging economies. In a seminal on “*Equilibria under active and passive fiscal and monetary policies*”, Leeper (1991) tried to assess the determination of fiscal behaviour by determining how monetary shocks

affect the prices and, thus inflation. The study quoted that the prices are mainly indeterminate when the nominal interest rate is pegged. Blanchard and Quah (1989) tried to characterise the dynamic effects of fiscal shocks on the US growth rate of income using SVAR. The study concluded that positive spending shocks were found to be growth augmenting, while positive tax shocks depress economic growth. Giavazzi and Pagano (1995) in their seminal, found that fiscal contractions can have non-Keynesian effects if they are sufficiently large and persistent. Ironically, they documented that all fiscal consolidations need not be successful more so if these contractionary policies depress the growth rate of income more than the growth rate of debt. As an addition to methodological construct Edelberg et al. (1999) tried to investigate the consequences of an exogenous increase in US government spending on various macroeconomic indicators. The study quoted expansionary effects of these government spending hikes on growth rate of aggregate income. However, the real wages and residential investments responded negatively. Ironically the production and consumption of consumer durables was found declining along with real interest rate pointing to possible non-Keynesian effects of fiscal expansions. These results point to the non-effectiveness of fiscal policy as a tool to long run economic stabilisation for US economy.

Aarle et al. (2003) for European Monetary Unions using S-VAR quoted significant interdependence between the monetary and fiscal policy instruments. These results were documented in a case wise basis to account for the cross-country differences. With a similar intent Gali and Perotti (2003) found that fiscal policies in the European Union have become more counter-cyclical in nature than what theory may suggest. In the case of emerging economies of Argentina and Brazil, Zoli (2005) found that it was mainly fiscal dominance during 1990 to 2000. Moreover, the monetary policy was not found to significantly accommodate the fiscal policy. Fiscal policy was found to have a significant impact on exchange rate rather than the monetary policy. In a theoretical debate on monetary-fiscal interaction, Hilbers (2005) stressed mutual interdependence between monetary and fiscal policy with more cooperative rather than a competitive behaviour. In a case study on Spanish Economy, De Castro (2006) examined the short- and long-term effects of alternative fiscal innovations on macroeconomic indicators using VAR framework. Using Cholesky scheme of identification, fiscal shocks were found to have small though significant effects on gross domestic product (GDP), Private Consumption and Investment, interest rate and level of inflation. Similar results were quoted for an increase in tax rates though only in short run. However, in both the scheme of shocks the multipliers were found to be significant only in short run.

Favero and Giavazzi (2007) in case of US economy found that an exogenous increase in government spending has expansionary effect on growth rate of income. On the other hand, an exogenous increase in tax revenue was found to depress economic growth. Dungey et al. (2008), in case of New Zealand, found that the magnitude of fiscal shocks has been larger than those of monetary policy shocks on the growth rate of income. Moreover, taxation and debt shocks were found to be significant and substantial than expenditure shocks. In a Meta-review Caldara and Kamps (2008) found significant variance in the literature regarding the impacts of fiscal shocks on macroeconomic indicators. Controlling for specification differences in alternative models, the study arrived similar conclusions as cited by most of the previous studies. In response to government spending shocks, real GDP, real private consumption and real wages are expected to increase while as private employment seems insensitive. However, in case of tax shocks divergent results were quoted ranging from non-distortionary to strongly

distortionary in nature. In an extension to the SVAR framework pioneered by Blanchard and Perotti (2002), Tenhofen et al. (2010) tried to investigate the effects of fiscal shocks in German economy. The study documented positive impacts emanating from fiscal shocks reflected mainly in growth rate of national income and private consumption, though on impact. Like many other studies, the output multiplier was found to be lower than one with a quick and significant decomposition rate. Compensation to government employees, revenue shocks and indirect taxes were found to be insignificant in stabilising the economy, even in short run. However, the impact of direct taxes, though recessionary in nature, were found to be significant and persistent.

Arby and Hanif (2010), in case of Pakistan, found that the conduct of monetary policy has been broadly independent of fiscal influences. This lack of coordination has led to immense losses and inefficiency. The study documented those years of coordinated conduct of monetary and fiscal policy were years of high growth and lower inflation and vice-versa.<sup>1</sup> Davig and Leeper (2011) found that an increase in government spending by \$1 raises output by \$0.80 when monetary policy is active. However, a similar expansion may increase output by \$1.80 when the monetary policy is passive. In a similar paper Reade (2011) found that monetary policy making is heavily forward-looking and exhibits an active and dominant nature while the fiscal policy was found to be passive exhibiting obedience to its past behaviour in case of the US. Lima et al. (2012), in case of Brazil found that fiscal shock leads to losses in national output, at least in short-run. Moreover, the study found that inflation need not necessarily be a monetary phenomenon as the fiscal policy was found to exert a significant influence. In case of EU, Cevik et al. (2014) reported cooperative conduct of both monetary and fiscal policies with more focus on fiscal tools intended for economic stabilisation especially post-financial crises of 2008.

In a panel study for Germany, the US, and Italy, Kliem et al. (2016) found the time-varying behaviour of both monetary and fiscal policy instruments. The coordination between the two instruments increases during economic downswings than otherwise. In a similar exercise covering a panel of 113 advanced and emerging market economies, Da Silva and Vieira (2017) reported counter-cyclical and pro-cyclical nature of monetary and fiscal policies during the pre-crisis period and vice-versa. Haug et al. (2019) in an integrated SVAR framework tried to examine the impact of government spending and tax policies on the growth rate of income for Polish economy. The study quoted positive and dominant impact of changes in government spending on the growth rate of national income. The study quoted expansionary effects of positive shocks to tax rates emanating mainly from better tax compliance and reduced shadow economy- finding mostly at variance with existing literature for advanced economies.

In a distinguished seminal on Indian economy, Goyal (2002) tried to analyse the need for rules to coordinate monetary and fiscal policies. The study upheld the effectiveness of a rule-based fiscal structure with a more back-loaded nature than compromising capital spending. Chakraborty et al. (2006) tried to test the validity of Keynesian philosophy of contra-cyclical nature of fiscal expansions in case of Indian economy. Using output gap as a proxy to economic activity the study quoted a long-term association between fiscal policy and macroeconomic activity. The study extended support to the Keynesian wisdom that fiscal policy stance in fact does work in a contra-cyclical nature in case of Indian economy. Thus, rather than demonising the fiscal deficits as an evil, they can be used as instruments of short-term economic stabilisation. In addition to existing studies under SVAR framework, Raj et al. (2011) quoted fiscal dominance in the Indian economy even after prohibition of automatic monetisation of debt. In case of Indian

economy monetary policy was found to be countercyclical while as fiscal policy was found to be pro-cyclical. The fiscal policy as a tool to economic stabilisation was found to have only short-term positive impact on economic growth with significant negative impact in medium and long run.

Using twin alternative schemes of identification, Yadav et al. (2012) found that shock to tax revenue has a significant impact on the level of national income as against the government's spending shocks. This positive and dominant influence of revenue shocks on GDP percolates through the channel of private consumption that responds more significantly to taxation changes rather than changes in exogenous government spending. Similar to Raj et al. (2011) the study quoted significant but short lived impact of fiscal innovations on the growth rate of income. Jain and Kumar (2013) found that government spending has a positive multiplier effect on the total economic activity, though short lived. A shock will translate into a decline in economic activity atleast in short run. Bose and Bhanumurthy (2015) estimated that a constrained fiscal policy translates into significantly lower multiplier values as against the unconstrained one. The study argued that in case of a restriction on fiscal deficit, the revenue expenditure is found to crowd-out the capital expenditure. Sethi (2017) had tried to examine the interdependence of the two policies empirically for Indian economy. The study found that fiscal policy responds in a potent and health manner for shocks in the monetary policy. However, the reverse was not found working through the proper channel.

Arora (2017) had tried to estimate the effects of monetary and fiscal policy on the selected macro-economic indicators. The study has employed an integrated approach of sign and magnitude restrictions in the SVAR framework to identify policy actions. The Indian monetary stance was found to react differently to the different shocks. In case of tax rebate shock the monetary policy was found to be accommodative as compared to expenditure shock. The interest rate as a tool to economic stabilisation was found to be more effective than fiscal policy innovations. Within fiscal policy tool kit, the instrument of tax rebate was found to be more effective than debt financed fiscal expansion to stimulate output. The study quoted fiscal dominance over the reference period as the monetary shocks were found to be accompanied by fiscal expansions. Bhat and Kamaiah (2021) using a structural econometric model of Tinbergen-Keynesian origin tried to investigate the macroeconomic effects of fiscal policy innovations. Instead of crowding-out, the study quoted crowding-in effect of public investment. Both monetary and fiscal policies were found to be growth augmenting but monetary policy was found to accompany a higher rate of inflation. The study quoted support in favour of twin deficit hypothesis in case of Indian economy.

#### 4 Research gap

Conventionally, there has been huge accumulation of empirical research with fiscal and monetary policy being the main focus. These are the prominent tools in the hands of government to alter the discourse of macroeconomic aggregates like GDP, Employment and Inflation. However, there are dead zones that lead to the genesis of a prominent argument of *Black Box* as far as the transmission mechanism is concerned. This *Black Box* paradox actually mandates more research with more disaggregated data to have better insights for policy making. In case of emerging economies, such exercises are more warranted given the severe trade-offs the public policy encounters. In case of Indian



economy there have been many prominent attempts along the line by Yadav et al. (2010), Raj et al. (2011) Jain et al. (2013) and Arora et al. (2018). The studies, though prominent, carry their own set of limitations. The dataset used in all these studies have become outdated by now. The latest dataset used by Arora et al. (2018) covers the time span from 1990Q1 to 2011Q4, which is almost a decade old. The use of sign restrictions in case of Arora et al. (2018) is yet another area of contestation. The most serious criticism cited against is the results become so obvious and can be directed to lead to any desired end. As against these and many more, the current study has utilised the dataset from 1990Q1 to 2019Q4, which is more updated thus reflecting a recent scenario of Indian economy. Both sign and magnitude restrictions have been avoided mainly on the principle of let data speak for themselves. The current study is employing a more disaggregated data on variables like private consumption, private investment, monetary policy and others. Most of the previous studies have proxied national income by output gap, which is not a healthy practice, statistically.<sup>2</sup> We have avoided the same in order to better reflect the economic scenario of the country.

## **5 Data and methodology**

### *5.1 Data description*

The dataset utilised in the study constitute a group of six variables including real national income (GDP), private consumption expenditure (PCE), private investment (PINV), inflation (deflator), GFD, and interest rate (PLR). The dataset used follows quarterly frequency from 1990 first quarter to 2019 third quarter.<sup>3</sup> The fiscal variables used in the study include changes in GFD. The monetary policy will be represented by prime lending rate (PLR) as it is the most suitable rate representing the influences of monetary policy shocks on the lending behaviour of financial institutions.

The series of GDP has been taken in real terms at the latest base of 2011–2012. Moreover, the series has been deseasonalised using the Census X13 method. As a representative and wider measure of inflation, the study used GDP deflator to represent the inflationary tendencies in the economy. The private sector responses will be captured by analysing the behaviour of PCE and private investment. Although the usual practice in the literature is to analyse the total investment, we have kept a deliberate focus on private component only so that its responsiveness to interest rate changes and crowding out/in can be better analysed. To capture the fiscal policy stance of the government, we have used changes in GFD as the representative. The dataset for all of our endogenous variables have been obtained from the handbook of statistics, Reserve Bank of India (RBI). We have used E-views 10 to estimate our model.

### *5.2 Methodology*

The prime focus of the study is to analyse the effects of fiscal consolidation on macro-economic indicators (like GDP, Consumption Investment, etc.) under alternative monetary stances. The usual practice in the literature has been the employment of the vector autoregressive (VAR) approach as it helps to analyse the impact of different types of random shocks on the variables in the model. Moreover, such a technique does not apply the restrictions of endogenous vs. exogenous and treats all the variables of the

model as endogenous. The basic VAR technique, however, has limitations as it does not take care of structural and contemporary relations unless some identification restrictions are assumed to follow (Bhat et al., 2018). To overcome these limitations, the VAR models are adjusted to accommodate the structural adjustments in economic relations. The structurally adjusted VAR (SVAR) models have many advantages like it possesses a better fit, it is almost order independent and more importantly, it can incorporate theoretical insights to improve the validity and predictive power of analysis. It helps to estimate the net impact of random shocks on the endogenous variables in the model and its use in the empirical literature has experienced an exponential growth (Yadav et al., 2012; Arora, 2018).

As SVAR serves our cause of concern, therefore we employed the technique to empirically assess the dynamic impacts of fiscal consolidation policies pursued by the government on the macroeconomic variables like the growth rate of income (GDP), Inflation, private consumption and private investment, etc. under alternative monetary stance. The empirical specification of SVAR is described as:

An unrestricted VAR model as used by Arora (2018) is given as:

$$X_t = A(l)e_t \quad (1)$$

Where ' $X$ ' is a ( $N \times 1$ ) vector of stationary endogenous variables,  $A(l)$  is a ( $N \times N$ ) polynomial of lag length  $l$  and  $e_t$  is a vector of reduced-form innovations with var-covar matrix  $\sum e_t = E(e_t e_t')$ .

Alternatively, the above VAR ( $p$ ) model may be further specified as:

$$AX_t = A_1 X_{t-1} + A_2 X_{t-2} + A_3 X_{t-3} + \dots + A_p X_{t-p} + e_t \quad (2)$$

Where, as above,  $X$  is an ( $n \times n$ ) vector of endogenous variables (in our case PLR, PINV, PCE, GDP, Deflator & GFD). Similarly,  $A$  is the ( $n \times n$ ) coefficient matrix of endogenous variables that are used to capture dynamic interaction between  $k$  variables in the model. ' $e_t$ ' is ( $n \times 1$ ) matrix of random but structural errors assumed to be normally distributed with zero mean and normalised diagonal variance-covariance matrix =  $\Omega$  and  $p$  is the lag length of the model. The residual coefficients ( $e_t$ ) in both the specifications are more likely to be associated and thus posing a challenge to identify the effect of a shock properly.

Thus a transformed error ( $U_t$ ) is employed instead, having a linear association with the structural shocks ( $e_t$ ) of the order,  $U_t = B e_t$ , where  $B$  is ( $n \times n$ ) matrix of structural coefficients representing the effects of structural shocks that are serially and contemporaneously uncorrelated with var-covar matrix  $E(U_t U_t') = D$ , with further normalisation of diagonal elements being equal to 1 (Amisano and Giannini, 2012; Tenhofen et al., 2010). The basic objectives behind SVAR is to orthogonalise the residuals so that the effects of innovations can be segregated out. So we may rewrite the equation (2) as follows.

$$AX_t = A_1 X_{t-1} + A_2 X_{t-2} + \dots + A_p X_{t-p} + B e_t \quad (3)$$

The model specified in equation (3) must be identified so that it can carry economic meaning and it should be interpretable. However, the above model has a limitation that it cannot be directly observed and estimated to derive true values of  $e_t$  and  $A_p$ . Thus we

must derive a reduced-form version of equation (3). To obtain the required specification, we must pre-multiply equation one by  $A^{-1}$  (Inverse of coefficient matrix) as:

$$X_t = A_1^{\wedge} X_{t-1} + A_2^{\wedge} X_{t-2} + \dots + A_p^{\wedge} X_{t-p} + U_t \quad (4)$$

Where  $A^{\wedge} = A^{-1} A$ . Here,  $U_t$  is the parameter of interest for the study as they are the reduced form VAR residuals uncorrelated with  $X_s$  and follow NIID  $\sim (0, S_m)$ , unlike the earlier. However, the reduced form model, as given by equation (4), does not take into consideration contemporary relations among variables as only lagged terms figure on the RHS. Moreover, the problem of cross-correlations may arise among residuals, if current terms make an entry. To overcome the cited limitation, we refer to AB-model of Amisano and Giannini (2012) that suggest a linear association between the reduced form innovations  $U_t$  and the variable of our interest, the structural shock  $e_t U_t e_t$ :

$$\begin{aligned} AU_t &= Be_t \\ U_t &= A^{-1} Be_t \end{aligned} \quad (5)$$

Now the structural coefficients in equation (3) can be obtained and estimated from the reduced form version (4) using equation (5). As stated already that A and B are matrices of order  $n \times n$  that will describe instantaneous relations between not only variables but also the linear relationship between reduced form residuals with that of purely structural shocks. In this specification structural shock ( $e_t$ ) are assumed to be orthogonal in order to investigate the impact of shocks.

As noted by Aarle et al. (2003), the SVAR models originated from monetary policy analysis, where it has been used extensively to study the transmission of real and monetary shocks. These models are found to be more relevant to analyse the dynamics of fiscal policies as it gives a separate response of each variable to policy innovations. However, these SVAR models need to be identified before their estimation, and accordingly, the literature has mainly focused on two schemes of identification, namely short-run restrictions and long-run restrictions (Lima et al., 2012). Since we deal with short run analysis we will be discussing only Cholesky short run triangular restrictions.

### 5.3 Short-run restrictions

There is a unanimous belief regarding the ineffectiveness of fiscal policy as a tool to economic stabilisation in long run. Even the founding father of fiscal policy contended that fiscal policy should be used as a tool to fight short term economic recessions. Accordingly, we will be investigating the short-term effectiveness of fiscal policy as an instrument of economic stabilisation. So, for identification purposes we will be employing short run restrictions. As noted by Arora (2018) these restrictions impose normalisation and exclusion conditions to orthogonalise the shocks or in other words, these restrictions are there to contain the contemporaneous behaviour of endogenous variables. The most common method of imposing these restrictions is Cholesky Decomposition. They are also known by the names of triangular structure or recursive structure.<sup>4</sup> However, these restrictions are criticised at least for one explicit limitation, i.e., these restrictions impose an unrealistic assumption of the timing of the responses. Although there is another method of non-recursive system and it provides with theoretically better results. But it is out of the scope of the present exercise.

These restrictions are either imposed on parameter matrices A or matrix B or both. Moreover, to avoid irrelevant restrictions and to ensure parsimonious property, exactly identified restrictions are used. However, there are a few considerations to be kept in mind while imposing restrictions. These include: the structural variance-covariance matrix is diagonal and normalised to an identity matrix  $I_k$ . Further, B is an identity matrix and A the lower triangular matrix with simultaneous relations among the endogenous variables. According to Breitung et al. (2004) when one of the matrices is assumed to be an identity matrix, then  $K(K-1)/2$  additional restrictions are to be imposed on other matrices.<sup>5</sup>

We have a set of six endogenous variables represented by the vector as:

$$X_t = (GFD, PLR, PINV, PCE, GDP, inflation)$$

Therefore, we need to impose 15 additional restrictions for the identification of the structural relations. All the restrictions that we will be imposing will follow a theoretical rationale. Following Blanchard et al. (1989), Blanchard and Perotti (2002), Gordon and Leeper (1994) and Bhat et al. (2018), the identifying restrictions on the interaction of variables follow given representation as:<sup>6</sup>

|                       |                     |                          |                   |                      |   |   |   |          |                           |
|-----------------------|---------------------|--------------------------|-------------------|----------------------|---|---|---|----------|---------------------------|
| $Au_t =$              | 1                   | 0                        | 0                 | 0                    | 0 | 0 | 0 | $GFD_t$  | = $Bu_{t-1} + \epsilon_t$ |
| $\gamma_{gfd}^{plr}$  | 1                   | 0                        | 0                 | 0                    | 0 | 0 | 0 | $PLR_t$  |                           |
| $\gamma_{gfd}^{pinv}$ | $\rho_{plr}^{pinv}$ | 1                        | 0                 | 0                    | 0 | 0 | 0 | $PINV_t$ |                           |
| $\gamma_{gfd}^{pce}$  | $\rho_{plr}^{pce}$  | $\vartheta_{pinv}^{pce}$ | 1                 | 0                    | 0 | 0 | 0 | $PCE_t$  |                           |
| $\gamma_{gfd}^{gdp}$  | $\rho_{plr}^{gdp}$  | $\vartheta_{pinv}^{gdp}$ | $\pi_{pce}^{gdp}$ | 1                    | 0 | 0 | 0 | $GDP_t$  |                           |
| $\gamma_{gfd}^{inf}$  | $\rho_{plr}^{inf}$  | $\vartheta_{pinv}^{inf}$ | $\pi_{pce}^{inf}$ | $\delta_{gdp}^{inf}$ | 1 | 0 | 0 | $Inf_t$  |                           |

Since the restrictions are sensitive to the ordering of variables, accordingly the row one indicated that the fiscal deficit is assumed to be affected by only its past lagged values and does not correspond to any other variable of the model.<sup>7</sup> Second row indicates that the interest rate is affected by changes in fiscal position of the country besides being responsive to its past values (Chakraborty, 2002). Row Third is the private investment function, which is affected by shocks to monetary policy reflected via changes in the interest rate and changes in the debt position in the economy besides its own lagged terms (Franta et al., 2012). Similar analogy has been arrived at by Pradhan et al. (1990) for Indian Economy. PCE as shown in the fourth row is assumed to be influenced by monetary shocks, changes in public debt, changes in private investment and its lagged values. Arapova (2018) has reasoned along similar lines as far as the determinants of private consumption for Indian economy are concerned. Similarly, row fifth represents national output as represented by GDP and will exhibit dependence on monetary and fiscal responses, private sector spending besides its past lagged values (Hilbers, 2005; Arby and Hanif, 2010; Arora, 2018). Sixth row will highlight the dependence of inflationary tendencies as captured by GDP deflator on all previous variables including

its past lagged values. The academic support to this thesis directly drew from the seminal of Mohanty and John (2015) highlighting the determinants of inflationary trends in Indian economy.

## **6 Econometric estimations and results**

### *6.1 Unit root analysis*

Before we proceed for the formal estimation of the structurally identified VAR model of our interest, we need to make sure that we did not encounter the problems of non-stationarity. Almost all the variables, i.e., PLR, PINV, PCE, GDP, GFD, and Inflation were found to be trend stationary with GDP exhibiting seasonality and hence adjusted by census X13 method. Thus they were detrended before the estimation of the SVAR using Hodrick-Prescott Filter (1997). The lag length of the unit root tests was chosen based on Schwarz Information Criteria (SIC). The unit root results of the endogenous dataset under Augmented Dickey-fuller (1979) and Phillips Perron test (1988) are reported in Table A1 (See Appendix). Since all the variables are of order zero, i.e.,  $I(0)$ , the possibility of cointegration does not arise.

### *6.2 Results and analysis*

The results of the study that follow directly from the estimation of the structurally augmented VAR model, as specified above, are organised in two subsections.<sup>8</sup> The first subsection will try to analyse macroeconomic impacts under alternative policy stances (especially monetary policy). The second subsection will encompass some policy implications following from Section 1.

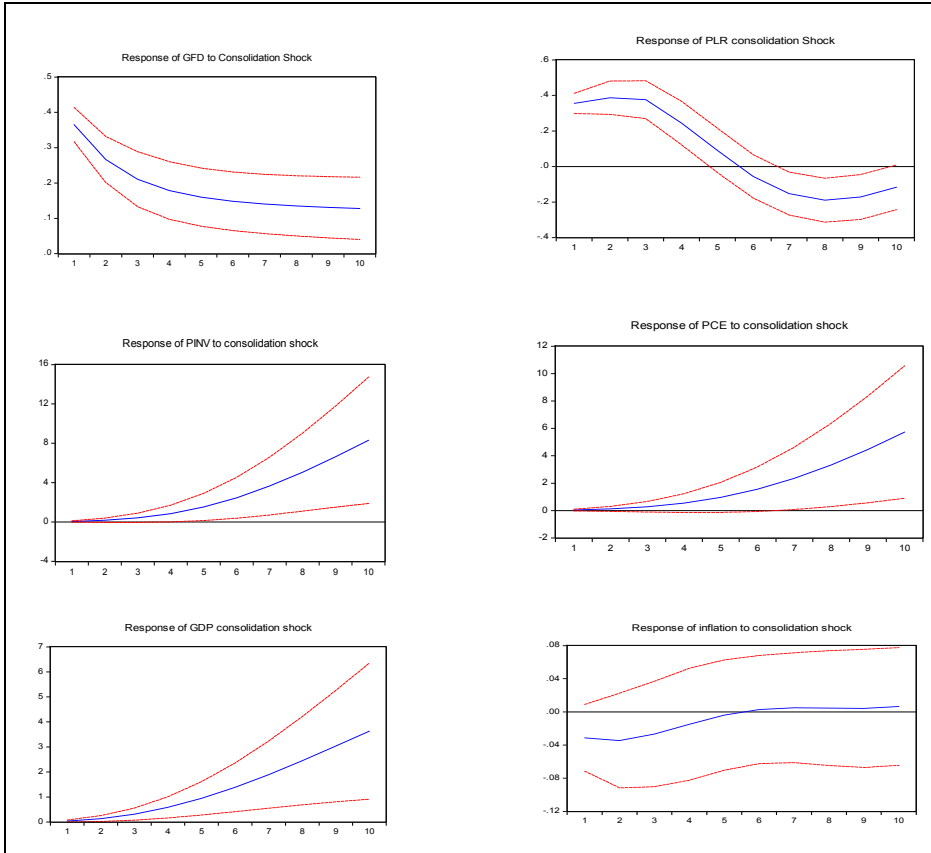
The results are interpreted using impulse response functions and variance decomposition. All the impulse responses are reported in percentage terms. However, readers need to be careful while interpreting the results of IRF's. A shock to government deficits is to be interpreted as a 1% change in the levels, while a shock to the rate of interest is to be interpreted as 1% point change. Moreover, a brief understanding of monetary-fiscal interaction and their interpretation may help readers to understand the interaction dynamics better. Muscatelli et al. (2004) define the two policies to be substitutes if there exists a positive association between fiscal and monetary policy as represented in our study by changes in GFDs and prime lending rate (post shock). In contrast they are said to be complementing each other if there exists a negative correlation (post shock). However, Leeper (1991) categorise these policies as active and passive depending on their response to the levels of debt. For instance, when monetary policy targets inflation independent of the level of debt, it is termed as active and vice-versa. Similarly, when the fiscal policy actions do not care about the level of debt, it is termed as active or non-Ricardian and vice-versa (Arora, 2018).

### *6.3 A negative shock to the gross fiscal deficit (fiscal contraction)*

We have employed structural impulse response functions to portray the response of variables to fiscal consolidation.<sup>9</sup> For each equation, a structural one standard unit shock is applied to the GFD to analyse the movement of other endogenous variables up to a

limit of 10 quarters. Figure 1 portrays the dynamic responses of macroeconomic variables interest rate (PLR), Private Investment (PINV), Private Consumption (PCE), National Income (GDP), Inflation rate (deflator) and level of debt (GFD) to consolidation adjustments. For cumulative response of different macroeconomic indicators to fiscal and monetary shocks refer to Table A2 in Appendix.

**Figure 1** Response of macroeconomic indicators to fiscal consolidation (see online version for colours)



The fiscal shock mainly in the form of expenditure compression is found to exhibit a prolonged negative impact on the GFDs. The impact of the shock does not seem to die down in the short run as the impulse response does not show any tendency to revert to steady state. This reduced government spending resulting from expenditure compression implies lower crowding out of private investment hence an impetus to private sector. This impetus to private investment can lead to inflationary tendencies as it will boost the effective demand. The increase in demand will be the outcome of twin effects. First an increased private investment will increase level of income and thus demand. Second, lower level of public debt implies lower future taxation and thus incentivising economic agents to increase current consumption. To check possible price rise, the monetary sector will respond with a tight monetary policy to maintain a healthy rate of inflation. Similar

results were arrived at by Zoli (2005), Arby and Hanif (2010), and Arora (2018). This active monetary intervention (first four quarters) will regulate the private sector expansion in the economy to counter the potential inflationary spirals. Thus a consolidation design based on slashing government spending leads to an increased space for private sector to creep in leading to a secular and consistent increase in private sector consumption as well. Driven by the combined behaviour of private sector investment and consumption demand, the growth rate of income experiences a consistent increase through-out. Thus, in short run with a flexible monetary policy to respond, the fiscal contraction to infuse more prudence does not necessarily harm growth rate of income. These findings are in consonance with the findings of Blanchard and Perotti (2002) but are at variance with Yadav et al. (2012) and Arora (2017).

The inflation as represented by GDP deflator experiences a mild increase throughout. This is because initially monetary sector responds quickly to check the inflationary tendencies in face of impetus to private investment due to contraction in government activity. However, after 3rd quarter monetary sector seems to support economic expansion at the cost of inflation.<sup>10</sup> The findings are in consonance with Blanchard and Perotti (2002) and Davig and Leeper (2011).

As already mentioned, based on Muscatelli (2004) classification, monetary and fiscal policies act as complements for the first three quarters. From the fourth quarter till 6<sup>th</sup> quarter its fiscal dominance and monetary policy seems to surrender. However, from 6<sup>th</sup> quarter onwards its monetary dominance pointing to short run fiscal but long run monetary activism. In terms of Leeper (1991) the first three quarters its monetary policy activism. However, the monetary policy turns passive after 4<sup>th</sup> quarter as it does not seem to target inflation even in face of continues declining debt burden. Similar results were arrived at by Raj et al. (2011) and Arora (2018) for Indian economy.

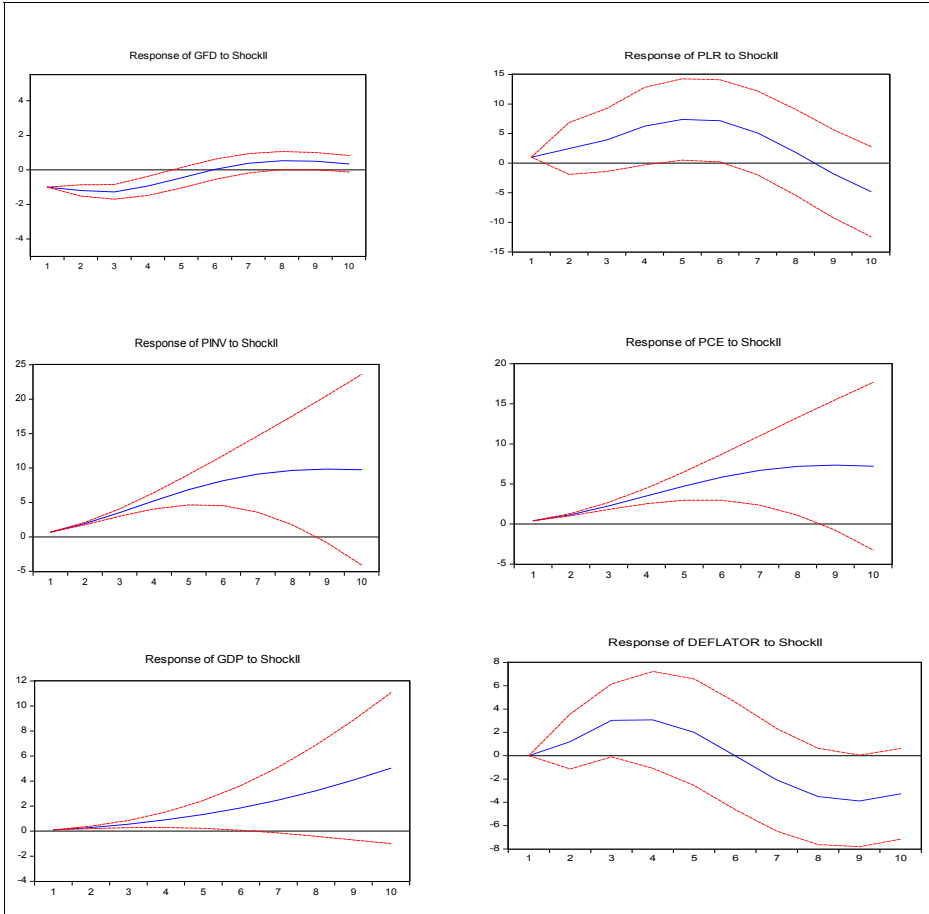
#### *6.4 A consolidation shock under a contractionary monetary policy*

The scenario II will analyse over the time trajectory of endogenous variables in the face of a consolidation shock accompanied by a contractionary monetary policy. Accordingly, a simultaneous, 1% point positive shock has been given to lending rate (PLR) and a one standard unit negative shock is given to the level of fiscal deficits implying the spending shock. As can be seen from Figure 2, the GFDs decreases on impact and then increases till quarter 8 and shows the signs of stabilisation thereafter. Surprisingly the results seem to be at variance with the standard economic theory that will expect fiscal deficits to decrease atleast on impact following the expenditure shock. However there is empirical support where-in the fiscal compression is found to fuel more fiscal deficits rather than infusing fiscal prudence. This is because if the consolidation plan is not persistent and significantly large enough (Giavazzi and Pagano, 1995).

The interest rate shock results in more stringency in the conduct of monetary policy as the rate of interest seems to rise till 5th quarter before it senses a possible economic recession. This liquidity constraint leads to stagnation of private sector when compared to the scenario 1 as discussed above. Both Private consumption and private investment increase at a mild rate as against the Scenario-I and gravitates around the zone of insignificance. This private sector stagnancy can be broadly attributed to two factors i.e., a tighter monetary policy implies a higher cost of borrowing funds thus lower new investments and hence lower demand. A second possible reason to explain private sector sluggishness is in terms of possible substitution of current consumption for future

consumption as induced by higher expected returns, though with a certain factor of risk (Davig and Leeper, 2011). The sluggish nature of private investment can also be explained by a reduced crowding-in effect due to expenditure compression by government.<sup>11</sup> Furthermore an interest rate shock usually have significant but negative impact on private investment than private consumption. This is because the private consumption is mostly downward sticky atleast in short run.

**Figure 2** Response of macroeconomic indicators to fiscal and monetary shock (see online version for colours)



The response of GDP driven partly by private sector responses will experience stagnation slightly higher than the insignificance zone. However, there are certain points to be made before proceeding. As can be seen from Figure 2, the decline in national output is not as steep as that of private investment and may be partly attributed to the slow decline of consumption component of the national income. Further, the decline in private sector performance and thereby a decline in the growth rate of income is more severe under Shock II when compared to Shock I. Although the fiscal retrenchment is expected to depress the growth rate of income, atleast under Keynesian frame work. But in the face of



a non-cooperative monetary regime, the scenario will be more recessionary and painful. Similar results have been arrived at by Raj et al. (2011) and Pashourtidou et al. (2014).

As against shock I, the inflationary tendencies are going to exhibit a more stable trajectory following the shocks. This is because a consolidation shock under *Ceteris-Paribus* may fuel the demand-pull inflation due to increased private sector investment. However, contractionary monetary policy is going to play against as it will exert a downward pressure on private investments via the channel of interest rate, thus controlling the inflationary tendencies. According to Muscatelli et al. (2004) rule the monetary and fiscal policies act as complements to each other following the scheme of shocks till 3rd quarter. There after both act as substitutes thus competing with each other. On the other hand, under Leeper (1991) rule its monetary policy that continues to target inflation irrespective of the fact that the level of debt is already stabilising pointing to long run monetary dominance.

### 6.5 A consolidation shock under an expansionary monetary policy

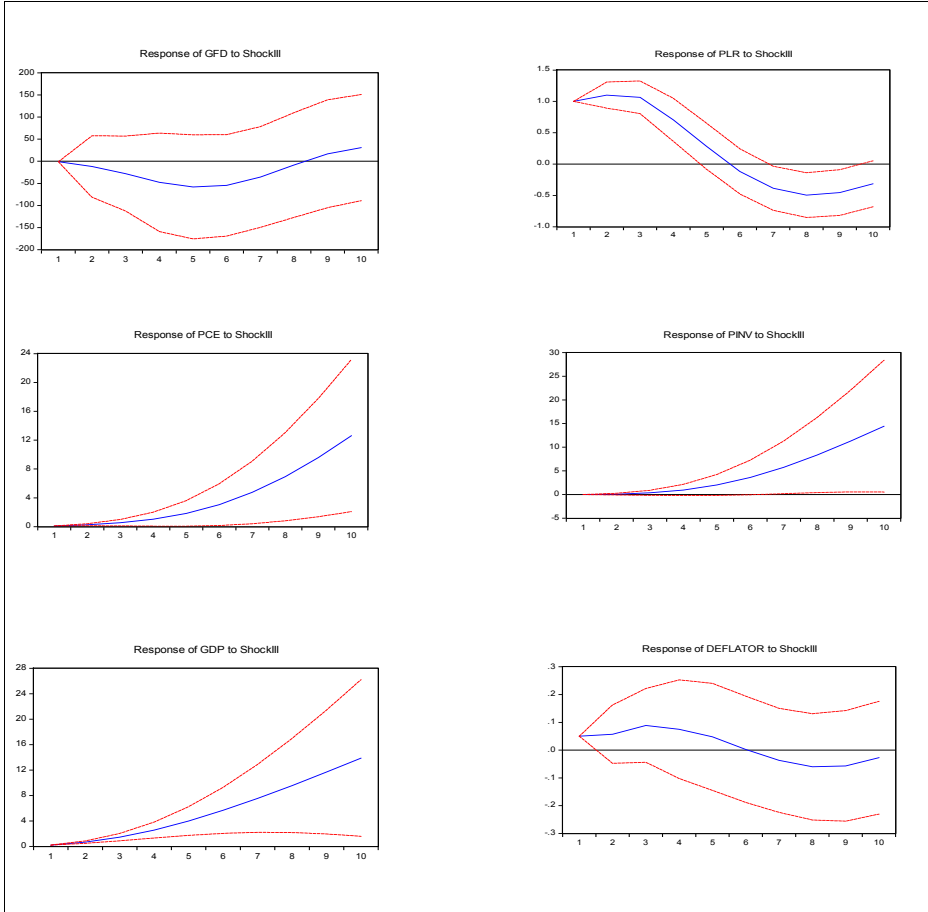
Under scenario III we tried to examine the impact of a consolidation shock under an accommodative monetary policy. Following the scheme of shocks fiscal deficits are seen to decline till 6th quarter and reverses its trajectory there-after (Figure 3). In face of a strict fiscal regime there is increased scope for private sector to flourish due to lower possible crowding out. This impetus to private investment is further strengthened by an accommodating monetary policy. This infusion of more liquidity leads to increased private sector economic activity mainly on account of three reasons. First, a reduced interest rate implies a lower cost of borrowing new funds i.e., with decrease in the price of new capital (interest rate) the demand for money increases, *ceteris paribus*. Second, lower public spending implies a lower diversion of resources from financial markets to the government thus more scope for private undertakings. Third, a reduced interest rate implies a more favourable and affordable credit to the consumers leading a consumer demand stimulus. As can be seen in face of a contractionary fiscal policy coupled with an expansionary monetary policy private sector optimism thrives the economic activity.

Driven by the combined influence of private sector consumption and investment, the growth rate of income expands through-out and does not show the signs of dying down in short run. This implies that fiscal consolidation can have non-Keynesian outcome in case of Indian economy given that monetary policy is accommodative enough. Similar results were arrived at by Blanchar et al. (2002) for US economy, Mundle et al. (2011), Yadav (2012) and S. Arora (2018) in case of Indian Economy. However, the results following from Mundle et al. (2011) are based on expenditure switching approach while as this study is based on expenditure compression approach.

The rate of inflation as depicted by deflator experiences a rise till 4th quarter and the shows the signs of stabilisation thereafter. The trajectory of inflation deserves a brief explanation as it is broadly at variance with the previous literature. With an economic expansion, one generally expects the inflation to consistently accelerate, unless there is excess supply. However, the results we quote follow converse trajectory. Two possible explanations can be cited in support of our results. First, following fiscal consolidation using expenditure compression, the debt fuelled inflation declines as debt contributes to inflation. Second, as private investment expands, it adds to both demand and capital stock (supply) implying a possible inflation neutrality on part of increased investment. This may partly explain a stable trajectory of inflation in face of economic boom, atleast for

this study. Under the current scheme of shocks, the monetary and fiscal policies act as substitutes till 5th quarter and there after signs of complementarity emerge under the Muscatelli et al. (2004) criterion. On the other hand Leeper (1991) rule states that the monetary policy is passive through-out as it does not target inflation independent of the debt situation in the economy.

**Figure 3** Response of macroeconomic indicators to contractionary fiscal and expansionary monetary shocks (see online version for colours)



### 6.6 Variance decomposition analysis

The variance decomposition analysis (Table A3) broadly corroborates the above results. The fiscal shock is found to explain 34 and 26% variations in private investment and private consumption significantly higher than the monetary shock. This points to the fact that in an emerging market economy the private sector functioning is not the sole domain of market led monetary property. The fiscal policy interventions through the budgetary tools can significantly target the economic activity of private sector. This finding is broadly at variance with the literature documented for advanced economies. Similarly in case of GDP the fiscal shock is found to explain 9% of variation, 3% higher than the

variation explained by monetary shock. This implies that in short run both monetary and fiscal policies enjoy relevance in terms of potency to stabilise the short term economic fluctuations. However the impact of fiscal policy seems to dominate in the very short run with signs of surrender to monetary policy in long run. In case of inflation the fiscal policy is found to have substantially significant influence than monetary policy thus pointing towards the fiscal theory of inflation in case of Indian economy.<sup>12</sup> In case of interest rate it is found to be mostly a monetary phenomenon though the influence of fiscal policy cannot be ruled out. However, it needs to be mentioned here that this strong influence of monetary policy on interest rate does not channel into a similar pass-through to private investment and private consumption. This points to the possible short run monetary ineffectiveness as has been quoted previously by many studies. Similarly the fiscal deficits can be broadly taken to be a function of fiscal policy, though with a long run influence from monetary policy.

### 6.7 Comparison with existing literature

Table 1 compares the impact of fiscal consolidation attained through expenditure compression or expenditure switching on the growth rate of income in different economies and at different periods of time. However, the readers need to bear in mind that the results arrived at under various studies differ in many critical aspects like regions, period of analysis, methodology used, scheme of identification etc. This necessitates the need of precautions for the readers while comparing the results given in Table 1.

**Table 1** Comparison of output multipliers with existing literature

|                              |                                     | Country             | Short run |
|------------------------------|-------------------------------------|---------------------|-----------|
| Our Study                    | Fiscal Shock only                   | Indian Economy      | 1.01      |
|                              | Fiscal & Monetary Shock             | Indian Economy      | 0.09      |
|                              | Fiscal Shock with Monetary Stimulus | Indian Economy      | 1.80      |
| Arora (2018)                 |                                     | Indian Economy      | 0.07      |
| Bose and Bhanumurthy (2015)  |                                     | Indian Economy      | 2.45*     |
|                              |                                     |                     | 0.98**    |
|                              |                                     |                     | 0.99***   |
| Yadav et al. (2010)          |                                     | Indian Economy      | 0.09      |
| Raj et al. (2011)            |                                     | Indian Economy      | 0.09      |
| Jain and Kumar (2013)        |                                     | Indian Economy      | 0.40      |
| Blanchard and Perotti (2002) |                                     | USA                 | 0.85      |
| Dungey and Fry (2009)        |                                     | Australia           | 0.06      |
| Mountford and Uhlig (2009)   |                                     | USA                 | 0.11      |
| Aarle et al. (2003)          |                                     | Cross Country Panel | 0.12–0.20 |
| Perotti (2005)               |                                     | Multi Country Panel | 0.31–1.30 |
| Haug et al. (2019)           |                                     | Poland              | 0.7       |

\*Capital Expenditure multiplier; \*\*Transfer payment multiplier; \*\*\*Other revenue multipliers

Source: Authors Calculations

The finding of our analysis in the earlier two cases are at variance with the existing literature for Indian economy atleast for Chakraborty and Chakraborty (2006). However, the positive impact of fiscal consolidation under an accommodative monetary policy is in consonance with the existing studies for Indian economy (Mundle et al., 2011). The magnitude of multiplier in our study (Fiscal shock) is greater than Arora (2018), Yadav et al. (2010) and Raj et al. (2011), Jain and Kumar (2013) but smaller than Bose and Bhanumurthy (2015). One possible reason for different results for the same country can be the definition or proxy used to capture spending shock. Sanchit Arora (2018) used reduction in government total expenditure as fiscal shock while as Raj, Khundrakpam and Das (2011) uses decrease in GFD as a fiscal shock as is followed in our study. Similarly, both Raj et al. (2011) and Arora (2018) have proxied national income by output gap rather than the actual GDP. While as Yadav et al. (2010) and this study has used actual GDP data. Bose and Bhanumurthy (2015) have used expenditure switching rather than an expenditure compression approach. In addition, different schemes of identification, period of study, methodology used and data transformation may lead to variation in results. On comparison with industrially advanced economies, our results under monetary contraction, seem to be similar to those for Australian economy by Dungey and Fry (2009). However, the results of our study are way below than US economy by Blanchard and Perotti (2002) and Mountford and Uhlig (2009). Similarly, our results seem to be very low when compared with the multi-country studies, though with similar directions atleast in the third scenario.

### 6.8 *Policy implications*

The results of our study discover various ways of interaction between monetary and fiscal policy in the Indian economy. Some of the policy implications that follow from the study include:

- Both Monetary and Fiscal policies interact in cooperative as well as competing manner depending upon the types and timing of shocks.
- So far as the question of dominance is concerned, the study reported mixed results. For instance, both fiscal and monetary policy shocks are found to affect the GDP positively in the short run. However, the impact of a fiscal shock though substantial is short-lived as compared to the monetary shock which is prolonged.
- In terms of effectiveness as a tool to economic stabilisation, fiscal policy seems to have an edge in the short run. In case of inflation the fiscal policy is found to be more potent while as monetary policy is found to have a significant impact on behaviour of interest rate. Thus, instead of having a sole thrust on monetary policy as a tool to inflation stabilisation, fiscal factors need to be reconsidered.
- So far as the question of the effects of fiscal consolidation on economic growth in the short run is concerned, the study found that fiscal contractions can have non-Keynesian outcomes.
- The consolidation programs pursued under alternative monetary stances yield differential economic impacts. A consolidation program pursued under a contractionary monetary policy is found to be of more recessionary nature than

otherwise. Thus, instead of having a sole thrust on fiscal policy as a tool to fiscal prudence, a judicious mixture of both the policy instruments should be considered in case of Indian economy to mitigate the possible short term economic pains.

## **7 Limitations of the study**

Though the study tried a comprehensive analysis of fiscal-monetary interaction and its possible impacts on macroeconomic indicators, but there are caveats present. Some of the prominent limitations are quoted as:

- Data deficiency pertaining to different variables of interest needs a special mention. For most of the variables we do not have quarterly data available. Most of the data used with quarterly frequency has been transformed using appropriate statistical tools. However, these transformations cost critical loss of information.
- The use of GDP deflator as a proxy to inflation has certain limitations like it understates the true inflation. However, when it comes to representation it serves a better proxy than other indices.
- Some of the impulse response functions transverse through the zone of insignificance. Moreover, many of impulses depict divergent rather than convergent trajectory. These can be further areas of investigation.

## **8 Conclusion**

The study found that both Monetary and Fiscal policies interact in cooperative as well as competing manner depending upon the types and timing of shocks. The study found that although fiscal policy enjoys a certain degree of short run superiority, the potency of monetary policy needs to be reconsidered. These findings corroborate the earlier findings by Khundrakpam and Das (2011), RBI report (2013) and Arora (2018). In terms of effectiveness, the study found that the fiscal policy is a better tool of economic stabilisation in the short run, but in long and medium run it may harm growth. The monetary policy performs better in terms of targeting interest rate. Ironically the fiscal policy was found to have more influence on inflation than monetary policy. This finding is in stark contrast with most of the studies for Indian economy like Khundrakpam et al. (2011) and Yadav et al. (2012). However, a similar result was arrived at by Reade (2011) in case of US economy.

The fiscal retrenchment shocks were found to have non-Keynesian results in the short run. A consolidation program aimed at infusing fiscal prudence was found to have different effects on economic growth depending on whether such a policy is undertaken in an expansionary or a contractionary monetary regime. A consolidation program followed under a contractionary monetary regime was found to have severe economic losses in terms of output forgone. However, a fiscal prudence program pursued under the expansionary monetary policy was found to have significant positive impacts on economic growth even in the short run. Thus instead of having a sole thrust on fiscal policy as an instrument of fiscal prudence, there should be more focus on a balanced and judicious mixture of both the policy instruments in case of Indian economy.

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## Notes

<sup>1</sup>However, an unfortunate finding was that the years of better growth and coordinated conducts between fiscal and monetary policy were the times of military dictatorship rather than democratic governance.

<sup>2</sup>For more understanding refer to Chakraborty et al. (2006).

<sup>3</sup>The use of quarterly data is encouraged to rule out the possibility of discretionary fiscal shocks within one time period in case of a VAR models applied to examine impacts of fiscal policies

<sup>4</sup>Since the concern of the study pertains to the short run and Cholesky Decomposition or recursive structure is the most suitable technique though with some limitations.

<sup>5</sup>'K' being equal to number of endogenous variables so we need to incorporate  $6(6-1)/2 = 15$  restrictions. As can be seen all these restrictions have been imposed on matrix A where all the upper diagonal elements are restricted to zero.

<sup>6</sup>The zero's in the upper diagonal of matrix A represent the restrictions on the different variables.

<sup>7</sup>The ordering of variables in the VAR models is an area of continues contestations. For more insights readers can refer to Tenhofen et al. (2010) and Haug et al. (2019).

<sup>8</sup>The lag length has been 3 based on AIC and SIC criterion.

<sup>9</sup>Fiscal Consolidation is taken as reduction in fiscal deficits due to a reduction in government spending. Although consolidation can also be interpreted as expenditure switching rather than expenditure compression. However, we have deliberately made use of expenditure compression approach as has been the case in Indian economy.



<sup>10</sup>Unfortunately, the results portrayed are statistically insignificant.

<sup>11</sup>For further insights regarding the crowding-in debate in Indian economy, readers may refer to Mundle et al. (2011).

<sup>12</sup>This however needs to be bring to the attention of the readers that the inflation in present study is proxied by GDP deflator giving an overall measure of prices in the economy. In case of CPI the results may have the potential to reverse.

## Appendix

**Table A1** Reporting unit root test results

| <i>Variables</i> | <i>t-statistics</i> |           | <i>P-value</i> |           | <i>Deterministic</i> |
|------------------|---------------------|-----------|----------------|-----------|----------------------|
|                  | <i>ADF</i>          | <i>PP</i> | <i>ADF</i>     | <i>PP</i> |                      |
| GDP              | 3.69                | 3.70      | 0.03           | 0.03      | Trend & intercept    |
| PLR              | 4.29                | 3.86      | 0.00           | 0.02      | Trend & intercept    |
| PCE              | 3.94                | 3.28      | 0.01           | 0.07      | Trend & intercept    |
| PINV             | 4.14                | 3.44      | 0.01           | 0.05      | Trend & intercept    |
| Inflation        | 4.30                | 3.77      | 0.00           | 0.02      | Trend & intercept    |
| TE               | 3.55                | 3.12      | 0.04           | 0.05      | Trend & intercept    |
| GFD              | 4.25                | 3.76      | 0.01           | 0.02      | Trend & intercept    |

All the t-statistics are in absolute values.

*Source:* Calculated by Author

**Table A2** Effects of fiscal shocks on macroeconomic variables under alternative monetary regimes

| <i>Macroeconomic variables</i> | <i>Impact of shock</i> | <i>Shock-I</i> | <i>Shock-II</i> | <i>Shock-III</i> |
|--------------------------------|------------------------|----------------|-----------------|------------------|
| PLR                            | Immediate              | 0.04           | 0.04            | 0.0009           |
|                                | Four quarter after     | 0.12           | 0.12            | 0.0005           |
|                                | Eight quarters         | 0.14           | 0.14            | 0.0004           |
| PINV                           | Immediate              | 0.13           | -0.04           | 0.0001           |
|                                | Four quarter after     | 0.40           | 0.03            | 0.0008           |
|                                | Eight quarters         | 0.38           | 0.10            | 0.0008           |
| PCE                            | Immediate              | 0.06           | 0.12            | 0.0000           |
|                                | Four quarter after     | 0.29           | 0.29            | 0.0006           |
|                                | Eight quarters         | 0.34           | 0.34            | 0.0007           |
| GDP                            | Immediate              | 0.05           | 0.02            | 0.0000           |
|                                | Four quarter after     | 0.28           | 0.06            | 0.0006           |
|                                | Eight quarters         | 0.35           | 0.09            | 0.0007           |
| GFD                            | Immediate              | 0.94           | 0.06            | 0.0019           |
|                                | Four quarter after     | 0.42           | 0.11            | 0.0009           |
|                                | Eight quarters         | 0.32           | 0.12            | 0.0008           |

**Table A2** Effects of fiscal shocks on macroeconomic variables under alternative monetary regimes (continued)

| <i>Macroeconomic variables</i> | <i>Impact of shock</i> | <i>Shock-I</i> | <i>Shock-II</i> | <i>Shock-III</i> |
|--------------------------------|------------------------|----------------|-----------------|------------------|
| Deflator                       | Immediate              | 0.01           | 0.01            | 0.0100           |
|                                | Four quarter after     | 0.09           | 0.05            | 0.1000           |
|                                | Eight quarters         | 0.08           | 0.05            | 0.1100           |

*Source:* Calculated by authors

**Table A3** Variance decomposition analysis

| <i>Variables</i> | <i>Horizon</i> | <i>Interest rate shock</i> | <i>Spending shock</i> |
|------------------|----------------|----------------------------|-----------------------|
| GDP              | 1              | 4.21                       | 0.55                  |
|                  | 4              | 5.00                       | 1.21                  |
|                  | 8              | 5.59                       | 5.05                  |
|                  | 12             | 6.01                       | 9.50                  |
| P. Investment    | 1              | 0.02                       | 1.56                  |
|                  | 4              | 0.05                       | 17.80                 |
|                  | 8              | 1.23                       | 30.00                 |
|                  | 12             | 3.06                       | 34.57                 |
| PCE              | 1              | 0.77                       | 1.49                  |
|                  | 4              | 1.15                       | 9.71                  |
|                  | 8              | 2.43                       | 20.16                 |
|                  | 12             | 3.74                       | 26.14                 |
| Inflation        | 1              | 1.10                       | 7.88                  |
|                  | 4              | 0.59                       | 16.11                 |
|                  | 8              | 1.62                       | 20.77                 |
|                  | 12             | 2.58                       | 22.91                 |
| Interest rate    | 1              | 69.08                      | 4.20                  |
|                  | 4              | 53.66                      | 9.26                  |
|                  | 8              | 45.91                      | 12.30                 |
|                  | 12             | 40.18                      | 19.53                 |
| Fiscal deficits  | 1              | 1.02                       | 94.00                 |
|                  | 4              | 5.10                       | 82.12                 |
|                  | 8              | 9.66                       | 74.36                 |
|                  | 12             | 17.35                      | 68.21                 |

*Source:* Calculated by authors